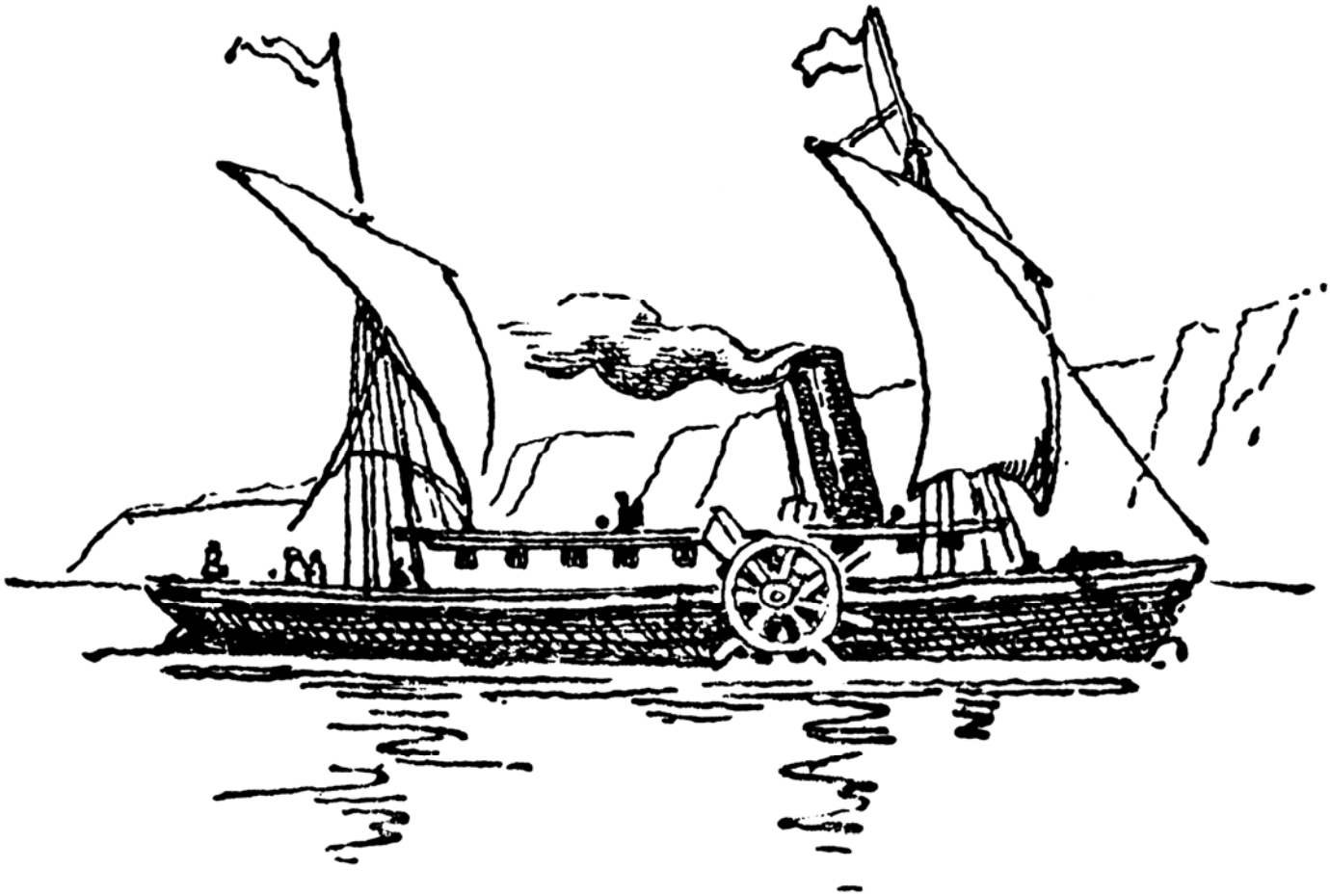
DISPLACED

Survival and Rebirth

by Phillip McGregor



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SURVIVAL AND REBIRTH

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Dedication:
These rules are dedicated to the memory of my father, Bevan George McGregor (1913-1999) who never really understood what it was I did in my weekends and much of my spare time (a lot of it sitting before a computer screen, which he didn't really understand either) for the last 30 years or so, but was always supportive of whatever it was I did. A great father and a really nice guy. I miss you a lot.

Contents

DISPLACED

THERE'S NO RETURN!

As mentioned in the introductory chapter to *Displaced: Lost in Time and Space* a fairly common trope in Science Fiction (and Fantasy) is the idea of a person or group of people somehow being transported to another time and place, perhaps recognisably the past or an alternate version of the past (or present) or a completely *different* time and place, perhaps a recognisably alien (but habitable) planet.

Variants of the basic premise include scenarios where the displacement is to a possible future, usually one where some disaster, whether natural or man-made doesn't matter, has knocked humanity down the rungs to a lower, more primitive, state ... and, in a pinch, also include scenarios set in the relatively immediate aftermath of such a disaster.

Such storylines seem to be perennial favourites and, in recent years, have had a big impact on the SF community – especially due to the efforts of writers like Harry Turtledove, S M Stirling and Eric Flint. There have been *some* attempts to translate the trope, and some of these stories, into role-playing backgrounds – but none have been (or have been *allowed* to be) particularly successful for a variety of reasons.

WHERE *DISPLACED* FITS

Displaced is intended to help make the trope workable in role-playing campaign terms.

Depending on your desire you should be able to use the material presented in the three Core Books as the basis for recasting campaigns that were created using previously available games in a believable and workable way *regardless of what game system they utilise.*

Alternatively, you will be able to use the material provided to create your own *Displaced* campaign based entirely on your own ideas (or using elements of published fiction) and your own favourite role playing rules.

IMMEDIATE PLANS

Finally, there will be a series of follow-on products for ***Displaced*** which will provide the essential historical background material for recreating the milieu covered (which will, of course, be usable as a stand alone Historical Sourcebook for a purely historical role playing campaign if that is what you prefer), a suggested campaign setting and background for a *Displaced* campaign **and** a complete role playing system (currently versions for the ***Action! System*** from Gold Rush Games and Politically Incorrect Games' ***Impresa/Impresa Express*** are planned as stand alone systems [since the rules are *Open License*, more or less], as well as the necessary information to allow BTRC's ***EABA*** to be used in conjunction with the background are planned).

The initial follow-on Sourcebooks are expected to include –

- ***This War without Enemies:*** A 17th century setting that specifically covers the period of the *English Civil War* and the *Commonwealth* but which will also provide enough background to set a campaign in the *Thirty Years War* or, indeed, any part of or period during the century.

The setting will, of course, allow GMs and players to more effectively recreate the background of a popular series of Alternate History stories set in this period than currently available product does – or, at the very least, provide the detailed historical and socio-political background information that is simply ***not*** *provided therein* ***if*** *you already have said product.*

- ***Road to Armageddon:*** An updated version with stand-alone rules of PGD's first product. *RtA* is a post-apocalyptic setting in a far future where soldiers from the last known (to them) world-spanning war are to be pitted against an inhuman enemy in a conflict in which their can be ***no surrender***, only extermination.

A lot of the material in ***Displaced*** *was originally part of* ***Road to Armageddon*** *and its unpublished predecessor(s) and will, of course, be stripped out of the new product for that reason.*

There is, however, a ***lot*** *of campaign specific additional material in the "old" (currently available) version of the campaign (available from RPGNow, DrivethroughRPG or, eventually, OneBookShelf) which will appear only in the new version rather than in* ***Displaced****.*

The order in which these will be produced is not set in stone at the time of writing, though, given that ***RtA*** needs mostly to be *rewritten* and given a layout makeover while ***This War without Enemies*** needs to be written from scratch, it is perhaps more likely that *RtA* will be the first.

FURTHER DOWN THE TRACK

After ***RtA*** and ***This War without Enemies*** are complete, the intention is to work on the following products ... hopefully at the rate of *at least* one per year.

The actual order of appearance for the next two products is even less certain than for the previous pair of products as both of them have had substantial work put into them but *also* have substantial amounts of work that still has to be done, in more or less the same ratio for each.

- ***Pax Romana:*** A setting for the world of classical Rome, from the Later Republic to the Later Empire (say the 2nd-3rd centuries BC to the 5th century AD or so), with the historical, political, military and socio-cultural background needed to create a *Displaced* or purely historical campaign anywhere during that period.

*Depending on the size of the finished product **Pax Romana** may also include material on the Eastern Empire from the collapse of the Western Empire (c. 476 AD) to the fall of Constantinople to the Ottoman Turks in 1453 AD. If the combined project is too large, then **Basileus and Autokrator** will be a separate project.*

*Specific campaign settings will include **Lifting the Veil: Apocalypse** for the First Jewish War (AD 66-73) against Rome and, perhaps, **Son of the Star** for the period of the Second Jewish War (AD 132–135) as well as **Delenda est Carthago** about the Third Punic War (149-146 BC) and **Artorius Imperator** set in the final years of the western empire (the middle of the 5th century AD).*

*Late Eastern Empire settings will possibly include **Far Byzantium** (between the Battles of **Manzikert** [AD 1071] and **Myriokephalon** [AD 1176) and **The Last Emperor** set during the final siege of Constantinople in AD 1453.*

*Some of these will be included as part of the **Pax Romana** and/or **Basileus and Autokrator** sourcebooks, but others will probably be stand alone supplements.*

- ***The Spanish Lady:*** Will be set in a completely alternate history ... a pulpish timeline set in the 1920's and 1930's in a world where the Spanish Influenza of 1918 occurs later and was orders of magnitude worse than it was historically, a world where the Russian Republic survived the Bolshevik crisis, Germany fell into communist revolution and a reactionary USA faces off against the British Commonwealth and a League of Nations with power even the modern UN would envy.

*The background will be available as a stand alone pulp-era campaign **or** as one in which a displaced campaign can be set just as easily.*

Even further down the track there are plans for an expanded version of ***Orbis Mundi*** as the basis for a complete historical sourcebook for a *real* medieval world and, of course, for a *Displaced* setting in the middle ages as well as a stand-alone historical medieval campaign ... and other more nebulous plans involving possible east asian backgrounds.

WHY *DISPLACED?*

Why does this product exist? Well, simply my discovery of *Lord Kalvan of Otherwhen* (H Beam Piper) and *Lest Darkness Fall* (L Sprague de Camp) several years earlier (Harry Turtledove wasn't the only person to be inspired into a career in history by reading the latter!) in the late 1960's followed by the discovery of *Dungeons and Dragons* in 1974 and *Empire of the Petal Throne* in 1975.

The fiction inspired my interest in all things historical while the whole idea of role playing offered a way of using that historical knowledge in fun and interesting ways ... for entertainment as much as just being part of my job.

The result has been that, over the last 30 plus years the most successful role-playing campaigns that I have run at my local gaming group have been based on alternate history to some degree or another ... not always *displaced* based backgrounds, but timelines where history as *we* know it has gone *significantly* differently.

Part of the reason for their success is that I have found over the years that most role players are interested in history – interested enough to try and track down advantages in what they know and how it can be applied to the campaigns they play in.

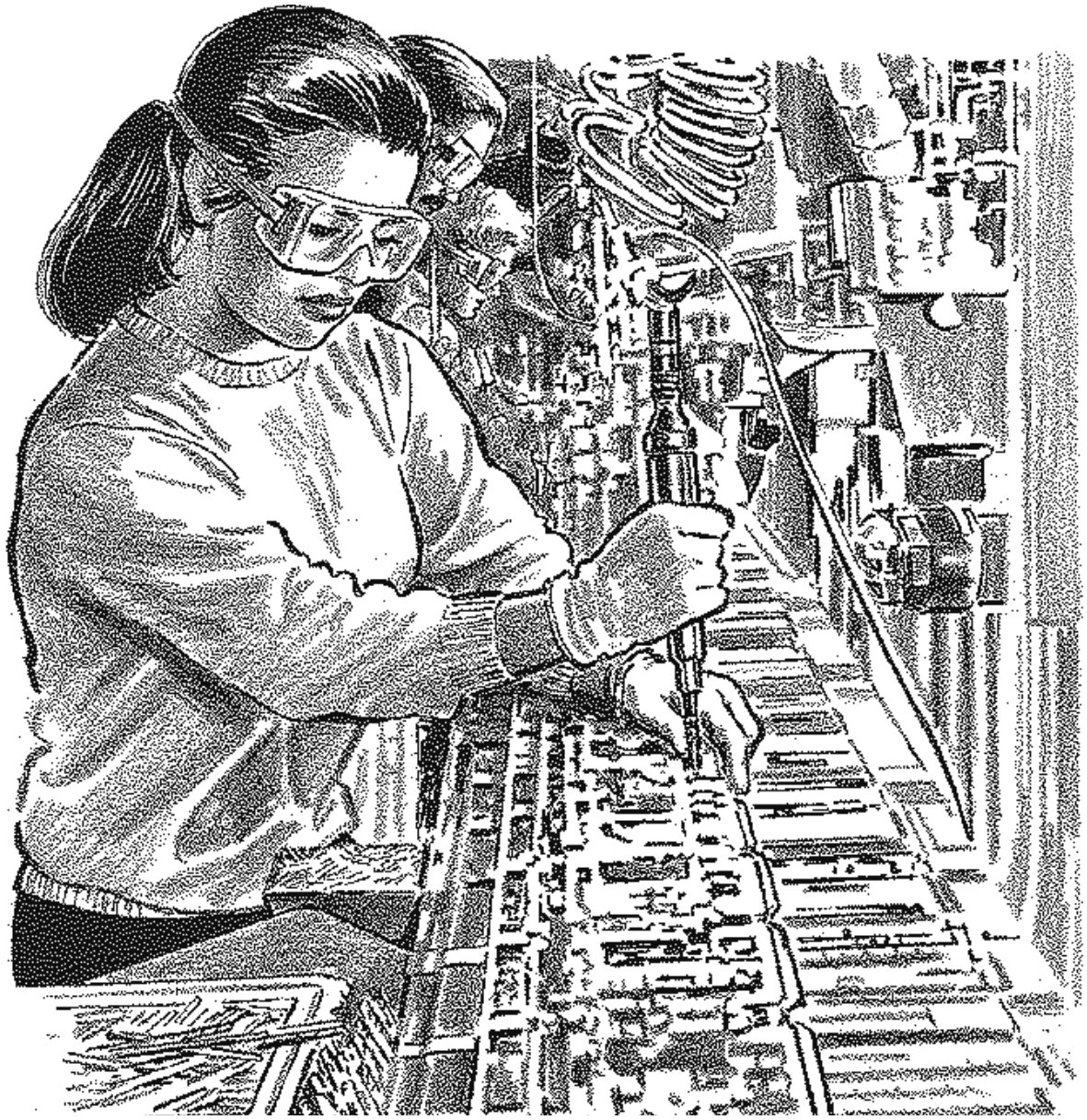
This *can* be a good thing – but, as with all human endeavours, players often took great pleasure in using the information to their own personal benefit, sometimes to the detriment of the game.

The good thing is, if you present a decently thought through alternate history, this short circuits most (if not all) of the "but it didn't work that way in the real world" sort of arguments yet *also* enabled the players to become immersed in what they *did* know and what they *yet* had to discover.

Hence, eventually, the *Armageddon* campaign which was rebadged as *Road to Armageddon* to avoid legal disputes (even though the game was available under that name long before another game of the same name appeared anywhere) and, finally, I decided to distill the essence of *that* campaign background into a stand alone campaign idea.

– Phillip McGregor (December 2006)

Survival Margins



"The more we exploit nature, The more our options are reduced, until we have only one: to fight for survival."
– Morris K. Udall

"It is not the strongest of the species that survives,nor the most intelligent that survives. It is the one that is the most adaptable to change."
– Charles Darwin

"Let every nation know, whether it wishes us well or ill, we shall pay any price, bear any burden, meet any hardship, support any friend, oppose any foe, to assure the survival and success of liberty."
– John F Kennedy, 35th US President

"Although prepared for martyrdom, I preferred that it be postponed."
– Winston Churchill, UK Prime Minister

The Basics
Logistics, Logistics, Logistics

Once you've been *displaced*, the fun has only just begun – as GM you will need to be aware (and make the *players* aware) that all is not a bed of roses, even if they have been displaced with more than just the clothes on their backs and the contents of their pockets.

In short, we need to discuss *logistics* (or, if you prefer, *supply*).

Remember the old military aphorism – *amateurs discuss strategy*, *professionals discuss logistics*, as it is entirely relevant to the situation!

Basics: Food

A normal human requires between two and 25 liters of water per day for survival (depending on the ambient temperature, humidity, and physical activity) plus food intake of 2000 calories for bare survival up through 3000-3500 calories for heavy physical labour.

This doesn't take into account any needs beyond bare survival.

Army Estimates

US Armed forces estimates calculate that the *average* consumption for *all types* of supplies is around 63-65 kilos per person per day.

Of this, about 25 kilos is for POL (*Petrol, Oil and Lubricants* – not *all* of which will be fuel for vehicles).

A further 14 kilos is ammo, leaving only 26 kilos for everything else (food, clothing, tools and spares, weapons and 6 kilos of water).

Doesn't sound like much?

Think of it this way, *one person* requires 7300 kilos of supplies and 2190 kilos of water per year, excluding ammunition and POL (Petroleum, Oil, Lubricants).

Almost *ten metric tons. Per person* – and that's the *bare minimum*.

Some fuel and ammunition will be needed, but not on the lavish scale used by the US army, and the supply requirements assume that all that is being done, in a sense, is *consumption* – the *displaced* will also need raw materials for any *production* they intend.

That's all *on top of* the 9490 kilos of bare subsistence!

Needs vs Wants

The characters in your *Displaced* campaign will want access to most or all of these things over the course of the campaign (though whether they truly *need* some of them will be situationally dependent).

Some of the items will be naturally available from the local *here and now* resources of the time and place to which they have been *displaced*, but others will have to come from "uptime" stocks, or be produced using "uptime" equipment or knowledge.

Some desirable items may not be reproducible with local technology, and, while there *may* be an acceptable local substitutes, the situation may be that, once the uptime supplies are used up, they are *gone*.

Often the players will be put in a position that what they want is simply not available as someone higher up the chain of command has decided ***they*** *don't need it.*

They'll have to manage with limited availability of ***uptime****, as opposed to local* ***here and now****, resources.*

Agriculture

OK. We know, more or less, that around 2 kilos per day of concentrated rations at *modern* rates or around 3 kilos of "fresh" rations are required. Around 730-1095 kilos per person per year.

Where does it come from?

Unless you live in a rural community, you buy the great bulk of your food *from a store*.

If you have a suburban quarter acre block you *might* have a vegetable garden or fruit tree or two, but you certainly won't be producing enough to feed *one* person, let alone a whole family.

Apartment dwellers?

They'll probably have little or nothing else – unless they have, as some European countries do, small allotments of land provided by local government for people who want to raise flowers – or veggies.

And that assumes that their allotments are *displaced* along with them – not very likely!

People in rural or semi-rural areas are somewhat more

likely to have a vegetable garden, but even active farmers most likely buy the bulk of their food from the local store.

Any unprocessed materials will require preparation before they can be consumed.

How much is on Hand?
That's really the $64,000 question, isn't it? And there is no easy answer beyond *"it depends."*

The biggest factor will be the actual *area or locale* that is *displaced*.

However, it is unlikely that more than the local retail stores with, if you are really lucky, a small wholesaler, will be *displaced*.

The local retailers? A week to two weeks supplies.

The small wholesaler? Well, it probably served a much larger area than is actually *displaced*, so it could well have a couple of months worth of supplies for the actual amount of people transported.

Most operations in the supply chain operate on "just in time" inventory and don't have a much slack and the number of small regional suppliers is declining year by year as transport makes delivering supplies from large centralised warehouses and producers more efficient.

A bit of GM finagling and you can claim that a big *regional* wholesaler "just happens" to have set up operations locally, and, for the *displaced* population this may mean that there is anywhere from six months to a year, perhaps more, worth of supplies.

Or maybe there's a military base that "just happens" to be a major logistics hub that stores large amounts of MREs etc, with the same amount of capacity as a large regional supplier.

But how likely is that?

Down on the Farm

Of course, if the *displaced* area is wholly or partly *rural*, then the situation is *potentially* different. How *much* different depends on the time of the year.

If it is close to harvest *and* the destination area and climate are in sync (or close enough to being so) with that, then the food problem is mostly solved.

With the proviso that mechanised harvesting and processing will require *large* inputs of fuel – and that becomes problematic.

You could, generously, assume that any farms have enough fuel on hand to harvest their crops *this year*.

Non-mechanised harvesting may be difficult, depending on availability of labour and "primitive" tools.

If the harvest is already in, then the key factor will be whether (or how much of) it has been transported away from local storage facilities.

There will probably be more than sufficient to feed even a rural township until next year's crops can be sown and harvested.

The worst possible time for a rural area to be *displaced* would be after the harvest has been substantially transported elsewhere for processing and before the new crops have been sown.

At this point, a rural community is likely to be only a little better off than an urban community – though there will most likely be seed grain available *and* it may be possible to use *some* of this for food (given that a smaller population needs to be supported by farms, and, therefore, less seed grain is going to be needed).

*It would be best if the GM didn't **displace** a farming community whose crops are are out of sync with the local conditions.*

*If you do, at least **part** of the crop **will** be lost and the **locals** won't have much extra food. **Mass starvation** is likely – either for the **displaced** or for the locals whose food they will **have** to try and steal) – unless they have transport to bring it in from elsewhere.*

Local Production

This depends on the time period. For most of recorded history, to around 1000 AD, a return of 3-4 kilos of grain per kilo of seed was expected.

Technical developments around 1000 AD boosted this to 4 kilos return, and from 1200 AD, to 5 kilos.

This was almost doubled from classical levels to around 7 kilos return around 1600 AD and, then, to 10 kilos return around 1700 AD.

*But these are **averages**. Certainly for the earlier period.*

*There were atypical areas that **always** exceeded the averages – Egypt, with its regular flooding of the Nile, for one; Sumeria (modern day Iraq), before the collapse of irrigation agriculture in early classical times.*

*Yields in Asia, once wetland rice cultivation was adopted, do not follow (and far exceed) these averages. For more detailed, information, PGD's **Farm, Forge and Steam**)*

*What is especially interesting is that those farmers who had access to a modicum of capital **and** a tradition of literate record keeping routinely **doubled** the base yields*

Yields vs Farmland Table			
Era	**Total Yield**	**Usable Surplus**	**Support Ratio**
Before AD 1000	225	150	0.5
AD 1000	300	225	0.75
AD 1200	375	300	1.0
AD 1600	525	450	1.5
AD 1700	750	675	2.25
AD 1950	1500	1425	4.75
AD 2000	3000	2925	9.75
Total Yield: *Expected average yield in kilos/hectare* ***Usable Surplus:*** *Total Yield minus 75 kilos (seed grain)* ***Support Ratio:*** *per hectare/year @ 300 kilos each.*			

for periods where we have reliable records.

Yields vs. Farmland

The table opposite indicates the expected average yields and surpluses for a hectare of *average* farmland for all periods up to the present.

Note: *It is thought that* ***crop density*** *was* ***considerably*** *lower than in modern times (reliable records only exist from the 16th century), but the only thing that is certain is that it took more than 2 hectares to provide the grain requirements of a single person in these periods, which is indicative.*

Labour vs Yields

For most of recorded history, certainly for the period up to the later middle ages (the *AD 1200* line for the ***Yields vs Farmland*** *Table*, opposite), the lack of any sophisticated machinery meant farming was a labour intensive pursuit.

In Classical times (the *Before AD 1000* line), about 10 in 11 people were fully occupied in farming and directly related pursuits.

By AD 1200 this had improved to around 9 in 10, but food surpluses were affected by the need for fodder for the working animals that assisted those farmers.

Only with improved farming technology from the 1600s, and especially from the 1700s, does this change – and the really *big* changes occur only with mechanisation only in the late 19th and 20th centuries.

The change from working animals, competing with humans for food, and machines, which run on coal or oil, was also a factor in increasing surpluses.

Assume a small ***rural*** *town of 1000 people are* ***displaced****.*

*If they are displaced to classical times (****Before AD 1000****) they will require the exclusive food output of 2000 (2km²) hectares of average farmland to support* ***for themselves alone*** *(at pre-modern dietary levels,* ***double*** *that (4km²), at least, for modern dietary levels!).*

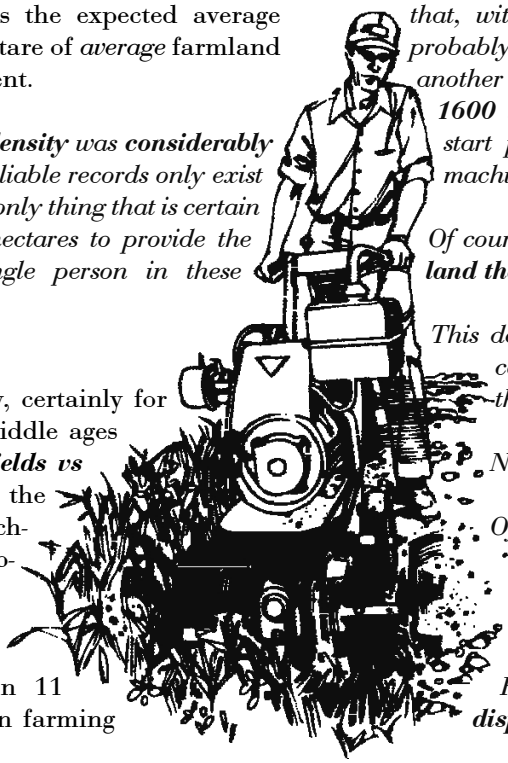
But what about the labour needed to work that land?

That's ***another*** *10000 people. And* ***another*** *20000 hectares (20km²) – 20000 people and 40000 hectares (40km²) for modern dietary levels.*

And that doesn't allow for the non-farming specialists the locals would require to service their needs.

Of course, it should be easy enough (for a ***displaced*** *rural community) to* ***double*** *those basic yields – raising the locals to the* ***AD 1000 line*** *– probably within a year.*

For each year or so thereafter it is reasonable to assume that, with average success the ***displaced*** *can probably boost the productivity of the land by another line on the table – to at least the* ***AD 1600 line****, at which point they will have to start providing some advanced agricultural machinery to go any further.*



Of course, this begs the question of ***how much land the displaced can effect****.*

This depends on politics and their ability to convince farmers to ***risk their lives*** *on (to them) untried new-fangled ideas.*

Not an easy task.

Of course, after a year or two of improved yields, well, farmers are ***not*** *stupid – just risk averse –* ***proof*** *of these "new" ideas will be established*

How about a light industrial complex ***displaced*** *to classical times.*

What farming experience do these probable suburbanites have?

Which makes their chances of improving local crop yields (in the short term at least) problematic.

Basics: Energy

A modern society is different from its pre-modern counterparts especially in the amount of energy it requires and consumes.

Until a little over 250 years ago human societies only

had three basic sources of power – muscle (human or animal), wind and water.

Then came the steam engine and then the internal combustion engine. More modern developments tend to be based on mass scale engineering projects utilising one of these old or new forms of energy.

For example, hydroelectric power plants are really mass scale waterwheels and coal burning (or nuclear fission or fusion) thermal power plants are just giant steam engines.

*Even wind turbines are only giant windmills. Silicon solar power panels are the **one** new wrinkle.*

Army Estimates

As indicated elsewhere, the US Army estimates an *average* requirement of 25 kilos of POL (mostly for vehicles) per person per day.

This figure is for a mechanised army and will be way too high for normal everyday civilian use – and won't be sustainable in any likely ***displaced*** situation.

Energy Sources

There are two basic types of energy sources – static ones and mobile ones.

- ***Static*** energy sources are those that are too large or too fragile (or *both* too large *and* too fragile) to be moved.

- ***Mobile*** energy sources are normally those that are designed to be moved and *often* move themselves as well as generate power.

Static Energy sources

These will normally arrive with the ***displaced*** – perhaps an emergency back-up generators or the regular power plant for a small, but remote, community.

Where they they do *not* arrive with the ***displaced*** they may be constructed *by* them as replacement or supplemental power sources.

Backup Generators

For reasons of efficiency and cost most facilities that warrant a backup power supply use diesels.

The capacity of such generators will vary – those installed in at a high value facility will have the capacity to power it fully and then some.

Those installed at a lower value facility will keep only critical functions operating at full capacity.

*Emergency generators are for **emergencies**. They are **not** intended to provide full baseline load 24/7. At best they are rated to operate for 8-12 hours a day, which is **usually** the amount of fuel they have.*

24/7 Static Generator Fuel Requirements

Generator Type	Consumption
Early Steam	2.25 C
Improved Steam	1.0 C
HP Steam	0.1 C
Basic Diesel	0.1 D
Improved Diesel	0.09 D
Fuel Consumption: kg/kw (kilos per kilowatt) per hour (coal) or liters/kw per hour (diesel)	

Using such generators for more than this period or for more than five or six days in any seven day period is guaranteed to result in breakdown.

The upside is that they are generally cheaper to buy and are also small enough and simple enough to be repairable with fairly basic power tools.

The downside is that fuel consumption is higher than a 24/7 rated generator or the same general type, making them less economic for long term running.

24/7 Generators

Generators capable of 24/7 operation are *much* more expensive to purchase than emergency units, though they are less expensive to run (requiring less non-renewable fuel and less maintenance).

They may come in many forms – for small facilities or towns this will normally be diesel, steam (coal or natural gas fired), or hydro-electric.

For larger towns and facilities it will probably be steam (most likely coal fired) or hydro power.

*Such generators are generally so large and complex that once stocks of critical spares are exhausted it is unlikely that **displaced** resources will be able to repair them.*

How long is it likely to be before critical systems failures renders them useless?

That will depend on many factors – it may be anywhere from a couple of months to a year or two, but probably no more than that.

This is probably best handled as a GM decision, but it could be the source of some roleplaying possibilities with the player characters struggling to keep a balky and

ageing power plant working for as long as possible.

*It doesn't make much difference what **type** of generator is involved, unless it is something really exotic – the major problem is **not** fuel but how long before it will finally and irreparably break down.*

The table opposite gives some rule of thumb figures for a 24/7 generators which will enabling you to figure how long on-hand fuel will last.

*Once on-hand fuel has run out, then availability (and **quantity**) of alternative fuels **is** –as is the capacity to **transport** fuel **to** the generators).*

As an example: a 1 Mw improved diesel generator burns through 90 liters of diesel fuel per hour.

2160 liters per day.

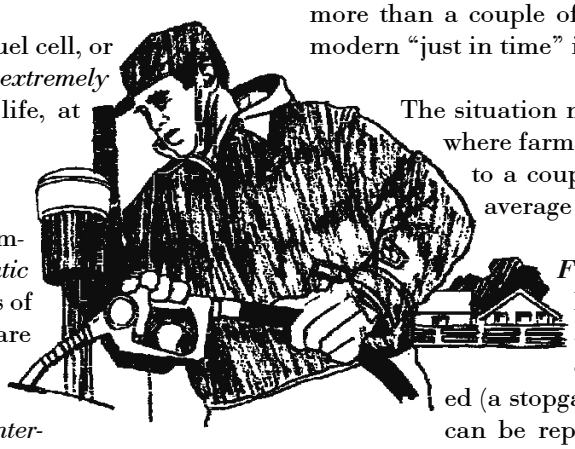
15120 liters per week.

60480 liters per nominal 28 day month (say 60 tons of bunkerage).

Mobile Energy sources

These are basically going to be those installed in vehicles – and will, overwhelmingly, be internal combustion or diesels, or variations.

Exotics such as solar electric, fuel cell, or even steam, are going to be *extremely* rare, just as they are in real life, at least in ground vehicles.



Maintenance Issues

Since vehicular units are normally simpler than most *static* backup generators, the chances of being able to manufacture spare parts is somewhat better.

Paradoxically, the older the internal combustion engine is, the longer it is likely to last and the more likely it is that it will be repairable when it breaks down.

*More modern engines rely on integrated circuits to operate and, obviously, if **this** is what breaks down **and** there are no **spares** for that particular IC, then it **may** be irreparable.*

*Such engines may be **extremely** difficult (and expensive) to convert to a basic mode of operation (providing for lots of necessity-driven role playing !).*

*Given the likely lack of manufacturing resources the **displaced** community may have to remanufacture them out of necessity in order to use the fuels available.*

*Diesel engines, being simpler, are less likely to have this problem **or** are simpler to convert.*

Energy Issues

Two important issues that a GM must consider –

- For those generators and engines that have a non-renewable fuel source (coal, natural gas, diesel, petrol or even nuclear fuel rods), *where will the fuel come from?*
- How can existing generators and engines be maintained and new ones constructed given limited manufacturing resources?

Standard Fuels

Depending on the circumstances, the *displaced* community may have stocks of standard fuels on hand

- petroleum based (petrol, diesel, bunker oils, aviation fuels, kerosene etc.), LPG (liquefied petroleum gas) and solid fuels (coal, charcoal, and wood).

As with food, suburban gas stations rarely have more than a few days to a week's supply on hand, as does each facility in each step upwards in the supply chain.

Even at the refinery level, it would be unusual to have more than a couple of weeks supply stockpiled with modern "just in time" inventory control.

The situation may be different in rural areas where farms *may* have stockpiles of a week to a couple of weeks' worth, unlike the average suburban home.

Fuel Sources

Leaving aside how much is actually on hand you need to consider how it can be rationed (a stopgap measure at best) and how it can be replaced. There are two possible sources for replacement fuels –

- Mining or refining standard fuels
- Sourcing alternative fuels.

Sourcing Standard Fuels

Standard fuels, with the exception of some types of coal, are rarely found in a form which is useful in generators or engines without some form of processing.

Accessing the raw fuels usually requires substantial investment in *extraction* as well – both in terms of labour and equipment – and how likely is it that the equipment needed for these processes will be easily or readily available in a *displaced* situation.

Petrochemical Fuels

The earliest use of petrochemical fuels goes back to biblical times and earlier, with ancient Near Eastern civilisations using natural oil bubbling to the surface.

This was sometimes used as fuel, but, more often, was used as asphalt for paving roads or sealing pottery.

Some refining of crude oil *was* done, but it wasn't used for heating or lighting fuel – it seems to have been limited use in warfare (the Byzantines *probably* used distilled petroleum in *Greek Fire*).

By the 19th century, demand for a clean burning fuel for high brightness lighting outstripped the supply of whale oil – coal oil was the only viable alternative.

This was distilled from coal or skimmed from pools seeping from subsurface oil bearing formations.

It wasn't until 1859 the first oil *well* was drilled in the US because of increased demand outstripping supplies gained by the earlier methods.

Availability: Petrochemical fuel availability depends on the ability of the ***displaced*** community to drill for oil – and, as importantly, to find a place to drill where there actually *is* oil, and that oil is close to the surface.

A large percentage of the oil we use today comes from wells that simply could not have been drilled with the crude early rigs of the 19th century.

Even the improved early 20th century drilling technology was unable to drill deep wells (those in Libya, for example, could not be drilled until the 1950's – which had a significant impact on the way WW2 was fought)!

*Even postwar technology was initially unable to drill undersea wells, so the **displaced** won't be!*

Drilling: Primitive drilling techniques (used as early as the 12th century AD to drill brine wells) can reach depths of at 100 meters with only a chisel, a series of connected rods and a springy sapling for power.

With steam powered (waterwheel power could be substituted in some places) improvements on this design depths of 600-1000 meters are achievable.

The downside is that the process is *slow* – an average of a meter a day, and a maximum of 3 meters.

Refining: Actually refining the crude oil into useful products is *rather* more difficult.

Modern refineries are hardly off the shelf facilities – most of the tens of thousands of tons of ironmongery is special order stuff and *way* beyond any industrial

Petroleum Product Shelf Life

All petroleum distillates – including gasoline and diesel – deteriorate over time to the point where there are unusable as fuel, though they will remain flammable.

Modern refining methods allow a greater percentage recovery of these light distillates from crude oil, but, along with governmentally mandated "environmentally friendly" additives, have greatly reduced the shelf life.

Petrochemical fuels can go "bad" to the point where it will literally gum up the engine or generator it is fuelling (increasing the chance and frequency of breakdowns) in as little as one or two weeks, and usually within a month.

*The rate of degradation can be slowed **if** proper storage procedures are followed and the fuel can be relied on to remain usable for **up to** a year.*

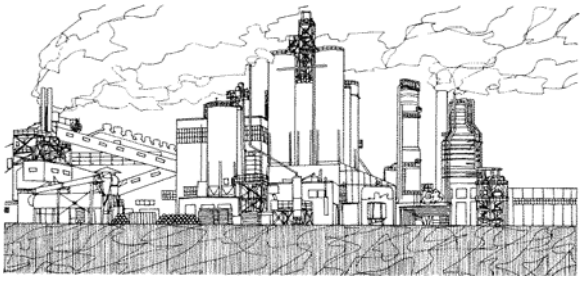
*Commercial fuel additives are available that are specifically designed to protect fuel against this degradation, and are rated to **certainly** maintain its usability for up to 10 years if used correctly, and in some cases have successfully restored 15 year old fuel to usability.*

These additives are commonly used by any industry that stores large amounts of bunker oil (used in generators and marine engines).

A liter of additive to 2000 liters of fuel every six months will prevent degradation and costs around $12 (2005).

*So, for those carefully hoarded fuel supplies – it really is a case of "use it or lose it" as **displaced** groups are unlikely to have much preservative available!*

*And making it is probably beyond their capacities. Of course, they could **re-refine** the fuel that has been "ruined" on a small scale – which may be an important option for them.*



capacity likely available in a ***displaced*** scenario.

A **barrel** of crude oil (159 liters) can be refined (using *modern* technology) into 75 liters of petrol, 35 liters of distillate (diesel) and 16 liters of jet fuel (the rest includes kerosene, lubricants, asphalt and other petroleum products in smaller quantities).

What sort of fuel production can you get using pre-modern and suboptimal technology?

*That would depend on the knowledge the **displaced** have of industrial chemistry and the amount of industry they have to produce a refinery.*

A simple Still for making moonshine could produce lighter fractions from crude oil – kerosene for sure.

*Of course the problem here is that **distilling** was a late development, so the **displaced** will have to design, build, and operate their **own** stills.*

The earliest refineries were 60% effective – 10 barrels of crude oil could be refined into 6 barrels of fuels.

*Before the introduction of catalytic cracking in the early 1920's gasoline yields were **a half** to **one third** of today's and octane ratings were low (and less reliable) – most petrol was 40-60 octane, but could be as low as 20 octane. Performance figures for 1920's and 1930's vehicles are generally based on 60 octane fuel.*

Before WW2 gasoline was, at best, 80-85 octane, and mostly still 60 octane, with experimental production of 100 Octane. The difference between 85 octane and 100 octane? 15% extra speed, range and altitude.

Coal

Coal was not widely used as a fuel until the 18th century *except* where there were surface outcroppings.

Mining was a *major* undertaking using the hand tools and manual labour available until the invention of gunpowder and steam powered machinery.

Even with gunpowder, mining was a relatively labour intensive industry – and, in the quantities needed, mining coal will be a major manpower sink if it is to be used in any quantity.

*This is an important factor in **Displaced** – most of the local labour supply is likely needed for subsistence agriculture, diverting enough manpower to mining some newfangled new fuel will be a long term project (though perhaps some mining can be done over winter?).*

Energy equivalence

Coal has around **one third** the energy per kilo a liter of gasoline does; **Coke** has around **half** the energy.

Where an engine or generator can be fuelled by either fuel, vary consumption accordingly.

***Wood** has around **one quarter** the energy content of a liter of gasoline and can be substituted for coal.*

***Charcoal** has about the same energy value as **coke** – but the exact value depends on whether it is made from hardwood (best) or softwood (energy equivalent of **coal**).*

Alternative Fuels

High tech Internal Combustion and Steam engines can be run on may sorts of fuels, not just fossil fuels (petroleum, diesel, and coal). Some of the alternative fuels are considered below.

Biodiesel

Diesel engines can be (and are) run on vegetable oil. Even on pure vegetable oil.

To do this, however, the engine needs to be specially converted (with a commercial kit *or* with the tools available in a well equipped garage or light industrial plant) and such a conversion costs around 10% of the engine cost for parts and labour.

There are *two* problems with the use of biodiesel – *availability* and *preparation.*

Availability: Vegetable (or other plant originated) oil *must* be grown on farmland that is removed from the stock available for growing food for human or animal consumption.

There will need to be a balance between food demands and fuel demands, as the two are in direct competition – which is *not* the case with fossil fuels (and which is their great advantage).

Preparation: The oil must be carefully pressed, filtered, and, depending on the type, have waxes or other "impurities" that tend to gum up the engine or fuel feed removed as well.

This is not an insuperable problem, however it would take time, ingenuity and a certain amount of "modern" tools and machines to implement.

Sources of Biodiesel

One of the advantages of fossil fuels was that they didn't compete for farmland, freeing up large tracts of

land for food production.

However, with better crop yields possible with modern technology, it would be possible to *grow* fuel –

Olive Oil: A hectare of *Olive trees* (AD 2005 line) can produce up to 3000 liters per crop – but they produce fruit only every *second year*.

A bigger downside is that it takes 15 years for an olive tree to start bearing commercially valuable fruit and 20 years to reach peak capacity, so it is not a quick fix.

*Yields for Olive trees are reduced proportionally for the **Yields vs. Farmland** Table they are dropped into the past, but they are treated as if they are **one less** line in the past than they actually are, as lower levels of mechanisation are needed to maintain yields.*

*For example, if a group is **displaced** to AD 1700 or thereabouts, the productivity of the Olive Orchards they control will be rated at AD 1950 levels when the GM determines they have had enough time to institute modernised practises there.*

Rapeseed (Canola) Oil: A hectare of *Rapeseed* (AD 2005 line) produces around 2000 kilos of seed, and around 1000 liters of oil).

Sunflower and Safflower Oil: A hectare of *Safflower* (AD 2005 line) produces an average of 2000 kilos of oilseed, and around 1000 liters of oil (50% yield).

A hectare of *Sunflower* (AD 2005 line) produces around 2500 kilos of seed, and 1250 liters of oil.

Intensive farming (irrigation and expansive use of fertilisers) can *double* yields of all three crops – but in a ***displaced*** situation this will likely be problematic.

***Note:** Residue from pressing Canola, Safflower and Sunflower seed can be pressed into a feed cake for animal consumption, (in a pinch, for human consumption) reducing competition with human food requirements.*

*Yields for all crops will be reduced proportionally to the reduction for standard grain yields for each line backwards on the **Yields vs Farmland** table.*

*The yields of **oil** from the seed produced will **also** be reduced – selective breeding has increased modern yields by at least 100% over that of the unmodified plants*

*So, before 1950, not only do you have reduced **seed** production, but reduced **oil** production from the seeds.*

*Without access to fossil fuels, these yields can never be better than the equivalent of the AD 1700 line, as growing them more efficiently than that requires the actual expenditure of **fuel** to do so.*

Oilseed Crop Yields (2005 line)

Crop Type	liters/hectare
Oil Palm	6000
Coconut Palm	2750
Jojoba	1800
Olives *	3000
Sunflower	1250
Safflower	1000
Rapeseed (Canola)	1000
Peanut Oil	1000
Linseed (Flax)	500
Soybean	400

* Olives only produce a crop every **second year**

*If you're relying entirely **on** biodiesel to do the farming at this level, then the 1700 AD line becomes an upper **net** limit for fuel oil yields from such crops.*

Fuel consumption runs around 5-25% higher for most forms of biodiesel fuel than for standard petrochemical diesel depending on the crop.

*Assume that, with the limited resources available to a **displaced** community, that it takes 5 liters of biodiesel to equal 4 liters of standard petrochemical diesel.*

Performance: The output and engine performance may also be degraded by as much as 20%, but is *mostly* within normal parameters.

This will not affect fuel consumption, but will reduce top speed and load carrying capacity by up to 20%

The game effects of increased fuel consumption and reduced performance could be used by a Game Master as a role-playing mechanism.

*The players could become involved in projects to increase the viability of the fuel processes their community is producing, involving direct use of skills they possess **or** the search for key resources for a better refining plant (or, of course, they could get involved in a search for better fuels!).*

Ethanol and Methanol

These alternative fuels are attractive because they are easy to manufacture with limited technology (though *efficient* manufacture requires more tech) *and* because diesel *and* internal combustion engines burn them.

ETHANOL

Ethanol is produced by fermentation and distillation of starchy crops – typically corn (because of its extremely high yields). Nominal yields are 5 liters per 100 kilos.

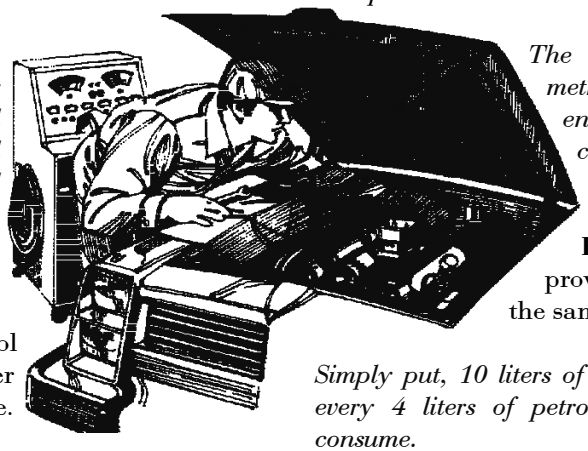
Net Ethanol Production: However, this yield depends on modern (2005 line) technologies – which use considerable fuel produce the corn in the first place.

It actually takes 60% of the gross energy value of the ethanol produced to cultivate and refine 100 kilos of corn, so the net fuel production is only 2 liters per 100 kilos of corn.

More efficient (low energy) cultivation techniques reduce fuel requirements to 25% per 100 kilos, and give net fuel production of 4 liters per 100 kilos of corn.

*Modern engines are rarely designed to run on pure ethanol (many older cars **were** built to run on ethanol through to the 1930's), and even mixtures of normal petrol with more than 10% ethanol can cause significant damage (a very few modern designs can run on ethanol petrol mixes of up to 85% ethanol), especially to the plastic and rubber fittings that feed and contain the fuel.*

Ethanol also corrodes any standard metal parts and nickel or stainless steel parts in the fuel feed system need to be changed as well. The entire fuel feed system would need to be rebuilt to avoid this problem.



Fuel Consumption: Ethanol provides only 60% of the power of the same volume of gasoline.

Simply put, 10 liters of ethanol will be required for every 6 liters of petrol an engine would normally consume.

***Note:** Diesel engines **cannot** run on pure ethanol, but it **is** possible to mix ethanol and vegetable oils as biodiesel.*

*Diesel engines not designed to run on ethanol biodiesel require **five times** normal basic maintenance (i.e. overhauls are required five times as often).*

METHANOL

While ethanol is produced mainly from fermenting and distilling starchy grains, *methanol* was distillation from cellulose as *wood alcohol.*

Methanol Production: The destructive distillation of wood for methanol production is *extremely* inefficient.

Distilling 1000 kilos of hardwood yields only 20 liters or so of methanol, and 1000 kilos of softwood yields *half* as much (10 liters).

The plus side of this method is that it is can be relatively easily started up using local charcoal burners as a basic framework for fuel production.

*Depending on locale there may be a **lot** of wood in **really vast** forests – which, if cleared, can become farmland.*

Obviously the byproduct – charcoal – is a fuel, too and could replace coal steam powered generators or engines.

One kilo of wood produces around 0.45 kilo of charcoal and charcoal has around the same fuel value per kilo as coal does.

The alternative method of producing methanol involves the use of biomass – crop residues, forage, grass, crops, wood resources, forest residues, short-rotation wood energy crops and the cellulosic components of municipal solid waste.

A ton of such biomass can produce 100 liters of methanol per day *if methanol is used to fuel the refining operation.*

The drawback of this alternative method is the complexity and expense of constructing the refinery compared to simply converting charcoal burners.

Fuel Consumption: Methanol provides only 40% of the power of the same volume of gasoline.

Simply put, 10 liters of methanol will be required for every 4 liters of petrol an engine would normally consume.

***Note:** Diesels **cannot** run on pure methanol, but it **is** possible to mix methanol and vegetable oil as biodiesel.*

*For diesel engines not **specifically** designed to run on ethanol based biodiesel maintenance requirements are approximately doubled (that is, you need to do a major overhaul twice as often and minor breakdowns are twice as frequent).*

WOOD GAS

During WW2 rationing and outright unavailability of petroleum fuels forced many to turn to alternatives – a common one was "producer gas" or "wood gas."

In parts of occupied Europe up to 95% of *all* engines that normally burnt petrofuels operated on wood gas.

The basic constituents include wood, paper, peat,

lignite, anthracite coal and coke burnt in a gasifier, which may be constructed from a galvanised metal garbage or similar cylinder.

Expedient models need major repairs or replacement after around 30,000 kilometers while purpose built units last as much as ten times the distance (around 250-300,000 kilometers).

One of the byproducts is ***carbon monoxide*** *(a colourless, odourless poison gas), and great care should be taken when operating on wood gas in a poorly ventilated space, when a vehicle is idling, or when refuelling.*

The producer unit must be cleaned every day, possibly every refuelling (softwood fuels are more problematic), and this takes 5-15 minutes for small and up to 45 minutes for large units.

About 45% by volume of the original fuel load is left as ash when the load has been consumed, though, as a bonus, this may be used as fertiliser on crops.

Fuel Consumption: A fuel consumption rate of 5 kilos of hardwood (12 kilos of softwood or paper) wood chips per liter equivalency of gasoline or diesel is achievable.

Coal and Charcoal would be expected to be around twice as efficient as wood chips, so 2.5-3 (assuming anthracite coal) kilos would be the equivalent of a liter of gasoline.

Weight of a converter unit ranged from 10% of the total unloaded vehicle upwards to as much as 20% for heavy vehicles.

Performance: Properly converted engines operate at between 50% and 70% of rated performance.

Conversions done on an expedient basis usually have the biggest performance drop, while those done with factory or workshop facilities and components tend to have the smallest.

Biomass Methane

Methane gas can be produced from manure – and the gas can fuel standard internal combustion engines. It is not the most efficient possible fuel, nor is it the safest, but it *is* doable.

Production: For cow manure, 27 kilos will produce 1.68 cubic meters of methane in around 50 days (25 days by some processes), and this 1.68 cm^3 of methane equals 1 liter of gasoline.

Different types of manure produce slightly different amounts of methane when processed, but not enough to model.

Gasoline Equivalency	
Fuel Type	**Equivalent**
Coal (kg)	0.3
Coke (kg)	0.5
Charcoal (Soft, kg)	0.3
Charcoal (Hard, kg)	0.5
Biodiesel (liter)	0.8
Ethanol (liter)	0.6
Methanol (liter)	0.4
Wood gas (Hard, kg)	0.2
Wood gas (Soft, kg)	0.083
Equivalent: *How many liters of gasoline the indicated amount of fuel equals*	

Use: Methane cannot be liquefied without expensive, purpose built, equipment and special high pressure tanks for storage and delivery, which considerably reduces performance.

Since methane is also highly explosive in small quantities, it is not an ideal survival fuel in a *displaced* scenario.

This means that, except for operations that can justify the cost of a liquification plant, Methane is best used as a fuel for stationary electric generators , where low pressure delivery does not impact on performance.

Raw Materials

Whatever the *displaced* decide to do once they've assured a basic supply of food and fuel they're going to need *raw materials.*

The key materials will be various metals and their alloys (especially iron and steel, but also copper, tin, lead and, of course, gold and silver)), but non-metals will also be important – chemicals and biochemicals (for organic and inorganic chemistry), construction materials (clay, cement and mortar, stone, wood), fiber (for rope and cloth) and much more besides.

Metals and Mining

The key material(s) any *displaced* group will need for *any* project they wish to undertake will be *metals.*

This will be primarily iron, which is pretty much ubiquitous in modern industry, but also includes copper, lead, tin, zinc and many others.

Ignoring for the moment the quantities of each type of

metal that will be required we need to consider how much is likely to be available and how much is produced locally in a *displaced* situation.

Mining Technology

For most of recorded history, the technology available for use in mining was very basic – hand tools and human muscle for the most part.

No explosives, no power tools and no high density power sources for equipment or vehicles.

This meant that the process of mining was quite different – shafts and tunnels were as small as possible, and generally followed the twists and turns of the ore body as closely as possible.

Considering that excavating them, in hard rock, was done with hand tools it is easy to understand why!

The typical shaft or tunnel was rarely high enough for the miners to stand it – and it was not uncommon for miners to have to crawl through them on their bellies.

Even hand tools were generally inadequate to the task – especially before iron and steel tools became available (and, then, became *common*), when miners had to use bronze, copper, stone or bone implements.

To make their job somewhat easier it was normal for miners to build a fire on the rock face and allow it to fracture the ore for (somewhat) easier removal.

The lack of power meant that mines had to be above the local water table *or* that some form of gravity based tunnel system had to be created to drain them.

Many of the richest ore bodies could not be comprehensively exploited because they could not be drained.

Productivity

Mines produced hundreds, possibly thousands, of tons of ore a year at best – not the hundreds of thousands or millions of tons that a modern mining operation would.

Hard data is difficult to come by, but reasonable estimates are that the Roman Empire produced less than 20,000 tons of iron a year. Likely *much* less.

Certainly, European iron production was *still* only on the order of 15-20,000 tons per year by the 17th century.

*The figures for Iron production only give **new** production – until quite recently one of the largest sources of iron was from the re-smelting of scrap!*

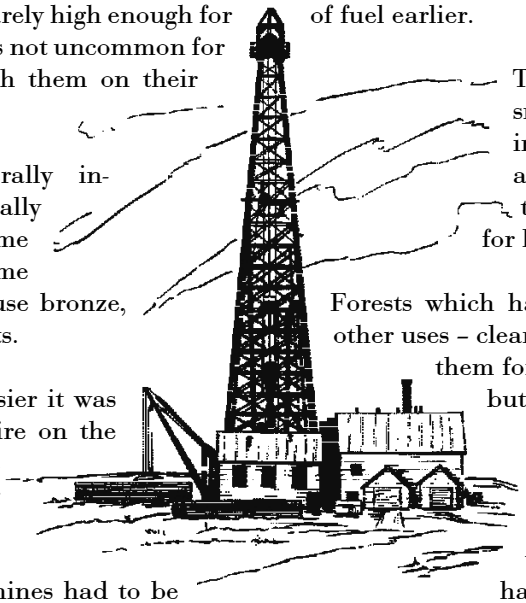
*Up to the 1970's almost 100% of the iron used in automobiles and construction was **recycled** and close to 80% of the iron in consumer appliances.*

Other metals were mined in proportionally small amounts.

During the early Bronze Age (c. 1200-1300 BC) in Europe the Alpine regions of Italy are believed to have produced around 20-30 tons of smelted copper a year – and the area was a major producer!

Smelting the Ores

Once you've mined the ores you need to smelt them to gain the metals you want – and smelting takes fuel. *Lots* of fuel. Consider the discussion of the availability of fuel earlier.



The only really suitable fuel for smelting iron (and other metals) in pre-modern times was *charcoal*, and its availability was limited by the size of the forests available for harvesting.

Forests which had heavy pressure on them for other uses – clearing for farmland and harvesting them for construction materials to name but two.

The ideal replacement for charcoal is, of course, coke – coal treated in much the same way wood is to produce charcoal. It has the advantage that it does not compete with farmland and can be mined in larger quantities than forests can be.

The obvious *problem* with coal/coke is that it must be *mined* – and all the problems noted above for mining.

*Mining Coal is also **dangerous.** Methane tends to build up in coal structures and is **very** explosive and breathing in coal dust over extended periods of time leads to **black lung**, an inevitably fatal disease of coal miners.*

A less obvious, but equally important problem is that the coal must then be *transported* to where the iron is (or vice versa) – and, as the following section on *Transport* will indicate, this is a *major* limitation.

Before the invention of the railroad and the steam locomotive Blast Furnaces not in sea ports were idle for most of the year (between two thirds and three quarters of the time) because it took most of that time

to transport the huge quantities of fuel needed to run them for a few days.

As a result, the average furnace could only produce around 400 tons of iron at a time – hardly a major industrial enterprise *in modern terms.*

For a considerably more detailed examination of the problems faced in mining and smelting ores refer to PGD's ***Farm, Forge and Steam*** *(shameless commercial plug ☺).*

Improving output

The most obvious and immediate improvements can be gained from the introduction of blasting explosives – black powder is fairly easy to make *if* you can get access to the required raw materials in the requisite quantities. See the chicken and egg problem here?

If you *have* the sulphur, saltpeter and charcoal in the requisite quantities then you don't have a problem – but *unless you already* ***have*** *gunpowder*, then there's no ***need*** for any of those materials in any quantity!

Charcoal, of course, is available as a common fuel – but some types of charcoal are less suitable for making gunpowder than others.

Sulphur and Saltpeter are available, generally in small quantities, as medicinals, but there are problems, quite considerable ones, in expanding the production of either (refer to ***FF&S*** *for more detailed information).*

Of course the nature of the old-style mines with their narrow and ill-supported shafts and tunnels will probably make using blasting explosive unsafe anyway unless and until new shafts and tunnels can be blasted.

The use of simple steam engines to drain mines will mean that many previously abandoned but rich lodes will now become accessible, offering a considerable boost to production *when they come online.*

Better tools, perhaps even basic power tools, mine locomotives or powered winch and pulley systems to move the ore will also improve productivity.

However all of the above will be subject to bottlenecks in the availability of key resources – such as the metals, fuel, modern tools and transport that are the very things needed to boost productivity.

Chemicals and Oil

Most of the chemicals we rely on in the modern world are directly or indirectly the products of the petrochemical industry.

The problem that faces most *displaced* groups is that

Coal Tar Chemistry

The five major chemicals extracted from Coal Tar are – Benzene, Toluene, Phenols, Xylenes and Polynuclear Aromatic Hydrocarbons.

Benzene *was distilled from coal tar in the early 1800s and is (or has been) an important component in – polymers, resins and plastics; rubber, waxes, oils and lubricants; dyes, inks and pigments; detergents and solvents; pharmaceuticals and pesticides; and explosives.*

Toluene *has been used mainly as a component in thinners (including nail polish) and adhesives, but has also been used (or is still used) in the manufacture of – dyes, inks and pigments; detergents and solvents; gasoline additives (antifreeze and others); perfumes and cosmetics; explosives; vinyl and rubber; pharmaceuticals and artificial sweeteners.*

Phenol *(****Carbolic Acid****) is used mainly to produce phemolic resins, an intermediate stage in the production of nylon and other man-made fibres; resins, epoxies and plastics; as a germicide and fungicide (it is used in many household and commercial disinfectants).*

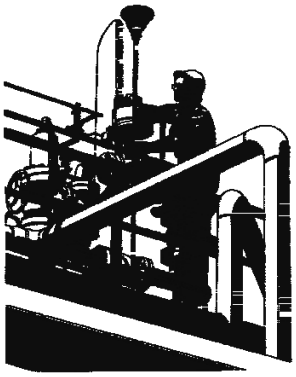
Xylene *is used in the production of solvents; dyes and pigments; perfumes and cosmetics; paint thinners; synthetic fibres, resins and plastics; coatings for paper and paper products; cleaning agents; aviation fuel additives; pharmaceuticals, pesticides and herbicides.*

Polynuclear Aromatic Hydrocarbons *are used in pharmaceuticals, dyes, plastics, and pesticides.*

All of the above are important general feedstocks in a chemical industry.

They are present in crude oil (30x more by volume than coal tar) and are essentially byproducts of the refining process.

And without them your attempts to make all sorts of vital modern chemicals will be severely hamstrung!



there *will be no petrochemical industry locally!*

Which makes it difficult – no bricks without straw, in effect – to acquire the chemicals needed without *creating* that petrochemical industry!

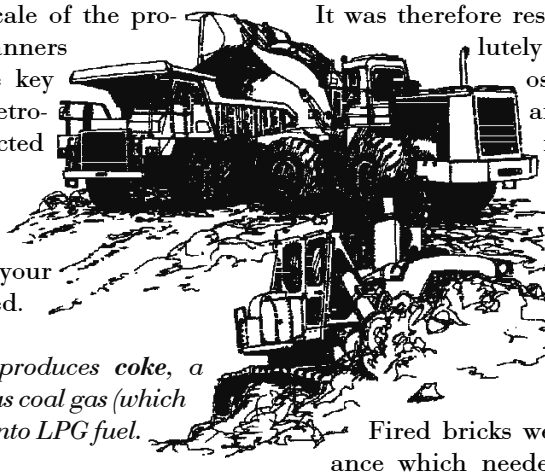
Still, there will be a small scale supply of some elements (not all of which were discovered until quite recently) and compounds for what passes for scientific (alchemical?) and "industrial" use – but it will be a *small* supply.

Tens, perhaps hundreds of tons a year for a continent the size of western Europe.

The problem for the *displaced* logisticians will be compounded by the fact that many of the chemicals that they need aren't available at all. They will need to be made – perhaps on a large scale.

The Petrochemical Industry

To give an example of the scale of the problem that the *displaced* planners will be facing, coal tars, the key element of a lot of the early petrochemical industry, are extracted from coal by distillation.



A ton of coal produces 20-35 liters of coal tar – and on that your chemical industry will be based.

The distillation process also produces ***coke****, a valuable industrial fuel as well as coal gas (which can be compressed and turned into LPG fuel.*

One possibility for savvy technological types is that coal tar can be extracted as a waste product from coal fired steam engines and industrial processes.

In effect, anti-pollution measures can produce valuable chemicals from processes that have already paid for themselves!

Crude oil is a *much* better source of chemical feedstock for a modern or semi-modern chemical industry – and is less dangerous to produce.

Crude oil is normally forced to the surface by gases trapped in the same geological structures as the oil, and all you have to do once the well is capped is to control the flow and store it.

Coal mining is a dangerous process – even in a proven facility, with methane gas explosions an issue on top of cave ins, flooding and the like.

Still, for some specific purposes (large blast furnaces, for example), coal is a necessity.

Building Materials

The main building materials used in pre-modern times were wood, stone, bricks and mortar.

The availability of wood depended on the availability of nearby forests, which, as they were also a key source of household and industrial fuel (charcoal) could be problematic, so a shortage of wood often existed and construction techniques often minimised its need.

Wood was often used only for key structural elements such as the roof-tree and the framework of a structure with the walls being made mainly from wickerwork (or similar) daubed with clay or mud which was then whitewashed to make it waterproof.

Stone was preferred for buildings of substance, especially military ones, because of its permanence – but it was difficult to mine and shape with hand tools.

It was therefore reserved for use only where it absolutely had to be – often as much for the ostentatious display of the wealth and power that its construction represented as for any other reason.

Bricks (which includes adobe or mud bricks) were also used – but not as widely as you might think because of the fuel cost (charcoal again!).

Fired bricks were used for buildings of importance which needed a degree of permanence, but where the expense of stone couldn't be justified (or where the buyer couldn't afford it).

Sun dried "mud" bricks were generally only used where there was a dearth of good wood *and* where the climate was arid or semi-arid.

Such bricks are actually moderately water resistant with the application of a dried clay coating or through being whitewashed and were generally not laid directly on the ground, but on a stone or brick foundation for further protection.

Stone and brick constructions were held together by the use of a more or less standard *lime* mortar (made by burning lime), discovered (probably by the Egyptians) around 4000 BC.

Cement was first discovered by the Romans, but was not as widely used as mortar, nor as geographically widespread in its use.

The major limitation was that it was produced from

volcanic byproducts found in and around the Bay of Naples.

It was very little used (if its secret wasn't "lost") between the fall of the Roman Empire and its "rediscovery" in the 14th century, and only became important in the 18th century.

Even so, it did not really replace lime mortar until the 1930's because of the energy intensive nature of the production process.

TRANSPORT

OK. You've found all the resources you need – but *how* do you get them to where they are *needed?* It is extremely unlikely they'll all be in the one spot.

The chances that the local transport systems, such as they may be, will be adequate to the task are, to put it mildly, not at all high.

Before the invention of high density energy systems to provide more than wind or muscle power to vehicles in the form of *engines* all that was available *were* wind or muscle powered vehicles.

Muscle power, either human or animal, has the drawback that the energy source is food – and you can't carry enough to go any significant distance before you consume more than you can carry.

In times of plenty that's not a major problem – until you start moving *really* large quantities of stuff, the quantities any sort of industrialisation will require.

You can, theoretically, buy the food and fodder along the way. In times of famine? Then you need to bring the food and fodder with you.

Wind power is, of course, limited to ships and boats. The beauty of wind is that it is essentially free once you've paid for the motive systems (masts and sails).

The limitation is, of course, that it is unpredictable in direction and strength.

Other problems include the small maximum size and capacity of all-wooden vessels (keel size is limited to that of the tallest suitable tree you can find, amongst other things) and the fact that most pre-modern sailors didn't sail far outside of land for the very good reason that navigation was all or in part by guess and by god.

Even where there were established systems of celestial (or other forms of) navigation, most mariners confined their activities to well known routes because of the difficulty of determining *exact* position until the late 18th century and the development of the chronometer.

FUEL CONSUMPTION	
Transport type	**Fuel Cost** (1)
Water	0.2 kg
Rail	0.4 kg
Road	1% of vehicle mass
Air, Conventional	2-5% of vehicle mass
Air, Helicopter	10% of vehicle mass
(1) In kilos of petroleum based fuel to move one ton of cargo 100 kilometers unless otherwise noted.	

So, as soon as possible, you're going to want to improve the transport systems, and their capacity, that are available to you.

This is where the *real* problems are going to arise.

FUEL ECONOMICS

The cheapest form of transport, even today, is *water transport*. A decent sized merchant vessel can move a ton of cargo 100 klicks on 0.2 kilos of petroleum fuel.

To move a ton of cargo by *rail* consumes about 0.4 kilos of petroleum based fuel.

If you're calculating with less efficient forms of fuel (wood, charcoal, coal or coke) then the figures will be slightly different, but those alternatives may be more easily available than petroleum fuels.

To move cargo by *road* takes 1% of the vehicle's mass (including the mass of the cargo) per 100 kilometers.

A 10 ton truck with a nominal 8 ton cargo capacity plus 2 tons of fuel (20 tons all up) could carry that cargo 1000 kilometers, one way.

This value is, however, heavily modified by terrain and the type of road that is travelled over. Proper paved highways with bridged rivers are the most efficient routes in terms of fuel usage.

To move cargo by *air* takes 2-5%, for conventional aircraft and up to 10% for helicopters.

*Obviously the transport method of choice will be **water** transport first, followed by **rail** transport. Road and air transport are luxuries and should be treated accordingly. Of course, in some circumstances, luxuries become **necessities** – especially in wartime.*

*This is one of the areas where the **displaced** will **want** to make the most of their technological edge.*

And it should always be remembered that fuel has to be

available at the terminus of the route or the operational ranges of any vehicle are halved.

Practical Limitations

In pre-modern times you need to consider key limitations other than the limited power supplies available for hauling cargo – especially the *infrastructure* involved in the transport process.

For land transport that comes down to roads and bridges. For sea and river transport it is ports, docks, unloading machinery and, perhaps, canals and locks.

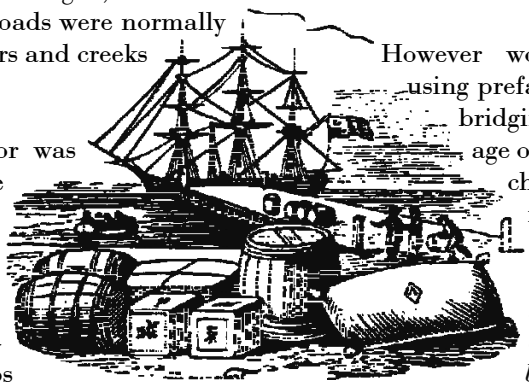
In most pre-modern eras these facilities were present in severely restricted and restricting forms.

Roads were most little better than dirt tracks, often the direct continuance of prehistoric footpaths.

Being mostly dirt, they turned into quagmires with any sort of rain at all, which *either* slows down traffic considerably *or* prevents it entirely.

Rivers and streams were rarely bridged, and were most crossed at fords – in fact, roads were normally diverted so that they crossed rivers and creeks at fords.

Where this was not possible, or was impossibly inconvenient, crude ferries might be constructed to provide transport across a significant water obstacle.



Ports were, initially, simply sheltered anchorages where ships could unload directly onto the beach or by lighters while remaining at anchor.

Even when improved by the addition of docks and wharves, unloading facilities were almost entirely based on extensive use of human stevedores with little or no mechanical assistance.

Improvements

Displaced characters will want to improve on these limits, either to enhance the capacity of the existing transport technology *or* to allow the improved technology *they* have access to to be used more efficiently.

Roads can be improved by simple, low tech, reconstruction with a properly laid road bed consisting of layers of increasing smaller stone aggregate to provide a proper all weather road.

Even dirt roads can be improved by regular grading and the use of some crushed aggregate surfacing.

If you develop a petrochemical industry you will have increased access to asphalt for properly laid road beds and, if you manage to construct a large enough cement industry, concrete roads become possible.

All of the above improvements can be made with basic pick and shovel labour and hand tools, though at considerable cost – the availability of modern technologies should reduce this considerably (e.g. blasting explosives will make quarrying of stone easier).

The key limiting factor to good roads in the pre-modern period was more a lack of money to build and maintain them and, as often as not, this was a factor of the lack of sophisticated governmental and administrative structures on the part of the organising state than any actual shortage of cash (at least for the major military and commercial routes).

Bridges can also be improved on fairly simply. Better architectural and engineering techniques offer real advantages in design and construction.

Most key pre-modern bridges were made of stone, as this was the most durable material available.

However wooden construction, especially using prefabricated sections, became a key bridging technique during the golden age of railroads, and could easily, and cheaply, be used to provide bridges in a pre-modern setting.

The development of a large scale iron and steel industry will also allow for the construction of iron bridges – the very earliest examples (including the first, still standing, example at Ironbridge Gorge in the UK) of which were constructed with techniques based on carpentry (dovetailing and slotting used extensively rather than the cheaper riveting and welding used later).

Ports can also be improved, though at some cost – more wharves and docks will boost unloading capacity can be increased by the introduction of block and tackle pulleys and cranes (which can be human or animal powered, if necessary), and the provision of simple dockyard rail lines (which can be wooden, if necessary, and for use with animal drawn rolling stock as well).

High density power sources will allow the use of cranes with real oomph, as well as some sort of mini-railway to service the docks, which will boost unloading speed.

*The biggest area of improvement, however, has nothing to do with the ports **directly** – it is, of course, the improved materials and design technologies that will allow the construction of improved **ships**.*

With better cargo loading and unloading access – possibly even with an early adoption of some sort of "container" system rather than the inefficient breakbulk system used for most of history.

Canals also become possible, even if limited to local technology and raw manpower, on heavily travelled routes, if they don't already exist.

The availability of black powder explosives will reduce their cost massively as it will allow them to tunnel or cut through objects quickly rather than having to follow contour lines for a longer, slower, route.

Powered machinery for the locks, incline planes and for water pumping will also improve profitability.

Modernity and Railroads

A modern double tracked standard gauge rail line can run around 50 trains per day, each carrying around 400 tons of capacity, for a total capacity of 20000 tons. Single track lines are less than half as efficient.

*Of course, that assumes that you **have** 50 trains and the attendant rolling stock for each such line (not to mention the track and other specialised equipment).*

Rail Capacity

Narrow gauge rail lines (2'6" or 3') originally ran on 30 lb (13.6 kilo) rails with a maximum axle loading of 6000 kilos, and this type of rail continues to be used in some mines and on temporary routes used in sugar agricultural applications.

It also continues in use in out of the way places where the cost of replacement is more than the route is perceived to be worth (or more than there is available to spend on it, which is not always the same thing).

Such lightweight narrow gauge trackage is still common in third world nations for just the reasons suggested.

If and when modernized, narrow gauge rails were normally upgraded to 60-70 lb (27.2-31.75 kilo) rails, and permitted axle loading was uprated to 9300 kilos.

*Rails are rated in **pounds**, which indicates the **weight of the rail per yard.***

A kilometer of 30 lb rail track requires 66 tonnes of iron.
A kilometer of 60 lb rail line requires 130 tonnes or iron.
A kilometer of 70 lb rail line requires 152 tonnes.

Standard gauge lines (4'8½") run on 120 lb (54.43 kilo) rails, which have much higher axle loadings.

A kilometer of 120 lb rail line requires 260 tonnes of iron.

Actually, standard gauge lines historically have run on track much lighter as well as much heavier than 120 lbs per yard, but this is the most common modern rating.

Remember the problems with mining and refining iron? See the connection? Maybe running supplies by road is actually cheaper in the short run?

Alternative Railways: There *are* alternatives to iron. Early tracks used by horse drawn mining carts, used stone – but the expense was prohibitive and they couldn't handle the weight of early steam locomotives.

If you ignore the expense, then stone trackways may be adequate for improvised lightweight internal combustion or diesel locomotives.

Axle capacities would probably be limited to no more than 3-4 tons, however.

*Stone tracks would also be slow to build, the reason for their considerable cost, so there might be a **slight** economic advantage if you could use modern machinery and equipment to construct them.*

Wooden rails with iron strapping is cheaper than stone – but the axle loadings are lower, too, probably no more than 2-3 tons.

*Despite the obvious limitations, wooden tracks **were** used well in mines where miners or draught animals would draw the ore tubs.*

There is no reason why they could not be adopted for special situations outside of mines as the advantages of increased effective traction power, of drawing something along even wooden rails is considerable.

Modernity and Roads

A two lane paved road can handle approximately the same amount of cargo traffic as a double tracked rail line (about 20,000 tons per day) – though fuel and maintenance costs will be higher.

An unpaved dirt road can handle half that, about 10000 tons per day, and the costs will be far higher.

*Terrain and weather have an impact on the capacity of both rail **and** road links.*

As noted elsewhere, constructing a modern, *all weather*, graveled road is relatively easy and relatively cheap even in pre-modern times.

Properly built all-weather roads were widely constructed by the Romans and are the Scottish engineer, John Macadam, duplicated them in 19th century.

Macadamised roads are made of layers of crushed rock, larger pieces at the bottom with smaller sized aggregate

until the top layer of regular sized gravel.

Along each side were stone faced ditches for drainage and to keep the aggregate from spreading.

Such roads could even be built over swampy or marshy terrain by laying down at least two layers (at right angles) of thick logs as a corduroy road, staked in placed by deep driven wooden stakes, and then graveled. Less permanent roads could be entirely log corduroy.

However it requires a strong centralised government to both pay for and maintain such roads.

For a modern transport system, however, a combination of railroads and roads (or ports, canals, railroads and roads) will be necessary.

*Historically it is interesting that the improvements in road construction **postdate** the development of railroads – which were developed **because** of inadequate roads!.*

***Roman Roads** were different because the major ones were built for **military** purposes and were only coincidentally a boost to a province's economic infrastructure.*

*They were also built mainly to move **infantry** around – cavalry armies, certainly in ancient times when iron was more expensive, preferred unpaved dirt roads which were kinder on their unshod horses **or** which used up their expensive iron horseshoes less quickly.*

Roman cavalry marched along the wide cleared margins at each side of the road for these reasons.

The reason?

The cost of building the improved roads was usually beyond the capacity (or willingness) of most governments to provide on the tax revenue available, and the cost of using a privately built turnpike was high enough so that it was really only economic for high value cargoes – passengers in a hurry, the mail and the like.

Railways changed all that – they increased economic activity overall, therefore increasing government revenues (both local and national) and also cutting transport costs massively.

These two factors meant that more goods were being moved around more cheaply, and that road transport was now only needed for relatively short distances from the nearest railhead to the final destination.

*It also meant that local, state and national governments had the tax revenue to build improved roads **and** an increased demand for transport to and from the railhead to make it attractive to do so.*

Railroading

*To construct a kilometer of **Standard Gauge (4'8½")** line you will need the following manpower and materials.*

Grading (including clearing average wooded terrain): 3100 man hours.

Ballast (delivered within 5 miles of quarry): 1550 man hours.

Tracklaying and Surfacing: 2100 man hours.

Bridging (~20 meters): 2000 man hours, 80 tonnes materials.

Culverts (~50 meters): 870 man hours, 5 tonnes materials.

Rail Ties (1802): 135 tonnes.

Rail: 115 tonnes.

Fastenings: 30 tons.

Total: 9620 man hours, 365 tonnes materials.

Railroad Installations

The following installations are needed for every 100 kilometers of track.

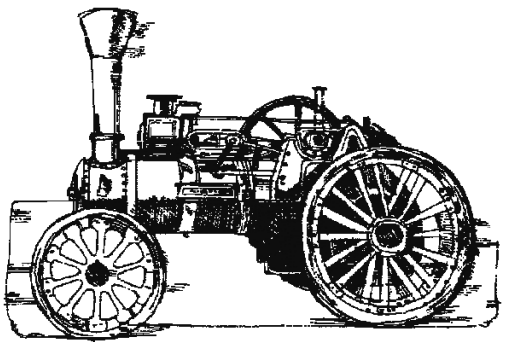
Passing Sidings: 2.5 kilometers, 650 tons materials, 7150 man hours.

Station Sidings: 1.6 kilometers, 450 tons materials, 4785 man hours.

Railway Terminal: 8000 tons materials, 160,000 man hours.

Water Stations (2): 85 tons materials, 6000 man hours.

Fuelling Stations (0.6): 7.2 tons materials, 360 man hours.



Extended Basics

Making Things

At some point in a *Displaced* campaign the players will want access to goods and services unavailable (or no longer available) locally.

This will inevitably lead to a desire to *make* those things – or to make something that is *functionally similar* while also being superior to anything local.

Sometimes these new items will simply be new applications of existing technology ***or*** new *ideas* that can be applied locally. Such situations will be the easiest to deal with.

*For example, there is no **technological** reason why the Romans could not have made **gunpowder**, and, once they had done, why they could not have produced gunpowder weapons.*

Saltpeter, Sulphur and Charcoal were all known to the Romans, so the raw materials are there for the explosive.

*The Romans also made iron and bronze, and so **could** have made welded wrought iron or cast bronze cannon.*

*Even improved iron for burst-proof iron cannon requires only simple developments . **If** they had had the required **knowledge**.*

However, *most* of what will be in demand *won't* be so easy to produce.

It may be local technology is not *advanced* enough – *either* because core materials are not available (or not in the required form or quantity) ***or*** because local manufacturing tech is incapable of processing the materials needed.

*While the Romans could produce **cannon**, it would be much harder to produce **handguns**.*

That requires "power" tools and "precision" machinery beyond what they had available.

*They could **probably** have come up with a crude matchlock.*

No rifling. No interchangeable parts. Muzzle loaders.

*With the addition of **some** transfer tech, though, you can have flintlocks, rifled ones, mass produced with interchangeable parts, and, possibly, cartridge firers within a fairly short period of time. A vast improvement.*

The final possibility is that the the *displaced* group will have knowledge to avoid the costly dead ends and pursue the short cuts that were, historically, developed well after the initial invention or discovery.

Technological 20:20 hindsight will offer great benefits.

One example shortcut would be knowledge of firearms allowing characters to produce cheap designs requiring little or no expensive machining.

Think cheap and cheerful Sten SMGs and AK-47s rather than expensively machined Bolt Action rifles.

The Sten was unbelievably crude but could be produced in bicycle repair shops, while a bolt action rifle required expensive machine tools – cutting edge technology.

Designing Things

There are a number of steps that you will need to consider as part of the process of designing things for production in your *Displaced* campaign.

That said, the foundations on which the "hard figures" of this chapter are set are, while the *best* information the designer has been able to assemble, really rather rubbery and dubious.

So if you decide that they don't make sense for *your* campaign, then by all means ignore them.

They are *game master* level tools and, at that level, what makes sense to *you* (or what you think will make sense to your *players*) is much more important!

Man Hours

A **Man Hour** is the amount of work a man does in one hour, and is used as a measure of how long it takes to produce an item. Some ***machines** multiply* this value, allowing a worker to do *more* work in a given time.

*For example, if an item takes 1000 **man hours** to manufacture, that would mean that one man would take 1000; or, alternatively, 1000 men could complete the item in one hour.*

The Design Process

The first step in the design process is to decide *what* you want – and how many *man hours* it takes.

Estimated Man Hours

This is the hardest part – information on how long it takes to make something is not readily available.

One way of doing this is to use the *cost of production* (not merely the *retail* or even the *wholesale* cost) – which may be somewhat more available.

Even that doesn't really work all that well as input costs vary wildly from item to item making any valid cross-comparisons difficult..

*For example, during the Cold War the CIA **tried** to estimate Soviet Defence spending – with no hard data on their input costs were, so they simply estimated what it would have cost the **US** to produce the items in question.*

*This missed the fact that, in the USSR, the military got the best of everything and civilians got the **leftovers** while in the West, the **reverse** was true – the civilian economy was the powerhouse.*

The estimates were misleading at best and effectively useless at worst, though no-one in the intelligence community realised – or weren't admitting it if they did. Today?

How do you compare a computer whose components are manufactured in low wage third world nations with one manufactured in the USA?

Assuming, of course, that the one manufactured in the US isn't constructed using components from those self-same low wage/low cost countries!

*How do you compare a computer made by **relatively** high paid workers in high-tech factories, no matter where, with Joggers made by illiterate peasants in a sweatshop?*

The short answer is, of course, that you can't. So, what do you do?

***Extrapolate**.*

*Some figures for a variety of products are provided at the end of this chapter (don't ask what **they're** based on.*

*They're the best that I could come up with, but, even so, are **extremely** rubbery) and extrapolate from them in a "best guess" or "reasonable assumption" mode.*

If you come up with (or already possess) better data, by all means drop me a line!

Sample Difficulties	
Game System	**Difficulty**
Action! System	25
CORPS	6
d20 Modern	DC 25
EABA (BTRC)	13
Impresa Express/GD*i*	6
*These are the **Base Difficulties** and may be modified up or down – +5 for d20 Modern, +2 to difficulty for EABA, and +3 to difficulty for Action! System.*	

Again, this is a best guess estimate – but the more complex the product is, the greater the likelihood that more complex tools will be needed.

*Complexity is **not** always obvious. Consider the humble screw – simple as you can get, you're thinking? Not so!*

*Sure, you **can** hand make a screw by filing the thread into a blank – but no two screws made by this method will be the same **and** the time required will make them prohibitively costly.*

*If you want **lots** of screws made in a short period of time **cheaply**, then you need a screw cutting lathe or similar – and these are **very** complex tools.*

Skills and Time

The next step is to determine what ***skills*** will be required for the completion of the design process (more than one may be needed).

*The exact skills will be some form of **Engineering**, depending on the exact game system being used.*

Then determine how many ***Steps*** the are involved, and

Major and Minor Flaws	
Game System	**Failure Level**
Action! System	-3/lvl
CORPS	-2/lvl
d20 Modern	-5/lvl
EABA (BTRC)	-2/lvl
Impresa Express/GD*i*	-2/lvl
*Each level of failure counts as a **Minor Flaw**. Every **third** "Minor Flaw" counts as a **Major Flaw.** On a **Critical Failure**, the design has an **automatic Major Flaw** in **addition**.*	

process (in which case skill rolls will be a factor).

Design Time
Designing an object or process takes time, divided amongst the ***steps*** in proportion to their complexity.

How much time is required for designing?

How long is a piece of string?

*As with everything else in this chapter, the data on which this process is based is **quite** rubbery.*

You Have Been Warned!

For the purposes of these rules assume a base value of ***ten times the estimated man hours*** needed for *making* a single example.

This value may be fudged up or down as required – or as desired (as, indeed, can any value in this entire process!)

*This should **not** be applied to large but simple constructions – such as, for example, houses, factory buildings, fortifications, roads, bridges and the like.*

*Or for the basic **hulls** of large(ish) seagoing vessels.*

Remember when you are designing may be made of pre-existing elements, so ***subtract*** the ***estimated man hours*** for those from the total.

*For example, a utility vehicle using an existing steam engine **doesn't** include the value for the engine in calculations to determine **design time**, only the values for design of the chassis, and components specific to that vehicle.*

Design Difficulty
Each **step** in the design process has a ***difficulty*** (see the ***Sample Difficulties*** Table on the previous page for some suggestions) and requires a roll against the skill of the designer(s) based on the game system you are using.

*Characters using **d20 Modern** may **Take 10** or **Take 20** but to do this **multiplies** the time required **by** that factor.*

For other game systems (such as Action! System, CORPS, EABA or Impresa Express) spending extra time also have beneficial effects specific to the game system.

***Base Difficulty** may be increased (or decreased) by a level or more for factors that affect the process – attempting to complete it more quickly, for example.*

Each step in the process takes up a proportion of the ***Estimated Man Hours*** in relationship to its difficulty.

The Design Roll
Success indicates *no* flaws, which is possible, but not necessary.

Failure does *not* mean the process has completely failed, only that flaws exist.

The amount a roll is *failed* by determines how ***many** flaws* there are (see the tables on the previous page for details).

*So, if the roll was failed by six (6) in EABA (15 in d20 Modern, 9 in Action! System), there will be (1) **major** and two (2) **minor** flaws.*

*Remember to add the flaws **from each step** of the process.*

If the process roll is a ***critical failure*** then there is an *automatic **major flaw*** – unless the game master decides that the process *obviously* failed at that point.

So obviously that it is obvious to the designers as well, and you want to take pity on them. Or maybe not, depending on how much role playing angst they can milk it for!

Prototype Testing
Each Prototype produced allows the design team to detect flaws that may exist.

*How many, if any, prototypes you decide to produce as part of the design process is completely **optional.***

***Testing** prototypes* can reveal *Flaws*. One prototype is required per *Major Flaw* – though for *really* large (or expensive) items (often the same thing).

*This assumes, always, that the prototype **survives** the testing process that reveals each flaw – if it doesn't, then it is unlikely to reveal more than one flaw.*

Minor Flaws can only be detected *after* Major Flaws, but any number can be detected on one prototype.

*Of course more than one Prototype can be produced and testing can be conducted simultaneously on **all** of them.*

The actual testing can be done by any competent end-user as long as the Design Team remains in overall control (i.e. not involved in doing anything else).

Once a *Flaw* has been detected, the Design Team may *attempt* to correct it.

Fixing a Flaw requires 10% of the *Design Time* (and the appropriate roll) for a ***Minor** Flaw* and 20% (*or more*) for a ***Major** Flaw*.

The difficulty rating of this correction process need not

Machine Classes

Machine Class/Category indicate the complexity of the tool.

Most processes require a certain minimum class of machine.

Machines are further classified by ***category***, which indicates the general area of use the tools are intended for.

*These classes and categories are only **guidelines** for the GM and are completely **generic**.*

A Type: Basic, mostly unpowered, hand tools.

B Type: The sort of equipment a moderately well-equipped home workshop might contain – including power tools.

C Type: What a serious hobbyist or small scale commercial operation would equip their workshop with. The bulk are power tools.

D Type: The sort of machinery that would be found in a small factory. The bulk are power tools, or designed to be used with power tools.

E Type: Really heavy machinery such as would be found in major factories or production facilities.

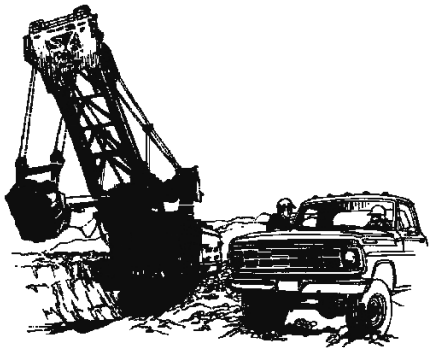
Locally Available Tools

A Type machines are generally available – except where local (lack of) knowledge precludes this.

*Screwdrivers before screws, for example (and even for a while **after** screws were invented, strangely).*

B Type machines of a sort will also be available – but are *not* the same as (or necessarily interchangeable *with*) B Type tools produced with modern knowledge, though they often perform the same or similar functions.

In both cases "modern" style tools of the same class are often more efficient at their designed function – often massively more so.



be the same as that of the original design process.

*It **is** possible to miss one or more Major and/or Minor Flaws during testing – which can have a variety of repercussions when the item enters service.*

Once it is decided that the Design Process is complete *enough* (allowing for time constraints), Production begins – with unresolved Flaws still "active," of course.

End users may be able to make field modifications that will minimise the effects of Major Flaws and, possibly, entirely remove the effects of Minor Flaws on an item by item basis depending on the skills they possess.

Mass Production

Given the material and personnel constraints likely in a ***Displaced*** scenario, only *Limited Production* and *Limited Mass Production* will be possible.

Limited Production

Limited Production involves the production of *up to* 100 items and may be done with *General Purpose Tools* taking full listed time.

This normally applies to very large items such as Large ocean-going Ships, Hydroelectric Generators, Oil Refinery equipment and the like.

Almost "one offs."

Limited Mass Production

Limited Mass Production involves the production of 101+ copies of an item.

Only 2/3rds of the Base Time is required if done with *General Purpose **Tools***, or 1/3rd with *Special Purpose **Machines***.

Full Mass Production will require many years of building infrastructure – perhaps as much as ten or twenty years of preparation and construction

Costs and Prices

Most of us assume that there is *some* connection between the *cost* of producing an item and the *price* at which it is sold.

Most of the time there is – but it is neither direct nor easily comparable.

There are too many variables involved in determining price, many of which have no direct connection with either the labour or material cost of production.

These "intangibles" can and do cause wide variation in price in the real *and* game worlds.

Intangibles and Price

Intangibles affecting price (as opposed to production cost) include *quality* (often *perceived* not *real*), *brand awareness* (sometimes connected with quality, sometimes simply on *familiarity*), *styling* (colour, shape – emphasis of form over function), *cross-subsidisation* (products sold at a loss/near loss in order to maintain market share) and, of course, *supply* (scarcity – real or manipulated – forces the price *up*).

*Of course, none of the above has to effect your campaign **unless you want it to**.*

*However, it **does** make explaining away any cost/price "anomalies" that you decide on **in** your campaign world for items produced locally **much** easier.*

The cost of Production

This boils down to three components – raw material cost plus the energy and labour costs of transforming them into the final product.

Of the three, ***Displaced*** only offers a reasonable and *direct* handle on the *labour costs*.

For items built using these guidelines you will have the *man-hour cost* to produce them.

That leaves the energy cost and the raw material cost, and these are somewhat more problematic to determine in game relevant circumstances.

Consider this – a top line laptop computer costs around 30% of the cost of a compact car. Is the labour input cost per hour the same for the both?

Do high tech workers in computer plants earn more than high tech workers in car plants? How much of the cost differential results from labour compared to raw material/energy costs?

There is no clear or easy answer to such questions. So what you need to are some *plausible* answers.

Comparisons with similar "real world" items will be important – using these and labour cost figures you *do* have to determine a reasonable approximation – or to use as an explanation for some *less than reasonable* approximation.

*After all, the **players** certainly aren't interested in resource management – they want **action**, and **you** don't want to get bogged down in fiddly details that will give no better answer than a ballpark estimate anyway.*

*Of course, that's not to say that the acquisition of the required raw materials cannot be part of important adventure hooks **for** the players – and it is **highly** recommended that you make it the case.*

*Hooks that they will **not** be able to ignore **if** they want continued access to products or services that they all too often take for granted. Of course, that's the **purpose** of these rules!*

Wholesale Cost

Really what you're doing is extrapolating backwards from the wholesale or retail cost with *one* set figure.

It probably doesn't matter what the actual cost of the raw materials and processing energy are – that's all being handled by **you**, seamlessly, in the background.

*After all, the **players** certainly aren't interested in resource management – they want **action**, and **you** don't want to get bogged down in fiddly details that give no better answer than a ballpark estimate anyway.*

*Of course, that's not to say acquiring raw materials can't be part of adventure hooks **for** the players.*

*Hooks that they will **not** be able to ignore **if** they want continued access to products or services that they all too often take for granted.*

If they want a steady supply of ammo for their locally made SMGs – well, then they'll have to make sure that the brass for cartridge cases and chemicals for smokeless powder and primers are also!

And that's just for starters! Think metals for the replacement drill bits for the machine tools – and even housing and food for the skilled operators of all the plant and equipment.

It can get very complicated – as complicated as you wish it to be!

Retail Cost

This is a somewhat easier matter to deal with, but does require some thought and decision making.

The reality of a *Displaced* situation is such that *any* "advanced technology" goods being produced (or what *passes* for advanced tech compared to what the *locals* possess) will be in short supply. ***Very*** short supply.

Infrastructure

None of the equipment that is likely to be transferred in a ***Displaced*** situation are *intended* to be used in isolation.

Resources

All of the machines and production lines in the world are worthless *without the raw materials they need.*

These may be manufactured components or subassemblies or may actually be raw, unprocessed, mater-

Making Machines

Machines may be made at the cost (in man hours) listed machines of the same level; or *half* that if produced by Machines of *a level higher*, or *doubled* if produced by Machines of *a level lower*.

Hours are the *man hours* needed to produce machinery and *Kw (Kilowatts)* is the power requirement *per worker*.

The *Machines* value (indicated by a letter A-E) indicates the machine level required for manufacture.

Chemical Tools: A (125 hours); B (500 hours, 2 kW); C (1750 hours, 5 kW); D (6000 hours, 7 kW).

*At Level A this covers basic glassware with spirit burners for heat and grades up from there to laboratory quality stuff. Powered equipment provided in these toolsets does **not** include computerised equipment or anything particularly sophisticated electronically.*

Cloth Working Tools: A (50 hours); B (100 hours, 1 kW); C (200 hours, 2 kW); D (500 hours, 5 kW).

*These tool sets are primarily for making or repairing clothing from finished cloth – they are **not** for weaving cloth **unless** specified for that purpose **before** construction.*

Construction Tools: A (25 hours); B (750 hours, 2 kW); C (3000 hours, 5 kW); D (7500 hours, 150 kW).

These tool sets include hand tools, whether powered or unpowered. Type C and D tool sets may substitute vehicles with a kW rating of 75% that listed instead of actual generators operating for 8 hours per day.

Electrical Tools: A (75 hours); B (150 hours, 2 kW); C (500 hours, 5 kW); D (1500 hours, 25 kW).

*Electrical Toolsets are **not** intended for maintaining or repairing **electronic** equipment (for the purposes of this game that includes anything with an integrated circuit) though they may be able to be used on the **electrical** parts of such sophisticated equipment.*

Glassblowing Tools: A (75 hours); B (150 hours, 2 kW); C (500 hours, 5 kW); D (1250 hours, 7 kW).

Mechanical Tools: A (250 hours); B (500 hours, 5 kW); C (1000 hours, 10 kW); D (1500 hours, 15 kW).

Metalworking Tools: A (60 hours); B (300 hours, 2 kW); C (1750 hours, 7 kW); D (3500 hours, 15 kW).

Mechanical and Metalworking toolsets do not include required fuel supplies for heating and smelting of components being produced.

The required fuels must be provided separately.

Optical Tools: A (25 hours); B (200 hours, 2½ kW); C (500 hours, 5 kW); D (1500 hours, 7½ kW).

Woodworking Tools: A (40 hours); B (200 hours, 2½ kW); C (750 hours, 5 kW); D (2500 hours, 7½ kW).

There is no way that this system can be "realistic" in an absolute sense, there are too many variables involved – it is only intended to give a "ballpark estimate."

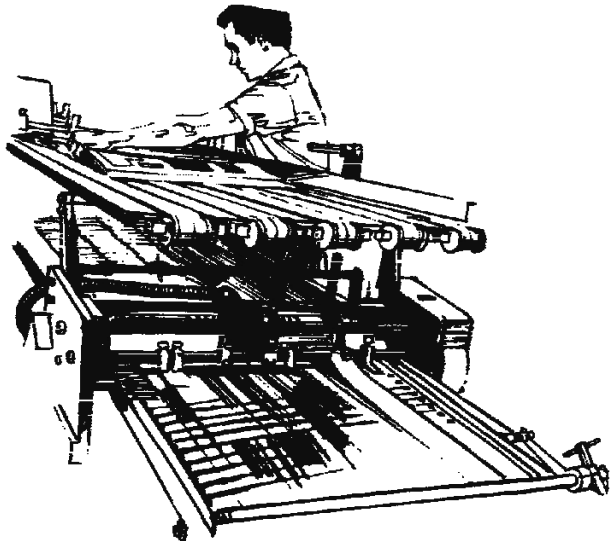
For example, many of these toolsets will actually include tools that require more power than the rated amount – but it would not be common for all of them to be operated at once.

*It may, therefore, be an idea to have a **minimum** power requirement per so many workers that must be provided up front even though each individual may not need more than the listed amount.*

So do not feel that there is any reason you can't modify the results to better fit *your* perception of reality.

Certainly the sources for the above figures had to be run through several "reality checks" before the designer(s) were satisfied.

Which doesn't necessarily mean that the results are *realistic* in a *real world* sense.



Production Lines

Machines are the basis of the production system in this chapter. They can, within type, resource, and complexity limits, produce *anything*.

They are, for the most part, **generic** – any one is interchangeable with any other (though, if needed, the GM may determine that a particular "unit" represents a specific type of machine).

Production Lines are specially constituted arrangements of ***machines*** that speed up ***mass production***.

Unlike machines they are only capable of manufacturing ***one*** *general type of item* and cannot be changed over to producing something else either quickly or cheaply (if at all).

Mass Production is a system of specialisation, speeding up the manufacturing process.

*Mass Production does not **have** to be of high tech goods – even simple items can be made more efficiently, more quickly, and cheaply by training each worker in only one **simple** step of a more involved or complex process.*

For example, arrows could be mass produced by having each component made by one person specialising in it rather than having one person do it all at a less skilled (and slower) level.

Production Multiplier indicates how more (or *less*) efficient a machine setup is in the production process. The multiplier increases the effective amount of work in ***man hours*** that can be done when using a ***machine*** or ***production line*** in a set amount of time.

*For example, a machine with a x 4 multiplier allows the operator to do the equivalent **four** man hours of work each hour.*

Production Line Design

To "design" special purpose tools for a *production line* the GM must first decide what basic tools would logically be required.

A *Production Line* will *normally* be one Tool Class *lower* than the Tool Class of the finished product (there are synergistic effects) – and may be even lower than *that* where their importance is secondary.

The Man Hours required to actually manufacture the production line is reduced by 25% and the facility's power requirements are reduced by 50% over the total cost/power requirements of the specific individual component machines/tools.

***For example**, a Lead/Acid Battery Production Facility would require B Metalworking + B Mechanical + B Chemical Tools for a total of 1300 hours, reduced by 25% (325 hours) to 975 hours to produce and the 9 kW power requirement reduced by 50% to 4½ kW per worker.*

Efficiency & Production

Where machines are a level *higher* than the minimum, they have and efficiency multiplier of x2, and +2 per level beyond the first – so a 2 level difference gains a x4 modifier.

*If the machines **already** have a multiplier, **double** the multiplier for the first level of difference, then add +2 for each level in excess of the first.*

Increasing Efficiency

Machines can be *redesigned* to be more efficient.

For each multiplier, this requires a nominal 100 x multiplier x base production hours.

For a +1 increase, giving a 1 + 1 = x2 multiplier, the time requirement is (2 x 100) x base production time.

Copying existing equipment

Copying *existing* machines that have an efficiency multiplier can only be done *exactly*.

This requires blueprints to be prepared, which takes the 100 hours x desired production multiple *squared*.

Once the blueprints have been prepared, to determine the man-hours needed for *manufacture* (which *must* be done with E type plant), multiply base time by *(multiplier + 1)*.

If you have Type D Ammunition Production Line (100 men, 300 kw, 2800 man hours to produce) x 5 multiplier, blueprint cost would be 100 x 5^2 = 2500 hours.

*Production time would be (5 + 1) x 2500 = 15000 hours for producing a single unit of **stand alone** plant. **Expanding** an **existing** plant takes **half** the time – as it relies on synergistic effects.*

*However, you cannot expand the size of existing plants more times than the original multiplier (that is, a plant with a multiplier of x4 can only have its capacity expanded **fourfold** and no more) – there is an upper limit, in effect.*

*Building new plants **in stages**, each with the same planned multiplier, is one way of avoiding this limit.*

ials – it really doesn't matter for game purposes as long as you have an idea of *where it's all coming from!*

For example, an ***Incandescent Globe*** *or* ***Thermionic Radio Valve*** *production line assumes it is being provided with glass, wire, plastics and raw materials from other sources.*

Under normal circumstances it is assumed that the basic raw materials are provided from local sources – produced with local technology in local factories, grown on local farms, or mined in local mines.

This will normally be an acceptable assumption – the *displaced* are really just providing advanced manufacturing capabilities to process, reprocess, or transform materials that are generally available locally.

However, where that is *not* the case, then the situation becomes much more complex and you will need to decide how to deal with it on a case by case basis.

It may be reasonable to simply tell the players (the ones who *really* want *whatever*) that it *isn't* available.

Which probably means they will want to find ways around the problem – and it's up to you whether you want this to be possible (or believe that it *could be* possible).

It's *your* call as the game master.

Some suggested production/refining facility data are provided opposite and can be used as a basis for providing the materials ***if*** *that's the way you need to go (do you* ***really*** *want to run a resource management game?).*

Alternatively, you could assume that all this is covered by the ***Plant & Infrastructure*** *section (see overleaf).*

Skilled Workers

There will be just so many trained people capable of operating the plant and equipment, running the factories and teaching in the schools and training centres – any more will have to be trained.

Training ***displaced*** personnel will be much simpler than training locals – so much basic knowledge is already in their possession that is not part of the local cultural and educational tradition.

For example, the ***Displaced*** *know such basic things as the uses and dangers of electricity, basic safety procedures used around any sort of power-operated machinery – procedures the locals will have no concept of.*

They know that red means "danger" or "off" or "stop" and that green means the opposite or how to turn the electric lights on and off and operate (if not program) a computer and have some idea of precision measurement and mathematics and basic literacy which makes it easier to train them in the first place.

Basic, simple, stuff learnt over their entire lives in a technologically advanced society.

To them, technology is ***technology*** *and to be used* ***by*** *mankind – while to the locals it may be seen as* ***magic*** *and* ***feared****.*

Training Displaced Personnel

Time displaced personnel can be trained to do specific production tasks (limiting their use to one specific production process) in three months.

They can be trained to general use (related processes within the same line) in six months.

After 12 months they are capable of quick redeployment between any basically similar industry and are capable of training other personnel.

Training Locals

Local Personnel take a *lot* longer to train, as they lack many of the assumed basics of culture and education required for retraining to work in modern industrial operations.

It will take a minimum of six months of training a local to be able to use modern tools or equipment in a *rote* manner, limiting them to employment on one specified production process.

It will take a further six months (12 months *total*) to train them for general use within related production processes.

It will take a further year (two years *total*) for them to be trained well enough to train others.

This is probably being generous – if the locals aren't literate, you should ***double*** *training requirements* ***or*** *require that they be taught to read and write before* ***any*** *training begins.*

Plant & Infrastructure

Production costs for plant and equipment produced according to these rules represent only the actual tools and equipment for the *specific factory or facility*.

If you wish to more realistically represent the supporting *infrastructure* without having to define specifically what it actually *is*, multiply that cost ***tenfold!***

The additional 90% cost includes refining and processing plants for raw materials, improved agricultural techniques to create a bigger non-agricultural workforce, better transport links (improved roads, bridges,

Sample Production Lines

Production Lines are created by adding together various Machine classes and categories to produce specific items.

Plant Type (Complexity, A-E): *xxx hours (man hours to produce), x kW (power requirement per unit/man). Components: machine types/classes forming the finished unit.*

Antibiotic Plant (Liquid/Injectable) (C): 750 hours, 2 kW. *Components:* B Chemical x 2.

Antibiotic Plant (Powder/Tablet) (C): 2000 hours, 4 kW. *Components:* C Chemical + B Chemical x 2.

Battery Plant, Lead Acid (C): 700 hours, 3 kW. *Components:* B Chemical + B Electrical + B Metalworking.

Can manufacture any size wet cell battery.

Battery Plant, Dry Cell (D): 2000 hours, 4½ kW. *Components:* C Chemical + B Electrical + B Metalworking.

Can manufacture any size of dry cell battery.

Cartridge Case Production (D): 600 hours, 4½ kW. *Components:* B Metalworking + B Mechanical.

*Can be set to manufacture **any** caliber cartridge.*

Cartridge Loading/Reloading Plant (Hand) (B): 400 hours. *Components:* A Metalworking + B Mechanical.

Cartridge Loading/Reloading Plant (Powered) (C): 600 hours, 4½ kW. *Components:* B Metalworking + B Mechanical.

Can be set to reload any size cartridge case.

Gunpowder Plant, Manual (A): 275 hours (Meal powder); 550 hours (Corned powder). *Components:* A Chemical + A Mechanical (Meal), 2 x A Chemical + 2 x A Mechanical (Corned).

Gunpowder Plant, Mechanised (C): 750 hours, 3½ kW (Meal powder); 1126 hours, 6 kW (Corned Powder). *Components:* B Chemical + B Mechanical (Meal); B Chemical + C Mechanical (Corned).

High Explosives Plant (C): 1125 hours, 3 kW. *Components:* B Chemicals x 3.

Can produce Nitroglycerine or Guncotton.

Dynamite & Smokeless Powder Plant (D): 2625 hours, 5 kW. *Components:* C Chemicals x 2.

Produces Dynamite and Smokeless powder.

Telephone Equipment (C): 500 hours, 4 kW. *Components:* B Electrical + B Mechanical + B Metalwork.

Set up to manufacture switch gear, handsets, switchboards and the like.

Light Bulb Plant (C): 825 hours, 3 kW. *Components:* B Electrical + B Glassblowing + B Mechanical + B Metalwork.

Manufacture light globes of all sizes and power ratings.

Thermionic (Radio) Valve Production (D): 1350 hours, 8½ kW. *Components:* C Electrical + C Glassblowing + B Mechanical + B Metalwork.

*Produces radio valves. It **may** also produce incandescent light globes.*

Advanced Optics Plant (D): 1725 hours, 8½ kW. *Components:* C Optical + C Mechanical + C Glassblowing + B Metalworking.

Produces Spyglasses, Binoculars and Microscopes

Expanded Production Lines

Production facilities may be combined to create even more complex facilities, for example –

Ammunition Manufacturing (D): Cartridge Case Production + Smokeless Powder + Powered Reloading Tools = 2800 hours, 7 kw per worker.

Radio Manufacturing (D): Battery (Dry Cell) + Thermionic Valve + B Electrical Tools + B Mechanical Tools (x2) = 3375 hours, 15½ kw.

Field Dressing (C): Antibiotic Powder + Cloth Working (C) = 1650 hours, 3 kw.

High Tech & Exchange Rates

When the high tech fruits of your labours start becoming available there is the problem of how much they are actually *worth*.

If let the *local* market set the prices, then, theoretically, the wealthier locals will simply drain the market dry (there are a lot more wealthy locals than there are *displaced* locals).

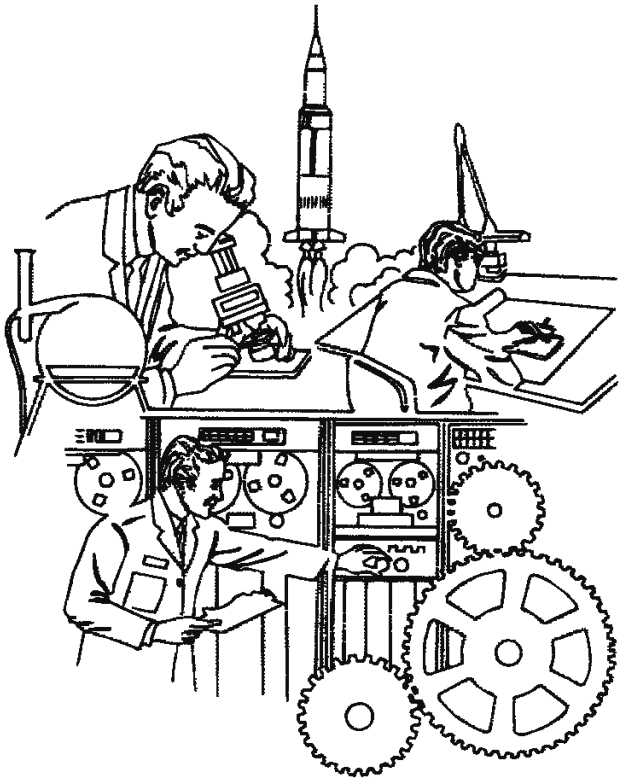
For some things this may be acceptable – but for those items that are vital to the survival of the Displaced?

That's where you'll start having problems.

One solution is to have a system of special *scrip* money such as is used by the US military for PX purchases on some overseas bases.

High tech equipment would *only* be available for purchase in *scrip*. €1 = 1 scrip and limit availability of scrip *only* to *Displaced* personnel.

Another option is to prohibit sales of certain items without a special "government" license – and *Displaced* interests get absolute (or high) priority for these licenses. Or the government could issue items on a "needs" basis – perhaps budgeting missions in € terms.



canals, and river and ocean ports) and much more.

That is only 10% of the cost is for machines and tools – the other 90% is to create and support the infrastructure.

Initial Plant & Equipment

The tools and equipment that arrives with the various time dislocated groups can start operating as soon as it is set up – but only at reduced levels.

Normal *civilian* production line equipment (or tools) requires infrastructure support *equal* to the cost of constructing the equipment (or tools) in time, materials and money.

Equipment produced for *military or exploration* use, or for use in facilities *isolated from normal infrastructure*, require infrastructure equal in cost to 50% of the cost of constructing the equipment (or tools) in time, materials and money.

In the unlikely event that the equipment is designed to be used entirely in isolation and, as such, is entirely self contained, then this cost may be reduced even further (some sort of outside raw materials are going to be needed no matter what).

Extrapolation

Some of the equipment described in the following chapters requires significant existing infrastructure to be useful – this will need to either arrive *with* the *displaced* or be constructed *by* them.

Rather than design each individual piece of equipment that such a support facility will need, it is simplest, for game purposes, to treat them as specialised production lines.

Maintenance & Repair Facilities

If all these facilities are intended to do is to *maintain* and *repair* the item(s) of equipment, then you can *double* the man hour cost reductions applicable to their construction (power requirements remain at a 50% reduction regardless) – making it 50% rather than the base level of 25%.

For example, the availability of wheeled motor vehicles assumes the availability of specialised service stations (or garages) with the facilities to maintain and repair them – but no such facilities are provided for in the game ***as such.***

Since they are basically mechanical in nature, then the required Garage Facility can be extrapolated from Mechanical Tools.

Producing a Garage: *Motor Vehicles are either C (Internal Combustion models) or B (Steam models) class to produce, so a Garage facility would require B class*

tools for at the very least.

B Class Mechanical Tools for one man require 500 man hours to manufacture and 5 kW to operate once complete.

*However, for a **production line** facility, this cost is reduced (see "Production Line Design" on page #27) – if you want one that can actually **make** things as well as act as a support/maintenance facility, then the standard 25% reduction to man hours required to manufacture production line equipment applies, so the garage equipment can be built in 375 man hours.*

*If you are happy to settle for a purely support only facility, capable **only** of maintenance and repairs, then a 50% reduction applies, and the equipment will take a mere 250 man hours to manufacture.*

*Regardless, in both instances, a 50% reduction to operational power requirements applies, so the full capability **and** reduced capability facilities both require 2½ kW worth of power.*

*In this particular instance, one man's worth of production line will allow one worker to work on one vehicle at a time – if it has a production multiple, then he will work **faster**, but he can only work on one vehicle at a time. Of course, to ensure that the equipment is working 24/7 you can ensure that there are three workers, each working a single eight hour shift – but that's another issue.*

Infrastructure Support: Do these facilities *themselves* require infrastructure costs to be paid? ***Depends!***

If they are constructed to support the production lines that made the machines and/or equipment they maintain *then* they *are* supported by the infrastructure that had to be created to support those production lines.

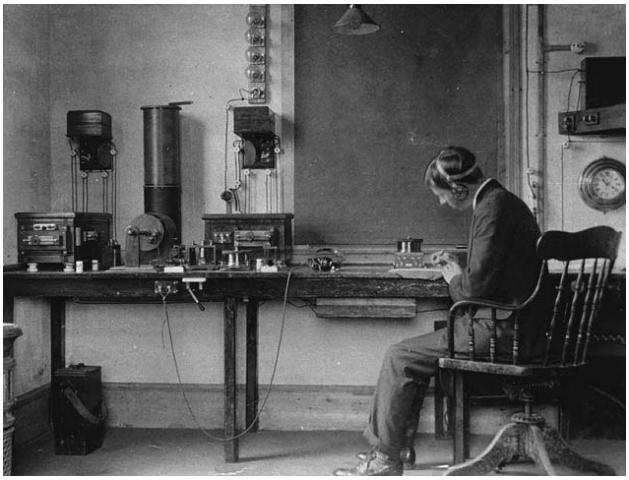
If they are constructed to maintain **existing** vehicles (i.e. the ones that arrived as part of the *displacement* effect), however, *then* they need infrastructure support.

Support Facilities

That's a simple example of a maintenance and repair facility. What about a facility that actually supports the operation of the equipment – without which the equipment either wouldn't work at all or would be much less effective?

Most of the equipment in the following chapters either doesn't *need* support of that sort *or* the equipment needed to support it is actually provided.

This is as much a factor of the limited nature of the equipment listings as much as anything else – and it is likely that the players (or the GM) will come up with



something that is sufficiently big that it simply doesn't make sense to design as a single item of equipment, but without which something *else* they want which is connected to it in some functional way *won't work.*

This is considerably trickier to handle and can't be done on the fly, so to speak. The only real solution is to extrapolate from real life while still using the basic solution suggested above.

*The one all to obvious example that **is** listed in this book is the **Cabinet Radio Set**. It is a receiver only unit, rather like a 1930's commercial radio intended to pick up commercial radio stations at a considerable distance – and for it to perform that function there has to be a suitable Radio Station with enough transmitting power within range.*

*While, theoretically, a **Base Station Transceiver** set would be enough to do the job, assuming that the **Cabinet Radio** was tuned (or tunable to) the "right" radio frequency, it really doesn't have the transmission power. A much more powerful transmitter is needed.*

*Such a Radio Station is obviously going to have an **Electrical Production Line** at its basis – but think what it represents. It means not only the transmitter (and, ideally, a backup), but the Sound/Recording studio(s), the transmission tower, emergency generator and much more.*

*While the equivalent of a small town radio station (with a 20-30 klick range) will only require 2-3 staff to **operate** – an announcer, a radio operator and, possibly, an electrician, **keeping** it **operational** will require many more. How many more?*

*That **is** the question – the best answer is that you'll have to **guesstimate** the answer.*

*A good rule of thumb would be to follow the general infrastructure rule – assume that each person required to **operate** the station while on the air needs nine more as support staff.*

That would mean an additional 18-27 personnel, for a total of 20-30 in all.

Producing a Radio Station: *Providing the equipment for such a station is based on* ***Electrical Machines*** *and uses the* ***Production Line Design*** *rules (page #27), slightly modified.*

The 25% reduction to man hours required to produce is retained, as is the power requirement reduction of 50%, but, since the equipment is intended to make it possible for something else to work, it is to be rated as the ***same*** *tool class required to construct said equipment rather than one tool class less.*

Cabinet Radios require C type production equipment, so the Radio Station must be based on C type Electrical Machines – 500 man hours to produce each unit, and 5 kW needed to power each unit. For a Station of 20 staff, that is (20 x 500) =10000 man hours to produce and (20 x 5) = 100 kW, but reduced by 25% and 50% respectively to 7500 man hours and 50 kW. For a Station of 30 staff the figures would be 15000 man hours reduced 12000 and 150 kW reduced to 75 kW.

If you wanted a station capable of greater range, transmitting on the Shortwave band, for example, you could assume that it requires more sophisticated equipment, such as a ***Semi-Portable Transceiver*** *which requires D type machines to construct. D type Electrical Machines require 1500 man hours and 25 kW per unit, which would mean that Station with 20 personnel would require 30000 x ¾ = 22500 man hours to construct and 500 x ½ = 250 kW to power. A Station with 30 personnel would require 33750 man hours to construct and 375 kW to power.*

Note: Power requirement is ***not*** directly indicative of ***transmission power***.

Infrastructure Support: Do such support facilities *themselves* require infrastructure expenditure? Indeed they do! Which makes these sorts of high tech facilities *extremely* expensive – which is as it should be!

SYNERGY

Eventually, there will be increasing synergy between the newly produced factories and their generic infrastructure that will reduce the additional infrastructure costs required to support any new factories.

- After five years, the total infrastructure costs for new production lines and support facilities will be reduced by 25% (to a multiplier of x 7½ instead of x 10)
- After 10 years the infrastructure reduction increases to 50% (a multiplier of x 5).
- After 20 years the reduction increases to 75% (a multiplier of x 2½).

If a campaign lasts twenty years of game time, you'll be doing well!

Of course, you may decide, at some point (even at the beginning – perhaps they are not the first to be ***displaced?****), to jump ahead that much time to a more evolved, but still changed, timeline for further adventures – to keep up high levels of player interest (and, of course, to keep them on their toes with the unexpected!).*

A FINAL WORD OF ADVICE

As I said at the beginning, the basis for this whole chapter (and the "hard" data in the following equipment chapters) is *extremely* rubbery – if you have better figures, or simply don't feel the ones I have provided suit what you want/need for your campaign, *go ahead and change them.*

I'd suggest that you think *very* carefully about the game related implications of any changes ... making things too easy will lead to the players taking advantage of the game in ways I pretty much guarantee you won't like. On the other hand, making things too hard will simply frustrate them.

I believe that the factors provided in these chapters stand for a successful balance between too easy/too hard, but you should feel free to make your own decisions.

Final Note: *If you come into possession of better data than I have provided here for* ***anything at all*** *it would be* ***greatly*** *appreciated if you could contact me at the email or snail mail address in the front of the book with details!*

EXTENDED BASICS
THINGS TO MAKE – GENERAL EQUIPMENT

Once you have determined exactly what sort of productive equipment is available to the displaced group(s) you will want to have some idea of *what* they can make with it.

This will be part determined by exactly what equipment they have and partly determined by what the displaced group (not necessarily player characters, either!) determine to be their most pressing needs.

Resources of all sorts will be scarce and the choices will be many and crucial – and you need some basis on which to balance them.

The information provided on the following pages details the man hours required to construct each specific item, the minimum level of machinery or production line required and the generic cost in €(uro) – a nonspecific value system used to determine the relative *retail* cost of each item (see opposite for some suggestions as to its game use).

More detailed game-related information, including item descriptions, will be provided in the appropriate *Displaced* Campaign Books.

It is important to remember that all of the things that characters will find that they need will require the use of uptime production machinery or production line equipment.

There will be many items that they will need which, although not ***initially*** *available to or produced by the locals can easily be made even with their less advanced technology once they have the* ***idea*** *and, perhaps, some uptime guidance as well.*

NOTES ON THE TABLES

You *really* don't want to know just how flimsy the basis for the above data is. *Really*. I *mean* it.

If you have access to material that offers markedly different data – *use it* (and, please, let *me* know ... email me!).

That said, even if the basic data *is* suspect (and it *is*), it gives results that *seem reasonable*. Which is probably as good as you're going to get.

Certainly, the inter-relationships between the items listed are all based on the same data, so if they're wrong, they will all be *consistently* wrong, and, hopefully, wrong *in the same way*.

While a wide variety of equipment is listed, it is neither meant nor intended to be exhaustive. It offers a good variety of items that are likely to be of interest or use to displaced groups and the populace they find themselves displaced *amongst*.

However, each campaign or worldbook will probably have some extra items listed that suit that particular situation – but which can be used freely between campaigns, published or home grown, for the most part.

Anything that isn't listed here, well, you can extrapolate from what is.

ACCESSORIES

In some cases items are listed with additional items needed for their effective use separately (printing presses and paper, for example) – mainly for items (or accessories) of relatively small monetary value.

For some complex items, however, this has not been done because, potentially, there are so *many* accessories and there is limited space herein.

For example, motor vehicles don't have tyres listed separately *here* – you can extrapolate from the vehicle cost if you need to – though they *may* be included in one (or more) of the *Displaced* World or Campaign books and can easily be transposed into *your* setting.

The hope is to have a *lot* of Worldbooks or Campaign Books ... including a new edition of *Road to Armageddon* and a new product based on the English Civil War tentatively entitled *This War Without Enemies*.

There are several chapters following, covering specific types of equipment, including weapons and vehicles. This chapter covers items *other* than weapons and vehicles – *General Equipment*.

General Equipment

All equipment is described using a standard format –

Equipment Name: Short description.

Production Time: in Man Hours. ***Tools:*** minimum tool type required for production. ***Cost:*** in € (scrip).

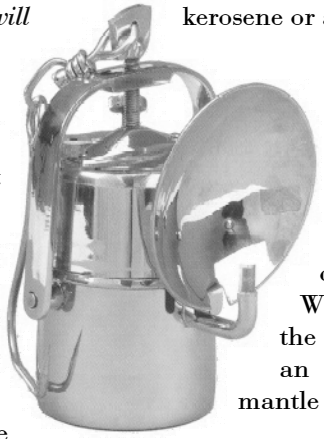
Artificial Lighting

One of the things that we take for granted in modern society is ***light*** *– artificial light – that enables us to turn, almost literally, night into day.*

Yet as little as a century ago, most people still worked entirely by the sun – what artificial light there was was expensive or difficult to access.

Working (and waking) hours were sunrise to sunset and working days were variable according to the seasons as a result (shorter in winter, longer in summer). Working people (the poor) rarely stayed awake more than an hour or so after sunset – artificial lighting was too expensive.

Cheap artificial lighting changes all that – and it's one of the first things that the Displaced will begin to miss.



Standard Flashlight – Standard design with a thin metal body and and using two standard dry cell batteries (not included).

Production Time: 25 hours. ***Tools:*** C. ***Cost:*** €50 (spare globe €25). ***Range:*** 2 meters. ***Burn Duration:*** 3-4 hours. ***Weight:*** ½ kg.

Heavy Duty Flashlight – Like the "Standard" model, but powered by 4-6 (disposable) dry cell batteries.

Production Time: 35 hours. ***Tools:*** C. ***Cost:*** €75 (spare globe €25). ***Range:*** 4/6 meters. ***Duration:*** 3-4 hours. ***Weight:*** ¾ -1 kg.

Dynamo Torch – A sealed (waterproof) unit with a hand pumped dynamo. It provides a weak light as long as it is pumped. A model with a storage battery (5 minutes of storable power) is available at extra cost

Production Time: 35 hours (50 hours with storage battery). ***Tools:*** C. ***Cost:*** €75, €100 with storage battery (spare globe €25). ***Range:*** 1 meter. ***Duration:*** 1 minute per minute of pumping (storage model only). ***Weight:*** 0.125 kg (0.25 kg with battery).

Survival Torch – Powered by a clockwork mechanism, this model can provide half an hour of bright light or five hours of standard light on a single "charge." ***Production Time:*** 250 hours. ***Tools:*** D. ***Cost:*** €500 (spare globe €25). ***Weight:*** 1.5 kg.

As you can seen, the most expensive single part of a locally produced electric battery operated torch is the incandescent globe. Don't break them!

Spotlight – Three models are available: standard electric, carbon arc, and carbide. The standard model uses a hard to replace incandescent bulb, the carbon arc model uses a powerful pair of carbon "candles", and the carbide model (see picture this page) uses carbide gas (½ kg Carbide provides gas for 4-5 hours).

Production Time: 750 hours (electric), 500 hours (carbon arc), 25 hours (carbide). ***Tools:*** C (electric), B (carbon arc and carbide). ***Cost:*** Electric = €375, (replacement globe €75); Carbon Arc = €125 (2 x Replacement "Candles" €15); Carbide Gas = €25 (Carbide Fuel, 1 kg tin €50). ***Weight:*** Electric = 5 kg; Carbon Arc = 10 kg; Carbide Gas = 7½ kg.

Lantern, Hurricane – A standard liquid fuelled lantern with a woven cloth wick, these normally burn kerosene or alcohol.

Production Time: 5 hours. ***Tools:*** A. ***Cost:*** €25. ***Weight:*** ½ kg (empty). ***Fuel Consumption:*** ½ litre per 8 hours. ***Fuel Capacity:*** ½ litre.

Candle Lantern – An light metal canister containing a single 9 hour candle. When opened, an internal spring pushes the candle upwards as it burns. The unit has an integral handle/hanger and clear glass mantle for wind protection.

Production Time: 2 hours. ***Tools:*** A. ***Cost:*** €30. ***Weight:*** 0.3 kg. ***Accessories:*** Extra candles, 0.2 kg, €15

Emergency Candles – Available in 50 hour and 150 hour duration in a waxed card tube. They have three wicks, but achieve maximum duration when only one is used. On three wicks, a pannikin of water can be boiled in 15 minutes or an egg in five.

Production Time: 30 minutes. ***Tools:*** A. ***Cost:*** €15, 50 hour; €20, 120 hour. ***Weight:*** 250 g (50 hour), 500 g (120 hour).

Camping Equipment

Most of the equipment listed here can be easily made with local, downtime, resources based on modern ideas.

Many of the items are sufficiently different (and of

Artificial Lighting				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Standard Flashlight	25 hours	C	€50	½ kg
Heavy Duty Flashlight	35 hours	C	€75	¾ - 1 kg
Dynamo Torch	35 hours	C	€75	0.125 kg
Imp. Dynamo Torch	50 hours	C	€100	0.25 kg
Survival Torch	250 hours	D	€500	1.5 kg
Flashlight Bulb	–	C	€25	–
Spotlight, Electric	750 hours	C	€375	5 kg
Spotlight Globe	–	–	€75	–
Spotlight, Carbon Arc	500 hours	B	€125	10 kg
Carbon Arc Candles	–	–	€15	–
Spotlight, Carbide Gas	500 hours	B	€25	7½ kg
Carbide Pellets, 1 kg	–	–	€50	–
Hurricane Lantern	5 hours	A	€25	1 kg
Candle Lantern	2 hours	A	€30	0.3 kg
Extra Candles	–	–	€15	0.2 kg
Emergency Candle, 50 hr	30 minutes	A	€15	250 g
Emergency Candle, 120 hr	30 minutes	A	€20	500 g

significantly greater utility) from what is likely to be available locally to come into widespread use.

Bedding

Light Blanket – A light wool or cotton blanket for moderate temperatures. They are commonly used in conjunction with a bedroll.

Production Time: 5/hour. ***Tools:*** B. ***Cost:*** €5. ***Weight:*** 2 kg.

Heavy Blanket – A heavy wool blanket for temperate climates or winter conditions.

Production Time: 5/hour. ***Tools:*** B. ***Cost:*** €7.50. ***Weight:*** 2 kg.

Bedroll – A light or heavy blanket with a sewn in, padded, ground sheet and a semi-permeable waterproof cover. They have become common as locally produced expedient replacements for pre-displacement sleeping bags.

They are rolled into a sausage shaped tube and tied around the upper body from shoulder to hip (or tied around a backpack).

Production Time: 5/hour. ***Tools:*** B. ***Cost:*** €25 to €35. ***Weight:*** 4 kg (light) or 5 kg (heavy).

Cot, Folding – A folding canvas and wood cot. ***Production Time:*** 20/hour. ***Tools:*** B. ***Cost:*** €5. ***Weight:*** 5 kg.

Tentage

Shelter Half – A waterproofed canvas tarpaulin which can be combined with another as a two-person tent or used as an improvised one-person shelter.

Production Time: 2/hour. ***Tools:*** B. ***Cost:*** €10. ***Weight:*** 1 kg.

Tent, Canvas, 2 Man – These waterproofed canvas tents have a light spring frame.

Production Time: 1½ hours. ***Tools:*** B. ***Cost:*** €75. ***Weight:*** 6 kg.

Tent, Canvas, 4 Man – These waterproofed canvas tents have a light wooden frame.

Production Time: 3½ hours. ***Tools:*** B. ***Cost:*** €25. ***Weight:*** 12.

Tarpaulin, Canvas, 5 x 6 m – Useful for roofing open areas – can even make a makeshift tent. ***Production Time:*** 20/hour. ***Tools:*** B. ***Cost:*** €20. ***Weight:*** 25 kg.

Accessories

Jerrycans – These are commonly metal for fuel storage and plastic for water storage. They have a lockable cap, spout for pouring and a 10 or 25 litre capacity.

Production Time: 12/hour (plastic), 6/hour (metal). ***Tools:*** C. ***Cost:*** €10-15 (plastic), €20-30 (metal). ***Weight:*** 1-2 kg (plastic), 2-4 kg (metal).

Water Bag – A simple canvas water bag that cools water by evaporation. Normally hung from the front of a vehicle where the airflow is better.

Production Time: 10/hour (5 litre), 8/hour (20 litre). ***Tools:*** A. ***Cost:*** €2 (5 litre), €5 (20 litre). ***Weight:*** ¾ kg, 4 litre (empty); 2½ kg, 20 litre (empty).

Water Purification Tablets – A waterproof (waxed card) container with 25 iodine tablets – each tablet purifies a canteen full of water (though the water will taste *awful*).

Production Time: 40 packets/hour. ***Tools:*** C. ***Cost:*** €5. ***Weight:*** negligible.

Stove, Coleman – This is a liquid fuelled single burner stove using pressurized alcohol, kerosene or petrol (see picture next page). This type of stove makes a loud hissing sound when in operation.

Production Time: 10 hours. ***Tools:*** C. ***Cost:*** €75. ***Weight:*** ½ kg. ***Fuel Consumption:*** 1/8th litre per meal.

Solid Fuel Stove – Commonly issued by armies as a field stove for heating water and rations, they are a simple folding metal stand into which solid fuel (hexamine) tablets are placed.

A packet of four fuel tablets sits inside the folded stove for storage. Each tablet is enough fuel to boil a canteen of water or heat a single meal.

Production Time: 12 units/hour (18 fuel packages/hour). ***Tools:*** B. ***Cost:*** €10. ***Weight:*** 300 g.. ***Accessories:*** Packet of 4 Fuel Tablets, 200 g, €7.50,

Firestarter – A plastic case containing a ½" diameter alloy flint bar and spring loaded hardened steel striker.

When the striker is pulled back and then triggered, it puts out a shower of high temperature that will light tinder or flammables in all but the most adverse conditions.

The Firestarter works even when soaking wet (though it won't *necessarily* start soaking wet materials!).

CAMPING EQUIPMENT				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Light Blanket	5/hour	B	€5	2 kg
Heavy Blanket	5/hour	B	€7.50	3 kg
Bedroll	5/hour	B	€25-35	4-5 kg
Cot, Folding	20/hour	B	€5	5 kg
Shelter Half	2/hour	B	€10	1 kg
Tent, Canvas, 2 man	1½ hours	B	€25	12 kg
Tarpaulin, Canvas (5x6 m)	20/hour	B	€20	25 kg
Jerrycan, Plastic	12/hour	C	€10-15	1-2 kg
Jerrycan, Metal	6/hour	C	€20-30	2-4 kg
Water Bag, Canvas, 5 liter	10/hour	A	€2	¾ kg
Water Bag, Canvas, 10 liter	8/hour	A	€5	2½ kg
Water Purification Tabs (25)	500 tabs/hour	C	€5	neg
Stove, Coleman	10 hours	C	€75	½ kg
Stove, Solid Fuel	12/hour	B	€10	300 g
Solid Fuel Tablets (4)	72 tabs/hour	B	€7.50	200 g
Firestarter	12/hour	B	€25	75g
Firelighting Flint	24/hour	B	€10	25 g
Waterproof Matches (50)	1000/hour	B	€2.50	neg.
Mess Kit	24/hour	B	€25	½-¾ kg
Magnetic Compass	12/hour	B	€50	125 g

Diving Equipment				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Air Compressor	3000 hours	C	€3750	50 kg
Hand Compressor	500 hours	B	€750	10 kg
Aqualung Tank	5000 hours	D	€2500	5 kg
SCUBA Regulator	1000 hours	C	€1250	1 kg
Rations and Food				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Military Ration Pack	6/hour	C	€40	1½ kg
Canned Rations	12/hour	C	€20	2 kg
Dry Rations	50/hour	A	€15	2 kg
Double Baked Bread	125 loaves/hour	A	€2	1 kg
Hardtack	125 packs/hour	A	€5	1 kg
Grain Mill	12 hours	C	€250	10 kg

Production Time: 12/hour. ***Tools:*** B. ***Cost:*** €25. ***Weight:*** 75 g (5" long).

4" Fire-lighting Flint – A functional and simple 4" long, ½" diameter flint stick with lanyard cap. The unit has a large surface area allowing each strike to produce an impressive shower of sparks.

Production Time: 24/hour. ***Tools:*** B. ***Cost:*** €10. ***Weight:*** 25 g.

Waterproof Matches – These are varnished so they will light when wet (they are *not* self lighting, however).

They come in waxed card containers of 50 which have a sandpaper striking surface on two surfaces.

Production Time: 20 packets/hour. ***Tools:*** B. ***Cost:*** €2.50. ***Weight:*** negligible.

Mess Kit – A metal mess kit consisting of two nested pannikins for cooking and a knife/fork/spoon set in a webbing container.

Some of these type of kits also include a metal cup designed to sit in the character's webbing, around the base of one of their canteens (the cup costs €5).

Production Time: 24/hour. ***Tools:*** B. ***Cost:*** €25. ***Weight:*** ½ to ¾ kg.

Magnetic Compass – A simple compass with a lever dampened needle.

Production Time: 12/hour. ***Tools:*** B. ***Cost:*** €50. ***Weight:*** 125 g.

Diving Equipment

*While Diving equipment is unlikely to be in huge demand, downtime, there may be some call for it, and it is **barely** possible to manufacture SCUBA equipment at some sort of economic cost.*

It is more economic to construct hand compressor units for relatively shallow diving – which will also have some utility in special circumstances.

Air Compressor – Suitable for Scuba tanks, the compressor provides compressed air to 3000 psi (which may be used for other applications).

Production Time: 3000 hours. ***Tools:*** C. ***Cost:*** €3750. ***Weight:*** 50 kg.

Hand Compressor – This is a hand powered rotary compressor that is capable of providing (through tubes) breathing air to a depth of 10-15 meters for up to three users.

The Compressor includes face mask, tubing, and connections for two users and may be modified to allow up to four people to use a single unit at the one time (though the extra masks and tubing must be bought separately).

Production Time: 500 hours. ***Tools:*** B. ***Cost:*** €750. ***Weight:*** 10 kg. ***Accessories:*** Mask and Tubing, €50.

Aqualung & Tanks – High pressure air tanks and Regulator (for up to 4 tanks), ½ hour air per tank. Tanks must be recharged with Air Compressor.

Production Time: 5000 hours per tank, 1000 hours per regulator. ***Tools:*** D (tank) or C (regulator). ***Cost:***

€2500 (tank) or €1250 (regulator). ***Weight:*** 5 kg (tank), 1 kg (regulator).

Food and Rations

In pre-modern times storable, pre-prepared, rations simply did not exist in any meaningful way. Soldiers or travellers might carry grain to be ground into bread whenever they stopped, or might have some form of dried meat or hard baked bread to carry as iron rations, but in most cases they relied on either buying meals at local Inns or Taverns or buying food from markets that followed substantial military forces around.

It was the rare army that had a logistic system capable of organising supply to follow a body of soldiers, supplying them from magazines set up for the purpose.

Displaced personnel will want something better – storable and easily transportable rations – and these ***can*** *be produced relatively easily by local industry.*

Military Ration Pack – A military ration pack (3 meals and sundries, toilet paper, soap, matches, chewing gum etc.) with all the contents contained in plastic sachets inside a large, tough, plastic bag.

Production Time: 6/hour. ***Tools:*** C. ***Cost:*** €40 each (€750 per case of 24). ***Weight:*** 1½ kg each (36 kg per case).

Canned Rations – Canned food and sundries plus three meals in the one packet (like WW2 era C-Rations), all in sealed metal or waxed card containers.

Each pack contains a can of sundries such as toilet paper, chewing gum and candy, powdered cordial mix and half a dozen cigarettes.

A can opener cum spoon is included (there is a 1:12 chance that it may have been inadvertently left out of any given pack, so many soldiers carry one on a loop around their neck).

Production Time: 12/hour. ***Tools:*** C. ***Cost:*** €20 each (€200 per case of 12). ***Weight:*** 2 kg each (30 kg per case).

Dry Rations – Dried meats, fruits and vegetables packed in waxed paper or cardboard. Each container contains a complete meal but no sundries.

Production Time: 50/hour. ***Tools:*** A. ***Cost:*** €15 each (€135 per case of 12). ***Weight:*** 2 kg each (30 kg per case).

Double Baked Bread – Bread has been baked twice till the crust is the consistency of rock (and the interior not much softer).

This old-style variety of storable ration is *not* meant to be eaten "raw." The recipe is higher in fats than normal bread and is intended to be soaked in hot liquid (soups/stews) or fried in bacon (or other) fat. Wrapped in waxed paper.

Production Time: 125 loaves/hour. ***Tools:*** A. ***Cost:*** €2 per loaf. ***Weight:*** 1 kg.

Hardtack – A variant on the idea of double-baked bread. Hardtack is a hard baked solid biscuit (four per box, each good for a meal) high in fat content that is intended to be soaked in hot liquids or fried in animal fats or ground up and used as a flour to bake ones own hot bread (griddle cakes, really) in the field.

Production Time: 125 packs/hour. ***Tools:*** A. ***Cost:*** €5 per box. ***Weight:*** 1 kg per box.

Grain Mill – Made of solid cast metal with, this hand or motor powered mill has a 1 kilo capacity hopper and will grind all grains (beans, corn, peas, lentils, coffee, seeds, nuts, and even shells sunflower seeds) into a fine flour in around 8 minutes.

Production Time: 12 hours. *Tools:* C. *Cost:* €250. *Weight:* 10 kg.

Field Cookers

Field Cooker, Medium – Provides all the facilities needed to feed up to a Company (c, 125 men) in the field, all on a wheeled trailer (may be horse drawn).

Field Cookers

Item	Production Time	Tools	Cost	Weight
Field Cooker, Medium	250 hours	B	€1000	750 kg
Field Cooker, Large	500 hours	B	€2500	1500 kg

It includes a multi-fuel (coal, coke, wood, briquettes or liquid fuels) cooker and a built in Stew kettle/boiler (100 liters), a Coffee/Tea kettle (60 liters), four large hotplates, and all required cooking and food transporting utensils.

Storage space is provided for 50 kg of solid or 75 liters of liquid fuel and for 125 kg of iron rations.

A tarpaulin is provided to shield the cooking staff and serving station in inclement weather.

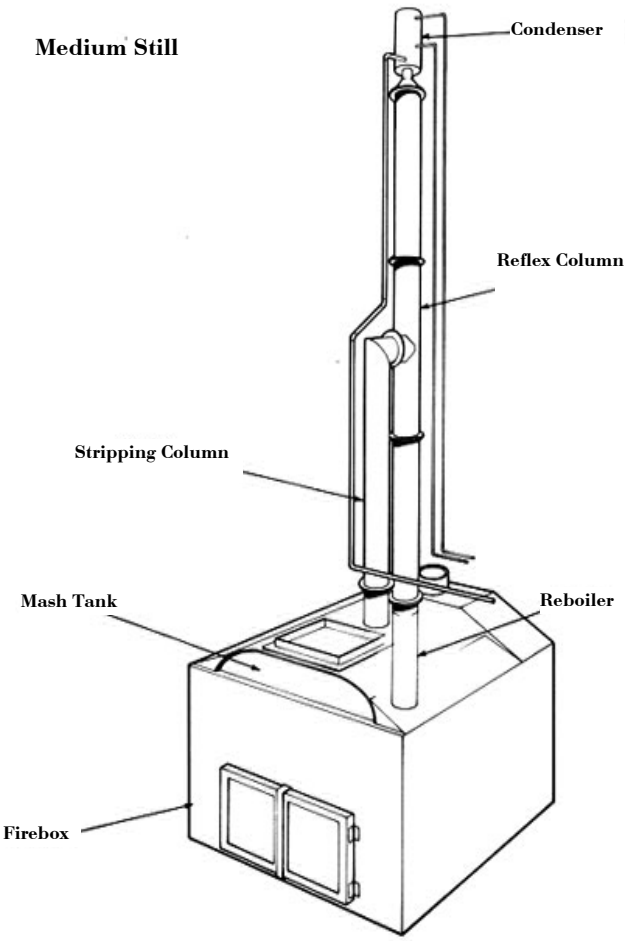
Production Time: 250 hours. ***Tools:*** B. ***Cost:*** €1000. ***Weight:*** 750 kg. ***Fuel Consumption:*** 4 liters liquid or 8 kilos of solid fuel per meal.

Field Cooker, Large – A larger version of the above, capable of feeding two companies (around 250 men).

It has a built in Stew kettle/boiler (175 liters cap), a Coffee/Tea kettle (90 liters), four large hotplates, and all required cooking and food transporting utensils.

Storage space is provided for 100 kg of solid or 150 liters of liquid fuel and for 250 kg of iron rations.

Production Time: 500 hours. ***Tools:*** B. ***Cost:*** €2500. ***Weight:*** 1500 kg. ***Fuel Consumption:*** Double *Medium* cooker rate.



Fuel

A lot of things that the Displaced will want depend on internal combustion engines, diesels or, given time, steam engines – and the fuel to run them.

However, oil wells aren't likely to exist locally, so the Displaced will need to manufacture alternative fuels and, equally, convert the existing vehicles they have to ***run*** *on these fuels.*

Running a Still to convert organic material into ethanol or methanol for fuel requires fuel – normally solid fuel, typically wood or coal, but any burnable organic fuel.

The process is simply a way of transforming generally low energy density solid fuels into high energy density liquid fuels and is not particularly energy efficient.

Fuel Production

Small Still – These units can convert 12 kilos of organic material into a litre of ethanol (or 2 liters of methanol) per hour.

Production Time: 12 hours. ***Tools:*** B. ***Cost:*** €250. ***Weight:*** 12 kg.

The conversion process requires fuel for the heating involved – 12 kilos of wood fuel or a proportional amount of coal or charcoal per hour of operation.

Medium Still – These units can convert 120 kg of organic material into 10 liters of ethanol (or 20 liters of methanol) per hour (see diagram on the next page).

The conversion process requires fuel for the heating involved – 45 kilos of wood fuel or a proportional amount of coal or charcoal per hour of operation.

Wood Gas Generator – These units generate wood gas to fuel internal combustion engines. The *medium* version is suitable for cars and vans, the *large* version is suitable for heavier vehicles.

Production Time: 100 hours. ***Tools:*** B. ***Cost:*** €250 (including fitting and vehicle conversion cost). ***Weight (unloaded):*** 40-50 kg (medium), 60-75 kg (large).

Engine Conversion Kits

Ethanol Conversion – Includes all the parts and fittings needed to convert a standard internal combustion engine so it is able to run on Ethanol fuel.

Production Time: 25 hours. ***Tools:*** C. ***Cost:*** €125 (includes installation cost). ***Weight:*** 5 kg.

Biodiesel Conversion – Includes all the parts and

Fuels and Engine Conversion Kits				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Small Still	12 hours	B	€250	12 kg
Medium Still	100 hours	B	€2500	120 kg
Wood Gas Generator, Medium	100 hours	B	€250	40-50 kg
Wood Gas Generator, Large	125 hours	B	€375	60-75 kg
Ethanol Conversion	25 hours	C	€125	5 kg
Biodiesel Conversion	50 hours	C	€250	5 kg
Diesel Fuel	–	–	€12	1 liter
Gasoline Fuel	–	–	€15	1 liter
Aviation Fuel (AvGas)	–	–	€30	1 liter
Ethanol	–	–	€2.50	1 liter
Methanol	–	–	€0.75	1 liter
Charcoal	–	–	€0.50	1 kg
Wood	–	–	€0.25	1 k
Coal	–	–	€1	1 kg
Coke	–	–	€2	1 kg
Biodiesel	–	–	€1 +	1 liter
Biodiesel + Alcohol	–	–	€1.75 +	1 liter

fittings needed to convert a standard diesel engine so that it is able to run on Biodiesel fuel.

Production Time: 50 hours. ***Tools:*** C. ***Cost:*** €250 (including installation cost). ***Weight:*** 5 kg.

Bulk liquid & solid fuels

Petroleum Fuels – Assuming that such fuels are available at all through local refinery operations.

Diesel – €12 per litre. ***Gasoline –*** €15 per litre. ***AvGas:*** €30 per litre.

Some local societies may have access to crudely distilled petroleum products from oil seeps or tar pits and, with some extra processing, these will be suitable for use in modern engines. They may even be suitable for use in diesel engines with minimal extra processing.

Alcohol Fuels – Based on "commercial" production rather than using the *Stills* detailed above to brew your own.

Ethanol: €2.50 per litre. ***Methanol:*** €0.75 per litre.

Fuel, Solid – Wood and charcoal are the main solid fuels available. Prices assume commercial production.

Charcoal: €0.50 per kilo. ***Wood:*** €0.25 per kilo. ***Coal:*** €1 per kilo.

Alternative Fuels – Assuming they are produced and/or available locally.

Biodiesel: €1 per liter and up (depends on the bio source). ***Biodiesel*** + ***Alcohol:*** €1.75 per liter and up (depending on the bio source).

Generators

One key thing that makes Displaced groups different and which gives them a huge advantage over downtimers is their access to electrical and mechanical power in a more concentrated packages than anything available locally.

This can provide industrial muscle or electrical power, or both. In doing so they will not only power the expansion of industries within whatever community they dwell in, but will also have significant impacts on the wider world.

Diesel generators are well within the capabilities of moderately sized, relatively well equipped, groups, though standard Internal Combustion engines may be too difficult because of their requirement for an relatively complex electrical ignition cycle.

Steam engines (possibly steam turbines) are also doable, and with a much lower level of technology and materials available, and yet offer almost identical advantages to those who possess them over those who do not – though acquiring fuel may be as problematic as for IC engines.

Diesel Generators

1.5 kW Diesel Generator – Diesels are considerably simpler (no need for an electrical ignition system for a start) than internal combustion engines for the power generated and are able to run on biofuels more easily.

Production Time: 1000 hours. ***Tools:*** D. ***Cost:*** €500. ***Weight:*** 20 kg. ***Fuel Consumption:*** 0.2 liters per hour. ***Fuel Tank:*** 6 liters.

5 kW Diesel Generator – A more powerful version of the 1.5 kW model.

Production Time: 3000 hours. ***Tools:*** D. ***Cost:*** €1875. ***Weight:*** 60 kg. ***Fuel Consumption:*** 0.65 liters per hour. ***Fuel Tank:*** 12 liters.

10 kW Diesel Generator – A larger and more powerful unit.

Production Time: 4500 hours. ***Tools:*** D. ***Cost:*** €3750. ***Weight:*** 120 kg. ***Fuel Consumption:*** 1.3 liters per hour. ***Fuel Tank:*** 72 liters.

60 kW Diesel Generator – A larger and more powerful unit.

Production Time: 10000 hours. ***Tools:*** D. ***Cost:*** €18750. ***Weight:*** 680 kg. ***Fuel Consumption:*** 8 liters per hour.

100 kW Diesel Generator – A larger and more powerful unit.

Production Time: 25000 hours. ***Tools:*** D. ***Cost:*** €37500. ***Weight:*** 1125 kg. ***Fuel Consumption:*** 13 liters per hour. ***Fuel Tank:*** 104 liters.

500 kW Diesel Generator – A larger and more powerful unit.

Production Time: 60000 hours. ***Tools:*** D. ***Cost:*** €187500. ***Weight:*** 5700 kg. ***Fuel Consumption:*** 65 liters per hour. ***Fuel Tank:*** 520 liters.

Steam Generators

Steam generators require at least one person with some level of basic mechanical skill to be assigned to watch and tend to them constantly while in operation.

The 100 kW and 500 kW models require two tenders. Larger models, if extrapolated from the ones offered here, require more personnel for safe operation.

*Steam engines are **very** likely to catastrophically fail **if not constantly watched and tended.***

This is the key reason why steam was so quickly replaced in all but some of the larger applications where constant

*supervision was likely to be required for **any** engine.*

5 kW Steam Generator – Even simpler than a diesel in many ways, and especially useful because it can burn any sort of fuel with minimal alterations – solid, or liquid, organic or fossil.

Production Time: 1500 hours. ***Tools:*** C. ***Cost:*** €750. ***Weight:*** 60 kg. ***Fuel Consumption:*** 0.65 liters per hour. ***Fuel Tank:*** 12 liters.

10 kW Steam Generator – A larger and more powerful unit.

Production Time: 2250 hours. ***Tools:*** C. ***Cost:*** €2500. ***Weight:*** 120 kg. ***Fuel Consumption:*** 1.3 liters per hour. ***Fuel Tank:*** 72 liters.

60 kW Steam Generator – A larger and more powerful unit.

Production Time: 5000 hours. ***Tools:*** C. ***Cost:*** €5000. ***Weight:*** 680 kg. ***Fuel Consumption:*** 8 liters per hour.

100 kW Steam Generator – A larger and more powerful unit.

Production Time: 12500 hours. ***Tools:*** C. ***Cost:*** €25000. ***Weight:*** 1125 kg. ***Fuel Consumption:*** 13 liters per hour. ***Fuel Tank:*** 104 liters.

500 kW Steam Generator – A larger and more powerful unit.

Production Time: 30000 hours. ***Tools:*** C. ***Cost:*** €125000. ***Weight:*** 5700 kg. ***Fuel Consumption:*** 65 liters per hour. ***Fuel Tank:*** 520 liters.

Alternative Generators

50 kW Windmill Generator – This model requires *at least* moderate wind speeds, the unit is mounted on swivel base to swing into wind as direction changes.

Production Time: 10000 hours. ***Tools:*** B. ***Cost:*** €2500. ***Weight:*** 3500 kg.

Generators				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
1.5 kW Diesel	1000 hours	D	€500	20 kg
5 kW Diesel	3000 hours	D	€1875	60 kg
10 kW Diesel	4500 hours	D	€3750	120 kg
60 kW Diesel	10,000 hours	D	€18750	680 kg
100 kW Diesel	25,000 hours	D	€37500	1125 kg
500 kW Diesel	60,000 hours	D	€187.5k	5700 kg
5 kW Steam	1500 hours	C	€750	60 kg
10 kW Steam	2250 hours	C	€2500	120 kg
60 kW Steam	5000 hours	C	€5000	680 kg
100 kW Steam	12,500 hours	C	€25000	1125 kg
500 kW Steam	30,000 hours	C	€125 k	5700 kg
50 kW Windmill Generator	10,000 hours	B	€2500	3500 kg
100 kW Windmill Generator	15,000 hours	B	€3750	4000 kg
10 kW Hydro Generator	1500 hours	C	€750	250 kg
60 kW Hydro Generator	3000 hours	C	€1500	500 kg
100 kW Hydro Generator	4000 hours	C	€2000	1000 kg
500 kW Hydro Generator	10,000 hours	C	€5000	2250 kg
Bicycle Generator (0.72 kW)	500 hours	B	€125	1 kg

100 kW Windmill Generator – A larger version of the above 50 kW windmill, with a reinforced structure, it is able to generate more power at the same wind speeds as the smaller model.

Production Time: 15000 hours. ***Tools:*** B. ***Cost:*** €3750. ***Weight:*** 4000 kg.

10 kW Hydro Generator – Requires a small stream and dam with moderate drop *or* a fast flowing stream for without a dam. These small units can be placed directly on the stream bed and still generate usable power – larger units need more elaborate arrangements. ***Production Time:*** 1500 hours. ***Tools:*** C. ***Cost:*** €750. ***Weight:*** 250 kg.

60 kW Hydro Generator – Requires moderate sized stream and dam with long drop for effective power generation and operation.

Production Time: 3000 hours. ***Tools:*** . ***Cost:*** €1500. ***Weight:*** 500 kg.

If the stream is large enough or the drop long enough (or both) then multiple generators may be installed.

100 kW Hydro Generator – Requires a large stream and a dam with long drop for effective power generation and operation.

Production Time: 4000 hours. ***Tools:*** C. ***Cost:*** €2000. ***Weight:*** 1000 kg.

500 kW Hydro Generator – Requires a very large stream and a dam with long drop for effective power generation and operation.

Production Time: 10000 hours. ***Tools:*** C. ***Cost:*** €5000. ***Weight:*** 2250 kg.

Bicycle Generator – A stand and belt-powered dynamo that can be attached to the rear wheel of any bicycle, and which can be used to partly recharge Lead/Acid Automotive Batteries.

Production Time: 500 hours. ***Tools:*** B. ***Cost:*** €125. ***Weight:*** 1 kg. ***Power Output:*** 0.72 kW nominal.

Hand & Power Tools

These are essential for any sort of repairs or maintenance to be carried out by characters. They do not normally qualify as "tools" for manufacturing things

Basic Tool Kit – Small hand tools required for basic repairs (equal to Type A tools *for maintenance only*). The GM may determine that no maintenance tasks may be undertaken without them.

Production Time: 80 hours. ***Tools:*** A. ***Cost:*** €75. ***Weight:*** 1 kg.

Swiss Army Knife – Almost a basic tool kit in itself, it allows basic repairs to be attempted on anything, but normally at a small to medium penalty.

Production Time: 40 hours. ***Tools:*** B. ***Cost:*** €35. ***Weight:*** negligible.

Power Hand Tools – A selection of powered hand tools (equal to Type C for maintenance and Type B for construction purposes).

Production Time: 500 hours. ***Tools:*** C. ***Cost:*** €1250. ***Weight:*** 35 kg. ***Power Requirement:*** 5 kW.

Wheeled Vehicle Tools – Basic repair and maintenance tools for wheeled vehicles. No repair tasks can be carried out without these, and maintenance tasks take double normal time (complex repair tasks will require more complex tools).

Production Time: 200 hours. ***Tools:*** B. ***Cost:*** €175. ***Weight:*** 5 kg.

Tracked Vehicle Tools – Basic repair and maintenance tools for tracked vehicles. Repairs cannot be carried out without these tools, and maintenance tasks take double time, if they are possible at all.

Production Time: 300 hours. ***Tools:*** B. ***Cost:*** €250. ***Weight:*** 20 kg.

Aircraft Tools – Basic repair and maintenance tools for aircraft. No repair tasks can be carried out without these, and maintenance tasks will take double time (complex tasks require more complex tools).

Production Time: 500 hours. ***Tools:*** B. ***Cost:*** €350. ***Weight:*** 20 kg.

Construction Tools (**Basic**) – Type A tools for excavations only when used by themselves. when used in conjunction with *Standard Construction Tools* (see below) they are complete Type A Tools.

Production Time: 50 hours. ***Tools:*** A. ***Cost:*** €75. ***Weight:*** 30 kg.

Construction Tools (**Standard**) – Type A tools for construction only when used by themselves – when used in conjunction with *Basic Construction Tools* (see above) they are complete Type A Tools.

Production Time: 50 hours. ***Tools:*** A. ***Cost:*** €75. ***Weight:*** 30 kg.

Small Arms Tools – Specialised tools for repairing small arms (maintenance tools are included in the price of individual weapons – *this* toolkit can act as a generic maintenance kit for all small arms).

Production Time: 250 hours. ***Tools:*** B. ***Cost:*** €625. ***Weight:*** 10 kg. ***Power Requirements:*** 1½ kW.

Heavy Ordnance Tools – Specialised tools for repairing and maintaining heavy weapons/artillery (maintenance tools are included in the price of individual weapons – this toolkit can act as a generic maintenance kit for all small arms if required).

Production Time: 500 hours. ***Tools:*** B. ***Cost:*** €1250. ***Weight:*** 20 kg. ***Power Requirements:*** 5 kW.

HAND & POWER TOOLS

Item	Production Time	Tools	Cost	Weight
Basic Tool Kit	80 hours	A	€75	1 kg
Swiss Army Knife	40 hours	B	€35	~
Power Hand Tools	500 hours	C	€1250	35 kg
Wheeled Vehicle Tools	200 hours	B	€175	5 kg
Tracked Vehicle Tools	300 hours	B	€250	20 kg
Aircraft Tools	500 hours	B	€350	20 kg
Construction Tools (Basic)	50 hours	A	€75	30 kg
Construction Tools (Standard)	50 hours	A	€75	30 kg
Small Arms Tools	250 hours	B	€625	10 kg
Heavy Ordnance Tools	500 hours	B	€1250	20 kg
Electrical Tools	1200 hours	B	€1250	2 kg
Hand Pump	100 hours	B	€125	2½ kg
Portable Machine Shop	35000 hours	D	€75000	1750 kg

Heaters and Coolers				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Freezer, Small	500 hours	C	€750	25 kg
Freezer, Large	1000 hours	C	€1500	175 kg
Refrigerator, Small, Electric	500 hours	C	€625	25 kg
Refrigerator, Small, Fuel	125 hours	B	€175	25 kg
Refrigerator, Large, Electric	1000 hours	C	€1250	150 kg
Refrigerator, Large, Fuel	250 hours	B	€350	25 kg
Portable Heater, Electric	50 hours	B	€75	5 kg
Portable Heater, Fuel	25 hours	A	€25	5 kg
Water Heater, Electric	500 hours	C	€300	30 kg
Water Heater, Fuel	25 hours	B	€75	30 kg

Electrical Tools – Specialist tools for the maintaining and repairing *electrical* systems and equipment (but *not* for the repair of Integrated Circuits or anything in the nature of *electronics*).

Production Time: 1200 hours. ***Tools:*** B. ***Cost:*** €1250. ***Weight:*** 2 kg.

Hand Pump – A hand-cranked pump that can move 20 liters of any normal fluid per minute.

Production Time: 100 hours. ***Tools:*** B. ***Cost:*** €125. ***Weight:*** 2½ kg.

Portable Machine Shop – A trailer containing power machine tools (bench grinder, horizontal and vertical boring and drilling machines, milling machine, metal-working and woodworking lathes and more). The unit also contains the equivalent of a set of *Power Hand Tools* to supplement the fixed machinery.

It provides the equivalent of D class non-electric and electronic maintenance facilities (and C class non-electric and non electronic construction facilities) and has a manpower multiplier of x 1.25).

Space is provided for a 60 or 100 kW generator on the trailer hitch, but this is must be purchased separately.

Production Time: 35000 hours. ***Tools:*** D. ***Cost:*** €75000. ***Weight:*** 1750 kg. ***Power Requirements:*** 60 kW.

A uniquely useful item for player characters who wish to operate away from their home base for extended periods of time and yet still maintain their "high tech" equipment in an operational condition – and even produce small items "on demand."

However, the unit requires that an appropriate supply of raw materials and/or spare parts need be provided for these activities to be undertaken.

*This ongoing need for resupply may be the biggest limitation on the utility of the Machine Shop in an operational sense – and **will** be the source of many adventure hooks as the players attempt to keep it fully operational.*

Heaters & Coolers

Another uptime luxury that the Displaced will deem a necessity – being able to store fresh food so that they will not rot is always a valuable thing.

Even more important is the need to store some medical supplies that need to be maintained in a temperature controlled environment.

*Similarly, being able to keep oneself warm – and provide warm water for bathing or cleaning – is also something that the Displaced will not wish to give up, even if it **costs** (and it **will**).*

Freezer, Small – suitable for storing food and those medical supplies that need to be frozen. There are both 25 and 300 liter models, details provided.

Production Time: (25 liter): 500 hours. ***Tools:*** C. ***Cost:*** €750. ***Weight:*** 25 kg. ***Power Requirements:*** 0.25 kW.

Production Time (300 Liter): 1000 hrs. ***Tools:*** C. ***Cost:*** €1500. ***Weight:*** 175 kg. ***Power Requirements:*** 1½ kW.

Refrigerator, Small – A 30 litre capacity unit for the short-term storage of food or medical supplies.

There are both fuel and electric models, details provided.

Production Time (Electric): 500 hours. ***Tools:*** C. ***Cost:*** €625. ***Weight:*** 25 kg. ***Power Requirements:*** 0.25 kW.

Production Time (Fuel): 125 hours. ***Tools:*** B. ***Cost:***

€175. ***Weight:*** 25 kg. ***Fuel Requirements:*** 1 litre/ week.

Refrigerator, Large – A 300 litre capacity unit, comes in fuel and electric models.

Production Time (Electric): 1000 hours. ***Tools:*** C. ***Cost:*** €1250. ***Weight:*** 150 kg. ***Power Requirements:*** 1½ kW.

Production Time (Fuel): 250 hours. ***Tools:*** B. ***Cost:*** €350. ***Weight:*** 25 kg. ***Fuel Requirements:*** 1 litre per day.

Portable Heater – This unit will heat one average sized room or tent as long as it is powered or fuelled.

Production Time (Electric): 50 hours. ***Tools:*** B. ***Cost:*** €75. ***Weight:*** 5 kg. ***Power Requirements:*** 1½ kW.

Production Time (Fuel): 25 hours. ***Tools:*** A. ***Cost:*** □25. ***Weight:*** 5 kg. ***Fuel Requirements:*** ½ litre per hour.

Water Heater – A 150 liter capacity water heater, it boil water in 20 minutes. There are two models, fuel and electric powered, details provided.

Production Time (Electric): 500 hours. ***Tools:*** C. ***Cost:*** €300. ***Weight:*** 30 kg. ***Power Requirements:*** 175 kW.

Production Time (Fuel): 25 hours. ***Tools:*** B. ***Cost:*** €75. ***Weight:*** 30 kg. ***Fuel Requirements:*** 4 liters per load.

Medical Supplies

*As noted in **Farm, Forge and Steam**, "modern" (Displaced) personnel are **probably** not in any particular danger from local diseases (or not any more than usual), especially where antibiotic drugs are available.*

*Of course, there are **many** other medical problems for which the Displaced will **demand** modern supplies, making it one of the highest priorities after weapons!*

Drugs

Anaesthetic (Local/General) – Liquid or gas (actually a volatile liquid) forms are available. Liquid anaesthetic must be refrigerated and the gas version is normally stored in an opaque, pressure tight, bottle.

Production Time (Gas): 20 doses per hour. ***Tools:*** C. ***Cost:*** €12/dose. ***Weight:*** 100 doses per kilo.

Production Time (Liquid): 10 doses per hour. ***Tools:*** D. ***Cost:*** €50/dose. ***Weight:*** 100 doses per kilo.

Antibiotics – These may be either *Liquid (injectable)*,

Medical Supplies

Item	Production Time	Tools	Cost	Weight
Anaesthetic, Local, Gas	20 doses/hour	C	€12 ea	100/kg
Anaesthetic, Local, Liquid	10 doses/hour	D	€50 ea	100/kg
Antibiotics, Injectable	25 doses/hour	C	€30 ea	100/kg
Antibiotics, Tablet/Powder	12 doses/hour	D	€60 ea	100/kg
Antifever, Injectable	20 doses/hour	C	€10 ea	100/kg
Antifever, Tablet	10 doses/hour	D	€30 ea	100/kg
Antiseptic, Liquid	200 doses/hour	B	€½ ea	100/kg
Antiseptic, Powder	100 doses/hour	C	€1 ea	200/kg
Pain Reliever, Mild	500 doses/hour	C	€¼ ea	250/kg
Sedative, Mild, Injectable	100 doses/hour	C	€1 ea	100/kilo
Sedative, Mild, Pill	200 doses/hour	D	€2	250/kilo
Doctor's Bag	10 hours + contents	D	€10 k	5 kg
Doctor's Bag (Refill)	–	–	€5000	–
Trauma Kit	100 hours + contents	D	€15 k	7½ kg
Trauma Kit Refill	–	–	€7500	–
Medic's Kit	5 hours + contents	D	€1500	2 kg
Medic's Kit Refill	–	–	€750	–
Personal Medical Kit	100/hour	B	€60	100 g
Wound Dressing	250/hour	B	€25	50 g

tablet (oral) or powder (sprinkled on a wound) forms are available. Liquid antibiotics *must* be refrigerated.

Production Time (Injectable): 25 doses/hour. ***Tools:*** C. ***Cost:*** €30/dose. ***Weight:*** 100 doses per kilo.

Production Time (Tablet or Powder): 12 doses/hour. ***Tools:*** D. ***Cost:*** €60/dose. ***Weight:*** 100 doses per kilo.

Antifever – Available in two versions – one storable at room temperature, the other needing to be refrigerated.

Production Time (Refrigerated): 20 doses/hour. ***Tools:*** C. ***Cost:*** €10/dose. ***Weight:*** 100 doses per kilo.

Production Time (Room Temperature): 10 doses/hour. ***Tools:*** D. ***Cost:*** €30/dose. ***Weight:*** 100 doses per kilo.

Antiseptic – Available as a liquid or powder type.

Production Time (Liquid): 200 doses per hour. ***Tools:*** B. ***Cost:*** €½/dose. ***Weight:*** 100 doses per kilo.

Production Time (Powder): 100 doses per hour. ***Tools:*** C. ***Cost:*** €1/dose. ***Weight:*** 200 doses per kilo.

Pain Reliever, Mild – Aspirin (or equivalent) – available in pill form only.

Production Time: 500 doses per hour. ***Tools:*** C. ***Cost:*** €¼/dose. ***Weight:*** 250 doses/kg.

Sedative, Mild – More powerful than aspirin; available in liquid and pill form.

Production Time (Liquid): 100 doses per hour. ***Tools:*** C. ***Cost:*** €1/dose. ***Weight:*** 100 doses per kilo.

Production Time (Pill): 200 doses per hour. ***Tools:*** D. ***Cost:*** €2/dose. ***Weight:*** 250 doses per kilo.

Medical Equipment

Doctor's Bag – Contains 50 units (or 100 pills) of all storable drugs, 50 bandages and wound dressings and surgical instruments (sold *only* to qualified MDs).

Production Time: 10 hours (for surgical instruments). ***Tools:*** C (Surgical Instruments). ***Cost:*** €10000 (€5000 to restock with consumables). ***Weight:*** 5 kg.

Trauma Kit – A mix of disposable and reusable surgical items, as well as the drug suite of a Doctor's Black Bag.

Production Time: 100 hours (for surgical instruments). ***Tools:*** C (surgical instruments). ***Cost:*** €15000 (€7500 to restock with drugs and dressings). ***Weight:*** 7.5 kg.

Medic's Kit – Contains ten units of all storable drugs (or 20 Pills), bandages, wound dressings (sold only to qualified paramedics or nurses).

Production Time: 5 hours (for surgical instruments). ***Tools:*** C (surgical instruments). ***Cost:*** €1500 (€750 to restock the kit with all the needed medical supplies). ***Weight:*** 2 kg.

Personal Medical Kit – Contains five units of Antiseptic Powder, two of Antibiotic Powder, Sterile Bandages and other first aid materials (enough supplies to treat 1-2 wounds).

Production Time: 100 per hour. ***Tools:*** B. ***Cost:*** €200. ***Weight:*** 100 g.

Wound Dressing – Contains a large and small sterile, antiseptic and antibiotic impregnated bandage.

Production Time: 250 per hour. ***Tools:*** B. ***Cost:*** €25. ***Weight:*** 50 g.

Photography

The ability to create a photographic record of events a variety of reasons will remain important enough that it is likely to continue to be in demand.

*The biggest manufacturing problem will probably be in making the cellulose film negative base – the chemicals and light sensitive paper were available **very** early (and could have been available earlier).*

Film, 35 mm – Locally made 35 mm cellulose based B&W film. Normally 100 ASA (useful for normal lighting conditions) – higher ASA up to 400 can be produced (divide production rate by 100/actual ASA to determine the frames per hour that may be manufactured, and adjust the cost accordingly).

Production Time: 360 frames per hour (divided into rolls of 12, 24 or 36 frames). ***Tools:*** C. ***Cost:*** €4/frame.

Photography				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Film, 35mm, B&W (36 exp)	10 rolls/hour	C	€144	50 g
Box Camera, Local	1750	D	€3750	1½ kg
Photo Chemicals/Paper	30 rolls capacity/hour	C	€750	5 kg
Power Storage				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Rechargeable Battery	500 hours	D	€500	1 kg
Dry Cell (one use) Battery	1 hour	C	€7.50	50 g
Lead/Acid Auto Battery	60 hours	B	€125	5 kg
Clockwork Battery	250 hours	C	€375	500 g

Weight: 50 g.

Box Camera, Local – Hand-held camera, a cross between a "Box Brownie" and a 1930's all-mechanical 35 mm camera (fixed 35 mm lens).

Production Time: 1750 hours. ***Tools:*** D. ***Cost:*** €3750. ***Weight:*** 1½ kg.

Photographic Chemicals & Paper – Enough to process 1000 frames of B&W photographs, regardless of ASA (note, some form of darkroom, specialist or makeshift, will be needed for the process).

Production Time: 125 hours. ***Tools:*** C ***Cost:*** €750. ***Weight:*** 5 kg.

Power Storage

*Electrical power is **so** useful – but it isn't always convenient to run a cord back to a generator or power point. This is where batteries come in.*

The main problem with making batteries locally, especially rechargeable battery replacements and dry cells, will be in getting the quality control right.

Poor quality control will mean that their duration will be erratic, but usually below that of an uptime equivalent.

Of course, as modern technology has shown, not all low tech power storage devices have to be mechanically based – the clockwork power supplies of the Freestyle type survival torches and radios offers an alternative that never runs down as long as someone can turn a crank!

Rechargeable Battery – This will replace (functionally, though not necessarily in size – it may, in fact, have to be mounted externally and connected by wires or cables) any rechargeable battery required by any of the devices listed.

These batteries are most likely sealed "gel" cell batteries – basically a variant of the automotive lead-acid variety but more easily and safely transportable.

Production Time: 500 hours. ***Tools:*** D ***Cost:*** €500. ***Weight:*** 1 kg.

Dry Cell (Disposable) Battery – This will replace any disposable battery and provides about a half to two thirds of the "normal" operating time (this is due to poorer local quality control).

Production Time: 1 hour. ***Tools:*** C ***Cost:*** €7.50. ***Weight:*** 50 g.

Lead/Acid Auto Battery – This can power any device requiring vehicle power for half to two-thirds of the time a non-local Auto Battery could (this is due to poorer local quality control).

Characters may be able to "rework" the battery to be the full equal of a standard uptime model if they have the appropriate skills, tools and materials to do so.

Production Time: 60 hours. ***Tools:*** B ***Cost:*** €125. ***Weight:*** 5 kg.

"Wind Up" Battery – Based on the clockwork power supply of uptime radios and torches, this is a heavy duty clockwork unit that can replace 12 dry cell battery/hours (i.e. 12 batteries for one hour or one battery for 12 hours) on a 15 minute winding.

Production Time: 250 hours. ***Tools:*** C. ***Cost:*** €375. ***Weight:*** ½ kg.

Precision Instruments

*Sometimes there is really no substitute for precision engineered equipment produced to absolute tolerances – or items intended for use **with** them.*

Marine Chronometer – Extremely accurate timekeeping mechanism.

Model A is rather large and stored in a specially constructed watertight wooden box (it loses less than a second a year) and can be constructed with simpler tools. One winding of the mechanism lasts a whole week.

Model B is much smaller, slightly less accurate (it loses around 5 seconds per year) and is the size of a old fashioned pocket watch. One winding of the mechanism lasts 36 hours.

Production Time (Model A): 10000 hours. ***Tools:*** C. ***Cost:*** €12500. ***Weight:*** 2 kg.

Production Time (Model B): 1750 hours. ***Tools:*** D. ***Cost:*** €3500. ***Weight:*** 100 g.

Navigational Instruments – A Sextant for taking astronomical readings plus an accurate compass for taking bearings. ***P***

Production Time: 2500 hours. ***Tools:*** C. ***Cost:*** €3750. ***Weight:*** 2½ kg.

Ephemerides – Gives the predicted positions of the Sun, Moon, and selected other Celestial Bodies at a set time and at a set latitude or longitude and tables along with the conversion factors to allow position sightings to be taken. Will need to be optimised for a specific time period because if the changing position of key stars.

Production Time: 1 hour. ***Tools:*** D. ***Cost:*** €100. ***Weight:*** ½ kg.

Surveyor's Transit – Standard optical Surveyor's Transit and associated gear, these are vital for any mapping and surveying that needs to be done. Also includes measuring rods and measuring chains.

Production Time: 1750 hours. ***Tools:*** C. ***Cost:*** €2500. ***Weight:*** 25 kg.

Stereoscopic Rangefinder – A survey or artillery version of an optical rangefinder still found as a backup to electronic models on even the most modern tanks. Baseline length of one meter allows it to measure accurately from 500 to 10000 meters.

Production Time: 750 hours. ***Tools:*** B. ***Cost:*** €1250. ***Weight:*** 10 kg.

Printing & Writing

One of the simpler technologies, yet one with the most profound effects – assuming a certain critical mass of literacy has been achieved in the target audience or that there is an intention to ***create*** *that level of literacy.*

Ink Duplicator (**Hand Cranked**) – A duplicating machine that uses wax stencils "cut" with a manual typewriter or other impact printer (or by a special stylus) to lay specially formulated ink (mostly black, less commonly red or blue) on paper that is run through by a hand or powered crank. A hand crank Duplicator can run off around 2000 sheets an hour.

Production Time: 300 hours. ***Tools:*** C. ***Cost:*** €375. ***Weight:*** 20-30 kg. ***Accessories & Consumables:*** Paper, 1 Ream, €10; Ink, 1 Tube (enough for six reams of paper), €25; Stencils, 20 = €20.

Typewriter, Manual – Allows bureaucracy to function more effectively in a computerless world and, with the Ink Duplicator, makes for entry level mass publishing of basic texts possible and encourages transmission of information between *anyone* in a cheap and utilitarian medium.

Production Time: 1500 hours. ***Tools:*** D. ***Cost:*** €3750. ***Weight:*** 5-10 kg. ***Consumables:*** Paper, 1 Ream, €10; Ink, Ribbon (enough for 10 or more reams of paper), €5.

Models suited for local languages or phonetics may be constructed for the same manufacturing cost as standard models, but may cost more depending on local requirements.

Flatbed Press – Iron framed bed holding type capable of printing 250 A0 (840 x 1189 mm – the equivalent of 16 x A4 sheets) sheets per hour (single sided – the sheets have to be reversed and printed again to get double sided) but can be modified for larger or

Precision Instruments				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Chronometer, Mod A	10,000 hours	C	€12.5 k	2 kg
Chronometer, Mod B	1750 hours	D	€3500	100 g
Navigational Instruments	2500 hours	C	€3750	2½ kg
Ephemerides	1 hour	D	€100	½ kg
Surveyor's Transit	1750 hours	C	€2500	25 kg
Stereoscopic Rangefinder	750 hours	B	€1250	10 kg

non-metric sized paper.

The press includes ten frames and enough type to allow them to be set up for quick changing between pages (it takes two men around 5 minutes to change in/out a frame of type).

Production Time: 1000 hours. ***Tools:*** B. ***Cost:*** €1250. ***Weight:*** 250-500 kg.

*A good, basic, press improving greatly on the first Gutenberg models, yet easy to construct at almost any tech level – and, if (as the **Displaced** do) you know of the utility of printing, it can be the basis of a revolution in widespread (if not mass) literacy **anywhere** and **any time**.*

Flatbed Press, Improved – Printing from dual flat platens, but with an automatic sheet feeding and return mechanism run by steam, electric, diesel or internal combustion power.

This press is normally set up to print 1000 A0 (841 x 1189 mm – the equivalent of 16 x A4 sheets) pages per hour, both sides at a time but can be modified for larger or non-metric sized paper.

The press includes twenty frames and enough type to allow them to be set up for quick changing between pages. It takes two men around 10 minutes to change in/out the two frames of type.

Production Time: 2000 hours. ***Tools:*** C. ***Cost:*** €5000. ***Weight:*** 500-1000 kg.

Fountain Pen – with metal nib and plastic or rubber bladder. Better than the (likely) local split reed or goose quill pens, but occasionally leaky.

One refill is good for around 50 to 100 pages of writing and ink is normally blue, less commonly black or red.

Production Time: 1/hour. ***Tools:*** B. ***Cost:*** €125. ***Weight:*** 30-50 g. ***Accessories:*** Ink (Bottle, 6 refills), €5,.


Crystal Radio Set

Radio Sets

*Another **really** useful technology – the ability to communicate over distances instantaneously.*

If the Displaced have the needed technological and manufacturing base they will want to go for radio communications – even if it has to be spark gap transmitters and Morse code. Otherwise they will try for telegraphy of some sort (dealt with in another section).

Radio Transceiver, Valve, Manpack – Locally produced (valve) transceiver that is nominally man portable (as long as the man doesn't carry much more than the radio and a spare battery!).

Morse only and voice capable models are available (both include Morse key and sounder). Both models have only five wavelengths that they can transmit or receive on.

They operate for four hours continuously (around 12 hours of normal intermittent use) on a large (5 kg) Dry Cell Battery *or* a standard Lead/Acid auto battery.

They can also be powered by a *Bicycle Generator* or by direct connection to mains power.

Printing and Writing				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Ink Duplicator (Manual)	300 hours	C	€375	20-30 kg
Duplicator Ink (1 tube)	–	–	€25	–
Duplicator Stencils (20)	–	–	€20	–
Manual Typewriter	1500 hours	D	€3750	5-10 kg
Typewriter Ribbon	–	–	€5	–
Paper, 1 ream	–	–	€1	–
Flatbed Press	1000 hours	B	€1250	250-500kg
Improved Flatbed Press	2000 hours	C	€5000	0.5-1 ton
Fountain Pen	1/hour	B	€125	30-50 g

Radio Sets				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Transceiver, Valve, Morse	5000 hours	D	€3750	25 kg
Transceiver, Valve, Voice	7500 hours	D	€6250	25 kg
Transceiver, Valve, Morse	7500 hours	D	€7500	125 kg
Transceiver, Valve, Voice	17500 hours	D	€12.5 k	125 kg
Radio Receiver, Cabinet	1250 hours	C	€1000	25 kg
Portable Radio	1875 hours	C	€1500	5 kg

Expected Range: 25 km with Whip antenna for voice transmissions, double that for Morse. ***Production Time (Morse only):*** 5000 hours. ***Tools:*** D. ***Cost:*** €3750. ***Weight:*** 25 kg. ***Accessories:*** Dry Cell Battery, 5 kg (included in unit weight), €375 (100 Hours, C tools; two are included in initial price).

Production Time (Voice): 7500 hours. ***Tools:*** D. ***Cost:*** €6250. ***Weight:*** 25 kg. ***Accessories:*** Dry Cell Battery, 5 kg (included in unit weight), €375 (100 Hours, C tools; two are included in initial price).

Radio Transceiver, Valve, Semi-Portable – Locally produced (valve) transceiver. Morse only and voice capable models are available (both include Morse key and sounder). Both are intended for vehicle or base station use as they require a 1.5 kW power supply.

Both are normally limited to a maximum of 25 transmit/receive channels.

Expected Range: 50 km (Voice) or 250 km (Morse) with Dipole antenna. ***Production Time (Morse only):*** 7500 hours. ***Tools:*** D. ***Cost:*** €7500. ***Weight:*** 125 kg.

Production Time (Voice): 17500 hours. ***Tools:*** D. ***Cost:*** €12500. ***Weight:*** 125 kg.

Radio Receiver, Cabinet – This is a locally produced Radio receiver set – emphasising the cheapest possible electrical elements.

It is large, bulky, fragile and relies on mains power (the unit is installed in a wooden cabinet the size of a late 20th century large screen colour TV.

As a result it is only suitable for fixed operation, but is very popular with local elites or in public entertainment venues where the *Displaced* are able to maintain or construct a public radio broadcasting system.

Production Time: 1250 hours. ***Tools:*** C. ***Cost:*** €1000. ***Weight:*** 25 kg.

The possibility of mass communications even in societies where literacy is limited is made possible by this basic type of radio set.

Portable Radio – This is a receiver set similar in concept to the "Cabinet" set, but with higher value components to allow it to be much smaller and the capability of running off a lead-acid vehicular battery for 12 hours of continuous use.

This unit is *much* less fragile than the cabinet set, it *can* be moved around easily, but is not really portable, especially because of the heavy battery.

Production Time: 1875 hours. ***Tools:*** C. ***Cost:*** €1500. ***Weight:*** 5 kg (not including battery).

Timekeeping

Pretty much every culture of any degree of social sophistication has a concept of the importance of the passage of time, and has some way of measuring it.

The Displaced have much improved ways of doing so – and find the need for measuring time to be of great importance, as will those who end up being influenced by or doing business with them.

Alarm Clock – A cheaply produced mechanical alarm clock. It is not terribly accurate (it loses perhaps 1d3 minutes a day), but is still more than good enough for its purpose – and better than anything likely to be available before early modern times.

Production Time: 100 hours. ***Tools:*** B. ***Cost:*** €125. ***Weight:*** ½ kg

Timekeeping				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Alarm Clock	100 hours	B	€125	½ kg
Mechanical Timer	30 hours	B	€35	300 g
Pocket Watch	1750 hours	D	€1875	100 g

Visual Light Communications				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Heliograph	50 hours	A	€25	18-20 kg
Aldiss Lamp, Carbide	2½ hours	B	€25	2 kg
Aldiss Lamp, Electric	100 hours	C	€75	5 kg

Mechanical Timer – A simpler variant of the Alarm Clock, it does not actually *tell* time, it simply marks the *passage* of time. It can be set to within +/- 1d3 minutes accuracy for any period from 5 minutes to 12 hours.

Production Time: 30 hours. ***Tools:*** B. ***Cost:*** €35. ***Weight:*** 300 g.

Pocket Watch – An old-fashioned pocket-sized case (glass face protected by flip open metal plate). It loses only (1d3 x 10) second per day.

Production Time: 1750 hours. ***Tools:*** D. ***Cost:*** €1875. ***Weight:*** 100 g

Visual Light Comms

*Long range, close to instantaneous, transmission of messages is **such** an attractive ability that the Displaced will want to ensure that they and their allies have access to it even if they cannot manage to manufacture wireless or even wired communications.*

The last alternative is to send messages visually – two easily adopted technologies below are based on Morse code

On a larger scale the construction of Semaphore Telegraph using large mechanical arms or different coloured panels on a mechanically operated grid and telescopes to boost the distance between the towers is also a possibility.

Heliograph – A simple mirror-flasher device used to transmit coded messages. Under optimum conditions range is around 50 km with height above the surrounding terrain, however, is the limiting factor (and the weather based visibility).

A special lamp attachment is used for night-time transmissions. Normal maximum transmission rate is 12 words per minute. ***Production Time:*** 50 hours. ***Tools:*** A. ***Cost:*** €25. ***Weight:*** 18-20 kg.

*A variation on this is to set up an **Optical** telegraph based on the system introduced in the late 18th century by the British and French.*

The British system consisted of six panels worked by ropes and pulleys and could be either face on or end on, which allowed 63 coded items (the British chose the letters of the alphabet, numerals 0-9, and some pre-set coded phrases or sentences).

This was later replaced by a semaphore type swinging arm unit (see previous page) that allowed better visibility – and more flexibility.

*The London-Portsmouth line had the two terminus stations plus seven intervening ones and a "ready" message could traverse the distance **there and back** in 2 minutes.*

A normal coded message took an average of 15 minutes to transmit from end to end (omitting vowels from common words for speed).

*Stations needed to be placed as high as possible to both reduce the number needed **and** to minimise the effect of local meteorological conditions such as haze and fog.*

In the period of operation (1794-1847) it was able to operate on an average of 200 days per year.

Aldiss Lamp – A shuttered lamp designed for transmitting coded messages over distance (often used at sea) and equally effective during night or day under standard weather conditions.

Two versions are available, a carbide gas fuelled (¼ lb carbide per hour) model and an electric powered unit

Optical Semaphore Telegraph

Vision Aids				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Binoculars (4x)	1200 hours	C	€2500	2½ kg
Spyglass (5x)	300 hours	B	€625	1½ kg
Spotlight, Carbide	25 hours	B	€25	7½ kg
Spotlight, Carbon Arc	500 hours	B	€125	10 kg
Spotlight, Electric	750 hours	C	€375	5 kg
Spotlight Globe	–	–	€75	–
IR Rifle Sight	7500 hours	D	€18750	2½ kg

(1.5 Kw generator or vehicle power hookup).

Production Time (Electric): 100 hours. ***Tools:*** C. ***Cost:*** €75. ***Weight:*** 5 kg.

Production Time (Carbide): 2½ hours. ***Tools:*** B. ***Cost:*** €25. ***Weight:*** 2 kg.

Vision Aids

The utility of devices that can aid long distance viewing is most apparent in military applications – scouts and commanders, even in Infantry units, would ride horses in ancient times as much for the height advantage in vision that it gave them as for any other reason.

Binoculars, 4 x Magnification – Allow the user to multiply their Sight based spotting distances by 4 x in daylight.

Production Time: 1200 hours. ***Tools:*** C. ***Cost:*** €2500. ***Weight:*** 2½ kg.

Spyglass, 5 x Magnification – Classic telescope with leather cased and capped wooden tube and brass fittings.

Allows Sight based spotting distances to be multiplied by 5 x, it is also usable as a telescope of sorts after dark – and for the observation of celestial bodies. ***Production Time:*** 300 hours. ***Tools:*** B. ***Cost:*** €625. ***Weight:*** 1½ kg.

White Light Spotlight – Three models are available – standard electric, carbon arc, and carbide powered.

The standard model uses a hard to replace incandescent bulb, the carbon arc model uses a powerful pair of carbon "candles", and the carbide model uses carbide gas.

Production Time (Electric): 750 hours. ***Tools:*** C. ***Cost:*** €375. ***Weight:*** 5 kg. ***Accessories:*** Incandescent globe. €75.

Production Time (Carbon Arc): 500 hours. ***Tools:*** B. ***Cost:*** €125. ***Weight:*** 10 kg. ***Accessories:*** "Candles", one pair (4 hours duration), €15.

Production Time (Carbide): 25 hours. ***Tools:*** B. ***Cost:*** €25. ***Weight:*** 7½ kg. ***Accessories:*** Carbide fuel, 1 kg (watertight can, fuel for 8-10 hours), €50.

Infra-Red Rifle Sight – This is specifically intended to be mounted on a weapon – but is otherwise identical to the Binocular model (below) in operation. The Sight *halves* all darkness related penalties within its 250 meter range.

The Gel Cell battery is normally attached to the belt of the user, and connected by wires to the Sight.

Production Time: 7500 hours. ***Tools:*** D. ***Cost:*** €18750. ***Weight:*** 2½ kg. ***Power:*** Rechargeable (Gel Cell) Battery for 4 hours operation.

Infra-Red Binoculars – A nominally hand-held version of the above (it is normally mounted on some sort of tripod because of the weight), and not intended for use in combat situations. The Binoculars *halve* all darkness related penalties within its 250 meter range.

The Gel Cell battery is normally in a belt pack and is attached to the Binoculars by wires.

Production Time: 3750 hours. ***Tools:*** D. ***Cost:*** €10000. ***Weight:*** 5 kg. ***Power:*** Rechargeable (Gel Cell) Battery for 4 hours operation.

Wired Communication

*Virtually instantaneous communication is of inestimable value in all times and placed – and if the Displaced cannot manage to manufacture wireless (radio) communication systems they will certainly be able to manufacture **wired** systems (telephones and/or telegraphs).*

*Even if they **can** manufacture radios, wired communications are cheaper and easier to construct under most circumstances.*

Field Telephone – Standard handset with hand-

crank bell-ringer, powered by internal battery, all in a waterproof satchel. These units requires eight dry cell batteries per week of operation.

Production Time: 300 hours. ***Tools:*** C. ***Cost:*** €150. ***Weight:*** 5 kg. ***Transmission Range:*** 25 km to another phone or to a line booster.

Field Telephone Switchboard – Capable of connecting 25 lines and 12 simultaneous two-way conversations.

A large and bulky unit, it may be mated with others to form a larger capacity switchboard. A single operator can handle up to four of these units with reasonable speed.

Production Time: 150 hours. ***Tools:*** B. ***Cost:*** €450. ***Weight:*** 25 kg.

Fixed Telephone – A cheaper, fixed installation version of the above, intended for permanent installation in fixed sites.

Production Time: 100 hours. ***Tools:*** C. ***Cost:*** €50. ***Weight:*** 1 kg. ***Transmission Range:*** 200 km to another phone or to a line booster.

Light Wire – A reel of insulated wire for use with Telephones or Telegraphs in situations where the connections are intended to be temporary (mostly for field rather than fixed usage).

Production Time: 500 hours per reel. ***Tools:*** B. ***Cost:*** €60 per 500 meter reel. ***Weight:*** 25 kg per reel.

Medium Wire – A reel of insulated wire specially designed for use with Field Telephones or Telegraph units.

Normally used where the connections are expected to be permanent ones.

Production Time: 500 hours per reel. ***Tools:*** B. ***Cost:*** €125 per 500 meter reel. ***Weight:*** 225 kg per reel.

Signal Booster Unit – This is capable of boosting the signal strength of Field Telephone or Morse Telegraphy communications to double the distance rating of the wire – and multiple units may be used.

The practical limit before signal degradation becomes too great is about ten times the maximum rated range for the type of wire used).

The Booster unit may handle up to twelve separate "lines" – but multiple units may be used to work around this limitation.

Production Time: 600 hours. ***Tools:*** C. ***Cost:*** €625. ***Weight:*** 5 kg per reel.

Morse Telegraph, Portable – Morse key, sounder, and batteries required for mobile operation, all in a waterproof box. Transmission range limitations as for Field Telephones.

Production Time: 450 hours. ***Tools:*** C. ***Cost:*** €115. ***Weight:*** 5 kg.

Morse Telegraph Base Station – Morse key and sounder, but with more powerful batteries and requiring a separate 1.5 kW generator to provide recharging capacity.

Transmission range, without signal boosting being required, is around 200 km.

Production Time: 900 hours. ***Tools:*** C. ***Cost:*** €750. ***Weight:*** 55 kg.

Wired Communication				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Field Telephone	300 hours	C	€150	5 kg
Field Telephone Switch	150 hours	B	€450	25 kg
Fixed Telephone	100 hours	C	€50	1 kg
Light Wire (500 meters)	500 hours	B	€60	15 kg
Medium Wire (500 meters)	500 hours	B	€125	225 kg
Signal Booster Unit	600 hours	C	€625	5 kg
Morse Key/Unit	450 hours	C	€115	5 kg
Morse Telegraph Base	900 hours	C	€750	55 kg

BASIC WEAPONRY
FROM SMALLARMS TO ARTILLERY

There are two basic assumptions on which the types of weapons detailed in this chapter are based.

Firstly, that black powder (gunpowder) is incredibly easy to make and that gunpowder weapons are well within the scope of even Bronze Age societies (the earliest *good* cannon were Bronze).

*In fact, you don't even **need** cannon to make effective combat use of gunpowder. Pottery containers and some fuze (also ridiculously easy to make with spirits of wine and saltpeter or even gunpowder and some cloth fiber twisted into a cord) and you have a grenade – bury them in the ground with a remote electric detonator (some wire and a battery) and you have a **fougasse** (a primitive mine). With a catapult, easily made and mainly of wood. you have some siege or field artillery – and with a Staff Sling you have a tactical weapon with greater range than a mere grenade!*

Secondly, that with slightly more advanced technology that may be available to some larger and luckier *displaced* groups, quite modern weapons are actually easy to make as well

Modern automatic weapons like the AK-47, M-16 or Sten SMG made mainly from cheap stampings are much easier and cheaper to make than the bolt action rifles that preceded them!

The main limitation that exists is not the making of the weapons themselves, but making the ammunition. AK-47s could have been made as soon as there were machines capable of mass producing rifle-muskets, but the ability to make brass cartridges and primers in quantity didn't exist for many years after.

HANDGUNS

***Trickster* Holdout Pistol** – is a sophisticated four-barrelled firearm that minimises the use of complex construction techniques while maximising mass production benefits. The four barrels cannot be fired simultaneously, as the firing pin is rotated onto each barrel by the recoil of the action.

While normally intended to fire brass or steel cartridges, it is possible to convert the weapon to fire cardboard or paper cartridges with little effort – even if filled with black powder rather than smokeless powder.

Production Time: 600 hours. ***Tools:*** C. ***Cost:*** €450.

If the weapon misfires the action may be worked manually rotating the firing pin to the next barrel. This is the most common misfire result if the weapon has not been properly maintained.

When loaded with cardboard or paper cartridges, it takes an extra turn to unload half the time.

***Last Chance* Derringer** – is a simple two barrelled derringer firing 9 mm Parabellum rounds one after the other. The design is extremely popular with locals who desire to have *something* like what the *Displaced* have once they see what modern style firearms can do.

Production Time: 150 hours. ***Tools:*** B. ***Cost:*** €75.

***Swordsman* Automatic Pistol** – is based on the Mauser C1896. It incorporates an integral ten round magazine in front of the trigger housing which loads from the top, either singly (the magazine doesn't have to be empty) or by an eight round stripper clip.

A slightly more advanced model has a detachable box magazine instead, but costs more (it comes with two 10 round box magazines).

Production Time (Internal Magazine): 800 hours. ***Tools:*** C. ***Cost:*** €600.

Production Time (Box Magazine): 1000 hours. ***Tools:***

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Trickster 9mm Holdout Pistol	600 hours	C	€450	1.1 kg
Last Chance 9mm Derringer	150 hours	B	€75	
Swordsman Mauser C1896 Autopistol	800 hours	C	€600	1.5 kg
Tsarevitch Tokarev M1933 Autopistol	1200 hours	C	€900	0.65 kg

C. ***Cost:*** €750. ***Accessories:*** 10 round magazine, €25; 20 round magazine, €30.

Rounds must be greased before loading into the standard model or there is an increased change of jamming. If they have not been greased, then Critical Failures occur on a 19-20 (or are +1 to occur, depending on the game system).

The box magazine has a tendency to misfeed. If a ***critical miss*** *is rolled then this is what has happened and it takes a whole action to clear the jam.*

Tsarevitch **Automatic Pistol** – This a locally produced knock off of the Soviet Tokarev M-1933 (itself a copy of the Colt M1911). The *Tsarevitch* comes with two magazines and has a grip safety.

Production Time: 1200 hours. ***Tools:*** C. ***Cost:*** €900. ***Accessories:*** 9 round magazine, €25.

The grip safety is faulty – on weapons that have not been properly maintained it can jam in the "safe" position even when gripped firmly.

Attacker **Single Action Revolver** – is a simple, single-action, revolver design (it must be cocked each time it is fired and has break open rather than flip-out cylinder, auto-ejecting all cartridge cases (most of the time).

The *Attacker* is easily converted to fire paper or cardboard cartridges – but these must be manually removed, they do not eject automatically when the break open action is worked.

Production Time: 600 hours. ***Tools:*** C. ***Cost:*** €450.

The auto ejection mechanism can fail to eject the unrimmed 9 mm rounds if not properly maintained.

If a malfunction occurs, this is the most likely result – 1d rounds will not have ejected and will have to be pushed out with a pencil, stick or something similar.

Volkspistole VP-44 **Automatic Pistol** – is based on a WW2 German weapon specially designed for mass production with minimum use of critical machinery. The VP-44 comes with two magazines and a cleaning kit included in the purchase price.

Production Time: 400 hours. ***Tools:*** C. ***Cost:*** €300. ***Accessories:*** 8 round magazine, €15.

Magazines are crudely produced and there is a 1:6 chance that they will misfeed as if the weapon is not properly maintained. This may be corrected with access to the proper tools, but is likely to re-occur randomly.

Demon Goddess **Shotgun Pistol** – is a largish "derringer" holding two 12 gauge shotgun shells (fired one at a time). The accuracy isn't high (high recoil makes sure of that), and the range is short (barrel is not much longer than the shells – but it *is* a useful emergency weapon.

As with the *Last Chance* it is a popular weapon with locals who have some idea of what modern firearms are capable of.

Production Time: 150 hours. ***Tools:*** B. ***Cost:*** €200.

There is a 1:16 chance that the firer will break a finger(s) if used one handed.

SUBMACHINEGUNS

Border Reaver **Submachinegun** – a copy of the Sten SMG of WW2 – quick and cheap to make with minimal precision machining (the original was often made with hobbyist tools for Resistance movements in Occupied Europe). It comes with two 32 round magazines and the usual cleaning kit.

Production Time: 100 hours. ***Tools:*** B. ***Cost:*** €150. ***Accessories:*** 30 round magazine, €15.

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Attacker 9mm Single Action Revolver	600 hours	C	€450	1.2 kg
Volkspistole VP44	400 hours	C	€300	1.0 kg
Demon Goddess Shotgun Pistol	150 hours	B	€200	
Border Reaver Sten Submachinegun	100 hours	B	€150	3.5 kg
Flame Lord Ingram M-10 SMG	200 hours	C	€300	3.0 kg

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Red Star PPSh-43 SMG	300 hours	C	€450	3.36 kg
Cherry Tree M3a1 SMG	300 hours	B	€450	4.5 kg
Brigadier Galil Auto Rifle	750 hours	C	€650	4.5 kg
Field Marshall Galil Auto Rifle	950 hours	C	€750	5.0 kg
Saint Basil AK-47 Assault Rifle	500 hours	C	€300	4.03 kg
Imperial BR 81 MP44 Assault Rifle	600 hours	C	€500	5.5 kg
Red Emperor Simonov SKS Auto Rifle	750 hours	C	€625	3.9 kg

Unlike the original, this uses curved magazines (the original straight ones were notorious for jamming) and the magazine is top mounted so that dirt tends to fall through the action rather than lodge in it and jam it

***Flame Lord* Submachinegun** – is a local copy of the Ingram M-10 SMG in 9 mm caliber. It comes with two 30 round magazines.

Production Time: 200 hours. ***Tools:*** C. ***Cost:*** €300. ***Accessories:*** 30 round mag, €20.

The Flame Lord will not accept standard M-10 magazines, regardless of capacity – though it will seem to. If these magazines are used there is a 3:6 chance that each burst will jam it.

***Red Star* SMG** – is a local copy of the Soviet WW2 PPsh-43 SMG. It comes with two magazines.

Production Time: 300 hours. ***Tools:*** C. ***Cost:*** €450. ***Accessories:*** 35 round magazine, €20.

The Red Star cannot accept the 71 round drum magazines of the PPsh-41 SMG, though it ***can*** *take the more common 35 round magazines with no problems*

***Cherry Tree* Submachinegun** – is a simplified local copy of the US M3a1 SMG of WW2, chambered for 9 mm Parabellum rather than .45 ACP and with a small knurled knob for easy cocking. It comes with two magazines.

Production Time: 300 hours. ***Tools:*** B. ***Cost:*** €450. ***Accessories:*** 30 round magazine, €25.

AUTOMATIC RIFLES

***Brigadier* and *Field Marshall* Automatic Rifles** – locally produced Galil (Israeli army) Automatic Rifle variants (with wooden, rather than plastic, stock and fore grips.

The *Brigadier* fires 5.56 mm NATO rounds, while the *Field Marshal* fires 7.62 mm NATO. Both come with two 20 round magazines.

Production Time (Brigadier): 750 hours. ***Tools:*** C. ***Cost:*** €650. ***Accessories:*** 20 round magazine, €20; 30 round magazine, €25.

Production Time (Field Marshall): 950 hours. ***Tools:*** C. ***Cost:*** €750. ***Accessories:*** 20 round magazine, €25; 30 round magazine, €35.

The 30 round magazines tend to misfeed if they are fully charged (1:3 chance), so it is common to only load them with 28 rounds to avoid this happening

***Saint Basil* Automatic Rifle** – is a locally produced variant of the Russian AK-47, much simplified. All the furniture (stock, fore grip etc.) is wooden, and the rifle has a bayonet lug as well as an adaptor for Rifle Grenades (lacking in the original). It comes with two magazines.

Production Time: 500 hours. ***Tools:*** C. ***Cost:*** €1500. ***Accessories:*** 32 round magazine, €20.

The sights on the Rifle Grenade adaptor are hard to zero, and the first 1d6 rounds fired will be at a -1d6 penalty to hit (determined randomly for each round).

Imperial Battle Rifle (Kaiserliche Sturmgewehr) Kstg-81 Automatic Rifle – a simplified variant of the WW2 German MP-44 Assault Rifle.

The IBR-81 comes in two models, one in NATO 5.56 mm and the other in Soviet 7.62 mm M43 (used by the AK-47). All *Imperial Battle Rifles* come with two 20 round magazines.

Production Time: 600 hours. ***Tools:*** C. ***Cost:*** €500. ***Accessories:*** 20 round magazine, €25; 30 round magazine, €30.

The return spring is sometimes too strong for the action, and does not recock the weapon on firing (1:10 chance). If this happens, it must be manually recocked before it can be used again.

***Red Emperor* Automatic Carbine** – a simplified variant of the Russian SKS carbine (without the integral

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Martini-Henry Rifle Mk 1	375 hours	C	€150	3.83 kg
Martini-Henry Rifle Mk 2	500 hours	C	€250	4.08 kg
Rifle-Musket, Flintlock	75 hours	B	€35	~4 kg
Rifle-Musket, Percussion	100 hours	B	€50	~ 4 kg
Volcano Double Barrel 12g Shotgun	250 hours	B	€185	3.6 kg
Demon Pump Action Shotgun	500 hours	C	€375	4.25 kg

bayonet). A version with a detachable box magazine instead of the internal magazine is also available.

The box magazine variant can be converted to fire cardboard cartridges, but only in single shot mode and only from special round magazines (€30). Conversion kits cost €100 and must be removed before the weapon can fire standard metal cartridges again.

Production Time (Integral Magazine): 750 hours. ***Tools:*** C. ***Cost:*** €625.

Production Time (Box Magazine): 850 hours. ***Tools:*** C. ***Cost:*** €800. ***Accessories:*** 10 round special magazine, €30 (cardboard cartridges only), 15 round magazine, €15; 30 round magazine, €20.

The detachable box magazines sometimes sticks slightly when being changed (1:10 chance), which means it takes an extra turn to reload when this happens.

STANDARD RIFLES

Martini-Henry **Rifle** – A simple, single shot, rifle using a drop bolt system operated by a pump action mechanism.

It can fire standard metal cartridges *or* can fire cardboard cartridges as well, in either smokeless or black powder loads.

Production Time: 375 hours. ***Tools:*** C. ***Cost:*** €175.

Martini-Henry Mk 2 **Rifle** – A development of the standard *Martin-Henry* with a tubular internal magazine (this limits caliber available as it can only handle round headed cartridges).

The Mk 2 is also capable of firing standard metal or cardboard cartridges in either smokeless or black powder loads.

Production Time: 500 hours. ***Tools:*** C. ***Cost:*** €250.

These are based on the original historical design, but fire a smaller caliber (especially for use with the more powerful smokeless cartridge)

Minuteman **Muzzle Loading Rifle** – a simple rifled barrel with a percussion *or* flintlock mechanism, loaded with a Minie Ball (which made it faster to reload) from a paper cartridge.

Production Time (Flintlock): 75 hours. ***Tools:*** B. ***Cost:*** €35. ***Accessories:*** 10 flints, €2.

Production Time (Percussion Cap): 100 hours. ***Tools:*** B. ***Cost:*** €50.

Flints are good for 4 + 1d6 shots before they start to misfire (+1 to a 1d roll each shot thereafter to do so).

SHOTGUNS

Volcano **Double Barrelled Shotgun** – a basic, no frills, double-barrelled shotgun, easy to produce with available machine tools. It fires plastic, cardboard, or even paper shells, black or smokeless powder loads.

Production Time: 250 hours. ***Tools:*** B. ***Cost:*** €185.

About 50% of the plastic shells can be reloaded. Cardboard shells cannot be. There is a 1:3 chance that the plastic or paper shells will not eject when the action is worked and will take a turn to extract. There is a 1:6 chance cardboard shells will .get stuck in the same way.

Demon **Pump Action Shotgun** – is a locally produced pump action shotgun incorporating a variety of features from commonly available western designs, all

Martini Henry Rifle

simplified as much as possible to minimise construction time and costs.

The *Demon* fires only plastic or cardboard shells (paper shells aren't strong enough to survive the pump action mechanism) though it can take either smokeless or black powder loads.

Production Time: 500 hours. ***Tools:*** C. ***Cost:*** €375.

An extra round can be chambered manually when the magazine is full. However, if roughly handled (used as an improvised melee weapon, for example) while it has an extra round it has a 1:6 chance of firing.

MACHINEGUNS

***Lightning* General Purpose Machinegun** – incorporates elements of several modern western general purpose machine gun designs. It has an integral bipod and may be fitted to any tripod mount. Two models are available, one firing 7.62 mm NATO and the other Russian 7.62 mm 54R.

Both versions use either a disintegrating link or reusable cloth belt – the standard model may fire from *Field Marshal* Rifle magazines as well. Both models come with one spare barrel.

Production Time (7.62 mm NATO): 1200 hours. ***Tools:*** C. ***Cost:*** €1750. ***Accessories:*** 50 round cloth (re-useable) belt, €10 (may not be linked together); spare barrel, €375; Tripod mount, €175 (for sustained area fire).

Production Time (7.62 mm M54R): 1200 hours. ***Tools:*** C. ***Cost:*** €2500. ***Accessories:*** 50 round cloth (re-useable) belt, €10 (may not be linked together); spare barrel, €500; Tripod mount, €175 (for sustained fire).

The barrel quick release mechanism be sticky (1:10 chance) taking an extra turn to swap barrels.

***Morning Star* Medium Machinegun** – A simplified version of the Browning M1919a4 medium machinegun. Two models are available, one firing 7.62 NATO rounds and the other Russian 7.62 mm 54R rounds.

Both models can fire disintegrating link or cloth (reloadable) 100 round or 250 round belts. All come with one spare barrel.

Production Time (7.62 mm NATO): 1200 hours. ***Tools:*** C. ***Cost:*** €2250. ***Accessories:*** 50 round cloth (re-useable) belt, €10 (may not be linked together); spare barrel, €425.

Production Time (7.62 mm M54R): 1200 hours. ***Tools:*** C. ***Cost:*** €3375. ***Accessories:*** 50 round cloth (re-useable) belt, €10 (may not be linked together); spare barrel, €575.

***Prince* Heavy Machinegun** – is a locally made Browning M2HB. Two models are available, one firing .50 cal BMG and the other Russian 12.7 mm.

Production Time (.50 cal BMG): 2500 hours. ***Tools:*** C. ***Cost:*** €3750. ***Accessories:*** 50 round cloth (re-useable) belt, €15 (may not be linked together); spare barrel, €600.

Production Time (12.7 mm): 2500 hours. ***Tools:*** C. ***Cost:*** €5625. ***Accessories:*** 50 round cloth (re-useable) belt, €10 (may not be linked together); spare barrel, €725.

Gatling Gun – an improved version of the rotary quick-firing gun that entered service with the US Army in 1865, based on hobbyist plans widely available.

The Gatling is fired by turning a geared hand crank which rotates, loads, fires and ejects the cartridges. It comes with a tripod mount but may be vehicle mounted or mounted on a field carriage.

Production Time: 900 hours. ***Tools:*** B. ***Cost:*** €1800.

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Lightning M-60 GPMG	1200 hours	C	€1750	12 kg
Morning Star M1919a4 Medium MG	1200 hours	C	€2250	24 kg
Prince M2HB .50 cal HMG	2500 hours	C	€3750	55 kg
Gatling Gun	900 hours	C	€5625	
2.7cm Sturmpistole 44 GL	300 hours	C	€225	2.5 kg
Thunderer M-79 Grenade Launcher	600 hours	C	€450	2.67 kg
Biter Disposable Rocket Launcher	600 hours	C	€15	3.5 kg
Panzerfaust 150 RL	250 hours	C	€185	3.5 kg
Panzerschreck 54/1a	450 hours	C	€350	10 kg

Accessories: 30 round stick magazine, €15; 50 round stick magazine, €20; 100 round clockwork drum magazine, €50; 250 round clockwork drum magazine, €150.

Grenade Launchers

2.7 cm Sturmpistole 44 – a WW2 German modification of a standard flare pistol to fire (small, 27 mm, caliber rather than the larger 40 mm ones used in modern launchers) grenades.

Production Time: 300 hours. ***Tools:*** C. ***Cost:*** €225.

The StP-44 cannot easily be used to fire flares, as a barrel liner is inserted to convert it to fire the 27 mm spigot launched grenades, and this requires armourer's tools to reverse.

***Thunderer* Grenade Launcher –** locally produced single shot 40 mm grenade launcher with a break open action (similar to the obsolete US M-79 *Thumper*) like that of a shotgun.

Production Time: 600 hours. ***Tools:*** C. ***Cost:*** €450.

Rocket Launchers

***Biter* 60 mm DRL** – a locally made disposable RL. It is a simple waxed cardboard tube with fixed peephole sights. The 60 mm rocket inside may be removed from and used as in the *Viper* RL.

Production Time: 600 hours. ***Tools:*** C. ***Cost:*** €15 + Ammo Cost.

Panzerfaust 150 – the last in a line of WW2 German A/T rocket launchers, developed by the Russians into the RPG-2. It is a simple metal tube with a mechanical cocking system activated by raising the sights. The major difference from earlier models is that it is reuseable, the charge is larger and range greater.

Production Time: 250 hours. ***Tools:*** C. ***Cost:*** €185.

Raketenpanzerbusche 54/1a – More commonly the *Ofenrohr* ("stovepipe") or *Panzerschreck* ("tank terror"), it was an (improved) version of the US *Bazooka* (larger caliber rocket with a larger and more effective shaped charge). It consists of a long tube with a central firing grip and blast shield. A second crewman is required to reload, but it may be *fired* by one man.

Production Time: 450 hours. ***Tools:*** C. ***Cost:*** €350.

***Viper* 60 mm Rocket Launcher** – Similar in concept to the US WW2 "Super Bazooka," a metal reinforced tube with firing grips in wood. A rocket is inserted in the rear by a second crewman, though one can fire it (the *Viper* can be reloaded with the 60 mm *Biter* rocket, offering improved range and accuracy.

Production Time: 225 hours. ***Tools:*** C. ***Cost:*** €300.

Explosives

Blasting Caps – Required to set off any explosive, they may be electric or non-electric.

Production Time (Non-electric): 25 caps/hour. ***Tools:*** B. ***Cost:*** €1.25.

Smallarms				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Biter Disposable Rocket Launcher	600 hours	C	€15	3.5 kg
Panzerfaust 150 RL	250 hours	C	€185	3.5 kg
Panzerschreck 54/1a	450 hours	C	€350	10 kg
Super Bazooka	225 hours	C	€300	9.5 kg
Blasting Cap, Non-electric	25/hour	B	€1.25	20/kg
Blasting Cap, Electric	12/hour	C	€2.50	40/kg
Detonator, Acid	5/hour	C	€2.50	25/kg
Dynamite/Gelignite, 1 stick	4 sticks/hour	B	€5	¼ kg
Fuze, Instant, 100 meters	100 meters/hour	D	€200	3 kg
Fuze, Time, 250 meters	250 meters/hour	C	€100	7.5 kg

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Gunpowder, Meal	60 kilos/hour	A	€½	1 kg
Gunpowder, Corned	12 kilos/hour	A	€4	1 kg
Igniter, Electrical	5 hours	C	€35	¼ kg
Igniter, Percussion	½ hour	C	€15	½ kg
Match, Slow, 100 meters	1000 meters/hour	A	€5	25 kg
Match, Quick, 100 meters	1000 meters/hour	A	€5	25 kg
Mine, Antipersonnel	12/hour	B	€20	2½ kg
Mine, Directional	8/hour	B	€30	2½ kg
Nitroglycerine, 100 ml	1 liter/hour	B	€20	0.1 kg
Timer, Clockwork	2/hour	C	€75	½ kg
Wire, Electrical, 100 meters	1000 meters/hour	C	€60	5 kg
HE Grenade, Offensive	½ hour	C	€5	½ kg
HE Grenade, Defensive	½ hour	C	€6	½ kg

Production Time: (Electric): 12 caps/hour. ***Tools:*** C. ***Cost:*** €2.50 per stick.

Detonator, Acid – Screwing the parts of this fuze together breaks the seal and the acid starts to eat through a metal plate between it and the detonator. Minimum detonation time is 30 minutes (then by nominal half hour increments up to 8 hours), but a +25% variation from the setting can be expected.

Production Time: 5/hour. ***Tools:*** C. ***Cost:*** €2.50.

Dynamite or Gelignite – Nitroglycerine mixed with a stabilizer (clay or sawdust) – less prone to "accidentally" exploding.

Production Time: 4 sticks/hour. ***Tools:*** B. ***Cost:*** €5 per stick.

Fuze, Instant – Burns 5900 meters per second (effectively instantaneous) and ignites blasting caps. It must be lit with a hot flame or Percussion Igniter.

Production Time: 100 meters/hour. ***Tools:*** D. ***Cost:*** €200 per 100 meter coil.

Fuze, Time – Burns at 100 meters/second and ignites nonelectric blasting caps. It must be lit with a hot flame or Percussion Igniter.

Production Time: 250 meters/hour. ***Tools:*** C. ***Cost:*** €100 per 100 meter coil.

Gunpowder – 75% saltpeter, 15% charcoal and 10% sulphur mixed as a powder that separates into its constituents easily (called *meal* powder) with reduced explosive force.

Adding water or spirits of wine and working it into a cake and then grinding it into grains (called *corned* powder) makes it much more powerful.

Production Time (meal): 60 kilos/hour. ***Tools:*** A. ***Cost:*** €2 per kilo.

Production Time (corned): 12 kilos/hour. ***Tools:*** A. ***Cost:*** €5 per kilo.

Igniter, Electrical – A hand crank and plunger electrical igniter. It may trigger up to ten electrical caps at once. ***Production Time:*** 5 hours. ***Tools:*** C. ***Cost:*** €35.

Igniter, Percussion – Generic percussion detonator – insert the Fuze (or Match) and trip the igniter to light whichever.

Production Time: ½ hour. ***Tools:*** C. ***Cost:*** €15.

Match, Slow – A simple cord soaked in a flammable mixture which burns at a predetermined rate.

Slow match burns at a rate of 10 cm per hour and sets off black powder or non-electric blasting caps.

Production Time: 1000 meters/hour. ***Tools:*** A. ***Cost:*** €5 per 100 meters.

Match, Quick – A simple cord soaked in a flammable mixture which burns at a predetermined rate.

Quick match burns at a rate of 0.33 meters per minute and sets off black powder or non-electric blasting caps.

Production Time: 1000 meters per hour. ***Tools:*** A. ***Cost:*** €5 per 100 meters.

Mine, Anti–personnel – A generic antipersonnel mine, an explosive charge wrapped with serrated wire or embedded with metal shot.

Production Time: 12/hour. ***Tools:*** B. ***Cost:*** €20.

Mine, Directional – A "shotgun" mine similar to the US Claymore though made of simpler materials. It can be set to be triggered by a tripwire (as a booby trap), remotely (command detonated) or both.

Production Time: 8/hour. ***Tools:*** B. ***Cost:*** €30 per stick.

Nitroglycerine – A very powerful, but very unstable, liquid explosive that is relatively easy to make in small lots.

Production Time: 1 liter/hour. ***Tools:*** B. ***Cost:*** €20 per 100 ml bottle.

Timer, Clockwork – a locally produced mechanical timer that can be set in ten minute increments for up to 24 hours.

It will trigger an integral detonator cap some time during that 10 minute period (it isn't that accurate, but it's generally good enough).

Production Time: 2/hour. ***Tools:*** C. ***Cost:*** €75.

Wire, Electrical – Used with a blasting cap and electrical igniter, to trigger a charge at distances up to a kilometer. ***Production Time:*** 1000 meters/hour. ***Tools:*** C. ***Cost:*** €60 per coil of 50 meters.

GRENADES

HE Grenades – Either *offensive* or *defensive* with different intended battlefield uses.

Offensive grenades have relatively small charge with little or no fragmentation effect) and can be safely thrown while attacking and/or in the open.

Defensive grenades have relatively large charge and a high level of fragmentation effect that can only be safely thrown from behind cover.

Production Time (Offensive/Fragmentation Grenade): ½ hour. ***Tools:*** C. ***Cost:*** €5.

Chinese Repeating Crossbow

Production Time (Defensive/Concussion Grenade): ½ hour. ***Tools:*** C. ***Cost:*** €6.

White Phosphorous & Smoke Grenades – this type of grenade has a secondary incendiary effect from the burning white phosphorous which sticks to the skin and can cause severe burns right down to the bone.

Production Time: ½ hour. ***Tools:*** C. ***Cost:*** €15.

Black Powder Grenades – are made using high quality corned powder packed into a thin metal or waxed card canister with a percussion igniter and a short length of quick match. Serrated wire wire is wrapped around the bursting charge or metal shrapnel (often lead shot) packed within it to enhance the wounding effect.

Production Time: 10/hour. ***Tools:*** A. ***Cost:*** €20.

MISCELLANEOUS

Crossbow, Pump Action – A crossbow that is re-cocked by a slide-operated ratchet. This mechanism allows it to be operated while in a prone position, though it limits the pull of the weapon to that of a standard self bow.

Since the main advantage of a crossbow was that it took only a few weeks to train soldiers to use it, while it could take decades to train a regular archer – a bow strength/ranged missile weapon that can be used from concealment is regarded as an acceptable trade off.

To maximise its effectiveness, the weapon is fitted with rail and post sights and can be fitted with optical

SMALLARMS				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
WP/Smoke Grenade	½ hour	C	€15	¾ kg
Black Powder Grenade	10/hour	A	€2	¾ kg
Crossbow, Pump Action	10 hours	A	€15	
Crossbow, Repeating	25 hours	B	€30	

Smallarms Ammunition				
1000 rounds	**Production Time**	**Tools**	**Cost**	**Weight**
5.56 mm NATO Ball	2/hour	C	€125	15 kg
7.62 mm NATO Ball	2/hour	C	€250	32 kg
7.62 mm M43 Sov Ball	2/hour	C	€375	14 kg
7.62mm M54R Sov Ball	2/hour	C	€625	40 kg
8 mm Cardboard	5/hour	B	€300	32 kg
8 mm Paper	10/hour`	B	€150	30 kg
9 mm Parabellum Ball	6/hour	C	€250	25 kg
9 mm Para, Cardboard	15/hour	B	€125	22 kg
9 mm, Parabellum, Paper	30/hour	A	€50	20 kg
.50 cal BMG	2/hour	C	€1000	100 kg
12.7 mm Soviet Ball	2/hour	C	€1250	100 kg
12 mm Minie Cartridge	50/hour	A	€50	40 kg
12 Gauge Plastic Shot	8/hour	B	€300	100 kg
12 Gauge Cardboard Shot	16/hour	B	€150	100 kg
Link Belts, Machinegun	100 rounds/hour	C	€1 ea	3¼ kg
Grenades and Grenade Rounds				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
40 mm HE	2/hour	C	€7.50	0.3 kg
40 mm HE Dual Purpose	1.2/hour	C	€12.50	0.3 kg
40 mm Canister	1.2/hour	C	€5	0.3 kg
40 mm Illumination	0.4/hour	C	€25	0.3 kg
40 mm Smoke	1.2/hour	C	€12.50	0.3 kg
2.7 cm HE	2.4/hour	C	€5	0.3 kg
2.7 cm HEAT	1.2/hour	C	€7.50	0.3 kg
2.7 cm Canister	1.2/hour	C	€5	0.3 kg
2.7 cm Illumination	0.4/hour	C	€25	0.3 kg
2.7 cm Smoke	0.9/hour	C	€12.50	0.3 kg
Rocket Rounds				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
60 mm High Explosive	1.2/hour	C	€6	2½ kg
60 mm HE Dual Purpose	0.6/hour	C	€12	2½ kg
60 mm Canister	1.8/hour	C	€8	2½ kg
88 mm HEAT	0.6/hour	C	€15	4 kg
150 mm High Explosive	1/hour	C	€12	4 kg
150 mm HEAT	0.5/hour	C	€18	4 kg

Mortars				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Retaliator 120 mm Mortar	1500 hours	C	€6750	520 kg
Kicker 60 mm Commando Mortar	400 hours	C	€1500	12 kg
Noisy 60 mm Mortar	750 hours	C	€2875	25 kg
Thumper 81/82 mm Mortar	1250 hours	C	€4675	50 kg
Recoilless Rifles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Firestorm 75 mm Recoilless Gun	1750 hours	C	€1875	145 kg
Firecloud 105 mm Recoilless Gun	2500 hours	C	€2500	550 kg

sights if these are available.

Production Time: 10 hours. ***Tools:*** A. ***Cost:*** €15. ***Accessories:*** Spare Bowstring, €1.

Crossbow, Repeater, Pump Action – a more complex development of the standard model (above) with an link-feed magazine which loads the weapon as the mechanism is worked. A selector allows the magazine to be isolated and keep that capacity in reserve while firing single shots.

There are two versions – one with an integral five round magazine (reloaded down through the action) and one with a removable seven round box magazine (comes with two 7 round magazines). To maximise its effectiveness, the weapon is fitted with rail and post sights and can be fitted with optical sights if these are available.

Production Time (Integral Magazine): 25 hours. ***Tools:*** B. ***Cost:*** €30. ***Accessories:*** Spare Bowstring, €1.

Production Time (Box Magazine): 30 hours. ***Tools:*** B. ***Cost:*** €50. ***Accessories:*** Spare Bowstring, €1; 7 round magazine, €10.

Heavy Weapons

Heavy Weapons, weapons that are either not man-portable or which are normally crew-served, are dealt with in this separate chapter.

Some of these weapons (the Mortars and "Archaic" cannon, for example) are actually quite simple to make even with limited access to "high technology." Most *displaced* groups that are capable of constructing small arms will be capable of manufacturing them.

The more sophisticated weapons will require considerable manufacturing development, but are probably within the eventual reach of more fortunate (and larger) *displaced* groups – and, of course, the manufacture of *ammunition* for weapons that they might *already* have is an option as well.

Mortars

***Retaliator* 120 mm Mortar –** Based on a German copy of the Soviet 120 mm Mortar that they encountered in the early stages of WW2 and the ancestor of many late 20th century 120 mm Mortars.

Production Time: 1500 hours. ***Tools:*** C ***Cost:*** €6750.

***Kicker* 60 mm Commando Mortar:** – The *Kicker* is a locally produced commando mortar, a simple tube with a fixed firing pin and a small fixed base plate.

Firing is done by placing the mortar on the ground, aiming by means of a white line engraved on the tube, and dropping in a standard 60 mm mortar round. An extremely simple weapon to produce, and maintain.

Production Time: 400 hours. ***Tools:*** C ***Cost:*** €1500.

***Noisy* 60 mm Mortar** – The *Noisy* is a locally produced 60 mm mortar of generic western design with a standard bipod and detachable baseplate.

Production Time: 750 hours. ***Tools:*** C ***Cost:*** €2875.

***Thumper* 81/82 mm Mortar** – is a standard conventional mortar design capable of firing either 81/82 mm Mortar rounds (most western mortars fire 81 mm rounds, so the soviets constructed *their* mortars as 82 mm caliber – in a pinch the Soviets could use western mortar bombs in *their* mortars, but NATO forces couldn't do the reverse).

Production Time: 1250 hours. ***Tools:*** C ***Cost:*** €4675.

Recoilless Rifles

***Firestorm* 75 mm Recoilless Gun** – Loosely based on a WW2 German design intended for use by their *Fallschirmjager* (Paratroops) and capable of limited local production by particularly well equipped groups. The gun and its light wheeled mount are designed for quick disassembly and equally quick reassembly.

Production Time: 1750 hours. ***Tools:*** C ***Cost:*** €1875.

***Firecloud* 105 mm Recoilless Gun** – Also based on a WW2 German design, intended for use by Fallschirmjager, Gebirgsjager and other Light Infantry troops. Like the smaller model, it comes equipped with a light field mount and can easily be broken down into vehicle or animal portable loads.

Production Time: 2500 hours. ***Tools:*** C ***Cost:*** €2500.

M-40a1 106 mm Recoilless Rifle – last in a long line of US weapons, but replaced by ATGMs. It is possible that some might still be found in National Guard Armouries and, thence, into the hands of well equipped *Displaced*.

Production Time: 2250 hours. ***Tools:*** C ***Cost:*** €1875.

Autocannon

20 mm Oerlikon – based on an Oerlikon design first introduced in 1914 yet still in use today, and within the capacity of well equipped groups.

Production Time: 2500 hours. ***Tools:*** D. ***Cost:*** €3750. ***Accessories:*** light (wheeled) field mount, €500.

37 mm Oerlikon – also based on an Oerlikon design from the WW2 period, it is, like the 20 mm model, still in service today.

Production Time: 3750 hours. ***Tools:*** D. ***Cost:*** €5675. ***Accessories:*** light (wheeled) field mount, €750.

***Crossbow* Light Autocannon** – a locally produced autocannon using an improved gatling style mechanism fed by a 100 round disintegrating link or reusable cloth belt. It may be fired by a single operator using a manual crank (at a lower rate of fire) or it may be powered off a vehicle's electrical system.

Production Time (Hand Crank): 1250 hours. ***Tools:*** C, ***Cost:*** €1875. ***Accessories:*** light (wheeled) field mount, €300.

Production Time (Electrical): 2250 hours. ***Tools:*** C, ***Cost:*** €3375.

Recoilless Rifles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
106 mm Recoilless Gun	2250 hours	C	€3375	165 kg
Autocannon				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
20 mm Oerlikon	2500 hours	D	€3750	70 kg
37 mm Oerlikon	3750 hours	D	€5675	250 kg
15 mm Light, Gatling	1250 hours	C	€1875	55 kg
15 mm Light, Electric	2250 hours	D	€3375	70 kg
Light Artillery				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
60 mm Gun-Mortar	1500 hours	C	€2250	75 kg
60 mm Rapid Fire Cannon	5000 hours	C	€7500	250 kg
81/82 mm Gun/Mortar	2500 hours	C	€3750	200 kg
81/82 mm RFC	7500 hours	C	€11250	1000 kg

Light Artillery				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
75 mm Pack Howitzer	12500 hours	C	€25000	575 kg
Archaic Cannon				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
90 mm Smoothbore, Bronze	250 hours	B	€1000	1200 kg
90 mm Smoothbore, Iron	250 hours	C	€250	900 kg
90 mm Rifle Cannon, Bronze	375 hours	B	€2250	1000 kg
90 mm Rifle Cannon, Iron	375 hours	C	€450	800 kg
120mm Smoothbore, Bronze	375 hours	B	€1500	1400 kg
120mm Smoothbore, Iron	375 hours	C	€300	1000 kg

Light Artillery

***Bulldog* 60 mm Gun-Mortar** – a breech-loading 60 mm Mortar equipped with a special recoil mechanism enabling it to be fired from a light vehicle.

Production Time: 1500 hours. ***Tools:*** C. ***Cost:*** €2250.

***Sabre* 60 mm Rapid Fire Cannon** – a clip-fed howitzer version of the *Bulldog*. Ammunition is fed from a 6 round hopper taking individual rounds or three round "clips," ejecting it through the bottom of the action with spent rounds.

The hopper may be topped up during firing by dropping in additional rounds Includes wheeled field mount.

Production Time: 5000 hours. ***Tools:*** C. ***Cost:*** €7500.

***Wolfhound* 81/82 mm Gun-Mortar** – The *Wolfhound*s mechanically identical to the *Bulldog* and is also provided with the recoil mechanism to enable it to be fired from a vehicle/turret mount, simply firing a larger caliber round.

Production Time: 2500 hours. ***Tools:*** C. ***Cost:*** €3750.

***Spiteful* 81/82 mm Rapid Fire Cannon** – The *Spiteful* mechanically identical to the *Sabre*, simply firing a larger round. The hopper feed takes a 3 round clip or individual rounds. Includes a wheeled field mount.

Production Time: 7500 hours. ***Tools:*** C. ***Cost:*** €11250.

75 mm Pack Howitzer – Based on a WW2 US weapon developed especially for light infantry units, it can be towed by a single mule or horse, broken up into four pack animal or seven porter loads for movement over rough terrain.

Production Time: 12500 hours. ***Tools:*** C. ***Cost:*** €25000.

Archaic Cannon

If the technology available to the Displaced group isn't up to constructing more modern weapons, virtually any civilisation from the Bronze Age onwards can make muzzle loading cannon from cast bronze – and its simple enough to make the gunpowder needed.

The Displaced can also introduce the concept of rifling, proper split-trail field carriages, screw elevation and traverse, paper or cloth "cartridges" for the powder and cast metal "shells" for the rounds to be fired.

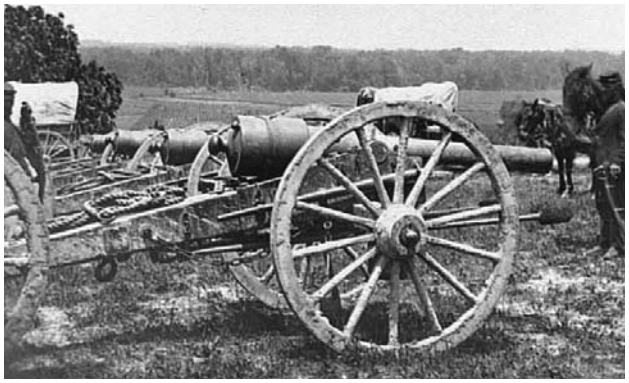
None of the cannon below have pneumatic recoil like modern artillery and, therefore, must be manhandled back on target after each shot.

90 mm Smoothbore Cannon – a cast metal (bronze or iron) smoothbore based loosely on US Civil War designs. The propelling charge is normally loose black powder (pre-loaded in waxed cloth charge bags) though the shells are manufactured.

Production Time (Bronze): 250 hours. ***Tools:*** B. ***Cost:*** €1000.

Production Time (Iron): 250 hours. ***Tools:*** C. ***Cost:*** €250.

90 mm Rifled Cannon – a cast metal (bronze or iron) rifled cannon based loosely on US Civil War designs.



Similar to the smoothbore above, the rifling allows it to fire more accurately and over a longer range.

The propelling charge is normally loose black powder (pre-loaded in waxed cloth charge bags for the right charge weight) but the shells are manufactured. Rifled cannon *can* fire round shot, but are most accurate when used to fire modern-style cylindrical shells.

Production Time (Bronze): 375 hours. ***Tools:*** B. ***Cost:*** €2250.

Production Time (Iron): 375 hours. ***Tools:*** C. ***Cost:*** €450.

120 mm Smoothbore Cannon – a larger version of the 90 mm smoothbore also comes in either Bronze or Iron and on a split-trail carriage. Smoothbore cannon fire only round shot.

The propelling charge is normally loose black powder (pre-loaded in waxed cloth charge bags) though the shells are manufactured.

Production Time (Bronze): 375 hours. ***Tools:*** B. ***Cost:*** €1500.

Production Time (Iron): 375 hours. ***Tools:*** C. ***Cost:*** €300.

120 mm Rifled Cannon – a larger version of the 120 mm smoothbore and also comes in either Bronze or Iron and on a larger split-trail carriage.

The propelling charge is normally loose black powder (pre-loaded in waxed cloth charge bags) though the shells are manufactured. It *can* fire round shot, but is most accurate when firing modern-style shells.

Production Time (Bronze): 500 hours. ***Tools:*** B. ***Cost:*** €3000.

Production Time (Iron): 500 hours. ***Tools:*** C. ***Cost:*** €600.

Coehorn Mortar (Modified) – Based on a US Civil War design, it is a black powder weapon firing explosive bombs. The originals had barrels set on a wooden base at a fixed angle, but *this* model has a limited elevation ability (but no ability to traverse).

The propelling charge is normally loose black powder (pre-loaded in waxed cloth charge bags) but the bombs are manufactured.

Production Time (Bronze): 150 hours. ***Tools:*** B. ***Cost:*** €600.

Production Time (Iron): 150 hours. ***Tools:*** C. ***Cost:*** €150.

15 mm Puckle Gun – Based on James Puckles' 1718 design, but updated with better materials technology this is a flintlock or percussion cap multi-fire rifled cannon.

The Puckle Gun has a 15 mm bore and a cylinder with nine chambers, each of which is loaded separately with a pre-loaded cardboard cartridge (though it can be loaded with loose powder and shot in an emergency, this is slower and less effective).

The whole cylinder is then inserted in the action and a crank handle rotates it on a cam which forces the chamber up against the base of the barrel to seal it .

Production Time (Flintlock): 150 hours. ***Tools:*** B. ***Cost:*** €150. ***Accessories:*** extra 9 round magazine, €15.

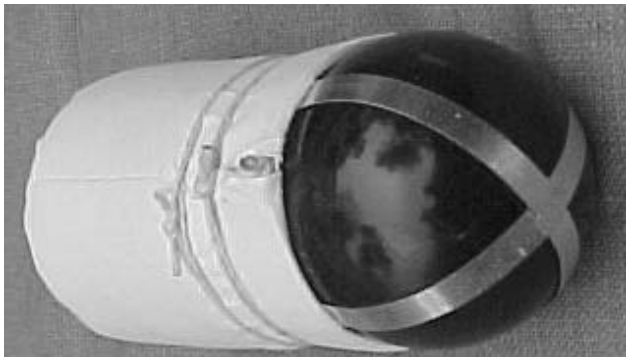
Production Time (Percussion): 175 hours. ***Tools:*** B. ***Cost:*** €175. ***Accessories:*** extra 9 round magazine, €20.

ARCHAIC CANNON

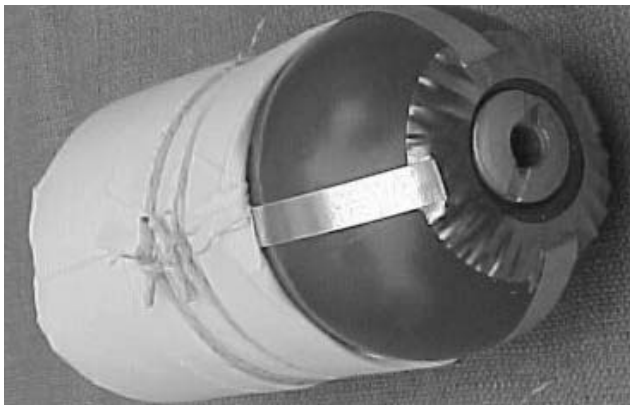
Item	Production Time	Tools	Cost	Weight
120mm Rifle Cannon, Brnze	500 hours	B	€3000	1200 kg
120mm Rifle Cannon, Iron	500 hours	C	€600	900 kg
Coehorn Mortar, Bronze	150 hours	B	€600	200 kg
Coehorn Mortar, Iron	150 hours	C	€150	175 kg
15mm Puckle Gun, Flintlock	150 hours	B	€150	65 kg
15mm Puckle Gun, Percussion	175 hours	B	€175	65 kg

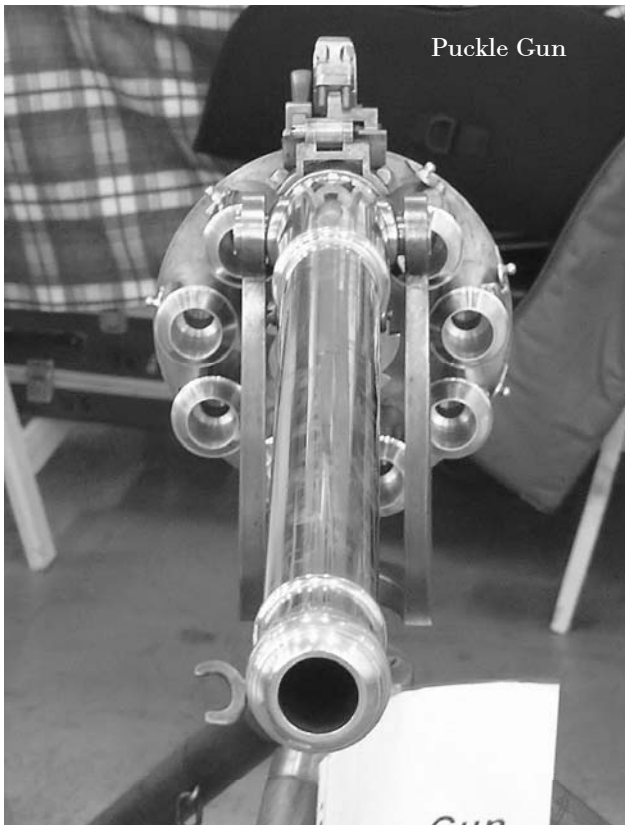
Heavy Weapons Rounds				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
60 mm Mortar, HE	1/hour	C	€5	1¾ kg
60 mm Mortar, Smoke	0.5/hour	C	€10	1¾ kg
60 mm Mortar, Illumination	0.4/hour	C	€12	1¾ kg
81/82 mm Mortar, HE	0.8/hour	C	€20	7½ kg
81/82 mm Mortar, Smoke	0.4/hour	C	€50	7½ kg
81/82 mm Mortar, Illumination	0.3/hour	C	€60	7½ kg
120 mm Mortar, HE	0.4/hour	C	€50	23 kg
120 mm Mortar, Smoke	0.3/hour	C	€120	23 kg
120 mm Mortar, Illumination	0.25/hour	C	€150	23 kg
75 mm Recoilless, HE	0.4/hour	C	€80	8 kg
75 mm Recoilless, HEDP	0.4/hour	C	€125	8 kg
75 mm Recoilless, Canister	0.4/hour	C	€80	8 kg
75 mm Recoilless, Illumination	0.4/hour	C	€250	8 kg
75 mm Recoilless, Smoke	0.4/hour	C	€150	8 kg
105 mm Recoilless, HE	0.3/hour	C	€125	15 kg
105 mm Recoilless, HEDP	0.3/hour	C	€175	15 kg
105 mm Recoilless, Canister	0.3/hour	C	€125	15 kg
105 mm Recoilless, Illumination	0.15/hour	C	€250	15 kg
105mm Recoilless, Smoke	0.3/hour	C	€150	15 kg
106 mm Recoilless, HE	0.3/hour	C	€125	15 kg
106 mm Recoilless, HEDP	0.3/hour	C	€175	15 kg
106 mm Recoilless, Canister	0.3/hour	C	€125	15 kg
106 mm Recoilless, Illumination	0.15/hour	C	€250	15 kg
106 mm Recoilless, Smoke	0.3/hour	C	€150	15 kg
20 mm Autocannon, API	6/hour	C	€5	½ kg
20 mm Autocannon, HE	3/hour	C	€7.50	0.65 kg
37 mm Autocannon, API	1.5/hour	C	€10	0.65 kg
37 mm Auticannon, HEDP	0.75/hour	C	€12.50	0.65 kg
15 mm Autocannon, HE	6/hour	C	€7.50	0.3 kg
75 mm Howitzer, HE	1.2/hour	C	€50	8 kg
75 mm Howitzer, Canister	1.8/hour	C	€50	8 kg
75 mm Howitzer, Illumination	0.6/hour	C	€100	8 kg
75 mm Howitzer, Smoke	0.6/hour	C	€75	8 kg
90 mm Spherical Shot	24/hour	B	€2.50	2¾ kg
90 mm Spherical Shell, HE	12/hour	C	€7.50	2¾ kg

Heavy Weapons Rounds				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
90 mm Spherical Shrapnel	6/hour	C	€10	2¾ kg
90 mm Spherical Case	24/hour	B	€5	2¾ kg
90 mm Rifle Shell, HE	12/hour	C	€10	5 kg
90 mm Rifle Shell, Shrapnel	6/hour	C	€15	5 kg
90 mm Rifle Shell, Case	12/hour	B	€7.50	5 kg
90 mm Propelling Charge	12/hour	A	€5	¾ kg
120 mm Spherical Shot	18/hour	B	€5	5½ kg
120 mm Spherical Shell, HE	9/hour	V	€10	5½ kg
120 mm Spherical Shrapnel	6/hour	C	€12.50	5½ kg
120 mm Spherical Case	18/hour	B	€10	5½ kg
120 mm Rifle Shell, HE	9/hour	C	€20	10 kg
120 mm Rifle Shell, Shrpnl	6/hour	C	€30	10 kg
120 mm Rifle Shell, Case	8/hour	B	€15	10 kg
120 mm Propelling Charge	6/hour	A	€10	1½ kg
150 mm Coehorn HE	12/hour	A	€10	
150 mm Coehorn, Shrapnel	8/hour	B	€15	
150 mm Coehorn Charge	24/hour	A	€2.50	
15 mm Cardboard Slug (500)	15/hour	B	€125	50 kg
15 mm Cardboard Shot (500)	15/hour	B	€125	50 kg



Solid Shot – Powder Cartridge and Ball (above)
Case Shot – Powder Cartridge and Ball (below)





Puckle Gun

Basic Vehicles
Land, Sea, Air and Rail

Vehicles – land, sea, and air – mostly, but not always, engine powered, are the subject of this chapter.

Displaced groups will find the possibility of introducing advanced transport technologies to be almost as attractive as developing new and better weapons.

Perhaps more so, as transport technologies improve logistics and therefore enable weapons to be more effectively used.

Then, of course, having modern(ish) personal transport may mean the difference between life and death for the characters on an individual level, too!

Ground Vehicles

Probably the type of vehicle most desired by *Displaced* groups, ground vehicles will also be some of the easiest designs to produce (in relative terms!) though not the cheapest to run nor, allowing for the state of roads in most pre-modern periods (and states), the easiest and cheapest to maintain.

The infrastructure to support the widespread use of these vehicles will also be scarce – especially for those vehicles that are powered by internal combustion engines, which is why many of the designs come with steam powered variants (as steam engines can be fitted to run on a variety of liquid *and* solid fuels.

The availability of liquid petroleum fuels (or substitutes) will limit the areas where vehicles that require them can be operated. Vehicles capable of burning solid fuel as well will be able to operate more widely.

Steam vehicles will have an edge, not only in being able to burn easily available solid fuel (screw feed mechanisms and crushed charcoal are almost as good as liquid fuels for them) they also benefit from the fact that they do not need electrical ignition systems (of course, diesels don't, either – but steam engines are simpler to manufacture than diesels as a general rule).

The problem with steam engines is that they require more supervision and more ***active*** *supervision than internal combustion and diesel engines and, when they fail, they are more likely to fail* ***catastrophically.***

Of course, all this assumes that the vehicles, whatever the source of motive power, have access to trained mechanics and spare parts to deal with the inevitable breakdown and maintenance issues that will arise away from the main centres of manufacture.

Note, however, that early automobiles (whether internal combustion, steam or diesel powered) were ***very*** *simple and even major repairs could often be done by the local blacksmith!*

Bicycle

A single (fixed) gear, chain drive, mountain frame bicycle made from the simplest parts, intended for civilian and military use, it allows the rider to reach higher speeds than they could walking – and it doesn't use any fuel to operate!

Production Time: 100 hours. ***Tools:*** B. ***Cost:*** €200. ***Accessories:*** Tyre repair kit (including bicycle pump), €20; Spare pneumatic tyre, €50.

Simple, easy to produce – and to ***mass*** *produce – requiring no fuel, and capable of speeding up movement considerably, the humble bicycle is likely to be a very popular production item.*

Moped Conversion

A small motor can be fitted to a standard or folding bicycle to convert it into a Moped. The motor (including gearbox and mounts) weighs approximately 6 kilos and takes about five minutes to mount onto a standard bicycle.

Production Time: 250 hours. ***Tools:*** C. ***Cost:*** €750.

This is a common conversion kit for those modern bicycles that accompany the ***Displaced*** *– effectively converting them into a very light motorcycle that may still be pedalled at need.*

Vehicles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Bicycle	100 hours	B	€200	13 kg
Moped	250 hours	C	€750	20 kg
Conestoga Waggon (only)	750 hours	A	€250	
Light Motorcycle	7500 hours	C	€5750	145 kg
½ ton Utility Car, IC	20000 hours	C	€15000	1050 kg
½ ton Utility Car, Steam	17500 hours	B	€8750	1475 kg
Light Armoured Car, IC	45000 hours	C	€40k	1650 kg
Light Armoured Car, Steam	40000 hours	B	€25k	2150 kg

Unlike real-world Mopeds, this conversion kit can easily be affixed to the frame and operate directly on the chain drive rather than simply sitting on the front forks and driving the front wheel through the use of friction rollers.

Conestoga Wagon

Based on the extremely successful north American design, yet easily built with nothing more than local technology, the *Conestoga* incorporates such improvements as the whipple tree (the pivot to which the horses' traces attach to the wagon body, enabling sharp turns to be made without breaking the traces or overturning the vehicle), on-wheel friction brakes, a sway backed body (minimising the movement of the cargo in the vehicle's bed to reduce strain on the rear drop-tray), a leaf spring suspension. roller bearings, and spoked, iron tyred, wheels.

A Conestoga wagon is approximately 8 meters long, 3½ meters high and weighed 1500 kilos and could carry 4000 kilos of cargo with a 6 horse team. Unlike the original (which was purely a cargo carrier), seating is provided at the front for the teamster and an assistant. The canvas canopy has been extended over their position to provide protection from the weather.

Production Time: 750 hours. ***Tools:*** A. ***Cost:*** €250 (wagon), €1500 (6 horse team).

Conestogas *were built at a time when the road network was abysmal – and the toughness and durability of the design became legendary. Just the thing for some* ***Displaced*** *settings!*

The fact that it can be manufactured with absolutely minimal equipment in a primitive setting will be a huge advantage for those needing a low tech, transport option.

Lance Motorcycle

A basic, no frills, multi-purpose motorcycle produced locally – as a result it is rather heavy for the 15 kW motor, reducing performance.

The *Lance* is designed for a rider plus a limited cargo in side-panniers, but can carry a passenger behind the rider in a pinch – it is too underpowered to enable it to mount a sidecar.

Production Time: 7500 hours. ***Tools:*** C. ***Cost:*** €5750.

With the experience gained from producing first bicycles and then Mopeds, it is a relatively simple step to manufacturing heavier frames and more powerful engines and mating them together to produce a more versatile vehicle – a basic motorcycle.

Lord ½ ton Utility

The *Lord* utility is a locally produced general purpose design that can be reconfigured as either a passenger or cargo carrier. There are two versions – one with a 35 kW internal combustion engine and the other with a multi-fuel 35 kW steam engine.

Much of the bodywork is constructed from plywood over a over a sturdy metal frame for lightness and cost reasons. There is seating for two up front in bucket seats and a rear cargo area has fold down bench seats that can take two passengers on either side if no cargo is being carried.

The IC powered version has electrical and crank ignition and a power storage battery that allows it to run headlights and brake lights as well as small electrically powered items (such as a radio). The steam powered version has carbide gas burning headlights and no electrics.

Production Time (IC): 20000 hours. ***Tools:*** C. ***Cost:*** €15000.

Production Time (Steam): 17500 hours. ***Tools:*** B. ***Cost:*** €8750.

Think something like a much simplified Model T Ford in concept, but manufactured with modern engineering knowledge – substituting simple, low tech, parts wherever possible and reserving "high tech" machined parts to vital areas (like the engine, gear box and drive train). Most of the vital structural members are designed to be manufactured and maintained with local tools available

to any good carpenter or village blacksmith, further enhancing the overall economy of the design.

Like most very early old-style motor vehicles, there is need be no set body design – the vehicle manufacturers make the chassis, engine, controls and drive train and the bodywork is actually produced by someone else entirely (and so may be utilitarian or luxurious or somewhere in between).

Knight Armoured Car

The *Knight* is a lightly armed and armoured vehicle based on the basic *Lord* utility chassis. The crew (one driver up front) and fighting compartment (commander and gunner) is enclosed by light metal sheeting on a plywood base, on a sturdy metal framework. This arrangement provides protection against all but the heaviest pre-gunpowder missile weapons (somewhat less against gunpowder small arms).

There is a a powered full traverse turret over the rear section with mounts for a HMG and MMG side by side (these must be purchased separately) and with storage for 800 HMG and 2400 MMG rounds. To improve speed and manoeuvrability a larger and more powerful engine (70 kW) is installed as standard. This may be steam *or* internal combustion.

Production Time (IC): 45000 hours. ***Tools:*** C. ***Cost:*** €40000.

Production Time (Steam): 40000 hours. ***Tools:*** B. ***Cost:*** €25000.

*A simple conversion based on the **Lord** chassis – similar in form and function to conversions of Model T or Rolls Royce chassis into ad hoc armoured cars by many combatants during WW1 (modified RR models remained in service through the 20's and 30's and into WW2).*

Farmer Tracked Utility Vehicle

The *Farmer* is a light multipurpose utility vehicle designed for general agricultural and utility purposes. The engine is mounted below the rear cargo area and drives a "dead" (cheap, but high maintenance) track over a Christie-style suspension.

The front cab (which seats two comfortably or three in a pinch) is enclosed at the rear and sides and is equipped with a canvas top.

The rear body is normally in the form of an open tray with fold down sides, but can be equipped with a light metal frame and a canvas tarp or a wide variety of special order purpose built bodies.

Both steam and internal combustion powered variants are available and both models are provided with power take-off mechanisms to allow other machinery to be run off of the *Farmer's* engine.

Production Time (IC): 60000 hours. ***Tools:*** C. ***Cost:*** €45000.

Production Time (Steam): 50000 hours. ***Tools:*** B. ***Cost:*** €25000.

One of the key means of dramatically boosting agricultural production locally is to mechanise as much of it as possible – both for transport and production.

*The **Farmer** is one way of doing this – as both transport **and** as a mobile power source for running other agricultural machinery (mobile threshing machines, for example) – but it also exists as a general purpose vehicle that could be more widely used in periods when "road" is a word describing a rutted dirt track that becomes a quagmire when it rains!*

Mule Medium Truck

A universal type 4 x 4 truck with continuous four wheel drive. The front cabin (which seats two comfortably, or three in a pinch) is enclosed, and the rear is normally an open tray with fold down rear and sides.

The *Mule* **may** be covered with a light metal frame and canvas tarpaulin *or* may be constructed with a wide variety of special-order *purpose* built bodies –

Vehicles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Tracked Utility, IC	60000 hours	C	€45k	2000 kg
Tracked Utility, Steam	50000 hours	B	€25k	2500 kg
Light Truck, IC	60000 hours	C	€45k	4000 kg
Light Truck, Steam	50000 hours	B	€25k	5000 kg

including enclosed, dump truck, tanker and passenger (limousine or bus).

Both steam and internal combustion variants are available.

Production Time (IC): 60000 hours. ***Tools:*** C. ***Cost:*** €45000.

Production Time (Steam): 50000 hours. ***Tools:*** B. ***Cost:*** €25000.

*The **Mule** is a somewhat larger version of the **Lord** and, like the latter, comes as a chassis onto which a wide variety of body types can be added for specific purposes.*

The design is intended mainly as a cargo carrier, but the chassis can be used as the basis for a whole family of specialised vehicles.

Water Vehicles

Marine craft are probably the easiest modern-style vehicles that could be produced by *Displaced* group given their limited manufacturing capability.

*Even if the **Displaced** group doesn't have the capacity to construct **powered** craft, they can make **real** contributions to the local maritime technology,*

For example, for most of the classical period (up to the fall of the Roman Empire in the west, at least) the major form of maritime construction was the carvel built hull.

*This involved carefully fitting together each plank edge to edge and top to bottom with mortice and tenon joints and wooden dowelling – a very strong form of construction, but slow and expensive ... and expensive and slow to **repair** when damaged. Such construction generally didn't have a significant internal skeleton (and what there was was added **after** the hull was constructed), and relied on the careful fitting of the planks for strength,*

This was eventually improved on, and stronger internal bracing was increasingly used, but the great improvement was the development of the much cheaper and faster clinker built method.

*This involved building the framework **first** and nailing overlapping planks onto it. It was stronger overall (but not necessarily by as much as some older historians suggest, based on more recent research) and it was cheaper and quicker to repair as well.*

*Other maritime advances would include more advanced rigging that would allow more effective **tacking** to sail against the wind (classical ships **could** sail against the wind, mostly by **wearing**, which is less efficient than tacking – they **could** tack, but they preferred not to, as their rigging could not be guaranteed to stand up to it); the sternpost rudder to replace the less effective steering oar; copper sheeting to protect the hull against teredo worm and much more.*

The main limitation that they suffer from is the obvious one – that they can only be used where there are bodies of water they can be operated *on*.

While they offer a considerable improvement over local craft and are the cheapest vehicles of all to operate, ground vehicles will be more in demand because of their relative versatility and the greater likelihood that any *Displaced* community (and campaign) will be land-based even if not on the *mainland*.

*One of the key advantages of these "modern" water craft is that they are normally powered by steam engines – which can be run on liquid **and** solid fuel (and solid fuel can be gathered simply by chopping down trees).*

Wind Steam Gig

A small, steam-powered, wooden hulled vessel intended for use as a lifeboat or ship to shore tender for larger vessels. The helmsman sits at the rear, in the open, just behind the firebox, and there is seating for eight in the main hull.

Vehicles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Light Steam Gig	2500 hours	C	€1875	700 kg
Medium Steam Gig	7500 hours	C	€5625	2350 kg
Steam Coaster, Cargo	120,000 hours	C	€750k	250 tons
Steam Coaster, Cargo-Passenger	120,000 hours	C	€900k	250 tons

Survival supplies (64 man days) are stored in sealed containers that double as watertight compartments that make the vessel more survivable.

Oars, a mast and sails are also provided for emergency use, especially when used as a lifeboat or for extended journeys away from land (and a source of fuel).

Production Time: 2500 hours. ***Tools:*** C. ***Cost:*** €1875.

*The **Wind** is basically a steam engine, drive shaft and screw propeller installed into a locally made wooden hull (based on modern designs), making it the simplest possible transport project. Though not intended for open-ocean use, (limited fuel storage), it is a handy little craft for harbour and ship-to-shore work.*

Storm Steam Gig

A larger craft than the *Wind*, it is also a wooden hulled, steam-powered launch intended mainly for use as a tender for larger vessels or as a work boat. It has an enclosed wheelhouse at the rear, just in front of the engine and smokestack, with seating for the helmsman and engineer. The main hull has seating for ten and watertight compartments with survival supplies (84 man days).

Production Time: 7500 hours. ***Tools:*** C. ***Cost:*** €5625.

*Like the **Wind**, the **Storm** is simply a drop-in design – a locally made wooden hull (though based on modern design and construction techniques) into which a steam engine, drive shaft and screw propeller are placed.*

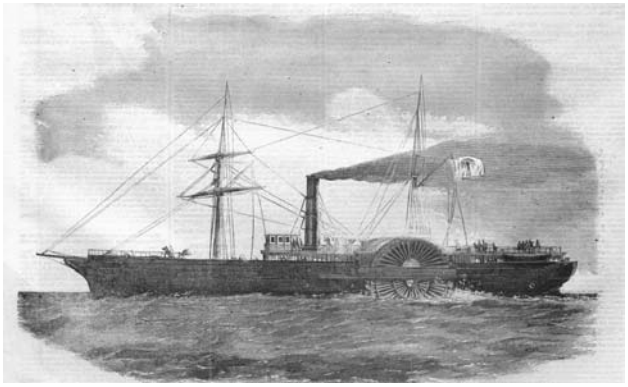
The greater size gives it improved range, though it is still really limited to harbour or riverine work, or for use as a ship-to-shore tender for a larger vessel.

A more powerful engine means that it is can easily act as a general work boat or basic harbour tug for the sort of smaller "large" craft common in most pre-modern historical periods.

Dolphin Class Steamer

This is a locally produced wooden-hulled steam yacht capable of acting as a small cargo/passenger vessel or in a variety of other roles with a modified superstructure and internal layout.

Two of the most common designs are a Cargo vessel and Cargo-Passenger vessel.



Cargo Steamer: This is a general purpose cargo carrier with two holds (one fore, one aft), each capable of taking 100 tons of breakbulk cargo (for a total of 200 tons) with superstructure (Bridge, Radio Room, Galley and most accommodation) amidships.

The vessel has a crew of 12 and 10 cabins (single and double occupancy) for 10-20 passengers. There are two Steam Cranes, one of 15 (for'ard) and one of 7½ tons capacity (aft).

The vessel is provided with 4 *Wind* class and 2 *Storm* class steam gigs and 8 Carley Floats. Ancillary equipment includes a Vehicular Radio, two Searchlights (may be carbide fuelled) and an Aldiss Lamp (again, this may be carbide fuelled) for signalling.

Production Time: 120000 hours. ***Tools:*** C. ***Cost:*** €750,000.

Cargo-Passenger: This variant has a single hold (for'ard) with accommodation (non-crew) in an extended superstructure from midships to stern (which also contains the Bridge, Officers Quarters, Radio Room and Galley).

The crew quarters and luggage holds are below decks aft. There is a single 7½ ton capacity steam crane for'ard to handle the cargo loaded in the for'ard hold. The vessel has a crew of 12 and 30 passenger cabins (dual occupancy) allowing for 30-60 passengers.

It is provided with 4 *Wind* class and 2 *Storm* class steam gigs and 16 Carley Floats. Ancillary equipment includes a Vehicular Radio, two Searchlights (which may be carbide fuelled) and an Aldiss Lamp (again, this may be carbide fuelled) for signalling.

Production Time: 120000 hours. ***Tools:*** C. ***Cost:*** €900,000.

Vehicles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Hang Glider, 1 man	5 hours	A	€75	50 kg
Ultralight, 1 man	3000 hours	C	€3750	135 kg

Vehicles				
Item	**Production Time**	**Tools**	**Cost**	**Weight**
Ultralight, 2 man	5000 hours	C	€5625	165 kg
Powered Glider	7500 hours	C	€15k	535 kg
Light Utility Aircraft	75000 hours	C	€150k	1250 kg
2-2-0 Light Locomotive	100,000 hours	C	€87.5k	3200 kg

These vessels are assumed to be wooden hulled, though they may have an iron or steel keel and internal structure

*They are probably the most sophisticated – and largest – vessels that a **Displaced** group would be capable of **constructing** in a pre-modern setting ... anything more technologically advanced and they can use (and modify) the locally produced vessels.*

Think small scale tramp steamers – though they could easily be modified for other usage by changes to the basic layout of the vessel without changing the basic hull form or engines.

Aircraft

Man has dreamt of being able to fly like a bird since the earliest times – but only managed to achieve it in the late 18th century with the invention of hot air (later hydrogen filled) balloons.

*Though Hang Gliders should be possible at any decent level of technology for a **displaced** group, **Balloons** may be more practical ... on the same sort of scale that they were used for in the US Civil War. Some zinc and Sulphuric Acid for generating Hydrogen gas, a doped fabric gas cell, some ropework, a wicker basket and a couple of waggons to carry it all and your army commander can be informed of all the manoeuvring of opposing units in a way rarely, if ever, possible in the pre-modern world.*

*Information is advantage on the battlefield! Being able to respond to the enemy's moves inside his decision making cycle is a **huge** advantage. Even the fact of the balloon **being there** will constrain the actions of the enemy general since he will have to take its ability to see most of his actions into account in **formulating** what those actions will be.*

The development of powered lighter than air craft followed slowly, and then the first powered heavier than air flight little more than a century ago.

But, with the advanced knowledge available to a *Displaced* group, flight need not be an unattainable dream even in the distant past! The utility of air transport, even of a limited type, is obvious and the *displaced* will want access to it if at all possible.

Spirit Hang Glider

Constructed locally from bamboo (or expedient materials) and fine cloth (silk, perhaps), with a harness for a single pilot beneath.

Production Time: 5 hours. ***Tools:*** A. ***Cost:*** €75.

*A hang glider is about as basic as you can get. You're not going to do anything more than observation and, perhaps, quick message transport, from it – but you can **fly!** And that's impressive as hell to ground bound locals!*

Sparrow Ultralight

A development of the basic hang glider, but with a larger delta wing based on steel or aluminium tubing with a single seat pilot's position slung beneath, and the engine directly behind.

Production Time: 3000 hours. ***Tools:*** C. ***Cost:*** €3750.

*The engine is the main cost in this design – but it does allow powered flight. The **Sparrow** is still mainly an observation and message carrying craft though, in a pinch, the pilot could probably drop the odd grenade or mortar bomb and, just barely, fire their personal weapon.*

Cuckoo Ultralight

This is a larger, two seater, version of the *Sparrow* – with two side-by-side seats (though they are still open to the elements. The craft may be piloted equally well from either the left or right hand seat.

Production Time: 5000 hours. ***Tools:*** C. ***Cost:*** €5625.

*As with the **Sparrow**, the **Cuckoo's** main cost component is the engine.*

*The **Cuckoo** can carry around 80-100 kilos of cargo in lieu of the second passenger. Where a second person **is** carried, they may drop grenades or mortar bombs and fire their personal weapons without hindrance.*

Judge Powered Glider

The *Judge* is a conventional sailplane design with a stronger airframe and light engine that is powerful enough to get it airborne with a pilot under normal conditions. The craft then normally uses thermals to gain altitude and distance, though the engine could still be used intermittently (the fuel capacity is limited).

With a passenger or cargo, a slope, winch, or following wind (or all three, perhaps) is also needed to get the craft airborne.

Production Time: 7500 hours. ***Tools:*** C. ***Cost:*** €15000.

*This is getting into the realms of **serious** heavier than air aircraft – limited mainly by availability (or capacity to make) powerful enough engines.*

Magician Light aircraft

A basic light aircraft, the *Magician* has a fuselage of light steel tubing (or plywood) covered with plywood and doped fabric. The cockpit has two seats (side-by-side) with extra space behind for onboard weaponry, cargo, communications gear, or passengers.

Provision is made for mounting two MMGs (top wing, 1500 rounds each) and the centreline of the fuselage has a hardpoint for up to 250 kilos of attached ordnance.

Production Time: 75000 hours. ***Tools:*** C. ***Cost:*** €150,000.

*This is probably the best that a very well equipped **Displaced** group could manage. Think something like a Tiger Moth (though it may not be a biplane design).*

Rail Transport

The most likely (and easiest to manufacture and maintain) form of land transport available to *Displaced* groups will be some form of railroad.

This may be as simple as hardwood rails on wooden ties and ballast on which specially designed wooden carts are pulled by horses (Conestoga style wagons with modified wheels would fit the bill).

The next step up would retain the wooden rails or, perhaps, replace them with very light gauge iron rails and a narrow gauge track and utilise improvised conversions of *displaced* vehicles (using motorcycle engines, perhaps; or converted ride on mowers).

Historically speaking, a number of US narrow gauge railroads are known to have used wooden "rails" onto which they fastened strap iron for durability, though this was not regarded as a permanent solution and iron rails were used to replace it as soon as it was feasible to do so

Magician Utility Aircraft

(either economically or when enough iron rails became available on the market ... or both).

More serious, but still basically improvised, operations would use standard weight trackage with converted heavy duty *displaced* vehicles – or rail conversions of the locally produced *Lord* or *Mule* vehicles.

All that is needed is to convert the wheels appropriately and, voila, instant "locomotive."

Of course, it's not *that* simple. Motor vehicles, steam or internal combustion, work well enough on dirt roads. Watercraft can operate with even makeshift port facilities. Aircraft need only grass runways.

Railroads, however, need *rails*. More than any of the other forms of transport they require *specific and obvious infrastructure* to work at all. See the sidebar on ***Railroading*** on page #20 for details to get you started.

Rail Conversion Kits

These are purpose designed, permanently installed, additions to convert the running gear of any suitable motor vehicle for rail operations.

*A **Lord** conversion (35 kW engine) can pull three car equivalents (a Passenger Car being one car equivalent and a Cargo Car being two); a **Mule** conversion (70 kW engine) can pull 5 car equivalents.*

Unlike regular locomotives, the chassis of these conversions isn't really strong enough to allow them to be joined together to pull larger consists – though, of course, there is no reason why player characters shouldn't be allowed to play around with the designs to get more out of them using the Design process.

*More modern (and powerful) vehicles can tow proportionally more cars based on their engine power compared to that of the **Lord** and **Mule** conversions.*

Towing speeds for such conversions will be the same as for the *Giant 2-2-0.*

Production Time: 2000 hours (including installation

time). ***Tools:*** B. ***Cost:*** €3000.

*Kits that allow a vehicle to quickly convert between normal road operations and rail operations **are** available, costing half the time to produce and install and half the monetary cost, but they are not as robust as the permanent installations and do not allow the vehicle to pull more than a standard single trailer.*

Giant 2-2-0 Light Locomotive

The *Giant* loco would only be a toy shunter on a modern railroad operation – but it only requires light trackage (30 kg/m rather than the normal 60 kg) to operate effectively, though it is standard gauge (4'8½").

An archimedes screw mechanism loads fuel (crushed coal or, in earlier periods, charcoal) into the firebox, running off engine power (and is manually cranked to start) though provision is made for manual fuelling using wood or similar.

Production Time: 100,000 hours. ***Tools:*** C. ***Cost:*** €87,500.

*A basic locomotive design that is probably within the manufacturing capabilities of medium to well equipped **displaced** groups.*

Tiny Tender

The *Tiny* is a locomotive Tender designed specially for attachment to the *Giant* locomotive – though the latter can run quite effectively without it.

The Tender is mainly to carry extra fuel and water, extending the loco's range between refuelling stops and also carries a full set of specialist tools (Type C) for on-the-spot maintenance of the loco and consist.

It also carries a locally made Radio and 1.5 kW generator (run off waste steam from the loco) with room for the radio operator and an extra engineer and fireman/mechanic.

Production Time: 40000 hours. ***Tools:*** C. ***Cost:*** €45000.

Five Ton Rail Cars

A variety of rail cars are available for the *Giant* class locomotive (or any expedient conversions) to pull. The major variants are –

Passenger Carriage: Comes in 1st or 2nd Class versions, with seating for 30 (5 x 6 seat) or 40 (5 x 8 seat) respectively. Each unit is a separate cabin with access via doors on either side, but with no connecting internal corridor. Provision is made for the storage of passenger baggage in overhead and under-seat spaces.

Production Time: 10000 hours. ***Tools:*** B. ***Cost:*** €15000.

Railroading Costs

To *completely* reconstruct a kilometer of standard gauge railroad track track on an existing right of way (1995 figures in US$) was estimated to cost/require the following –

110 tons of 45 kilo (100 lb) rail

170 Joints	3759 Tie Plates
2700 Anchors	Bolts, 11 kegs
730 Washers	Spikes, 50 kegs
1875 ties	375 tons of ballast

Total Cost: $155,000 (parts and labour)

Per turnout: $15000
Road Crossing: $1365 per track meter
Fencing: $93750

The following costs are the total costs of the facilities spread averaged out on a per kilometer basis.

Telegraph Facilities: $10000
Water Stations: $8125
Passenger & Freight Stations: $53000
Roundhouses and Terminal: $28750
Operational Equipment: $212,500
Bridges and Culverts: $75000
Sidings and Yards: $5500

***Water Stations** with a capacity of 20-50000 liters are required every 150-160 kilometers, usually in the form of water towers capable of refilling the water tank of a steam locomotive within fifteen minutes.*

*The cost for **Operational Equipment** covers all switching and signals equipment and all maintenance and repair equipment.*

*The cost for **Bridges and Culverts** assumes the railroad traverses basically lightly rolling terrain with no rock cuts required and with no major rivers or defiles cutting across it.*

If the land on which the railroad and its buildings needs to be purchased, then the following averaged costs per kilometer of track apply –

Right of Way: $45000
Land Purchase: $90000

Operating Costs

In terms of 2005 US$ it costs around $16 per kilometer for fuel, water and crew costs.

For "right of way" costs (maintenance of the system as a whole), add double the vehicle's operational costs.

Troop Carriage: Has seating for up to 50 in canvas seats on wooden frames in a single large open area with access via doors at each end and double doors in the middle of each side (it can double as a 3rd class passenger carriage).

Roof racks, hooks and wall racks are provided for storing weapons, packs and light personal equipment.

The carriage can be easily and quickly converted to a sleeping car – 32 cots (two rows of 8 each along each wall) and 12 hammocks (two rows of 6 down the center of the carriage, hanging from attachment points on the roof), and floor space for a further 6 sleepers, for a total of fifty. Alternately, it can be used as a Hospital carriage with 16 cots along the wall and space for 6 medical staff.

Production Time: 8750 hours. ***Tools:*** B. ***Cost:*** €12500.

Flatcar: A simple tray platform on top of the chassis capable of taking up to 8500 kg in assorted cargo. The car may be provided with chest-high detachable sides (in sections) or left open.

These flatcars can take vehicles of up to 5000 kg in unloaded weight as well, though special loading and unloading arrangements may be needed.

Production Time: 5000 hours. ***Tools:*** B. ***Cost:*** €7500.

Boxcar: A simple boxy superstructure built on the chassis, and capable of taking up to 8500 kg in assorted cargo. Access is via two large sliding doors, one in the center of each side and two roof hatches (one towards each end). They can be internally fitted out with collapsible pens to allow them to transport 20 horses or mules.

Production Time: 7500 hours. ***Tools:*** B. ***Cost:*** €10000.

Bulk Cargo Car: This is a simple unroofed car with reinforced side walls to allow it to carry heavy bulk cargoes – especially such things as coal and stone ballast.

Production Time: 7500 hours. ***Tools:*** B. ***Cost:*** €10000.

Tanker Car: A cylindrical tanker on a standard chassis, capable of carrying up to 10000 liters of liquids, or a maximum of 8500 kilos weight (so, for example, it could carry only 8500 liters of water). Fuel tankers are the most common variant.

Production Time: 15000 hours. ***Tools:*** B. ***Cost:*** €15000.

Workshop Car: This has the equivalent of a Portable Machine Shop (page #67) with space for 10 workers at a time) installed, and a 60 kW steam generator. It is

Daytime arrangement of a Pullman Sleeping Car

can provide support for all sorts of repair and construction work on locomotives, cars or and railroad facility or installation.

Production Time: 50000 hours. ***Tools:*** D. ***Cost:*** €100,000.

Wrecker Car: Somewhat of a misnomer, this is a flatcar with a crane (7½ ton capacity) and side-supports to allow the recovery of locomotives or cars that have been derailed. A 60 kW steam generator is installed to power the crane and other recovery gear.

Production Time: 35000 hours. ***Tools:*** D. ***Cost:*** €50000.

Caboose: A simple boxy superstructure with a small office for the conductor and/or loadmaster (seating for four, two fold down cots on the walls and hooks for 2 hammocks), heavy duty brakes (so it does double duty as a Brake Van) and secure storage for high value cargoes, including a lockable mailroom and a bullion safe securely bolted to the frame *internally*.

There is provision for the office to mount a locally made Radio and a 1.5 kW generator (externally, on the roof rear, for the latter), but neither is included in the standard time or money cost listed below.

Production Time: 10000 hours. ***Tools:*** B. ***Cost:*** €15000.

Railroad Consists

The "consist" is the makeup of a train – the locomotive (or locomotives), tender (if any), passenger and/or freight cars and possibly a caboose.

*A **Giant** locomotive can haul a consist of a single Tender and 20 car equivalents (passenger carriages count as 1 car, cargo cars count as 2) over most terrain, or double that on flat terrain.*

More than one locomotive may be hitched together to increase the consist size. A two locomotive train, for example, could haul 40 car equivalents.

EXTENDED BASICS
OPERATING AN ECONOMY

Displaced isn't *intended* to be an economics management game – but it tries to not *completely* ignore the real world either. In the real world economics is a driving force – you might well wish not to be the case, but those individuals and governments who ignore reality inevitably fail.

Inevitably.

There are some fairly basic rules that *you* should not ignore, and that you should not allow your *players* to ignore.

For a start – *you consume more than you produce.* Which is not *quite* the same as saying *"you can't spend more than you earn"* – the latter isn't entirely true, in the short term, as you can *borrow* against future earnings.

You can't *really* borrow against future production. You either have it here and now or you don't.

Of course, you can increase the amount you produce by ignoring maintenance and replacement requirements for the production machinery, but that isn't at all the same.

You, as GM, should have a pretty good idea of how much the *displaced* community is capable of producing and you need to adhere to those limits (you might fudge them in the first place, and this whole rulebook is a giant fudge in any case, but adhere to whatever it is you decide on).

*The players might want to make **"Five Year Plans"** like the communists did – but, unless they reflect something resembling reality, they will simply fail. Nazi Germany tried something similar in the lead up to (and during the course of) WW2 – and it failed to work again and again.*

*The Nazis never **did** learn any more than the Communists did.*

A corollary of this "rule" is that *the world doesn't owe you a living.* Or, put more simply, *you have to pay for what you need.*

Which means that your production capacity is constrained by having to make things that can be sold to purchase the stuff you need – you better be a net exporter of goods (or produce whatever it is you need *locally)*, in other words. Or you'll somehow have to *become* one – and even if you don't have to *import* stuff, you *still* have to pay the workers/producers of whatever it is!

*Slave labour is a short term "solution" to the problem – or it **seems** to be until you look at it closely. The productivity of slaves, even under the most brutal repression, is **far** lower than it is for "free" workers. And the cost of repression makes the whole process nowhere near as cheap as it looks – not only is there the cost of the mechanism of repression, there is the fact that you are crippling your consumer base which is, ultimately, the driving force of your economy.*

Worse, politically it makes it difficult for you to achieve international diplomatic aims – other countries simply won't trust your intentions

A second factor that you simply can't ignore – raw materials are an *absolutely* limiting factor in planning what you want to produce and, therefore, in deciding what you can and can't do.

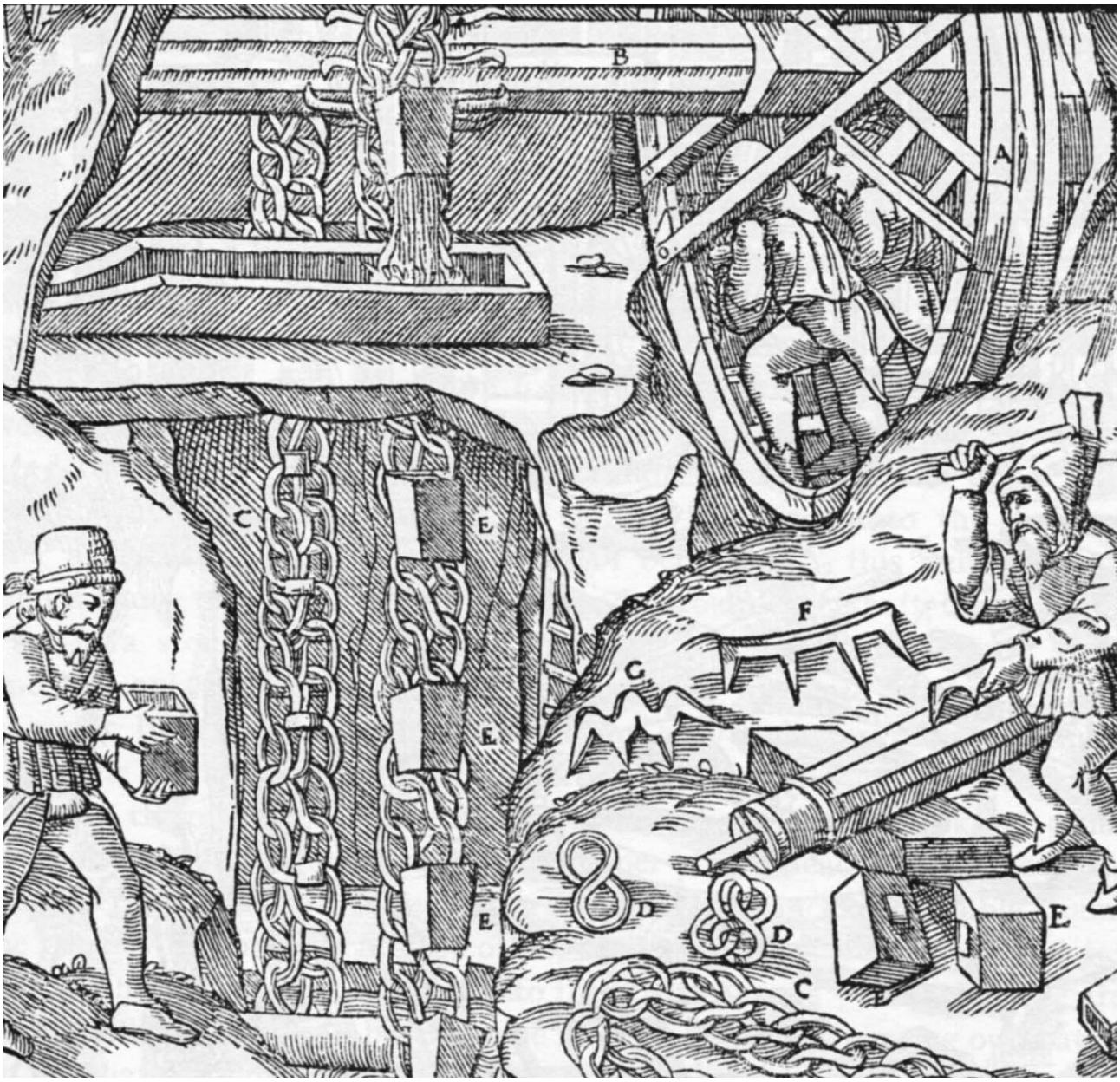
In other words, you shouldn't allow players to "plan", as the Japanese did in WW2, on oil tankers that didn't exist appearing out of thin air to refuel IJN Task Forces with fuel that didn't exist simply because that was the only way the plans for war against the allies would work.

*Look where **that** ended up!*

Some people might even be tempted to try the old adage *"Make war support war"* – problem is, when, for example, Gustavus Aldolphus' Sweden attempted this during the Thirty Years War it *gutted* Germany for generations to come. Hitler's attempt to do it before and during WW2 was even worse – his plans were predicated on the extermination, not just of the Jews, but 30 million of the estimated 40 million Slavs in the parts of the USSR he planned to conquer, and the enslavement of the rest. It worked out even worse in the short term than did Sweden's earlier attempt.

There's lots more but, as I said, this *isn't* an economics text. However, to get a better idea of the way in which everything interconnects in the development of technology, I highly recommend PGD's *Farm, Forge and Steam* supplement – available from wherever you purchased *Displaced!*

Apo Mekhanes Theos



"Any sufficiently advanced technology is indistinguishable from magic."
– Arthur C. Clarke

"Any technology, no matter how primitive, is magic to those who don't understand it."
– Florence Ambrose

"Any technology distinguishable from magic is insufficiently advanced."
– Barry Gehm

"Technology presumes there's just one right way to do things and there never is."
– Robert M Pirsig

DEUS EX MACHINA
THE GOD OF THE MACHINE

Deus ex Machina *(from the Greek* ***"Apo mekhanes Theos"****) – An unexpected, artificial, or improbable character, device, or event introduced suddenly in a work of fiction or drama to resolve a situation or untangle a plot.*

– The American Heritage® Dictionary of the English Language, Fourth Edition

Of course, the whole *premise* of ***Displaced*** is one based on a *ginormous* improbability – the grand-daddy of all *deus ex machinae*.

Time and dimension travel is, as far as we *currently* understand things (or at least as far as we can *apply* our current understanding of things) in the physical universe, at present, is impossible.

Whether it will *ever* be possible is debatable. Regardless, it is *extremely* unlikely that, if it *is* possible, that it will ever have implications of the sort described in ***Displaced***.

So what's *one more* improbability between friends?

PONDERING THE IMPROBABLE

Let's face it, on any reasonable reading of things, there's little way that anything but a *really* large and *amazingly* well equipped group of people is ever going to have the sort of impact on the past/future or whatever alternate dimension your campaign is going to be set in and around without one *hell* of a lot of fudging.

So far ***Displaced*** has attempted to put that fudging on as reasonable and seemingly logical a footing as possible, but for some circumstances you (or your players) may deem this to be *insufficient*.

As the saying goes, *"reality is for those people who can't handle role playing games ... "*

The chapters in this section of *Displaced* are intended to offer some ideas and semi-technical suggestions as to how you, as GM, might insert a little extra *oomph* into the background that will add some technological edge to the players' position (and enjoyment) while not being *too* obviously outrageous or *too* unbalancing.

After all, a little technological edge is probably *all* the characters have going for them in the face of sheer numbers on the "other" side – and, as noted elsewhere, the likelihood is that there won't be too many locals who will *really* be friends when they realise what a threat you are to *everything* they hold dear. You'll need all the help you can get!

SOLVING THE INSOLUBLE

Many people (and most of them *should know better*) tend to fall into the trap of assuming that *all problems can be solved through the application of appropriate (for which read:* ***advanced****) technology* – just before completely misjudging what the problem *is* and, thence, immediately applying technology that proves to be wildly inappropriate.

Technoblindness, in other words.

Of course, that said, sometimes technology ***is*** a solution – quite possibly even the *best* solution. However, it may *not* be the most advanced technology available – it may simply be a better way of utilising *existing* technology.

Equally, it may be there is *no* technological solution *at all* (worse, there may be *no solution*) – or, just as bad, none that can be manufactured locally – though there may be a *political* or *social* one.

Social and Political solutions are more easily handled by role playing – but, ***in reality***, would be ***extremely*** difficult to impossible for player characters to actually *implement* in any reasonable period of time.

Players may, however, be more willing to accept what amounts to "miraculous" course of events in this area, simply because most gamers tend to be technologically adept rather than literary-historically so.

Technological solutions are less likely to be standalone solutions, but are inherently attractive to most players and GMs because we all do tend to get caught up with the aforementioned *technoblindness*.

The whole thrust of the preceeding ***Survival Margins*** sections has been to provide a basis for the technological capacity of the group that the player characters belong to ... but it may be that that is simply not enough, even allowing for inherent player greed.

MACHINERY OF THE GODS

There are several basic ways in which you, as GM, can provide that little extra boost to the player character's efforts over and above what they find themselves

directly displaced with –

- **Hidden Facilities –** Sure, the PCs may have been transported with specific structures containing all sorts of resources and equipment *that they know about.*

  But is that *all* there is available to them? After all, the idea is that the cause of their displacement is somehow either unknown or, at the very least, *unreproducible* and, in all likelihood, inherently unpredictable.

For example, that old, long abandoned and mothballed military base or semi-derelict industrial facility up in the backblocks of your town (or industrial estate, or gated community ... or whatever).

Of course. it may take a while for the player characters (and the players) to figure out what it conceals.

- **Random Vehicles –** Depending on the location, there is a real chance that there will be unexpected cargoes to be found on some of the vehicles randomly passing through. Of course, there would have to be some rationale for this.

*For example, the likelihood that an entire trailer convoy moving the weapons and vehicles of a Mechanized Infantry Battalion is just **coincidentally** moving through as things are displaced is, well, not **terribly** high!*

*On the other hand, it's reasonably likely that a train passing through spur at the outskirts of town **could** be carrying industrial equipment intended to set up an engineering factory ...*

- **Resources** – The town just happens to be built on a working goldmine? Or maybe its dumped *on* a gold deposit that can easily be exploited with the technology the displaced have at hand?

Or perhaps its right next to an oil seep – drilling for crude oil would be a doddle there, and so they'll have the wherewithal to keep their internal combustion engines running indefinitely.

- **Uniquities** – These *probably* fall in one of the above categories, but are really *way out.*

  The whole underpinning of the *displaced* mil-ieu is that something *unique* has happened. Some-thing inexplicable.

  So there's absolutely no reason why you can't have something of practical use to the player characters result from the whole mess!

  This is obviously a grab bag ...

*This is the widest field of possibilities. If you're dealing with alternate dimensions, then it might be that the locals have resources available that the **displaced** are uniquely placed to exploit.*

Those weird bushes, regarded as dangerous weeds by the locals, whose berries contain an foul smelling, sticky, flammable goo? Well, it can be refined into gasoline! Whoda thunk it?

Or possibly the unknown agency behind the whole displacement thingy have left some usable traces – high tech traces.

*Sure, the time warp machinery has self destructed, but that strange doohickey over there? The big one with the power cables hanging off it? It's a **Mr Fusion** – just insert **any** mass and it can convert it to energy. Best of all? It's rated for self repair! It will last for, oh, **hundreds** of years!*

- **Bell Curves and Curve Balls** – Maybe whatever caused the *displacement* worked in unexpected ways?

*Maybe the effect operates on a bell curve – and the displaced are spread over time and, possibly, space. So the players might not be the first to arrive nor might they be the last. And what they arrive **with** may be supplemented by what arrived earlier or what will arrive **later**.*

The following chapters will provide examples of the *things* that can be dropped into your campaign and some guidelines on *how* and *when* to do so.

HIDING IN PLAIN SIGHT

THERE'S MORE HERE THAN MEETS THE EYE!

Not everything is out in the open and obvious. Not even to those who are actually *displaced.*

Even when things are *obvious* it may well be a case that we're only seeing what we ***expect*** to see?

The abandoned warehouse on the industrial site? Sure, it's empty. Everybody knows that. Been empty for years.

*But what is **empty**? It might mean the place has been used as a dump for the owners – who just **happen** to have been storing obsolete industrial equipment there from a factory they tore down years ago. Equipment that can be cleaned up and put back into use.*

*Or maybe it **is** empty.*

***Except** for the 1 Megawatt diesel generator that was the emergency power supply for when it was a secure data storage facility?*

*Or maybe you were only expect to **think** it was empty?*

The local drug cartel have a Meth lab set up there with lots of feed-stock. Maybe with a small arsenal onsite?

*And it just so happens that the guards were doing a patrol of the perimeter ... just **outside** the displacement effect zone!*

Then, perhaps, it might be a disguised emergency facility for some alphabet soup agency to be used in time of national emergency. Or could it be an equally secret al Quaeda base containing armaments for a mass attack against ... somewhere else..?

And we all know that the Simmons' place is just an ordinary semi-rural home. The family were all (good luck to 'em!) out of town when the displacement effect hit – and you've salvaged the food, the farm equipment, even the backup generator.

But did you know that old man Simmons was a survivalist freak from way back?

Or that he built the house over a natural cavern (or old mine-shaft) which he had converted into a survivalist bunker – and not just for him and his immediate family, but for an group of like-minded professionals with money?

So it's fully stocked with all the goodies they thought they'd need to survive whatever disaster they were planning for – and also to allow their descendants to rebuild something resembling civilisation if push comes to shove!

Of course, the entrances are carefully concealed – and aren't going to be found by a casual search. Maybe they won't even be found by a close search – not right away.

Then there's the Bell facility out on Nemo Ridge – mobile phones and microwave relays, or some such. Serviced by technicians coming in from outside, infrequently.

*When you hit it first time round, sure you find what the builders **expected** you to find. What they **wanted** you to find.*

The backup generator set.

The solar power arrays, banks of lead-acid batteries, and power inverter. The computer equipment. The mobile phone communications gear. The microwave relays themselves. All open and above board, and valuable in your predicament.

But did you notice that the paved parking area has spaces for 20 vehicles? Or that there's a concrete helipad just over the rise? And why is there a lift in the enclosed concrete tube/tower that contains the equipment and acts as a mast for the commo gear? Why not just a ladder? Or stairs?

*Will you notice that the lift shaft actually goes **down** as well as up? That there's a concealed swipe card reader near the elevator controls?*

*And that down below, a **long** way down, is a **Continuity of Government** facility built back in the 1950's, since updated.*

*A facility on the scale of Mt Weather, but more secret? For **hundreds** of people, including security forces!*

HIDDEN FACILITIES

In some parts of the world there were many shelters built during the heyday of the Cold War, some purpose built (or converted from shelters left over from WW2) and many others either converted from existing structures or consisting of inherently suitable structures that could easily be fitted or retrofitted for the purpose.

Of course, as cold war hysteria ebbed, many were converted to other uses, or their secondary purpose as a shelter was forgotten.

PUBLIC AIR RAID/FALLOUT SHELTERS

Public shelters were meant to provide basic shelter for anywhere up to thirty days (sometimes more, but usually at least two weeks) for groups of up to 8000 people (or more), though, more usually, for groups of several hundred people.

Solidly constructed buildings usually had basement areas designated as shelters and required minimal conversion to the role, as most of the supplies that would make the facility (minimally) habitable were stored away in specific, separate, store-rooms while the main spaces were generally left bare/clear.

Newly constructed buildings were generally given some sort of tax break for including shelter spaces and access to them in their basement levels.

Some covered parking garages were also deemed suitable for use as shelters and similarly equipped with storerooms containing basic supplies.

Of course, as cold war hysteria ebbed, many such spaces were converted to other uses, or their secondary purpose as a shelter was forgotten.

WW2 BOMB SHELTERS

Some of the shelters were simply converted WW2 Air Raid shelters – in some cities, these were deep shelters built as part of the underground train system (London, Paris, and Moscow, for example).

In others they were purpose built structures in basements of public buildings and, in a few case, solidly built reinforced concrete above ground structures capable of withstanding direct bomb hits.

Such shelters required little or no conversion for use during the cold war period and could shelter large numbers of people.

However, they were often only minimally equipped in the first place (conventional air raids didn't force the survivors to stay under ground for weeks at a time) and conversion and refurbishment was often difficult to do fully.

Or so many governments *claimed*. Were they hiding something?

THE SWISS AND SWEDES

Since the end of the war the Swiss have built enough fallout and blast shelter spaces to protect their entire population.

Much of this space was provided by simply requiring new private and public buildings to include reinforced basement space when they were constructed, but there are a number of purpose built facilities for the military, government, and also for civilians.

The larger civilian facilities are capable of holding around 4-6000 people, some up to 8000 and one, now demolished, up to 20,000.

The Swedish government undertook a similar policy and also constructed large shelters including four in Stockholm that had space for 20,000 people, and which was used (and is still used) as an underground car park in normal times (the civil defence infrastructure is still in place even today).

Like the Swiss, the Swedes require all new public building construction to have reinforced basements for this purpose, though there are at present only enough spaces for about 2/3rds of the population.

Every town has a purpose built underground comm-

and and emergency center even today, and these can have quite extensive facilities.

Public Shelter Contents

Since these are open to *anyone* (at least in theory) the contents will tend to be minimal.

Provision was made for sleeping (usually on the "hot bunk" system, if any bunk space was provided), basic sanitation (cans that could be sealed and placed outside the shelter), food (canned rations, usually sealed biscuits and supplements that did not require any cooking or preparation such as peanut butter, tuna, canned fruits, and canned beans), emergency medical supplies, and some sort of air filtration system.

Some sort of emergency lighting was provided for (even if only emergency candles or hand-dynamo powered emergency torches) and, in many (but not all) shelters there was some sort of emergency power generator system.

However, the supplies they were provided with were, being *government property*, often left in situ, unused (more or less) – where they can still be found in many places.

Depending on the nature of the supplies, they may still be usable and/or (as appropriate) edible.

Shelters in *privately owned* buildings often had better facilities provided by the companies that owned them – especially as they could do so and claim tax breaks for their trouble!

Government Air Raid/Fallout Shelters

There are known *government* shelters or facilities that have other primary purposes but which are also, effectively, shelters.

US Government Sites

In the US, FEMA's *Mount Weather* is well known (as are several other FEMA or military related sites), as is the US Congressional shelter, codename *Greek Island*, under the Greenbrier Hotel (White Sulfur Springs, West Virginia) which was continually updated and resupplied while it was active.

Then there is *Site R (*formerly the *Alternate National Military Command Center*, now the *Alternate Joint Communications Center)* at Raven Rock Mountain, Pennsylvania, one of three ANMCCs around the country.

The Raven Rock facility has a "footprint" of around 24,000 square meters, but is believed to have several stacked levels meaning that there is much more space in the facility (perhaps 75,000 square meters) – enough, it is thought, for around 3000 people and the supplies they need.

The facility has extensive communications and computer equipment, a reservoir, medical and dental facilities, dining hall and kitchen (and 30 days worth of freeze dried pre-prepared rations in storage), barber shop, and chapel.

Mount Weather is still in use and is thought to have an important role to play in any *Continuity of Government* program after a major disaster (such as a nuclear war, which was its original purpose).

Greek Island, on the other hand, has been decommissioned – and can be toured by the public today.

Raven Rock was *officially* manned 24/7 until 1992 and is still the worksite for several hundred military personnel, officially the *Defence Information Systems Agency (Western Hemisphere)* is in charge – and, of course, the government is telling the entire truth!

UK Government Sites

The UK government bunker at *Corsham* (Wilts), variously known as *Stockwell*, *Subterfuge*, *Burlington* and *Turnstile* (and most recently as *Site 3*), was built in a WW2 era underground aircraft factory and could house *four thousand* civil servants and military personnel for months in the wake of an atomic attack.

It was secretly connected to the main British Rail network with its own station and had dormitories, kitchens, canteens, medical facilities and even its own Pub (the *Rose and Crown*).

It also had extensive radio and wired telephone-tele-

type communications facilities, its own complete emergency power generation system, water purification plant, and ventilation system that could be sealed against NBC threats.

There was also a complete (small) BBC Radio/TV studio, vehicle workshops (and garage), Maintenance workshops (including fabrication machinery) and storage facilities for the Bank of England's gold reserves and important artworks.

There was also a network of smaller *Regional Government Centres* around the country as well as shelters for local government authorities.

Then, of course, there were a variety of hardened *military* sites, mostly for command and control, but some for active operational use.

Canadian Government Sites

The Canadians weren't being left out of the Cold War madness, nosiree. The Diefenbaker government commissioned a series of bunkers across Canada in the late 1950's, the largest being at *Central Emergency Government Headquarters (CEGHQ)*, at *Carp*, outside of Ottawa.

The Carp site was four stories (about 11,000 square meters of floor space and 358 rooms, including a vault for the Bank of Canada's gold reserves and a Canadian Broadcasting Commission studio) of reinforced concrete and had facilities to accommodate "several hundred" people for an extended period. It was decommissioned in 1994 and is now a museum.

At least six similar, but *mostly* smaller sites were also constructed across Canada for the national government, and still smaller sites for most of the provincial authorities.

Some of these have been demolished, but others are intact but largely unused – according to official government sources. Who never lie or mislead!

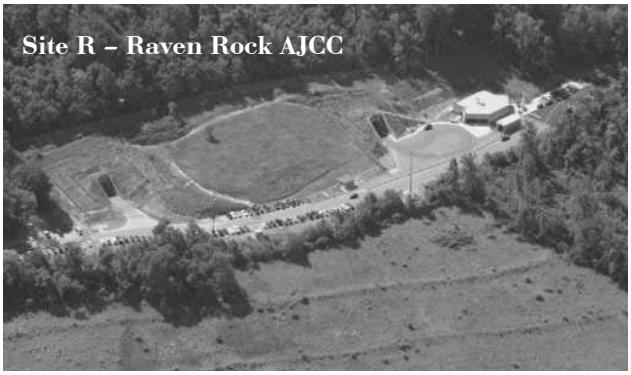
French Government Sites

The French government is known to have re-used some of the Maginot line fortresses (*Rochonvillers*) for nuclear bunkers, extensively updating them in the process, though they are now "surplus to requirements" and being offered on sale to anyone interested.

Many of the other fortresses and bunkers are alleged to have been left derelict – but who can tell for sure?

Swiss and Swedish Government Sites

The Swiss built extensive fortress and bunker systems throughout their country during WW2 and, to a lesser extent, during the Cold War – many of the WW2 era facilities have been decommissioned, some sold, some


Site R – Raven Rock AJCC

demolished, some simply left abandoned.

The larger fortresses had underground facilities including barracks, hospitals, kitchens and messing areas for several hundred to a few thousand soldiers and were often connected to other nearby fortresses and bunkers by underground passages.

The Swedes also relied heavily on fortified sites and facilities to protect their military, especially during WW2 and the Cold War, and there are many still active underground or fortified facilities still in use as well as many more that have been decommissioned but which are still physically intact.

Russian Government Sites

The Russian government is known to have *some* sort of *massive* facility in/under Mount Yamantau in the Ural mountains.

There are *definitely* large rail lines running into the mountain (there is allegedly a secret subway/rail line running all the way from Moscow and the Kremlin to Yamantau for use by the highest echelons of the Russian government) and there was *definitely* an ongoing massive construction project ongoing even after the fall of communism.

The Russian government has given at least a dozen different, wildly different, responses – ranging from a storage facility for "national art treasures" in time of danger through to an equivalent of the US's Cheyenne Mountain complex.

Speculation, presumably based on some level of fact, by US officials indicates that it may include "millions of square feet" of bunker space, sufficient for ***sixty*** *thousand people* (and the supplies they will need) and supposedly capable of surviving at least *six direct hits* (one after another, all on the same point) by nuclear weapons ... all spread over *four hundred square miles.*

What is *actually* in there is, however, *simply unknown.*

And there are many more complexes in Russia that have been substantially upgraded in since the beginning of the 1990's – the CIA claims at least two

hundred – but in some cases this may simply have been the first upgrades since they were built at the height of the Cold War.

More than meets the Eye?

These are merely a selection of the ones that are *known* – it isn't inherently unreasonable or downright unbelievable to assume that there are *other* facilities that *aren't* known.

Likewise, it isn't unreasonable to assume, in the face of some future crisis, that older bunkers aren't reactivated and refurbished, or that new bunkers couldn't be constructed.

And there is the possibility that the shelter may not actually be from the recent past or present, but from a *future* "cold war" – after all, the premise of *Displaced* is that it is for *one way* time and dimensional travel.

Government Shelter Contents

Because of the enormous cost of construction (CIA estimates are that the Mt Yamantau facility has cost US$6 *billion* – of course, CIA estimates are often wildly wrong), space inside such shelters is generally at a premium, and living and working facilities will tend to be *very* cramped.

They are also normally *working* facilities, and there is rarely provision for the *families* of those personnel assigned there *in the facilities themselves* (Mount Yamantau may well be different).

Regardless of whether they are military or civilian in their nature, they will have extensive communication and command and control facilities at the very least, as well as much nicer (if still *very* basic) quarters (often based on hot-bunking for all except the most important occupants), provision for properly prepared meals (and onsite storage for the same).

There will be more extensive medical facilities (probably including freezer facilities for dead bodies that cannot be buried outside while radiation levels are high), and the facility will have power generators sufficient to meet all environmental (light, heat, ventilation) and operational demands, with enough fuel for months, perhaps, and certainly for weeks (it is possible that some of the very biggest and best equipped sites may have renewable energy sources – hydro power based on the use of underground rivers or, possibly, even a nuclear power plant, though the latter is *extremely* unlikely).

All will have *some* maintenance facilities and the larger and better equipped ones are likely to have *extensive* facilities capable of manufacturing mechanical parts from raw stock –as well as having extensive stocks of spare parts.

Long Term Recovery Facilities: *It would seem reasonable to expect that some of the major powers involved in the Cold War made some sort of practical preparations for rebuilding after a nuclear exchange.*

Something ***other*** *than storing billions of dollars of paper money as the US did until quite recently.*

What sort of preparations could they have made? Well, stockpiles of basic machine tools and industrial equipment for key industrial processes would be a possibility.

This could be done quite easily by storing older, but still usable, equipment being replaced by the latest models, especially on military or facilities. Especially on seemingly abandoned military facilities (or seemingly abandoned ***parts*** *of active military facilities) – or in seemingly abandoned government facilities.*

Mothballing existing, no longer needed, facilities would also be a possibility – just as the US government has the ***National Defence Reserve Fleet*** *of WW2 era Liberty and Victory Ships, there is no reason why they could not have supported, secretly, older repair, maintenance and industrial facilities for the same reason.*

Of course, with the progress of computerised technology, many of these mothballed sites would become truly obsolete for the simple reason that there would be no workers left who would have the required skills and experience to operate non-computerised equipment any more – and they might then be sold off or, less likely (but still possible – bureaucratic inertia is a terrifying thing!) effectively abandoned apart from an infrequent caretaker visit.

Non-Personnel Facilities

Some of the hidden/underground facilities that may be found around the world are not primarily intended as personnel bunkers, but have other purposes.

Food Supplies: In the UK, for example, there was an extensive program aimed at providing emergency food supplies for the survivors of a nuclear attack and, while most of the known facilities where such food was

stored were above ground (or at least the *known portions* are), there is reason to suspect that some supplies *may* have been stored in some of the underground factory spaces built for industry during WW1 and WW2.

The UK Ministry of Agriculture, Fisheries and Food held around 200,000 tons (high protein flour, fats, yeast. Sugar, biscuits, tinned meats etc.) in 63 facilities as of the 1980's but all stocks were allegedly disposed of by the mid 1990's.

The US almost certainly had a similar program (and may still *have* one – the USAid *Disaster Logistics Officer* must have *Top Secret* clearance, and that's a *civilian* position – what could they possibly be hiding?), and one could expect that many otherwise seemingly abandoned military bases (or seemingly unused areas within a larger military reservation) may have been where some of these stockpiles were kept.

As recently as 2004, the US government had around 500,000 *tons* of skim milk powder and large tonnages of cereal grains in storage at sites around the US, partly as a price support mechanism for US farmers, but also as an emergency food stockpile used mainly for overseas emergencies, and there's no reason why one of those storage points couldn't be within the area *displaced*, is there?

Medical Supplies: The US deployed around 1900 *"Packaged Disaster Hospitals"* during the height of the civil defence craze in the 1950's and 1960's. A PDH was basically a fully equipped 200 bed Army Field Hospital, including all supplies and equipment (from tents to operating tables, from forceps to X-Ray machines).

Most of these were deployed to already existing medical facilities to supplement their limited facilities in an emergency, but others may, of course, have been deployed at sites like Mt. Weather or even more out of the way and secret (and forgotten?) ones.

In more recent times, since the September 11 attacks, the US has deployed a dozen emergency medical *Push Packs*, 50 tons of medical supplies including 84 different types of items, to deal with possible medical emergencies (including, but not limited to, bioterrorism).

These are all supposedly capable of being placed *anywhere* in the US within 12 hours (problems were found with the concept as a result of practical experience with Hurricane Katrina, but the government's response was to increase the number of packages from eight to the current twelve).

Military Supplies: The USSR (and, presumably, the CIS/Russia, still) is known to have had *huge* under-

Packaged Rations

Shelters found in a *Displaced* campaign will normally be stocked with a variety of supplies, including food.

Survival Crackers/Candy: These date back to the height of the Cold War and came in cardboard cartons each containing two 20 pound cans, each containing approximately 1300 crackers (the actual number varied according to the manufacturer).

The same sized carton, with the same sized cans, could contain 35 pounds of candy per can.

C Rations (1938-1957): Postwar C Rations came in eight or nine cans and massed 5½ lb. Three cans (one per meal) contained one of ten ***meat*** menus; another three cans (one per meal) contained ***bread*** (7 crackers, chocolate bar; cake; cookies and jam).

Then there was one or two cans of ***fruit*** and a can of ***accessories*** (four cigarettes, waterproof matches, plastic spoon, salt, pepper, sugar, non-dairy creamer, 2 pieces of chewing gum, toilet paper).

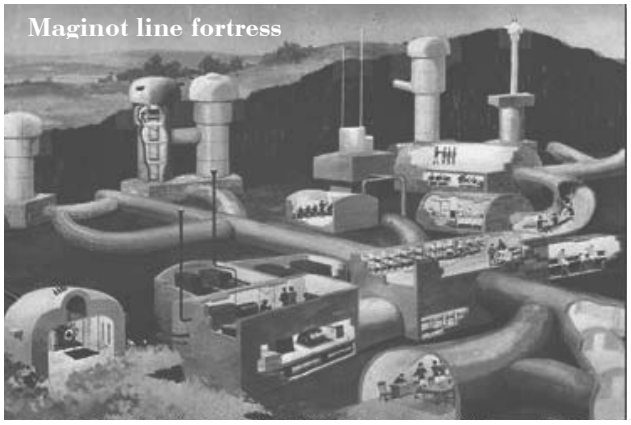
The cans came in a three waxed cardboard packages that, theoretically, could be burnt to heat the meals it contained and twelve of these packages came in a cardboard box along with (theoretically) four can openers (which were often missing).

Meals, Combat, Individual (1958-1980s): These were identical in basic components to the C Rations, but the menus were planned with the intent of providing a more balanced meal.

Meals, Ready to Eat (1980's on): Offer a wider variety of menu choices, all in plastic pouches inside a larger plastic bag.

Humanitarian Daily Rations *(HDRs)* are similar, but contain no animal products (except a small amount of dairy products) or alcohol, and are intended for slightly malnourished individuals (like nuclear holocaust survivors, perhaps?), the individual pouches come in pink or yellow plastic bags.

C Rations


Maginot line fortress

ground stockpiles of fuel, military supplies, and even weapons – including everything from armoured vehicles through artillery to smallarms and ammunition.

Australia, for many years after WW2, kept its war production stocks of several million SMLE Rifles and Vickers HMGs in sites around the country, most still in the original cosmoline and greased paper preservative, *unused*, before finally selling them off and/or (allegedly) destroying them (the rifles, at least).

The US evidently tends to largely destroy or sell obsolete weapons – but there is no particular reason to believe that the US government could not out and out lie about this if it felt the need to do so.

Perhaps there are scattered stocks of obsolete, but still useful, weapons and ammunition scattered at key sites around the US for use in war emergency situations?

There's no reason you can't assume that this is the case for the purposes of *your* Displaced campaign.

US Strategic Petroleum Reserve: Set up after the mid-70's oil shock, the US has reserves at four sites in the vicinity of the Gulf of Mexico in salt domes where the crude oil (refined petroleum, as noted elsewhere in this book, decays over relatively short periods of time) is stored in underground caverns.

Capacity of the sites varies between 72 million and 226 million barrels.

International Energy Agency: All 26 member nations have agreed to hold reserve stockpiles equivalent to a minimum of 90 days worth of national consumption, and most not only have the minimum in *government* reserves, but have more in *private* reserves.

Almost all of these are, however, in conventional above ground facilities ... which doesn't *necessarily* preclude their being somehow *displaced*.

Military Operational Facilities

Most major military forces made some plans to keep their forces operational during the cold war (and earlier) periods through the use of protected operational support facilities – logistical and maintenance sites, rather than fortifications.

Many of these were quite elaborate, and not always that large, depending on their specific purposes.

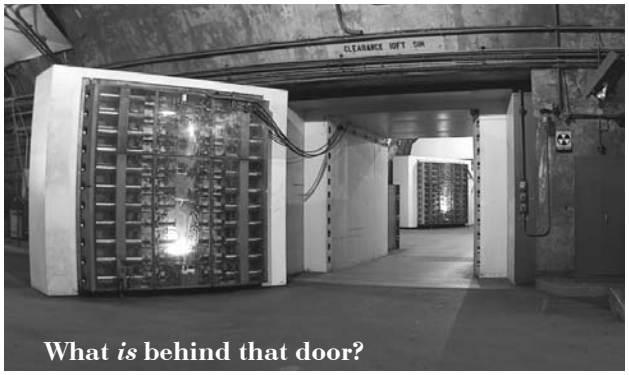
They could range from an entire operational airbase logistical facility carved into the side of a mountain such as the Swiss maintained to recycled WW2 era fortifications used for protected maintenance, logistics and command and control purposes.

During peacetime they may have only a skeleton staff, with the intention being to man them fully only on threat of war, but they will have a mostly full inventory of key equipment and consumable supplies maintained by said staff, intended, again, to be rounded out by supplies and equipment the manning unit would bring with them when the facility was activated.

It is highly unlikely that such facilities will be overly endowed with armouries full of heavy weapons – or, indeed, anything much in the way of weapons at all, as the expectation would be that the unit(s) staffing them would bring their weapons (and ammunition) with them and, of course, these are *support* units rather than combat units, and would have nothing more than light personal weapons for the most part.

NDRA Facility #37

"The National Defence Recovery Act of 2022 led was prompted by the al Quaeda "dirty bomb" attack against Paris in 2021 which killed 12,000 people and poisoned several square kilometers of that city. Congress voted to implement a vastly improved Civil Defence program based on the assumption that the worsening world situation would inevitably result in terrorist organisations or rogue nuclear states initiating a nuclear attack or general nuclear exchange directed primarily at the US." – NDRA FAQ, 2025 (found in facility #37).



What *is* behind that door?

There is no reason that this facility *need* be from the future. It could as easily be a secret government facility constructed during the latter part of the cold war scare in the early 1960's or even, possibly, the 1970's.

Equally, there is no particular reason that it *has* to be a US facility – though its elaborate (and, therefore, expensive) nature would *probably* mean that it would have to have been constructed by one of the major powers of the time (the UK, France, or USSR), with a lesser likelihood that it could have been part of second tier power's civil defence infrastructure (Germany, Switzerland, Canada etc.).

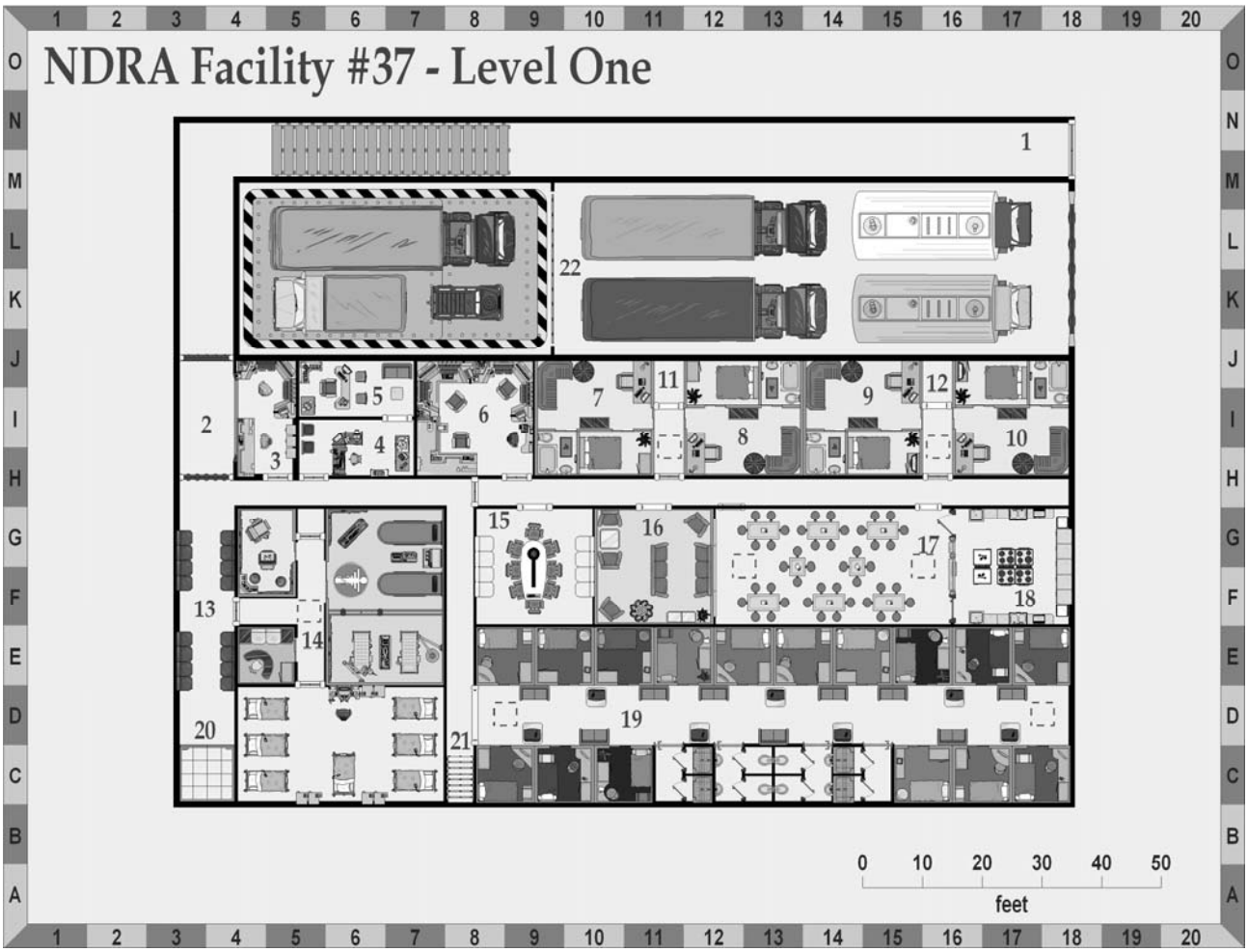
It is *not* a military facility, though there will be *some* weapons available for the security staff, as it was/is intended to be protected by deployment of such military or paramilitary assets as remained to the national government after being activated.

Construction and Siting

Since the facility is not, per se, a military one, its primary protection was *concealment* – if it re-uses an existing military facility, it will be one that is *known* to have been abandoned and decommissioned long ago.

Even the locals are likely to have been duped by a carefully orchestrated disinformation campaign that will have them assuming that the site is disused, derelict and stripped bare.

There will be some security presence on site, and these may be locals, but either they are highly cleared and



entirely part of the deception operation or they are dupes the same as everyone else (in which case the *real* parts of the facility will be concealed behind some *fake* but plausible outer "facility").

The facility is not blast hardened, but *is* EMP hardened and is entirely fallout and CBW protected, capable of operating on internal resources for up to two years at a time. Outer walls are constructed from two meters of reinforced concrete even so.

Level One: Contents

Level #1 is the main personnel level, with entry via a concealed passageway from the surface (**1**).

The entry area (**2**) has a heavy steel blast door on the outside, controlled from the Security Station (**3**).

The Entry hall is capable of being hermetically sealed against CBW agents and has emergency decontamination facilities.

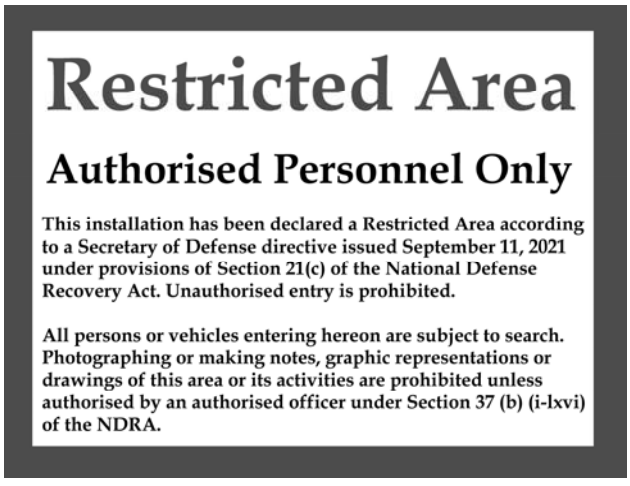
The wall between the entry area and Security is a reinforced glass window with a concealed airtight metal internal protective shutter on the inside.

There is provision for passing items through a sealed/CBW protected chute between the Security area and the Entry and similarly sealed firing ports to allow security personnel to attack anyone in the Entry area should the need arise.

The operator on duty has complete control of the locking and opening mechanism of the doors, access to all external CCTVs and other sensors (motion, heat etc.) and can flood the entryway with a narcotic gas at the flip of a switch.

There is storage in the office for small arms (mostly automatic pistols, pump action shotguns, tasers, some tear gas grenades and riot batons) and body armour (kevlar vests, helmets etc.).

*The entry door **can** be locked up tight from the inside, but this requires manual placement of locking bolts that prevent the disengagement of the locking lugs by the automatic or manual mechanisms intended to do that.*



*Other than that, there is provision for the door to be opened from the outside (there was evidently some consideration given to the possibility that the facility's personnel would be killed or incapacitated and that access would need to be gained from the outside) through either a mechanical combination lock or electronic lock of some sort, both of which can be hacked **eventually** if time is not of the essence.*

*Since you actually **want** the PCs to eventually gain access to the goodies herein, the doors may even be opened – perhaps the disaster that caused the **Displacement** originated here, even, and the project personnel made some effort to escape.*

Regardless, gaining access is merely time consuming.

Next to the Security Station is the office of the facility's commander – with an outer reception area (**4**) and inner office (**5**) that are equipped appropriately for the period when the facility was constructed.

There is likely to be provision for a Taser or Shotgun concealed under the Secretary's desk (and it will probably be stored in the safe behind the desk, which is locked, but the combination is on file in relevant documents in the filing cabinets located alongside).

There is a safe in the CO's office as well, and there is an automatic pistol and/or a submachinegun or PDW stored there as well.

Somewhat further down the corridor is the Communications Room (**6**) which has appropriate communications gear for the period.

Powerful Radio and Microwave transceivers (not hooked up to the external aerials, however, and EMP hardened to boot *if* of a period when such technology is available), Satellite links, connections to secured wired telephony links, computer connections to DARPANet and other secure military or government networks and more.

*The technology represented here will be a mixture of cutting edge for the period and less advanced, but more disaster resistant, stuff. The equipment controls communications links internally **and** externally. There is provision for three operators, but mostly there would only be one or two on duty at any time.*

The next four rooms along the corridor (**7-10**) are intended for senior officers and executive personnel. Suite (**7**) is the CO's suite and has a secure safe and its own secure commo links.

Suites (**8-10**) are simply relatively nicely appointed living and working areas.

These suites are fully provided with entertainment technology appropriate to the era when the facility was created and will automatically include a selection of books, card and board games, stereo sound systems and the like.

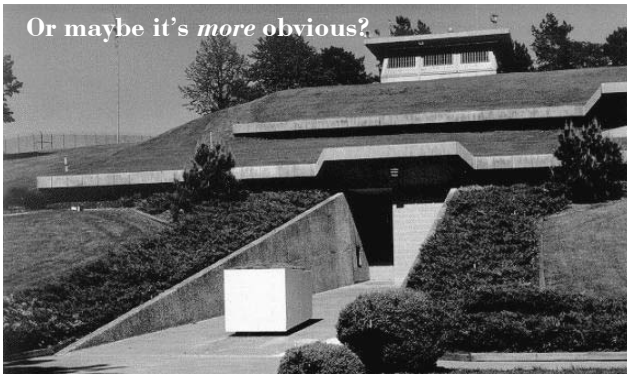
Later periods will include computers and computer game systems as well as a VCR/DVD and a selection of movies and TV shows to choose from. Work hard, play hard.

Areas (**11-12**) are extra storage areas for personal items belonging to the occupants of the suites above.

Note that each pair of these suites has access to their own private escape tunnels (installed in the roof over the entry corridor to each pair).

The wide corridor (**13**) leading from the entry area to the elevator has fold down seats on ether side for use by those personnel waiting to see the medical staff.

The level also boasts a well-equipped Sick Bay (**14**) with a two bed ICU and two table Operating Theater, a seven bed General ward, an office for the medical officer and a multi-purpose diagnostic technology suite (medical imaging, pathology etc.).



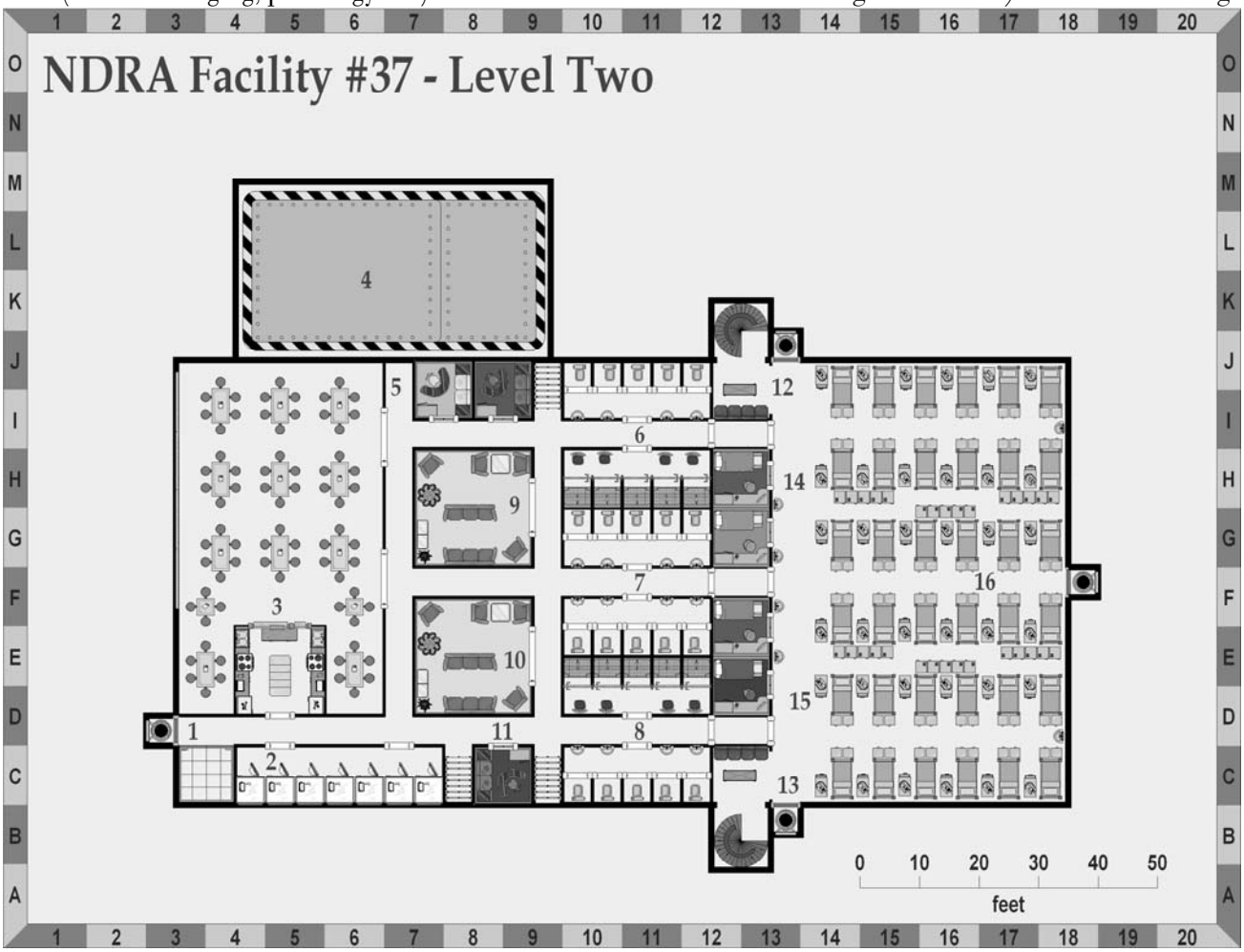
Or maybe it's *more* obvious?

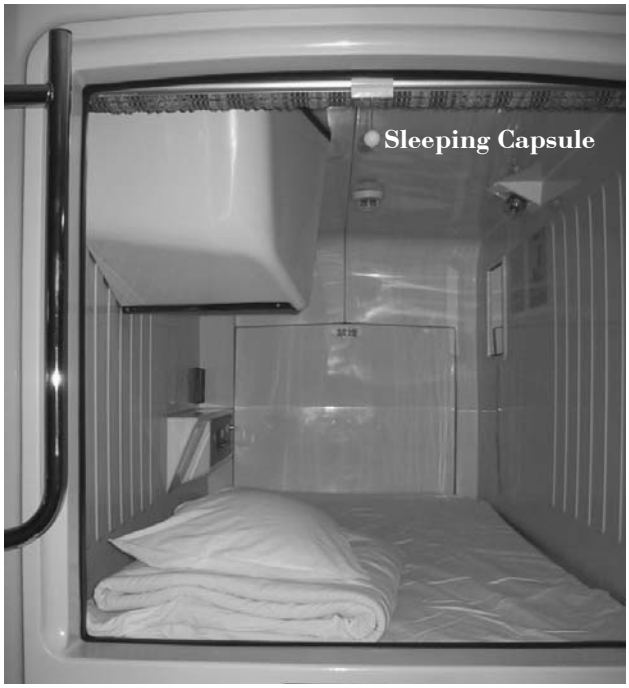
The small cupboard at the north end of the north-south corridor in the Sick Bay is the restricted Drug store, containing all of the painkillers and other Scheduled drugs.

More general surgical and medical supplies are stored around the facility (and, of course, stocks are in the storage levels below).

Along the long corridor running the length of the level, on the south side, opposite the senior officer quarters, are a Conference Room (**15**), Officer's Lounge (**16**) an Officer's Mess/Canteen (**17**) and a Kitchen (**18**).

The Kitchen facilities are equipped mainly for reconstituting pre-prepared meals (which are provided in bulk here and in the storage levels below) rather than creating





them from fresh ingredients. There are also two in roof emergency exits in the Canteen area as indicated.

The Officer's Canteen can furniture is collapsible and the room can be converted for use as a theater or entertainment center as required.

The remaining part of the first level, the south-east "quadrant", has individual quarters (**19**) for junior officers and/or specialist personnel – sixteen in all – and shower and toilet faclities for them as well.

*These quarters may be **either** single occupancy **or** dual occupancy with bunk beds – though the sanitary facilities would be stretched to the limit if that **were** the case.*

The wide corridor running through this section is set up as a sort of long narrow lounge for the use of the occupants of the separate rooms when they feel somewhat more sociable than their cramped quarters will provide.

As with the Senior Officer quarters, these rooms and the "lounge" are provided with appropriate entertainment facilities for the era when the bunker was created.

Access to the lower levels is through the passenger lift (**20**) and stairs (**21**) inside the facility proper.

Access is also available through the vehicular/goods lift (**22**) which is partly outside the facility, but which can be sealed off (there is a reinforced external gate and the lift-door is reinforced as well).

Level Two: Contents

Level #2 is the main barracks level, with access from Level #1 via the Lift (**1**) in the southwest corner and the stairs next to the Laundry (**2**).

Access to the lower levels of the facility are via the Lift (**1**), the staircases down to the Supply levels (between the Offices (**5, 11**) and Sanitary Facilities (**6, 8**) and, of course, the spiral staircases down to Level #3 at (**12-13**).

*There is no **intentional** access to the vehicular lift (**4**) from this level, but there are actually inspection panels at the end of the blind corridor between the Enlisted Canteen (**4**) and the Offices at (**5**).*

The panel looks like an ordinary drywall panel and only a close examination will reveal that it is, in fact, a removeable service panel.

Behind it is an armoured wall panel secured by heavy bolts all around the edge and several cross-braces over the top ... short of cutting through the plate from the lift well, it can only be opened from this side, and not quickly, either.

*Spaced around the level (**1, 12, 13, 16**) are emergency exits leading to the surface through concealed passageways (the external exits are concealed **and** buried.*

Next to the lift running to Level #1 and the lower levels are the Laundry (seven industrial grade Washer-Dryer combinations (**2**) and the Enlisted Cafeteria (**3**) which, like that on Level #1, is fed by a Kitchen that is really intended only to cook pre-prepared meals rather than create them from fresh ingredients.

The Cafeteria furniture is collapsible and the whole area may be converted into a Theater or for other entertainment purposes – the western wall is intended to either be a projection screen or (at higher tech levels) may be a LCD/Plasma or some other active display technology.

The two Offices at (**5**) and one at (**11**) are intended for the use of the senior NCO's or Supervisors quartered on this level – and, in a pinch, like all the Offices in this facility, can be used as Quarters (the sofas fold out into beds etc.).

The showers and toilets at (**6-8**) are provided for all the personnel who are quartered on this level.

The two Lounges (**9-10**) are for the use of the enlisted personnel, for smaller groups than the converted Cafeteria, and are equipped with era specific entertainment equipment.

The Barracks (**14-16**) may be furnished in a variety of ways – two tier bunks, three tier bunks, or even four tier bunks.

Alternatively, two or three tier "capsule" cubes (a la Japanese capsule hotels, but with superior soundproofing and with individual video and sound entertainment

facilities integral).

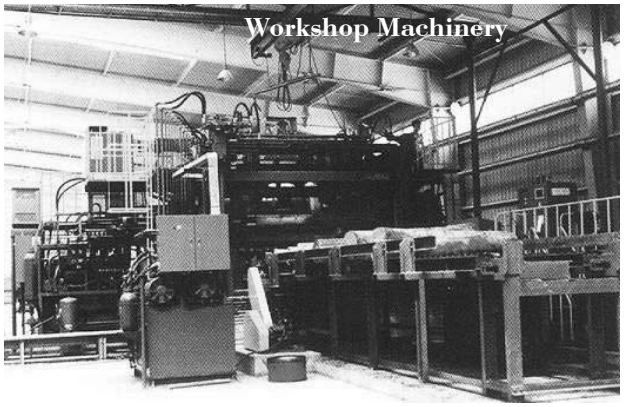
Lockers are provided for personal possessions, though it would be expected that most of the personal needs of the occupants would be provided from stocks within the storage levels.

*Personnel assigned to such facilities are normally given a list of required (or **allowed**) personal possessions that they can (and/or **should**) bring with them when they get the "go" warning but, of course, depending on their mode of arrival they **may** bring more – but any excess would normally have to be stored outside, where it would be unprotected from whatever disaster has triggered the whole situation.*

*They would be discouraged from arriving by private transport since there is unlikely to be sheltered parking and, more to the point, this might provide targeting data for enemy surveillance satellites – though it **is** possible that there may be under-cover parking onsite.*

*If the facility is **very** large, then it is likely that there will be **two** identical levels of this type, doubling the personnel capacity.*

There may be some minor layout differences – the Cafeteria might be a Gym on the second level, for example, and the two Lounges might be Classrooms.



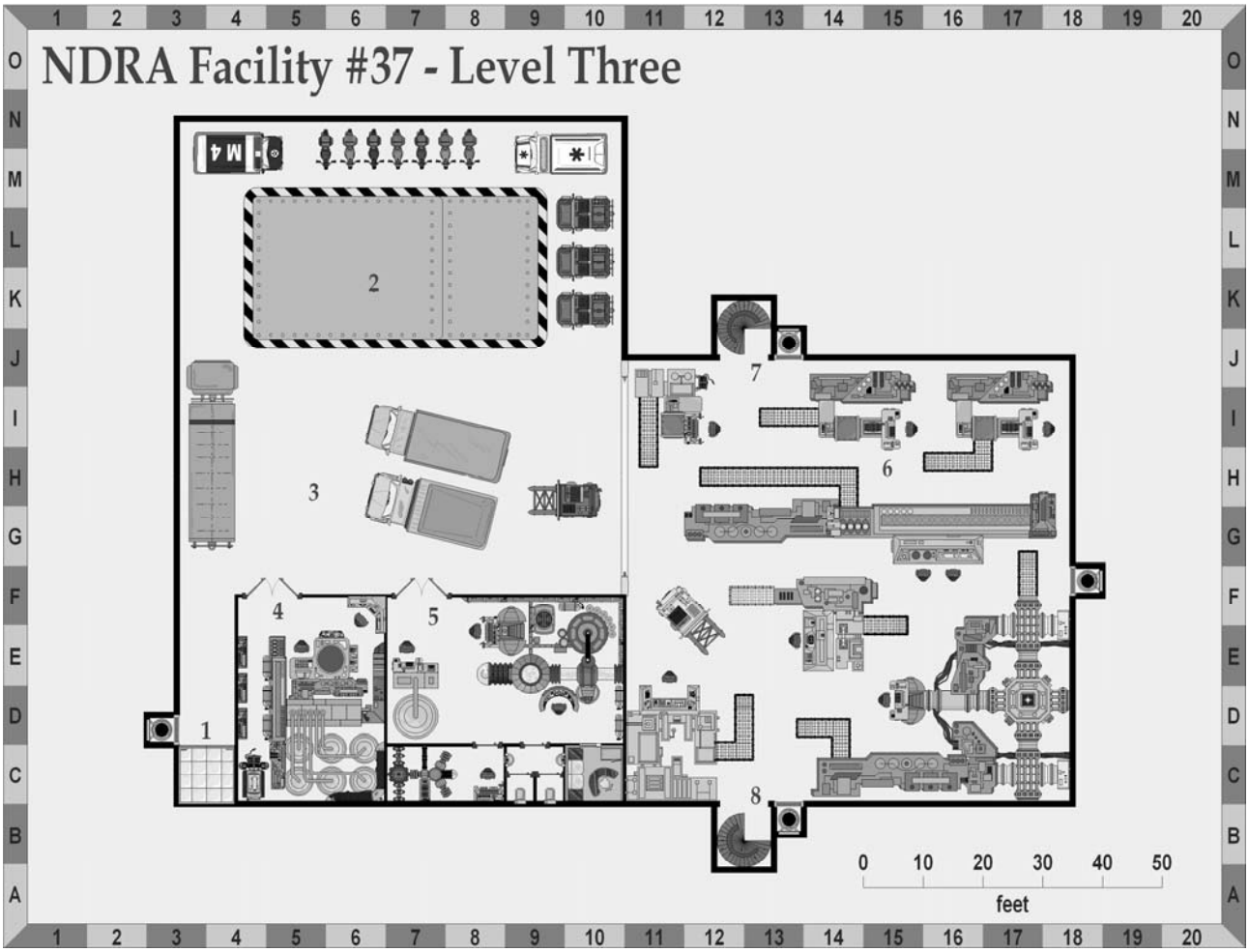
Workshop Machinery

Level Three: Contents

Main access to/from other levels is via personnel lift (**1**) up and down (to levels #1 and #2 above and the supply levels below) and the Vehicle and Cargo lift (**2**) from the surface and down to the supply levels, supplemented by spiral staircases (**7-8**) from level #2 and down to the supply levels.

*There are also emergency exits leading to concealed and buried surface exits at several points around this level (**1, 6, 7, 8**).*

The Vehicle and Goods Lift shaft is surrounded with parking and/or storage space on this level and the shaft can be sealed at floor and ceiling level with heavily reinforced "shutters."



The ceiling level one is armoured and the floor level one is reinforced to take loads of up to 100 tons.

Fronting on to the Vehicle/Goods lift well is a parking and storage area (**3**) to allow vehicles to load and unload incoming supplies or outgoing finished product from the workshop facilities on this level.

The number of vehicles that will be found here will depend on whether the displacement effect that hit the facility was the result of an emergency or not. At the very least there will be some forklifts, some well used, others up on blocks and mothballed.

There are three major workshops on this level. One is a multipurpose Chemical production facility (**4**), another is a Biochemical/Pharmaceutical production (**5**) and the third is for general Mechanical production (**6**).

All of the machinery is close to cutting edge for the era from which the facility originated and, likewise, is as automated as possible for that era.

All of the machinery and equipment is carefully mothballed to ensure long term storage doesn't damage it, and step by step instruction manuals detailing how to ready it all for reactivation are provided in all workshop areas.

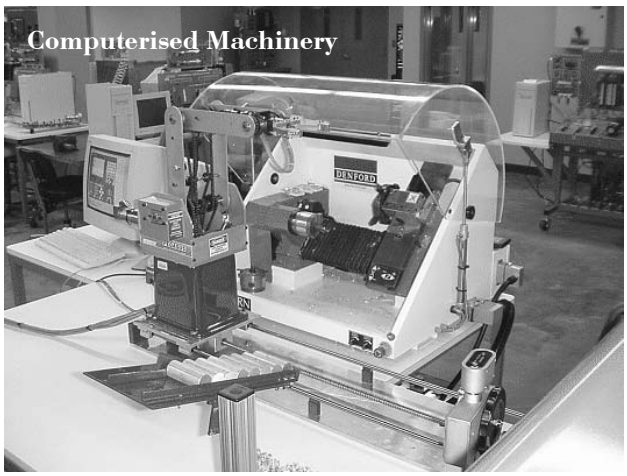
*Alternatively, for a **really** big facility (and a **really** big boost to the players), there might be more than one of these levels, each specialising in a different production area – say one for mechanical engineering, another for electrical and electronics, another for chemicals, and another for pharmaceuticals.*

Apart from the machinery (type and layout), the basic floor plan would be the same for all.

Level Four: Contents

This is the power generator level and the lowest level of the vehicle and cargo lift.

Access is via the Personnel lift (**1**), which connects to the upper levels as well as to the supply levels below; the Vehicle and Cargo lift (**8**) from the surface, and the stairs from Level #1 (**2**, **3**).


Computerised Machinery

Access to the Supply Levels is via the ramp down (**9**) which spirals down off this map level.

*This level is much bigger than the others – being **taller** at around 8 meters (25' give or take) from floor to ceiling to allow for the large generators being emplaced, maintained and, if necessary, removed.*

The level contains immediate supply storage (**2**) though this is mainly stock parts for the control and display consoles and mechanisms – parts for the generators are too large to be stored on this level.

The storage area is more extensive than indicated as the shelving extends upwards to the ceiling and (possibly) along over the offices, dormitories and etc. to the right of the area shown. Automated ladder/lift units allow access.

There are offices for the Chief Electrical Engineer and the Shift Supervisor (**3**) which, like most offices in this facility, can be converted into quarters as the sofa in each is a convertible bed.

Likewise, for emergency shift/maintenance operators there is a dormitory (**4**) with a capacity of eight (two double bunks), toilets and showers (**5**) and a kitchen cum dining area (**6**).

*Optionally, if more storage space for small parts is not required (see notes to (**2**) for details), these facilities may be expanded **upwards** into another level with two dorms, toilets, showers and lounge/kitchen. Access is by external ladders and internal doors as needed.*

The bulk of the level is taken up with the massive generators, which have the capacity to power the whole facility at full operational capacity *and more* (**7**) – the equivalent of at least a Megawatt.

How were the generators installed? They were brought down by the vehicle and cargo lift!

*The wall indicated between (**7**) and (**8**) is, in fact, designed to be partly or completely dismantled as needed to allow large replacement parts to be installed.*

*Medium-small parts would be brought up by the standard personnel lift (**1**).*

*What sort of generators are installed? Diesel, possibly oil fired Steam turbines, or even hydro-electric turbines fed by an underground river (or an underground tunnel to a nearby river with the appropriate gravity drop built in). If the facility is from the **very** far future, then it may have a nuclear or, more likely, some sort of Fusion reactor.*

The ceiling is criss-crossed with tracks for overhead cranes that have the design capacity to handle the largest components that make up the generators installed, and which, of course, were used to install the generators in the first place and which will be vital in any ongoing maintenance and repairs that will be needed by them.

***Note:** Generators don't last forever (nothing mechanical does), and there are critical parts that will go unexpectedly.*

The facility may have a greater or lesser supply of these critical parts, depending on your intention as GM.

If there are relatively few such parts – either because the facility was never fully stocked or, equally possible, because it was partly de-stocked when the reason for its creation ceased to be meaningful, then you can probably expect that the generators will last for around a year before something irreplaceable goes ... something that can't be manufactured with the machinery available in the facility.

*Of course, there **may** be more than one generator, turbine or whatever, so cannibalisation may extend the life span of the power plant overall, at reduced capacity.*

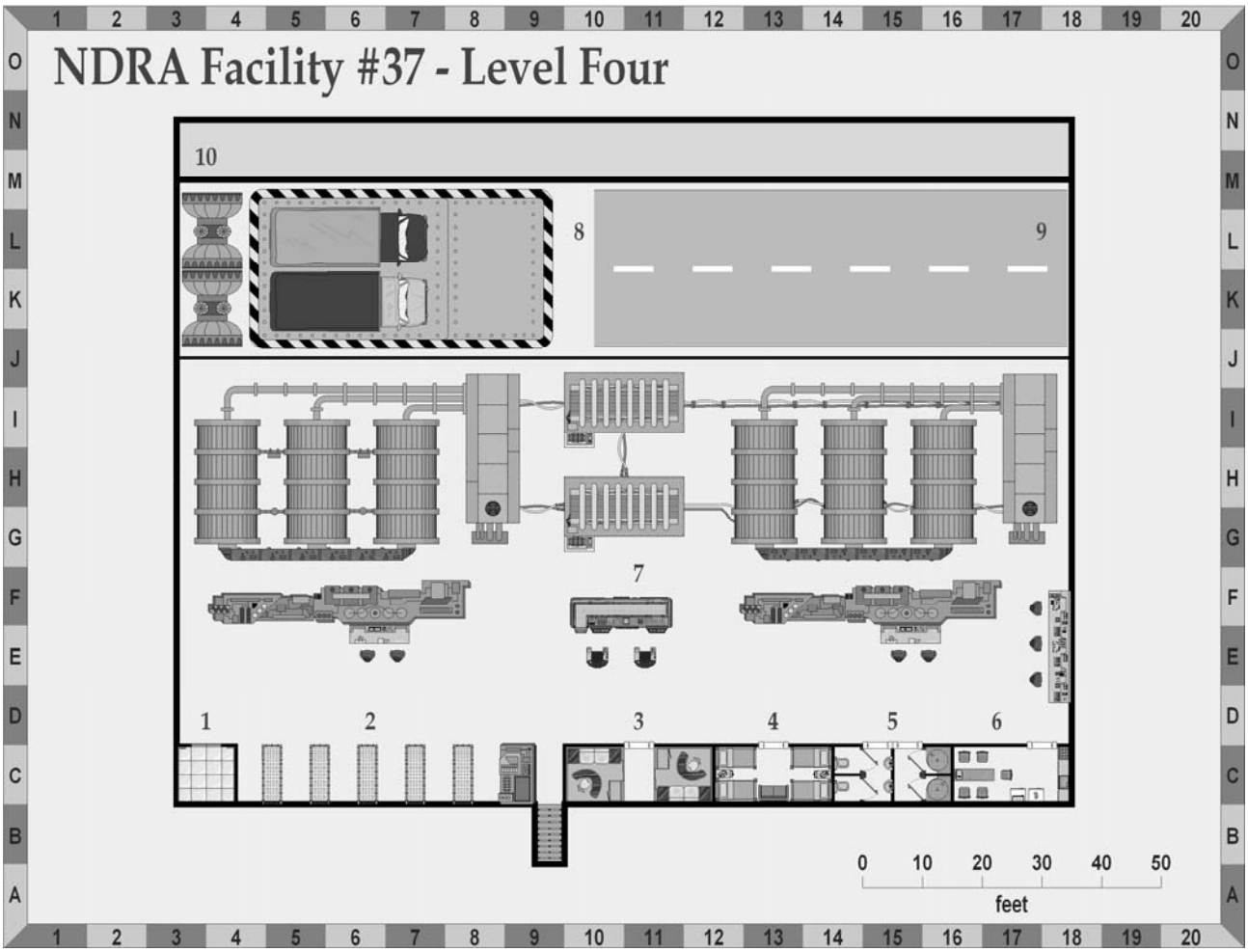
Likewise, there is built in excess capacity ... so you could allow the players to eke out the life of the gennies by an extended period by them deciding to use (or not actually needing) only using part of the capacity.


Generator Controls

*Remember, this is all in your gift, and isn't intended to make the PC's lives **simple** or **easy** ... merely tolerable. Make allowances accordingly.*

This is the bottom level of the cargo/vehicle lift (**8**) and the large machinery shown to the left of the lift are the lift mechanisms.

The northernmost section of this level is walled off and actually contains part of a huge reservoir for diesel or fuel oil, enough to run the generators for at



least a year as well as providing feedstocks for any chemical production facilities that are part of the facility.

Bunkerage is as extensive as you wish it to be, within the parameters indicated above.

There could be a lot more if you desire – and there is provision for vehicular fuel storage for at least a year's operations for whatever vehicles that the facility was provided with, or expected to support.

*Of course, just because there's **storage** there for the fuel doesn't mean that it will be **full** – or that it's immediately usable ... it may have been there for well beyond its use-by date!*

Storage Levels: Contents

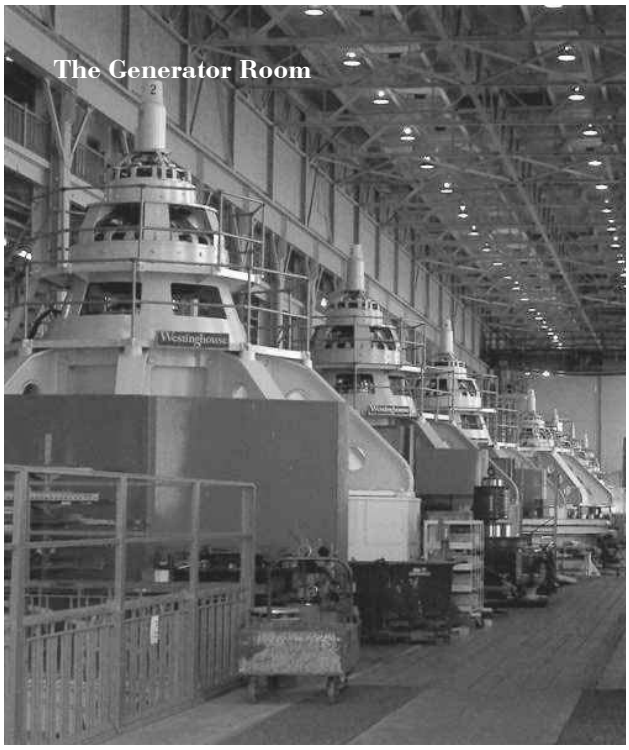
There are no specific maps given for the Storage levels.

How large they are or, indeed, whether there is more than one level, is entirely up to the largesse of the GM (that's *you*) and what you intend your campaign group to have access to (which, in turn, has determined if, in fact, there are actually duplicates of some of the levels already described).

Remember, this is your deus ex machina gift to the PCs to make things just a little more survivable.

*What is there, and how useful it may be, are **entirely** in your gift – think carefully.*

*Also, remember the **purpose** of the facility. NDRA facilities are intended to help the US recover from a **limited** nuclear exchange (of the sort hinted at in **Jericho**) rather than a full scale thermonuclear war.*



*Their equipment, therefore, is based on an assumption of great disruption **in the short term** with a gradual return to something resembling "normal" with the interim assistance of the NDRA facilities.*

So, while the equipment might be extensive, it is not intended to recreate an entire industrial base from scratch – only to provide rebuilding assistance while the surviving elements of the US industrial infrastructure comes back online.

*So, while the equipment stored in an NDRA facility will be useful to the Displaced, it **will** have shortcomings.*

*Of course, **your** facility doesn't **have** to be anything to do with the (entirely made up) NDRA – and **could** be a leftover from the Cold War. If this **is** the case, then the equipment stored within would likely be intended to operate more independently for extended periods after a major thermonuclear exchange between the US and USSR. Entirely differently to the NDRA scenario.*

*Likewise, as is suggested elsewhere, there isn't **likely** to be a whole Mechanised Infantry Regiment's equipment stored here – though, perhaps, for certain sorts of campaign you might consider it!*

How It All Got Here

The displacement of the facility might well purely an accidental side effect of whatever process caused the displacement event – of course, paranoid types will assume that the displacement event may have been *linked **to** the facility*.

If this is decided to be the case, then there should be an extra machinery level where there is sign of extensive damage (a self-consuming sort) and some scattered bodies all inexplicable in their purpose and so severely wrecked as to be incomprehensible and totally irrepairable.

*Displacement events are intended to be **one way**.*

THE MORLOCK'S TOWER

"The Tower dominated the small rise, jutting forth like the stump of a tooth in a gaping jaw, short and squat, windowless except for a small opening just under the conical roof capping the structure. In truth, it was taller than it looked, but it had an air of unease about it that made it seem mis-shapen ... a sense of ***wrongness*** *that was enhanced by the barren, thorny, sward in which it stood." – The Morlock's Tower*

Just as *Facility #37* doesn't have to be from the future, the "hidden" facility doesn't have to be from *our* time line or dimension, either – or, perhaps, it might be from so *far* in the future that Clarke's Law applies *("Any sufficiently advanced technology is indistinguishable from magic")* or, of course, if *your* campaign is set in a technological/magical interface situation, it may well *be* magical.

Not all disasters that cause *displacement* are the result of *technology* gone awry. *Magic* can have the same problematic effects in the genre – and why should the characters have an easy time figuring things out?

Wherever (and *whenever*) it is from, the *Morlock's Tower* seems to have had some of the same purpose as *Facility #37* – to protect its owner/inhabitants from some sort of disaster that has (or might have been expected to) affected *their* world and time.

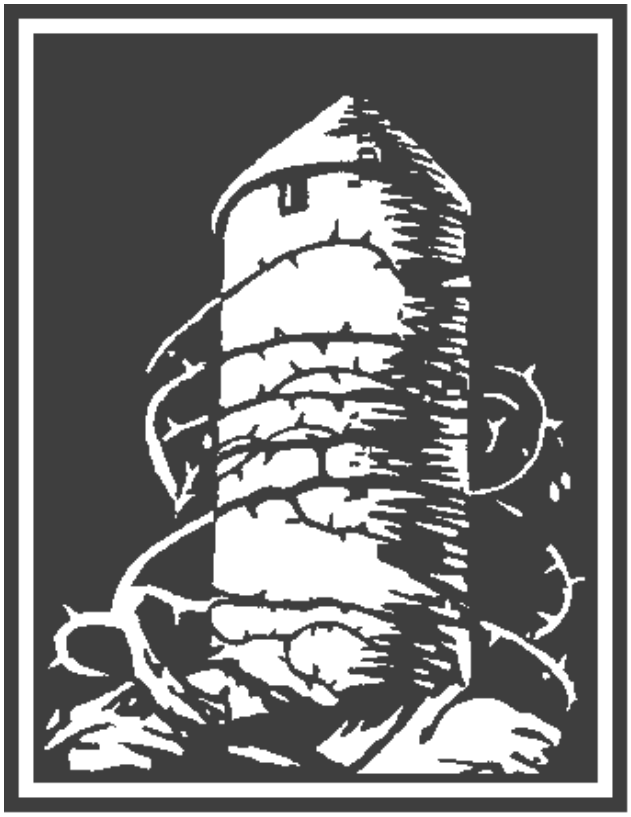
Not all "hidden" facilities are *completely* out of view – they can be *hidden in plain sight.* The entryways to *Facility #37* were concealed behind something else, and, in the same way, the *Morlock's Tower* is much more than it seems to be.

On the face of it is a simple tower sitting on a small rise that wasn't there before the *displacement*, looking like a medieval-1930's fascist-industrialist cross stylistically (or think of a cross between *Metropolis* and the *Aliens* movie cycle, take your pick!). Short. Squat. *Almost* menacing in a way.

The "grounds" on which it is situated are barren – covered with patches of dead thorn-vines and what seem to be the dried remnants of pools of some liquid that has left behind a dirty white, brown, grey, purple, red and green crust scattered amongst grey, weathered, rocky outcrops with a winding cobblestoned path leading from the base of the rise to the single doorway.

This is the only ***obvious*** *entrance (apart from the "window" already noted, which is about 20 meters up), but* ***not*** *the* ***only*** *entrance.*

The tower itself is featureless – with no indication that there are joins anywhere along the surface – and is a dull grey that seems to absorb any light that hits its surface rather than reflecting it.



It seems to rise from an irregular base of the same material (which is actually quite circular, but partly covered by the barren, rocky, debris that covers the surface of the mound, should anyone care to do some trial digging to check) and there is no seam at the base.

INTERNAL LIGHTING

The interior of the tower is lit by wall mounted translucent globes of a glasslike material about 10" in diameter.

These globes are mounted in a metallic bracket with a handle at the base.

Twisting the handle anti-clockwise raises the globe inside the bracket and, as this occurs, the light level dims – down to the equivalent of bright moonlight.

Twisting it clockwise lowers the globe and, at the very bottom of the bracket, the globe provides light equivalent to that of a bright sunny day.

It is possible, when the globe is in the fully raised position, to remove it from the bracket, thus turning the light completely off.

There are otherwise inexplicable stands scattered around the various rooms with spherical depressions in them which are, when one considers the situation, obviously intended to act as holders for the light globes when they are removed.

Though the globes look like they are glass (and are heavy enough to be glass), they are virtually unbreakable (and will last longer than the lifetime of the average human before "burning out") and are probably some sort polymer.

When unlit they are a creamy yellow in colour and the light they emit when fully on is tinged a creamy yellow.

Food/Water Dispensers

Scattered throughout the facility, shown as wash basins, are Food/Water dispensers.

They have a standard faucet and water fountain to provide washing and drinking water on top – but there is a cabinet underneath with hinged doors and a square panel alongside that acts as a food dispenser/cooker.

The panel has a number of squares with raised symbols on them which, when depressed, will flash indigo for up to a minute before turning a soft yellow.

When this cycle has completed, and the cabinet door opened, there will be a disposable container (and appropriate utensils) of the chosen food, steaming hot (or cold, as appropriate) for one inside.

More than one meal may be ordered by tapping the appropriate square more than once during the indigo flashing phase of the cycle.

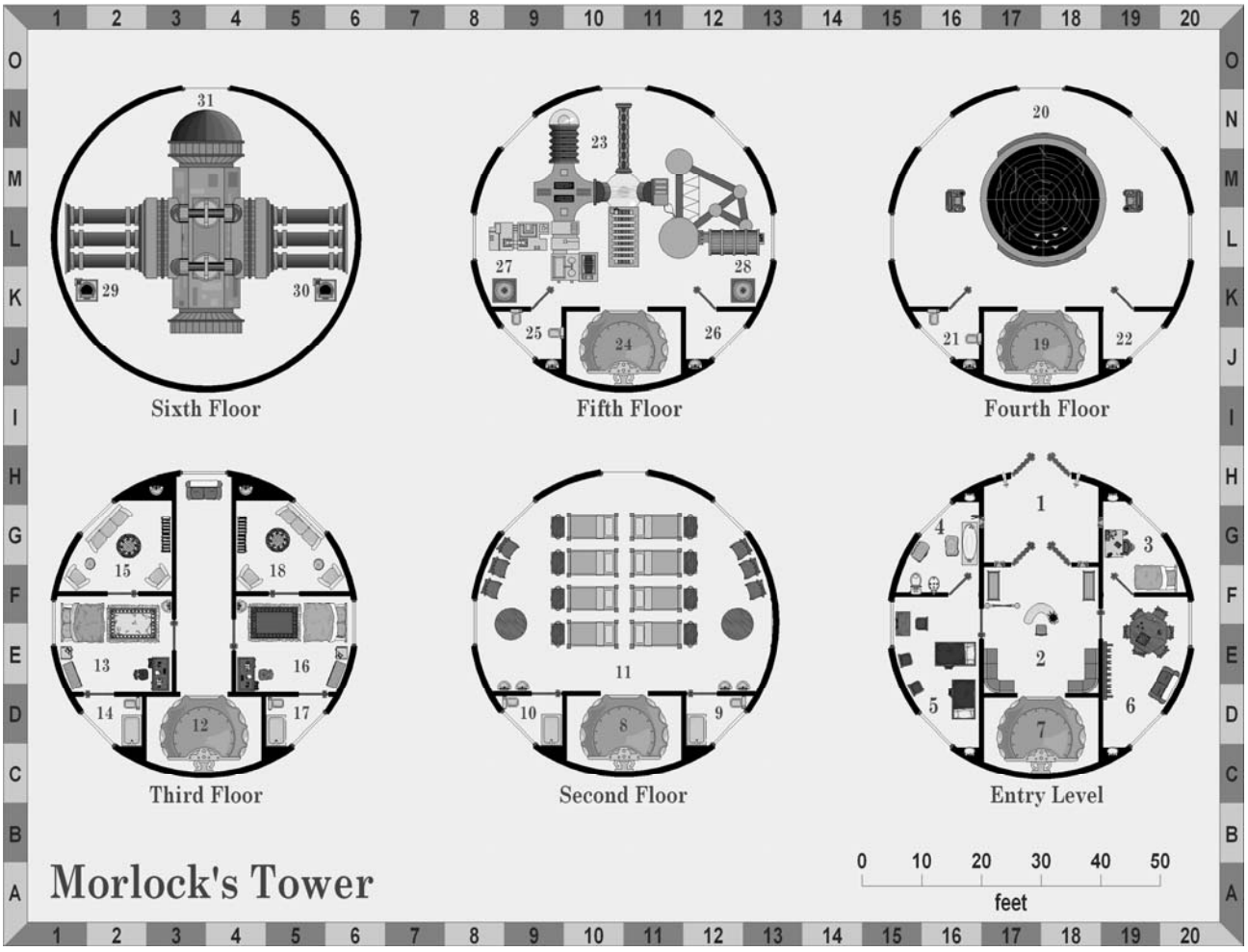
Each extra tap and an extra meal (up to a dozen, total) will appear, sixty seconds after the last tap.

Meals available are mostly stews or soups, and the vegetables and meats included tend to be the same or similar to what the players are used to, though the spices and/or particular recipes will likely be quite different.

Meals come with a beverage of some sort (either fruit juice or wine or some sort of stimulant like tea or coffee) and some sort of dessert (commonly fruit pieces, but perhaps some sort of pastry or cake), but all these extras will vary, as the main meals do, from somewhat to a lot different to what might be familiar to the characters.

All of them show signs of being mass produced – pre-prepared in effect, and likely stored by some means not obvious, but possibly similar to freeze drying or irradiation or the like.

The water faucet runs hot and cold, or mixed, depending on the direction it is turned – and there is a square panel above it with several squares containing symbols which operates similarly to the food cabinet, but which provides hot or cold beverages from the faucet when operated.



The beverages available will be a mix of some the same as are included with the meals and some that are different – milk, fruit juices, wines, beer or other similar brewed alcoholic beverage, and tea and coffee analogs.

Furniture and Interior Decoration

The furniture is intended for humans – or human*oids* similar enough to humans to make it as comfortable for humans to use as furniture specifically for *humans* would be.

However, that doesn't mean it is familiar in design – think a cross between industrial simplicity and bio-extruded Gigerist!

Materials are unfamiliar – the rigid structural members are mostly some sort very hard polymer and the softer parts seem to be foamed from a similar material and covered with woven dyed polymers that are similarly tough.

Colours are mostly dull earthen tones for the furniture, but the walls and ceilings tend to be much lighter, soft very faintly yellowish creams. If there are carpets on the floors they seem to be personalised, and have a mix of brighter colours.

Some of the furniture is obviously different – probably personal (or personal*ised* anyway) and may be made of unfamiliar woods and fabrics made from unfamiliar fibers or leather/hides from unfamiliar beasts (or the woods, fibers and hides/leather may be entirely familiar, but used stylistically in ways different from what the characters are used to).

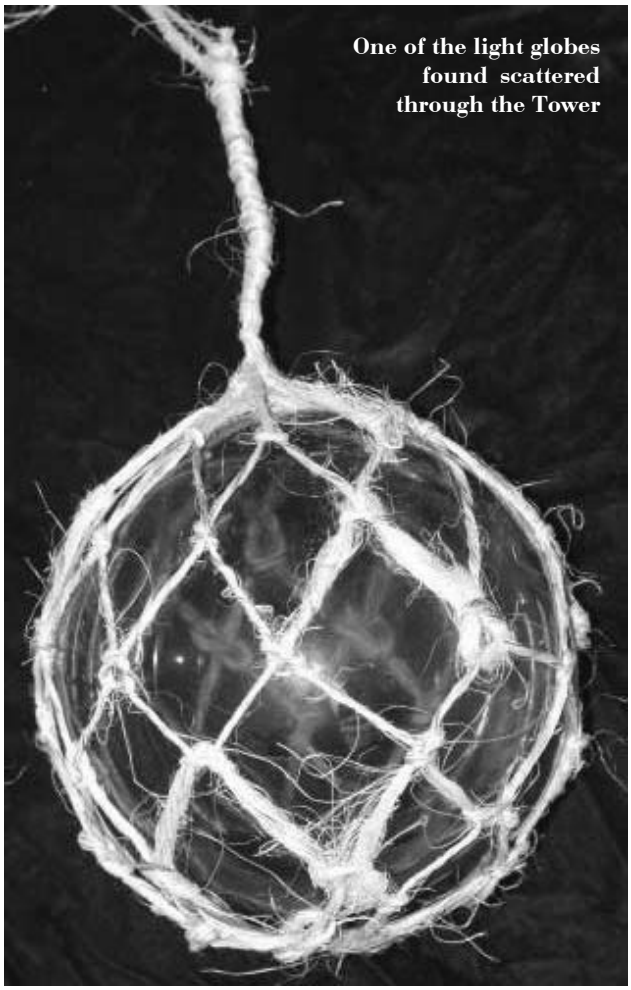
There are no obvious painting or photograph analogs anywhere on the walls, though there are some panels with unfamiliar calligraphy based script (see one possible example of what it might be like on the previous page) which may be decorative, or, just as likely, may be the local equivalent of *"Authorised Personnel Only"*, *"Watch Your Head"*, *"Wear Safety Headgear at All Times"* or *"Danger"* signs.

There *may* be some framed pictures in whatever personal possessions there are found (and, as explained elsewhere, these are likely to be *very* limited) – most likely with no depictions of *people* or, indeed, of *animals* ... landscapes, both rural and urban, mostly brooding and dark, so it seems.

Entry

The single door is of a dull brown material that seems to meld with the tower material, though it is slightly recessed, and there are no visible external hinges – no lock, and no part in the center even though it is wide enough to be a double door.

As one approaches the doorway, an oblong panel



One of the light globes found scattered through the Tower

slightly offset from the center of the door and about chest height (for someone about 6' tall) lights up enough to stand out from the background.

Placing one's hand on this panel – and *anyone's* hand will work – causes the door to go "snick" and a seam runs down from bottom to top, separating the two halves of a double door, which can then be pushed open easily.

*The door can only be locked from the **inside** – and the tower seems to have normally had at least a caretaker garrison to keep unwanted guests **out**.*

*Of course that doesn't mean that it was garrisoned when it was displaced, and, likewise, it doesn't mean that the garrison **survived** being displaced, either.*

Placing one's hand against the outside panel while the door is unlocked, but closed, caused the seam between the two parts of the door to seal up, running from bottom to top, and ending with a definite "snick" when complete.

Ground Level: Contents

On entering the tower, the characters will find themselves in a plain room (**1**) of the same material as the external walls facing another doorway, more or

less identical physically (and opened in the same way) to the external door.

*There is a "bar" running along the centre of each door, around chest height and, though it **seems** to be part of the door material, it actually **slides** across to the other side when the doors are shut, double locking them from the inside (this mechanism can be remotely controlled from the Reception Desk below).*

*When locked in this way, the doors **cannot** be opened from the **outside**.*

This vestibule is completely empty – but a close(ish) search will reveal that there are two "peepholes", one on either side of the door – transparent *(from this side only)* panels about 18" wide and running from knee height to about head height, allowing a perfect view of anyone standing outside *even at night* (this *effective* "night vision" is line of sight, to normal visual range for human beings).

*Even if you know they're there, these "peepholes" show no sign of their presence on the **outside** ... and the material the tower is made from is no weaker here than anywhere else.*

All of these one-way optically clear solids (including the "windows" on the upper levels are transparent to micro-waves and radio waves as well, but become selectively opaque if they are subjected to laser, maser or high intensity radio wave transmissions and, coincidentally, alpha and gamma waves from nuclear radiation sources – enough to protect anyone on the inside.

What *might* be found in the Tower?

The level of protection provided indicates that the inhabitants had similar protective needs to human beings in these areas.

The internal doors lead to a Reception area (**2**) which is more pleasantly constructed than the exterior and entry vestibule.

The walls are a warm *very* slightly yellowish cream colour and the floor *seems* to be constructed from some sort of organic woodlike material (which is *much* harder than wood, and will self repair over a few days if holes are drilled – or shot – into it, though it will not expel fasteners, like bolts or screws, fastened into it).

On either side of the entry there are benches and, just alongside in the common wall with the vestibule, weapon ports that can only be opened from this side (there is a small red panel next to each).

The ports are normally optically clear, but when activated they allow any missile firing weapon brought up to them to fire through as if they were not there while remaining impervious to any (normal) weapons fire from the other side.

The Reception desk is a simple curved desk, with a slightly angled flat viewscreen showing the outside of the tower and, like the windows and spyholes, whatever technology is involved, it enables the user to see in the dark as if it were high noon.

The point of view of the "camera" can be moved by simply using the screen as a trackpad.

Next to the viewscreen are two coloured squares – initially they will be yellow, indicating that the doors from the outside into the Vestibule (**1**) and from there into Reception (**2**) are unlocked (unless the PCs have locked one or both manually from the inside).

Pressing these squares three times in rapid succession closes and locks the doors if they are open and unlocks and opens them if they are closed.

*When the doors are closed and locked the squares change colour from **yellow** to **indigo**.*

Behind the Reception desk, on either side of the entry to the lift shaft (**7**) are two corner fitting couches.

The rest of the rooms on this level are for the duty guards (none present – at least, none present who are still *alive*).

There is a sleeping area (**5**) with two bunk beds (sleeping two each, for a total of four), a small desk

and three chairs as well as a sink/water outlet (which also serves as a food dispenser, see details elsewhere).

Off of this room is a Bathroom/Toilet with tub, lavatory, and bidet and another sink/water outlet cum food dispenser.

*Note that there is a weapon port identical in function to that described in the Reception area (**2**) just at the end of the bath tub, enabling the user to fire into the entry vestibule from the side.*

The room on the opposite side of the Reception area is a Squad room (**6**) with weapons rack, couch, and table with six chairs and some sort of game board and game pieces on it. At one end is another sink/water outlet cum food dispenser.

What weapons are likely to be found in the weapons rack? The answer is an equivocating "depends." What does it depend on?

*It depends on **your** take on fantasy or science-fantasy "technology" and how much you want the player characters to have access to.*

*This facility wasn't intended to be the base for a major military unit wherever and whenever it came from any more than Facility #37 was – so the weapons available will be similar **functionally** to those found in the Security Station near the entrance of that facility.*

That is, the equivalent of Riot Control weapons – a mix of lethal and non-lethal. Alchemetical (or biochemical) Sleeping or Sneezing powders or gases,

Riot sticks or Quarterstaves with a Paralysis touch or Electric shock function, multi-firing Crossbows, Blowguns with drugged or armour piercing darts, or any magical or non-standard technology that can be used to restrain or injure.

Off of the Squad room is the Duty Officer's room, with a bed, desk and the ubiquitous food/water dispenser.

There may be personal weapons stored in this room – depending on the background of your campaign these may be missile/magic casting ranged weapons or standard, enhanced, or magical melee weapons.

The internal Lift (**7**) is the only obvious and easy access between levels (except for the Sixth Floor).

There is a incised square panel alongside the doorway containing coloured squares – pressing any one will light it up and call the elevator from whatever floor it is on (if unused for more than 10 minutes or so it automatically returns to the entry level). In ascending order the call/floor colours are Red (Ground Floor),

Some of the script found in the Tower?

Orange, Yellow, Green and Blue (Fifth Floor).

There are removable panels in the sides of the elevator car allow access to the lift shaft when opened and there are ladders on either side of the shaft that allow movement between levels when it is out of action.

The base of the elevator shaft is quite solid and shows no sign that there are any lower levels to the tower (though, of course, there are).

Second Floor: Contents

Access to the Second Floor is via the internal Lift (**8**).

This floor is a barracks with eight double bunks in one large room (**11**) and two bathroom/toilets (**9, 10**).

There is a chest on a shelf at the end of each bunk (i.e. both the upper *and* lower bunks) and two tables and some chairs.

There may be some personal items in these trunks – most likely a scattering of basic personal items (towels, washers, soap, tooth powder, tooth brush and cleaning brush etc.) and not much more.

*Of course, if you have decided that something related to the Tower was the **cause** of the displacement effect, then there might be more in the way of personal possessions ... and there may be bodies of the garrison/staff here who have died as a result of whatever the disaster that triggered it **was**.*

On the western and eastern ends of the southern wall are four (two each side) water/food dispensers.

Third Floor: Contents

Again, access to the Third Floor is via the internal Lift (**12**) which opens onto a 10' wide corridor that runs the length of the tower.

There are two doors on either side which lead to two mirror-image apartments with a large bedroom cum office (**13, 16**) with a double bed, a small bedside table, wardrobe and a small desk with chair.

At the foot of the bed is a richly woven, thick pile, carpet with a geometric pattern design. There is also a food/water dispenser on the wall near the door from the corridor.

These apartments are the most likely to have been occupied even if the Tower was largely deserted at the time of displacement, and, therefore, are most likely to have personal items in the wardrobes, in and on the desk, and in the bedside cabinet.

Exactly what might be found is up to the GM but would likely include personal clothing (probably of unfamiliar cut and design), other small personal possessions and toiletries, some familiar in purpose if not design, others unfamiliar and perhaps incomprehensible, and perhaps some personal armour and weapons.

Each apartment has its own private bathroom/toilet (**14, 17**) with tub and flush toilet and also has its own lounge/recreation room (**15, 18**) with couch, two overstuffed armchairs, bookcase and a table with an unusual circular game board and pieces on it. They also have food/water dispenser units.

The bookcases have a variety of bound books (some mass produced, some hand bound) and boxes containing small personal items whose purpose/use may or may not be easily comprehensible.

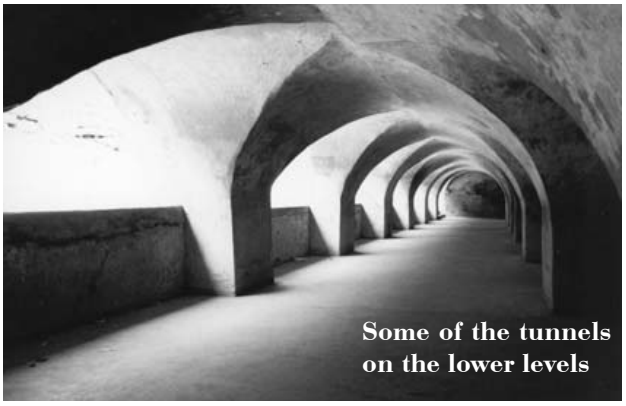
Depending on the background you, as GM, have decided on, this may be in an alphabet/script that is completely unfamiliar ... or not ... and may be in a language that is unknown ... or strangely similar (see the picture opposite for a possible example).

Fourth Floor: Contents

Access is still via the internal Lift (**19**) which opens onto a single large room dominated by a central round table flanked on left and right by swivel chairs.

Flickering above the table is a domelike light source in which there are moving lights and shapes – moving closer to it and it is clear that it shows a 360° three dimensional colour depiction of the terrain for approximately a kilometer around the tower, and centered ***on*** the tower.

The controls on the chairs can be used to expand the area shown and to change the area on which the display is centered to anything within 20 kilometers of the tower (though this will take a considerable amount – probably days, perhaps weeks) of trial and error as the controls are not likely labelled in any way comprehensible to the characters even if in a familiar alphabet or language (which is, in itself, inherently unlikely).



Some of the tunnels on the lower levels

The level also has a toilet (**21**) with a food/water dispenser unit and an empty room (**22**) that *may* have been a storeroom (there are signs of shelving having been removed from the walls, but no contents).

Fifth Floor: Contents

This is the topmost level reached by the internal Lift (**24**) and opens onto a single large room filled with incomprehensible machinery that has a wide variety of moving parts and parts that pulse with light or crackle with power.

*These components are the facility's emergency power generator system – though what it uses to **generate** power isn't entirely clear.*

*It is almost as if they suck it from thin air as far as the characters will (after many months of study) determine – and it seems to have been doing it **indefinitely** before the characters discover the Tower and its contents!*

The components, insofar as they can be disassembled, are often incomprehensible as to their specific purpose or simply make no sense as to what role they could possibly play in generating power.

They are also largely unbreakable and will simply not wear out within the likely life span of the characters (or, let's face it, the campaign!).

The controls, such as they are, are incredibly simple, a panel with a hinged, transparent, cover on which there are two squares – one yellow, the other indigo.

*When the characters arrive here, the yellow square is softly pulsing – if they touch it the **other** square, the indigo one, will light up and start pulsing for approximately 30 seconds.*

If it is touched within that period, the generator shuts down and the indigo square stops pulsing but remains lit.

To restart the generator, simply touch the indigo square and the yellow square will pulse for approximately 30 seconds and, if touched within that period, the generator will restart and the indigo square will go dark.

There are no other obvious controls that the characters are likely to be able to find – the generator is either on or off. Providing no power or, potentially, full power.

Access to Level Six is via the two indicated in-ceiling hatches with pull down ladders (**27, 28**), rather like those that you see giving access to attic storage areas.

The other two rooms on this level comprise a toilet with standard food/water dispenser (**25**) and another empty storeroom (**26**) like that on Level Four.

Sixth Floor: Contents

Access is by in-floor hatches from the fifth Floor (**29, 30**).

The whole of this floor, directly under the conical roof, is taken up by a large device of incomprehensibel design and purpose (**31**).

There is a single "window" which, unlike the others, is visible as such from the outside, but is likewise solid and there is some indication that the whole level, or at least the device, can rotate 360° ... but apart from that, there isn't any indication of what the device might be for and there are no obvious controls.

What is the "incomprehensible device"? Is it a weapon? It could be – and if it is, that would explain why the characters will probably never be able to figure out what it does exactly or how to operate it.

*Let's face it, **no one** would leave a **working** weapon in an abandoned facility, and, if the facility **wasn't** abandoned, they're not going to leave one that can be triggered by accident by any Tom, Dick or Harry that randomly appears on the scene.*

They're going to make sure that the activating and using the weapon requires security codes and access procedures at the very least.

*The other possibility is that the mechanism on this level is "slagged" (or **seems** to be ... how would the characters know?) in interesting ways ... which **might** mean that it was the trigger for the displacement event that put the characters in this mess and caused the tower complex to end up here as well. Who knows?!*

Sub-Level One: Contents

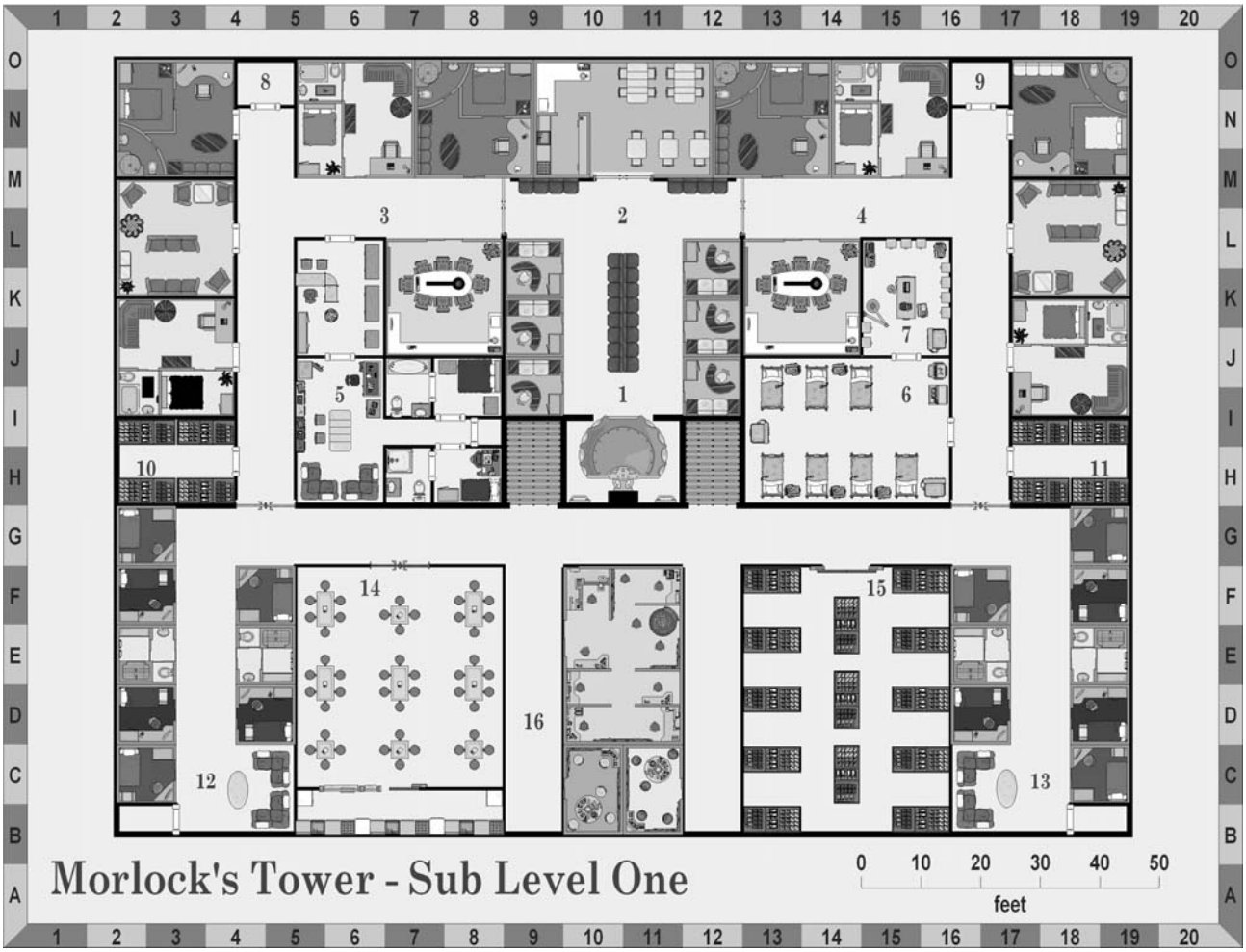
Access to this level is via the personnel Lift (**1**) down from the tower and up from the lower levels.

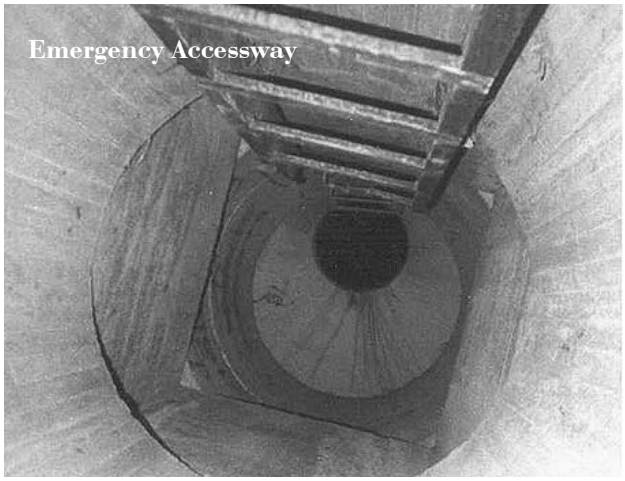
Access to the lower levels *only* is via the staircases indicated on either side of the lift shaft.

The lift lobby area (**2**) has six offices and seats for those waiting for the attention of those working *from* the offices (or just waiting for the lift).

The offices are pretty standard in layout – file cabinets contain paper files (or at least have file folders to contain them when they are generated/moved in) and there are standard pre-computer office equipment, typewriters, telephones and the like.

However, they are of unusual design – the typewriters




Emergency Accessway

may *have a keyboard that contains letters and symbols that are probably completely unfamiliar to the players, making them basically unusable, and the telephones, though of an old design, are cordless and have a rotary dial that has symbols some of which are identical to those on the top row of keys on the typewriters.*

Of course, if you're feeling generous, perhaps they use a slightly modified version of the Roman alphabet (even if the language that is written with it is unfamiliar) or can be modified to do so.

There are also standard office supplies – paper, pens (mainly fountain pens with ink cartridges or bottles of ink), pencils, paper tacks (but no paper ***clips*** *or* ***staplers****), manilla folders, scissors, paper knives/letter openers etc.*

The offices show no sign of having been used for a long period of time, if ever. The equipment is mostly still in its packing material, ready to be unpacked and used but otherwise "new."

At the rear of the lobby is a Cafeteria for the Officers/Heads of Department (or whatever their classification might have been) who were intended to occupy the private quarters (**3, 4**) indicated on the map.

The Cafeteria has a stock of preserved foods in the cupboards and cabinets, but the main supply of meals comes from the large "stoves" which operate in much the same way as the food/beverage dispensers on the upper levels, but which can dispense up to 48 meals at a time.

The Officer's Suites are mostly fully equipped, but evidently never occupied, as are the two Lounges and Conference Rooms indicated.

Each of the Officer's suites has a locked cabinet containing personal weapons for the occupant – the nature of which will depend on exactly what you have chosen as the background the facility has been displaced from.

They may include a mix of magical melee and missile weapons (generally moderately low level, but useful) or something with the same sort of ***effects*** *as modern missile and melee weapons, but with a more "science fantasy" or "weird science" feel to them.*

All these weapons are carefully packaged/stored so that they require minimal cleaning before they can be used and come with a moderate supply of ammunition or charges (or whatever), perhaps 1000 rounds for the long arms and 200 rounds for pistol equivalents plus a small amount (a dozen, perhaps) of explosive weapons functionally similar to grenades (not necessarily lethal).

The Base Commander's Suite (**5**) consists of four rooms – an outer office, a lounge room, master bedroom and guest/children's bedroom (both bedrooms have ensuite bathrooms) and, if the facility showed any signs of being recently inhabited on the above ground levels this will also show signs it was in use.

In the northeast quadrant is a fully equipped Hospital Suite (**6, 7**) with a Ward of seven beds and an Operating Theater.

The medical supplies are somewhat unfamiliar, but their use can mostly be determined with some unpacking and a little trial and error. They are either ***very*** *high tech or based on unfamiliar principles (****magic?****), but they seem to be pretty much idiot proofed.*

They will offer minor healing and curative advantages to the characters who have access to them for the most part – probably because they aren't using them to their full capacity, not understanding how they work/how to operate them effectively (for example, they might allow healing to take place without the need for constant medical rolls by skilled personnel ***as if such personnel were making those rolls****, or they might instantly sure the subject of some specific diseases – or life threatening diseases in general).*

There is not an inexhaustible amount of such medical supplies, but they should be available for the characters to access for "special" occasions – perhaps for a year or two from the facility's arrival, perhaps longer with careful husbanding.

The two closets (**8, 9**) are lined with shelving, but are most likely empty – they were probably extra storage for personal items belonging to the occupants of the surrounding officer's quarters.

There are emergency escape hatches in the ceiling that can be pulled down and which lead to the surface.

These are normally locked from the inside at both this point and at the hatch leading to the surface (which is, of course, concealed in any case).

The two Storerooms (**10, 11**) are lined with shelving

containing a variety of supplies, including packaged rations, camping gear, utility clothes (including footwear, in a variety of sizes, for both males and females), all obviously intended for emergency use.

*There are no **combat** weapons stored here – or, at least, none intended **specifically** for combat.*

There are a variety of survival tools that could be so used – utility knives, machetes/brush knives and the like, which are particularly well made.

These two Stores are fully stocked, and the equipment is packaged/preserved for long term storage.

*There may be limited signs of some of it having been used **if** the above ground levels of the tower also show signs of occupancy, but the supplies are largely intact.*

The southwest and southeast quadrants (**12, 13**) have smaller, semi-private, quarters for junior Officers (or NCOs or equivalent), each of with sleeping two in a double bunk bed.

There are two bathrooms, a recreation lounge as well as a storage closet for personal items.

As with the same areas in "Officer's Country" these contain shelving but not much else – as well as emergency exits in the ceiling.

The southwest quadrant also contains a Cafeteria for the NCO's/Junior Officers (**14**) and a *large* storage area with survival, medical and other supplies (**15**).

*As with (**10, 11**) the supplies here do not contain weapons **intended** for combat, and the stores are completely undisturbed.*

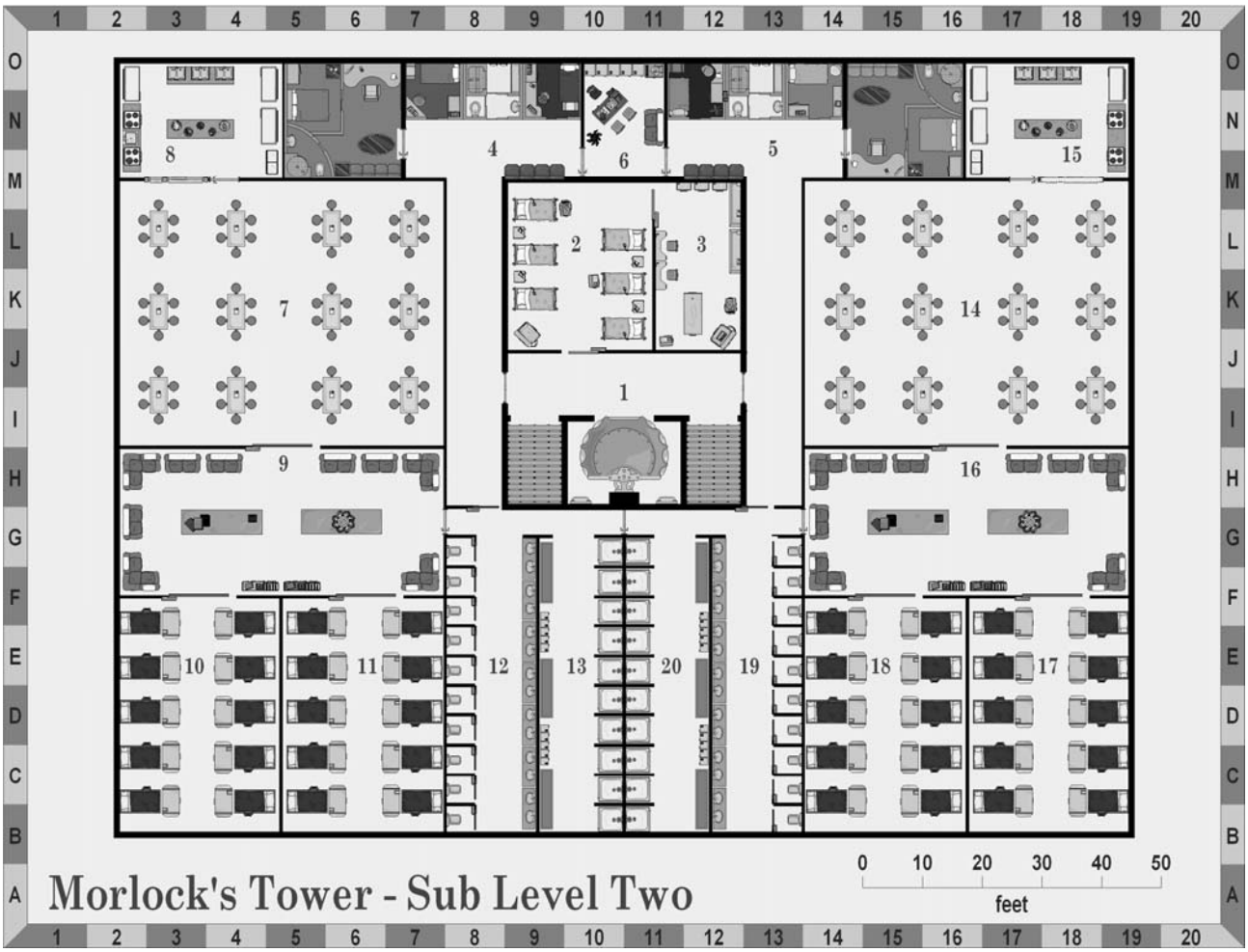
*There are quantities of medical supplies (recognisable as such from those found in the Hospital (**6, 7**).*

The central range of the southern part of this level contains one large and two small rooms containing a variety of equipment of an indeterminate nature.

The larger room seems to contain communications equipment – what seem to be old Teletype machines and banks of equipment with speaker grilles and 1930ish styled desk mikes associated with them. There are also desks with a number of standard typewriters.

In one of the bays there is a units which resembles the "radar" (or whatever it is) display unit found on *Level Four* of the Tower.

This operates, as far as can be determined, in a similar way but with a 100 kilometer range – the difference is



that it seems to be able to pick up any source of radio frequency emissions, including direct line of sight maser or microwave and display it on the "screen" – even more interesting, it will eventually be found that it can actually intercept these transmissions and connect with them through the comms devices elsewhere in the room!

The other two rooms have slagged equipment – and, possibly, the remains (badly damaged by blast and heat) of several human(oid)s probably killed by whatever destroyed the equipment.

If the facility was the trigger for the whole *displacement* event, then it would seem that these rooms were somehow connected with the disaster.

Sub Level Two: Contents

Access to this level is via the personnel Lift (**1**) and the stairwells on either side, to both upper and lower levels of the facility.

Fronting onto the lift lobby is a small medical facility supplement the one on Sub-Level One.

This consists of a six bed Ward (**2**) and Operating Theater (**3**) and has about the same amount of medical supplies as the upper level facility.

Unlike the facility on the upper level, this is completely unused – the equipment and supplies are all still in the original wrapping, though perfectly preserved).

To the east and west of the lift lobby are Officer/NCO Quarters (**4, 5**) each with one large suite of rooms (for single/dual occupancy) and two smaller rooms for dual occupancy (with twin bunk beds and a separate, shared, bathroom).

These rooms show no signs of having been used – their contents are still in the original wrapping. The Officers quarters have weapons cabinets equipped/stocked as those on Sub Level One.

Between these two ranges of rooms is an Office (**6**) with a full set of equipment and office supplies, all still in their protective wrapping.

Morlock Tower Communications

The east and west ranges have mirror image Cafeteria style mess halls (**7, 14**) and kitchens (**8, 15**)

*Each Cafeteria has a stock of preserved foods in the cupboards and cabinets, but the main supply of meals comes from the large "stoves" which operate in much the same way as the food/beverage dispensers on the upper levels, but each of them can dispense up to 48 meals at a time (and, like the dispensers on the upper levels, the source of the food packs is not clear – there are no obvious connections between the ovens and **anything** that would explain the arrival of the food).*

The Cafeteria furniture can easily be collapsed and stacked to one side to allow the spaces to be allowed for lectures, entertainment, or physical exercise.

Tthe east and west ranges have well equipped Lounges (**9, 16**) for each pair of Squad Dorms (**10-11, 17-18**) containing double tier bunk beds for 20 men each.

The Squad Lounges have bookshelves with books in the language of the facility and there are also boxes there and on the tables which contain boards and pieces that would indicate that they are probably for games.

Several of the games show a distinct resemblance to something like Draughts and others are possibly a descendant of Chess.

*At the foot of each bunk bed is a two level shelf with two large trunks for the personal possessions of the squad member – there are no **personal** items in them at present.*

There is no sign that any of these areas were ever occupied – all the equipment is in its original packing.

Each of the ranges has toilet (**12,19**) and shower (**13, 20**) areas, all ready for use but showing no signs of having been used.

There is only one of these levels in the "standard" Morlock Tower underworld – but there is no reason why you should be limited to one if you want the facility to be much larger than "standard" ... simply add one (or more) identical levels (as desired).

Sub Level Three: Contents

Access is, again, primarily by personnel Lift (**1**) and stairwells on either side of the lift shaft, all of which provide access to the upper and lower levels.

However, there is also a large Vehicle/Cargo lift (**5**) and a ramp (**6**) that runs out about 100 meters before angling towards the surface – which it doesn't reach, as it's been cut off by the displacement effect.

It would be a simple enough matter, though not trivial, to dig a connecting tunnel or trench to once again allow

surface access via the ramp.

Note that the rampway is also joined by a ramp from Sub Level Four about halfway down its remaining length.

The Lift Lobby has four Offices (**2, 3**) facing onto it, and, like most of the offices in the facility, all except one shows no sign of ever having been used.

The one that has been used doesn't seem to have been used for much, but there are some personal possessions scattered around it – a coffee mug with the dregs still in it, some plates with crumbs, a jacket slung over the back of a chair, a belt with a pistol or some sort of small melee weapon (depending on the milieu of origin) – and there are some files in the cabinets and even a sheet of paper in the typewriter with a message half finished on it.

The bulk of this sub-level is taken up with lots of *large* machines.

None of them are particularly familiar to the characters – however, what they *do* **is**, though it may take a while to figure them out to the point where they can be *operated* by displaced.

*Like so much of the equipment in the facility, these units are a mix of 1930's industrial fascist (as in **Metropolis**) and H R Giger biomechanical (as in the **Aliens** series) in weird proportions. The thing is, though it all looks like it can't possibly work, it **does**. Well.*

They are, despite their unusual appearance and peculiarities of design, general purpose machines set up to allow the production of *other* machines.

There are mechanical and chemical/biochemical production units scattered around the level, all fully operational (and some showing signs of recent use).

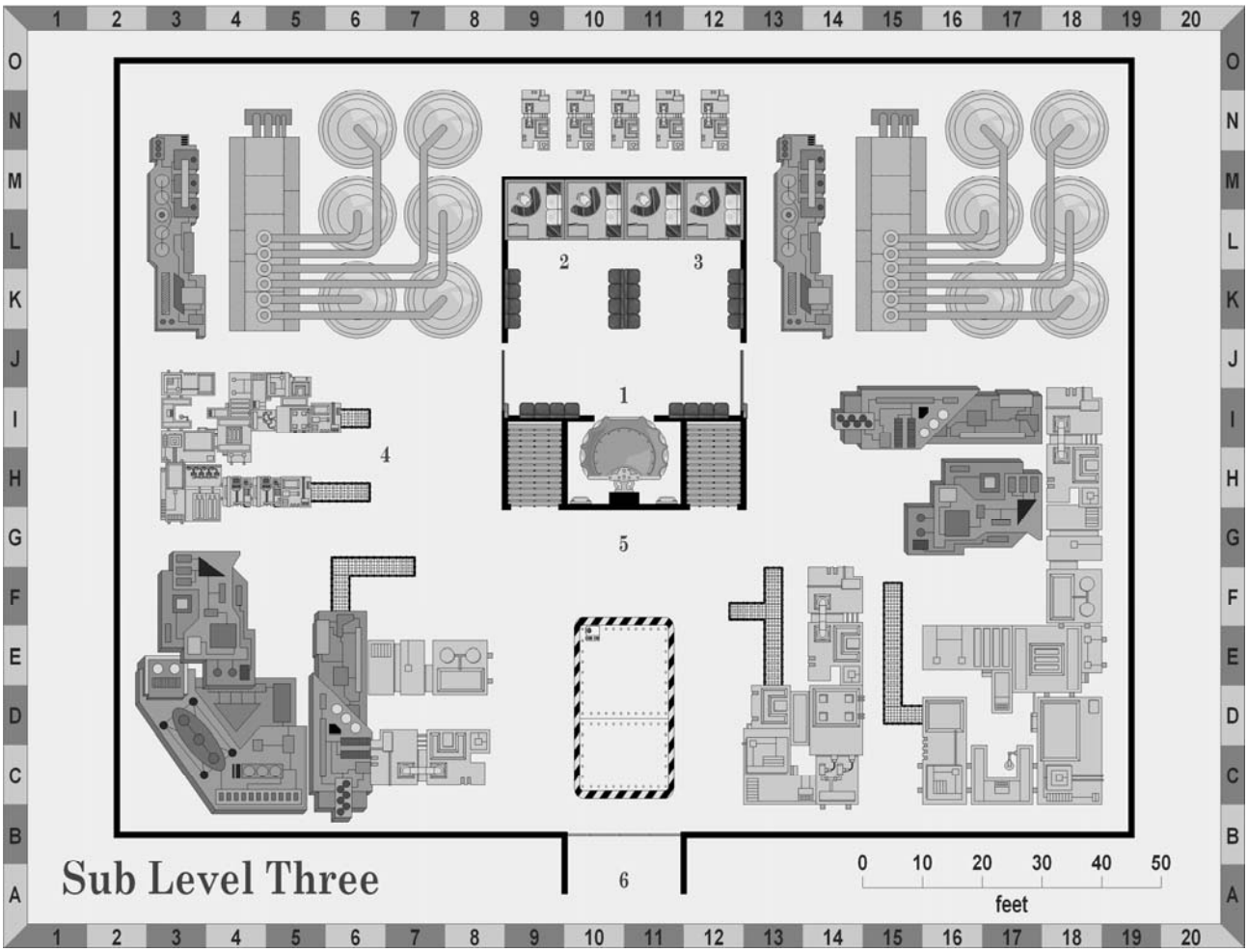
*The thing is, unlike Facility #37, though the characters will be able to figure out how these machines work, and use them, they can only do that **in situ**.*

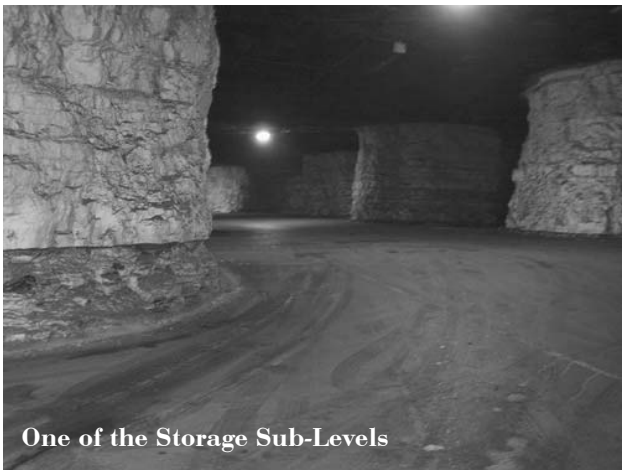
That is, they cannot be moved from this facility – they are much more a deus ex machina than in Facility #37.

Of course, they're more versatile than those in Facility #37, so the trade off is probably reasonable.

*And, yes, there are **no** electronics production units – or nothing the displaced are likely to be able to recognise as such nor, indeed, to get to **operate** as such.*

***If** the Tower technology is simply **very** advanced (or **science** fantasy), then the reality is that it is probably **too** advanced to be compatible with whatever the characters have **and** they won't understand how it operates anyway.*





One of the Storage Sub-Levels

*If it represents **some** sort of "magic" then, of course, it works **so** differently that its even less compatible!*

*The assumption is that there is only **one** of these levels, however, if you feel the displaced group **needs** more to have more manufacturing equipment to make a go of it, then add a duplicate of this level.*

*Or, perhaps, it is an **almost** duplicate with slightly different looking machinery, with slightly different purposes (just remember, this is a fine balance – you don't want to give too much!).*

Sub Level Four

This is the first of the storage sub-levels, and access is through the personnel Lift (**1**) and adjacent stairwells as well as via the Cargo Lift (**5**) and Ramp (**6**) that angles up to connect with the ramp at Sub Level Three.

The Lift Lobby faces a complex of four dual occupancy quarters (bunk beds in each) with separate bathrooms, mini-kitchens and a combined dining and lounge area for the use of the crew running this level.

There is no evidence that any of these quarters were ever used, as with so much of the Sub Levels. The furniture and facilities are still largely in their original wrapping.

The bulk of the level is inaccessible except through inspection panels – and is the top of a huge grain silo.

*Exactly what sort of grain the silo contains, and how much, is up to **you** – but the silo extends the equivalent of at least 20 storeys below this level.*

*The inspection panels cannot easily be opened, and are airlock-like (which should be a **big** hint) – as the grain is preserved by using a carefully controlled atmosphere that, while not exactly **poisonous** to humans, will cause nausea and, eventually, unconsciousness (and, eventually, brain damage through lack of oxygen even if it doesn't actually **kill** you).*

The two machinery rooms (**3, 4**) work the aeration and environmental control machinery as well as the loading/unloading mechanisms (which are the rotary arms shown near the Vehicle Lift (**5**)) and are currently on housekeeping status.

Operating the loading/unloading mechanism is not particularly difficult – trial and error can work out the procedure, and the worst problem that is likely to result is a couple of tons of spilled grain on the floor of the loading area needing to be bagged.

Storage Sub Levels

These are not mapped, but are accessed by the Personnel Lift that runs from the top of the tower to the very bottom-most level as well as the stairwells that run down alongside the lift shaft.

There is also access via the Cargo Lift that, likewise, runs from Sub-Level Three to the bottom-most level.

Each of these sub levels (and there are at least two) is also accessed via rampways that connect to each other and, for the topmost level, to Sub-Level Four's rampway (which, in turn, connects to the rampway on Sub-Level Three and, thence, to the surface).

There are no specific maps given for the Storage levels, but they can be quite extensive, extending far beyond the circumscribed areas shown for the man-made levels, as they are based on deep caverns only partly man-made (or, more accurately, man *modified*).

How large they are or, indeed, whether there is more than one level, is entirely up to the largesse of the GM – that's *you* – and what you intend your campaign group to have access to (which, in turn, has determined if, in fact, there are actually duplicates of some of the levels already described).

*Remember, this is your deus ex machina gift to the PCs to make things just a little more survivable. What is there, and how useful it may be, are **entirely** in your gift – think carefully.*

*Likewise, as is suggested elsewhere, there isn't **likely** to be a whole Dragon Mounted Aerial Assault Squadron's equipment (including eggs for the Dragons!) stored here ... though, perhaps, for certain sorts of campaign you might consider it!*

The major difference between the Morlock's Tower's storage levels and those of Facility #37 is that they have larger bulk storage facilities – not just the grain silo, but tanks containing huge amounts of edible oils (functionally the same as olive oil – and coincidentally usable as diesel fuel), huge cellars containing vast tuns and many barrels of wines and distilled liquors and the like as well as large tunnels containing thousands of ingots of refined metals (iron/steel, bronze, copper, tin, and even

some gold and silver).

Power Generation Level

The very bottom-most level is where the power generation equipment is installed, and is accessed in the same way as the storage levels, though it is much smaller.

At least, the parts that are *human accessible* are much smaller!

Exactly what is down here in the way of equipment depends very much on your desires.

This could vary from the same sort of incomprehensible equipment present in the Tower Levels (on the Fifth Floor) and which will operate in much the same way as described there.

Or they could be connected to bubbling Lava Pits – or a Core Tap right out of ***Forbidden Planet****, if you prefer; or a raging underground river funnelled through something that works like a hydro-power turbine – or a collection of parts that sucks power from* ***somewhere****.*

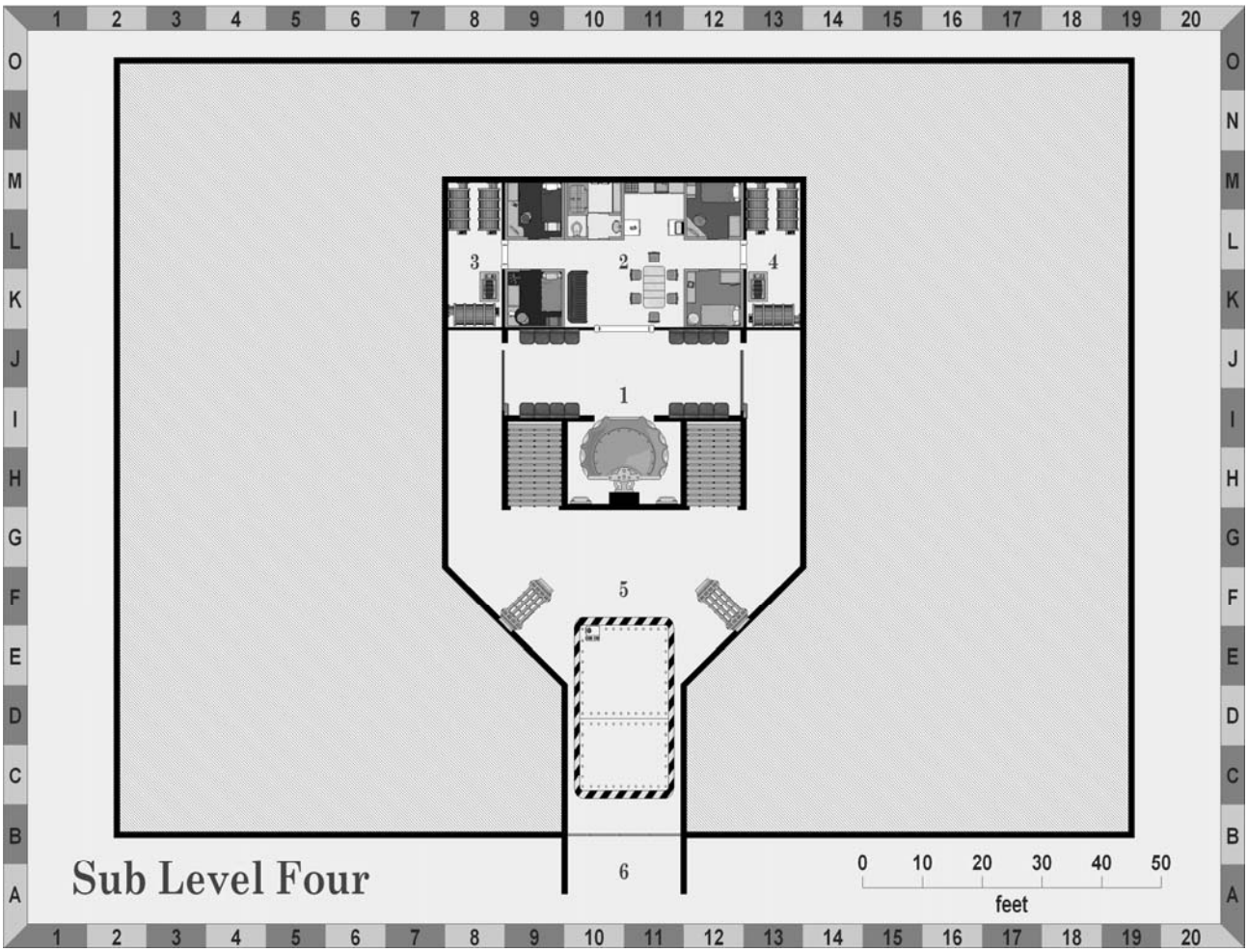
How much power? Several megawatt equivalents, at least – though whether it is in the form of electrical power that can be used by ***your*** *Displaced or not is entirely at your determination.*

Like the power equipment on Tower Level Five, these generators are so over-engineered that they are likely to last longer than any of the characters are likely to live – though, at your discretion, you may use maintenance problems, or finding rare materials to make exotic spare parts for them plot hooks ***for*** *your players!*

How It All Got Here

The displacement of the facility might well purely an accidental side effect of whatever process caused the displacement event – of course, paranoid types will assume that the displacement event may have been *linked* ***to*** *the facility*.

If this is decided to be the case, then there should be an extra machinery level where there is sign of extensive damage – a self-consuming sort – and some scattered bodies all inexplicable in their purpose and so severely wrecked as to be incomprehensible and totally irrepairable. *Displacement events are intended to be* ***one way****.*



On the Road Again?
Getting there is ALL the fun!

Short of the venue for your *Displaced* campaign being the most isolated community any reasonable traveller is likely to encounter, there is generally going to be *some* scope for there to be something unusual "just passing through" which can be of benefit *to* the community – and therefore of benefit *to* the *players*.

Sure, if the displacement event takes place in an isolated scientific base in the middle of Antarctica ... or the Matto Grosso ... or the back end of nowhere in the Texas Panhandle, then the chances of something randomly useful "just passing through" would ***seem*** *to be low.*

But that's only because you're insufficiently ingenious! Do some lateral thinking – the displacement event is, to a greater or lesser degree, a degree ***chosen by you****, meant to be* ***inexplicable****, so* ***how*** *it works is* ***up to you****.*

Sure, there isn't likely to be much in that randomly passing Snow Cat that gets displaced with the Antarctic Base ... but there's no reason why the displacement event has to hit ***only*** *that base and its vicinity.*

Why, the displacement event doesn't even have to ***originate*** *in the Base. It's as random as* ***you*** *want it to be.*

So, while the Snow Cat doesn't have anything much but a few startled Geologists aboard, maybe they're startled as much because they see a WW2 Liberty or Victory Ship (fully laden with whatever goodies ***you*** *want) and thousands of tons of seawater suddenly drop from 30 meters up a half a klick in front of them as because they've been* ***displaced*** *... somewhere that definitely* ***isn't*** *Antarctica?*

If the ship in question was a modern container vessel, then the goodies are somewhat of a mixed blessing – getting those containers off the ship without the proper port handling equipment is going to be one hell of a big job! Make the displaced group ***work*** *for any benefits!*

Or maybe the small town in the Texas Panhandle, population under 100, finds itself suddenly not only displaced but co-located with a train full of "scrap" shunted off onto the long-deserted branch line that runs nearby because for some obscure administrative reason.

On (eventual) examination, the "scrap" turns out to be perfectly usable but obsolete (in a computerised age, anyway) lathes and industrial machinery removed from an old (and ***large****) engineering factory* ***somewhere else****.*


It doesn't have to be *new* either!

Vehicles or Contents?

Sometimes players have the damnedest time not being able to see the forest for the trees – as any experienced GM will be able to attest.

The thing is, maybe it's the *vehicles* that are the benefit, rather than their cargo?

Vehicles

As indicated in previous chapters, keeping *any* vehicles running will be a *major* problem – lack of spares and the fact that, compared to older vehicles, modern makes are not very *robust* (even if more reliable).

There are three possibilities – either the displacement effect can bring with it a supply of ***older*** *vehicles that are more robustly built.*

For example, many parts of a Model T Ford could be repaired by any reasonable well equipped and skilled Blacksmith – even the "high tech" components are simple enough that they can be repaired with little more than the tools available in a moderately well equipped home workshop of the late 20th/early 21st century.

Which, coincidentally, is likely to be available to all but the smallest and least well equipped groups.

There is also the possibility that these early vehicles could be ***steam powered****, which would make the proposition of fuelling them somewhat easier than if you suddenly had a whole hell of a lot of petrol burners!*

Or, equally likely, the displaced vehicles are ***high tech*** *– running off* ***Mr Fusion*** *units (which only require a few banana peels every now and then to keep them powered).*

If they're big enough, even having their very own fission

power plant is a possibility.

*If Nuclear Subs are a **little** too much for your campaign, how about something **like** the **Savannah** (with a 74 Mw Reactor capable of steaming 300,000 klicks @ 20 kts), or the German or Russian equivalents, the **Otto Hahn** (35 Mw, 900 days under full load) and **Sevmorput?***

*Whatever cargo they happen to be carrying would be nice, but that nuclear generator and the range and endurance it offers would be **much** better!*

Or simply view it as a source of electricity for the displaced tech base.

*The third possibility involves some "outside the box" thinking – depending on where and when the characters originate and where and when they are displaced **to**, the most mundane of things may be important.*

*In a world/dimension without horses, for example (as in MAR Barker's **Tekumel** or the equally horseless pre-Colombian Americas), the displaced group finding that they are now the proud possessors of an entire herd of horses being brought to market from, say, the equivalent of the US "Wild West" era **also** dumped alongside them would be a godsend!*

*Yes, even **horses** can make a huge difference in your campaign **if** the locals don't have them. Think cavalry. Think horsedrawn logistics.*

LIMP HOME MODE

Modern automobiles (increasingly from the 1980's, universally in the US since 1996) have their engines controlled by onboard computers (to meet emissions standards, amongst other things) – but what happens when the computer decides to die?

There is what is loosely called a *"limp home mode"* implemented – but this is *not* much help for anyone in a *displaced* situation. Why?

Well, common implementations of this "protocol" include the fuel injection being left in "rich" mode

A 1924 Doble Steam Car

STEAM CAR OPERATION

Players may encounter (or *build*) steam powered cars during the course of the campaign and they are obviously *different* from standard internal combustion engine vehicles, but *how?*

- Most 20th century steam cars (*Stanleys, Dobles* etc.) burn liquid (petrol or kerosine) rather than solid fuel in both the pilot light for the burner and the burner itself.
- Boiler design incorporated safety features that made it virtually impossible for the boiler to blow up – the rare occasions when this happened were due to the operator deliberately screwing down the safety valve.
- The most common engine malfunction was a scorched boiler where the water had run low and the boiler started to leak.
- Early designs took an advertised 10-15 minutes to warm up to start, though 20-25 minutes was evidently more realistic. Later designs had flash boilers and could start up and go just like a normal car, at full design speed!
- Early automotive steam engines could generate power equivalent to 100-125 hp for short periods of time, later models could generate up to 150 hp and do so more consistently.
- Early cars 1910's-20's) could consistently achieve speeds of 45-55 mph while later models (late 1920's) could manage 95-100 mph.
- Fuel consumption was 10-14 miles per gallon. Water consumption was 1-2 miles per gallon on the early, non-condensing, engines, and 8-10 miles per gallon on the later, condensing, engines.
- Flash boiler engines could achieve 60 miles per gallon of boiler water. Modern ones should be *at least* that efficient (modified steam engines are 50% efficient; internal combustion engines only 28%).
- Engines were very reliable, and light weight, as they contained no clutch, transmission, distributor, points or fan belts and could typically run for 150-200,000 miles before needing anything other than routine maintenance.
- Steam cars are, except for road noise, completely silent when running.

Liberty and Victory Ships

These vessels were produced in large numbers (2751 Liberties, 534 Victories) to replace losses and meet increased shipping needs during WW2, initially at the request of the British government.

Liberty ships had a cargo capacity of 9140 tons (300 railroad cars, 2840 jeeps, 440 light tanks, 230 million rounds of rifle ammunition, 3,440,000 C Rations), but were routinely, often grossly, overloaded – which is thought to be one of the contributing factors to losses resulting from cracked welds that resulted in 19 splitting in half without warning (and 1500+ reported "serious" fractures) – at a speed of 11 to 11½ knots for 17000 miles.

Displacement: 7000 dwt
Length: 441 ft 6 in (135 m)
Beam: 56 ft 10.75 in (17.3 m)
Draught: 27 ft 9.25 in (8.5 m)
Engine: 2 oil fired boilers, triple expansion steam engine, single screw, 2500 horsepower (1.9 MW)
Complement: 41

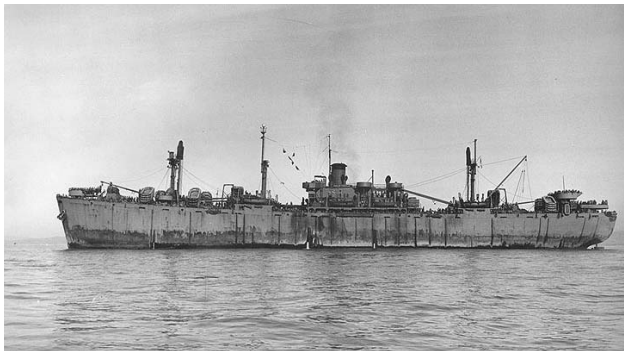
Victory ships carried 10850 tons of cargo (and were also routinely overloaded), but at speeds of 15-17 knots over longer distances.

Apart from speed and cargo capacity, the Victories were a more modern design, with electrical power for their auxiliary machinery rather than steam for example.

Of those produced, 414 were standard cargo ships, the rest were AK's (Attack Transports) for use in support of amphibious operations.

Better design meant that no Victories had weld crack problems.

Displacement: 10750 dwt
Length: 455 feet (139 m)
Beam: 62 feet (19 m)
Draught: 25 feet (7.6 m)
Engine: Reciprocating steam engines, steam turbines or diesels of 6000- 8500 hp (4½-6 MW)
Complement: 62



which will make the engine difficult to start and difficult to prevent from stalling repeatedly. Fuel consumption will, theoretically, go up in the unlikely event you manage to drive the continually stalling engine for more than a relatively short distance (50 miles seems to be the recommended maximum).

An alternate protocol is to drop the vehicle immediately into 2nd gear and leave it there – with the obvious operational limitations that will result.

What is the solution? It depends.

The problem may not be with the engine computer specifically – in which case fixing whatever the underlaying problem actually *is* will *probably* put the computer back on track (though, since many subsystems on modern cars are *also* computer controlled, if the problem is with a bad chip in such a subsystem, tough!).

What if the engine computer has had it?

You're stuffed. Unless you can get a replacement part, of course – and this is unlikely in the extreme in a *Displaced* campaign.

Cannibalisation is a possibility – but that simply means taking two (or more) immobilised cars and getting one that works. It's a short road to ***no cars at all****.*

Basically this means that cars with Engine Control Modules are a ticking clock – while those which hearken back to a simpler time can probably be kept running almost forever.

If you find that a trainload of WW2 trucks and jeeps is ***displaced*** *along with your characters, for example, they should be happier than if it were a trainload of 2006 model trucks and jeeps!*

Sure, modern cars are easier to maintain, but there's a cost – they'll be dead metal by the roadside long before the older vehicles finally give up the ghost.

Of course vehicles from places like Russia or China that have been built for ***domestic*** *use will probably not have such fripperies until much more recently than in the industrialised west – so a trainload of GAZ's or Nikis (Polish Fiat 126's, last production, 2000) or Brazilian VW Beetles (last production, 2003) or Renault 2CV's (last production, 1990) would be a godsend.*

Contents

The other possibility is that it is the *contents* of the vehicles that is their prime value.

What could be in those pesky ... er, *mysterious* ... vehicles? Almost anything.

Certainly anything *you*, as GM, decide that you'll torment ... er, *gift* ... the players with. And we all know how diabolically ... er, *inventively* ... imaginative GMs can be, don't we?

Some Content Ideas

The most likely contents will, of course, be mundane goods – in some bulk (even a single 40' contained can contain a *lot* of ... *whatever*).

This could vary from consumer items (anything from Toilet Paper and electric Light bulbs to handyman Power tools and Paperback novels and anything in between) to bulk items from which consumer items are likely made (screws and bolts, electrical or electronic subassemblies, spare parts for consumer durables like cars) – like the man said, anything.

Of course, the uses don't ***have*** *to immediate, obvious or, well,* ***large scale*** *and earthshaking.*

Toilet Paper, for example – quickly becomes a luxury item in most likely displaced scenarios, so several container loads, though relatively quickly used, would ***seem*** *to be useless ... except in the* ***influence*** *that gifting them to the right people (or, more importantly, their* ***wives****) will bring.*

This could be crucial when your players need the newly produced 90mm Rifled Cannon ***now!***

Or that truckload of assorted electronic subassemblies for ghu knows what consumer electronics – useless, right?

Not if you forget what they were ***intended*** *to be a part of and consider them as a source of electronic spares just waiting to be disassembled and used in something you can make ... or to keep something you have but can't replace* ***operating****.*

Likewise, a trainload of spare parts or subassemblies for cars and trucks not commonly available to the displaced could be cannibalised to keep the ones they ***do*** *have running, or, equally, could be used as the basis of locally designed vehicles.*

If the shipment included ***engines****, then they could be used as generators, to power locally made vehicles – even locally made watercraft or aircraft.*

Or, if you're feeling particularly nasty, give 'em a truckload of ammunition – of a caliber none of the common weapons they have access to use!

Of course, if they're smart and cunning, they will realise that they can either use the powder and primers for reloading calibers they ***do*** *have or they can* ***make*** *weapons to use the ammunition with their local resources. Modern cartridge ammunition would be a big plus in*

Containers

Starting in the mid-1950's, the gradual spread of shipping containers has had a huge impact on world trade – such that, today, 90% of the world's non-bulk cargoes are shipped in containers.

For international shipping their are ISO standard container sizes. Dry Cargo containers (the enclosed models usually depicted) are 8' (2.44 m) wide by 8'6" (2.59 m) high and there are five standard lengths – 20' (6.1 m), 40' (12.2 m), 45' (13.7 m), 48' (14.6 m), and 53' (16.2 m). The US uses mainly 48' (container trucks) and 53' (trains) internally.

Reefer, Open top (bulk cargo), Open Side (for large palletised cargoes), Flat Racks (no sides, for oversized or nonstandard cargoes), Tankers and Gas Bottle models conforming to ISO Standards are also available, as well as more specialised (and, possibly, nonstandard) models.

Capacity is measured in **TEU** ("Twenty Foot Equivalent" with approximately 39m^3 of internal shipping space) and the most common size is the 40', or **2 TEU**, container.

2 TEU Containers cost around US$5000 in China, which is the world's biggest manufacturer of containers (26% market share).

The largest container ships today are designed to carry 9000 containers, but larger ones with a capacity of up to 14,000 have been proposed.

Because developed countries (the US especially) tend to have more containers coming in than are used for exports, it is not uncommon for excess containers to be sold off relatively cheaply for all sorts of uses.

Excess containers are mostly used as makeshift storage spaces, but may be used for housing (some architects have made innovative use of them), and as transportable accommodation modules that can easily be transported anywhere a container can be!

Containerised Accommodation

A number of firms around the world have designs that allow a variety of standard sized containers to be converted into easily transported but substantial accommodation for workers, commonly (but not exclusively) in the oil industry for use (again, commonly but not exclusively) on oil rigs.

A selection of the designs available include –

40' Accommodation Module: This model contains two cabins, each with four beds (2 x 2 Bunk Beds), Shower/Toilet unit, Lockers and Desks.

20' Accommodation Module: Two cabins, each with a 2 tier Bunk, Desk, Lockers and a centrally located single shower and toilet off the entryway.

20' Shower/Toilet/Washroom Module: This contains two toilets, two showers, a washer and a dryer and locker/changeroom space.

40' Shower/Toilet Module: There are three types – one with eight showers and changeroom/locker space, one with eight toilets/washbasins, and one with of each.

40' Mess Room Module: Has space for five tables, 20 chairs, and a table with a Coffee Machine. Normally mated along the long side with ...

40' Galley Module: This is equipped with a Dishwasher, Range (Stove), Workbench, Slicer, Deep fat fryer, Microwave, Refrigerators and a Service counter.

20' or 40' Office Modules: These are normally shipped with no internal furniture or fittings beyond lighting and power outlets, the actual fit-out depending on the requirements of the end user.

These are only a *selection* of some of the common designs.

All have light and power fittings for 220/440V at 50 Hz and are fitted with smoke/fire alarms (and generally with fittings for positive pressure reverse cycle air conditioning to be mounted) and emergency exits.

Internal walls are lined with insulated material to minimise heat/cold problems and, of course, protect against electrical shorts.

They are stackable up to three high, though external access would have to be provided onsite for those stacked above "ground" level.

locally made firearms of simple (and believably doable) design.

*Even the most useless **seeming** items could have a high intrinsic value because of their rarity and uniquity **to the locals**.*

For example, dolls or action figures that have sound self-powered sound chips built in would be amazing at most pre-modern technology levels.

A container load of PET plastic bottles and the tops to go with them might seem useless, until you consider their lightness and strength as well as their non-reactivity with most liquids ... why, put a good canvas sheath around them and attach them to a sling and you have a water or wine container that any traveller in pre-modern periods would be proud to have!

Without having that mythical convoy of miltary equipment being shipped off to the Gulf (or wherever!) *"just passing through"* you *could* have interesting high value cargoes.

*An Armoured Car containing banknotes and base metal coinage might not be much use (on the other hand, once you have some sort of market for and production of "high tech" ... for the time and place ... items up and running, maybe it **will** be ... as "special" scrip that is the **only** medium that can be used to purchase said "high tech" stuff!), but the cargo might be bullion coinage from whoever produces such in your nation (or elsewhere – or else**when** ... remember, the displacement effect doesn't work neatly!) being shipped to coin dealers.*

Or it could be a shipment of gold bars from a mine/refinery to your nation's Central Bank.

A trainload of high pressure industrial steel pipe and wire cable would easily form the basis for some quickly produced cannon barrels ... for black powder weapons, anyway.

*And that bulk cargo of fertiliser? Think of it as the basis for one **hell** of a lot of explosives!*

Of course, maybe its neither the vehicle *nor* the cargo? Possibly the *container* the cargo is being transported in is what could have some interesting uses – such as the container accommodation opposite?

Trucker Convoy

A section of interstate is part of the *displaced* environs. Most of the cars and light vehicles were evidently nimble (or fast) enough to *not* be caught by the transition effect – but a number of semi-trailers (Trailer trucks in the US) were not so fortunate (perhaps their drivers were).

As it happens, the trucks had just left a major ***Multi-Mart*** (not naming real names here, but you know who I mean) distribution center and have on board an interesting variety of goods destined for MM stores within the region.

The bulk of the cargo seems to have been destined for the Camping/Outdoors sections in time for the Christmas shopping season and may include such useful (and not so useful) things as – Electrical Generators (1.5, 2 and 5 kW models); assorted Firearms (Pump, Lever, and/or Bolt action Rifles and Shotguns) accessories and ammunition; Fishing Rods and accessories; Sleeping Bags, Tents, Camp Furniture Stoves and Cooking gear; Jerrycans (Water and Fuel); Lanterns (Fuel and Battery); Bottled Gas (for lanterns and cook stoves); Batteries; Freeze Dried Rations and much more.

All will be in exquisitely random amounts and varieties – entirely within your gift as GM, as it should be!

Perhaps not all of the Semis belong to ***MultiMart*** and therefore contain other things. Some could belong to a chain of supermarkets and contain canned and packaged foods; others could be shipping automotive spares for common local and imported vehicles (or even carry a container load of brand new Motorcycles!).

There could be shipments of bulk cloth off to be turned into clothing – or readymade clothing in bulk amounts.

Bulk food – perhaps some grain trucks passing by during harvest season – would be a nice touch, or maybe they're carrying the latest hybrid seed varieties?

Bulk components – a container load of nails, screws and other modern fasteners would be valuable. Even if there are more than the displaced are likely to use any time soon they could, at the very least, be melted down for their metal content.

Spools of copper or galvanised wire would be useful in any electrical projects that might be undertaken – and spools of ***barbed*** *wire would have both civilian* ***and*** *military applications.*

Electrical components can be used in building new electronic or electrical items – or they could be useful in ***maintaining*** *those items that the displaced already have.*

A container load of **incandescent** light globes (or fluorescent tubes) would be of great importance in pre-modern times when the capacity to make replacements would be **extremely** limited.

You need high level glass manufacturing and shaping skills, the ability to make the filament (not an easy job for one that is intended, and likely, to a reasonable amount of time), ensure there is a vacuum in the tube etc. And it's ***quality control*** *issues which will kill you!*

A Petrol (or, perhaps, LPG) Tanker could be a temporary boost for the community's mobility. Or maybe its a container load of Olive Oil tins (usable as fuel or as food)? Maybe a container load of fertiliser – of obvious and probably immediate use in ensuring that the *displaced* community doesn't starve (*this* harvest season, anyway).

Perhaps of more long term use, a container full of standard automobile ***tyres*** *would be useful – as these will wear out* ***long*** *before the vehicles they are fitted to are likely to ...* ***and*** *there is not likely to be any immediate means of replacing them, even if, by chance, your* ***displaced*** *group happens to have been dumped down right next to a rubber tree plantation!*

The convoy could, alternately, be carrying (fortuitously) large pieces of infrastructure – an oversized load consisting of a 100 kW (or even larger) diesel generator intended for an isolated community or, more likely, an industrial plant (perhaps accompanied by another truck containing spares and installation gear) – being a diesel means that, even without fuel, it is valuable because you can probably run it on biodiesel or something similar.

Or, possibly, the "convoy" consists of road repair and construction equipment – Bulldozers, Graders, Rollers etc. – all of which are of use to a *displaced* community and can probably be kept operational for several years with some judicious repairs.

As noted elsewhere, even the *containers* are potentially valuable as a source of prefabricated housing – or as a source of metal to be melted down and made into

Victory Ship Cargo Manifest A

Below Deck Cargo

Beer, Bottled, 20376 cases (373 tons)
Clothing, 11628 cases (223 tons)
C Rations, 37984 cases(1) (877 tons)
Food (Canned/Packaged), 1656 pallets (1815 tons)
Gasoline, 8224 barrels (922 tons)
Parts, Repair, Aircraft, 110 crates (87 tons)
Parts, Repair, Marine, 300 boxes (270 tons)
Parts, Repair, Vehicle, 2250 boxes (668 tons)
Stores, Naval, 525 boxes (145 tons)
Supplies, Miscellaneous, 5000 boxes (652 tons)
Tools, Machine, Various, 1606 crates (1050 tons)
Truck, Cargo, 2½ ton, 24 (127 tons)

Deck Cargo

Truck, Cargo, 2½ ton, 16 (98 tons)
Truck, Cargo, ¾ ton, 18 (40 tons)

Victory Ship Cargo Manifest B

Below Deck Cargo

Ammunition, .30-06 Ball, 48416 cans(2) (344 tons)
Batteries, Radio, 870 Cartons(3) (7 tons)
Coca-Cola, Bottled, 20376 cases (373 tons)
C Rations, 116,593 cases (1902 tons)
Electric Generators, Diesel, 40 kW, 45 (58 tons)
Gasoline, 10213 barrels (1145 tons)
Parts, Electronic, 150 cartons (61 tons)
Parts, Repair, Vehicles, 2250 boxes (668 tons)
Radios, Assorted(4), 150 units (20 tons)
Rifles, M-1, Garand, 500 cases(5) (5 tons)
Steel, Structural,1500 pieces (1000 tons)
Supplies, Medical, 5000 boxes (180 tons)
Tools, Garage, 100 crates (80 tons)
Tools, Machine, Various, 1900 crates (1300 tons)

Deck Cargo

Motorcycles, Courier, 96 (127 tons)
Truck, Cargo, ¾ ton, 36 (40 tons)

(1) 8 Ration Packs per Carton (3 meals per pack).
(2) 200 rounds per can (9683200 rounds).
(3) One dozen per carton.
(4) Man Portable and Walkie Talkie sets.
(5) One M-1 Garand per case.

Cargoes as listed are suggestions. Chop and change as you like. *Gasoline* can be changed, wholly or partly, for *Diesel* or *AvGas*. *Miscellaneous Supplies* can be a wild card – as can *Naval Stores*, though the latter needs some connection to naval operations (which could be pretty strange – including Cavalry operations in the Gobi desert!).

These are standard (sort of) cargo sizes for WW2 Victory ships, and are, obviously, *not* containerised – but such vessels *still* form part of the US reserves.


US Navy Maritime Prepositioning Ship

something of more immediate use!

The tractor trucks? Fuelling them may be problematic, though, since they are almost certainly diesels, they can be run on *biodiesel* – and they will be useful as prime movers for whatever big haulage needs the community may have – or the diesel engines can be salvaged for power generation in a pinch.

Victory at Sea

With so much more of the earth's surface being covered by the oceans rather than dry land, it is entirely reasonable to assume that at least *some* of the *Displaced* groups will be maritime ones.

With the focus of this chapter being on the *vehicles*, this could make for an interesting and different campaign basis.

The ship (or ships) that are *displaced* will (assuming they are *displaced* onto *water*) will allow the characters to choose *where* they want to settle (or interfere) – within fairly broad limits (ships will not always be fully fuelled when they are translocated, for example).

Ships, modern ones at least, also usually have some sort of machine tools aboard that could be useful in setting up some sort of industrial operation – and, of course, cargo ships will have all sorts of goodies *in* their cargo holds (or, for more modern ships, their *containers*). Unloading it may be a problem, though – especially for container vessels!

Since modern vessels are *rather* large, it is unlikely that a significant number (more than one, perhaps two) could go missing without it being noticed – except in wartime (and even that doesn't increase the upper limit for an *individual* instance much, anyway).

The most common scenario for modern vessels being displaced is, therefore, during one of the two major 20th century conflicts – WW1 and WW2.

The other option would be the Bermuda Triangle (the stories behind which are complete rubbish) or during some *really* major, and unexpected, storm.

The wartime options are probably the easiest to deal with – so data on the Victory and Liberty ships used in WW2 are provided in this chapter, as well as two sample cargo manifests.

*Of course, who's to say that there won't be a **World War Three** some time in the 21st century, fought with basically the military equipment of the late 1990's and early 2000's? Plus, of course, whatever barrel scrapings may end up as all that is available after the almost de rigeur nuclear exchange!*

For a small group, a single LST with miscellaneous cargo would be appropriate – perhaps the PCs could even be the crew of the LST.

For a *modest sized group, a single such ship turning up, mysteriously uncrewed (like the Trucker Convoy, the crew seems to have had time to leave before the vessel was displaced), would offer a good balance between letting an isolated group whither on the vine through a shortage of some fairly basic products and going all Monty Haul and letting them have far too much!*

*A couple of ships would do nicely for a medium sized group – and for a very large group, perhaps one with a military core, even a dozen or so would be fine. In fact, a **displaced** convoy might make a good basis for a whole campaign – though you would need to include some civilians and/or women to balance things out in a long term fashion.*

These decisions, however, right down to the cargoes they carry, must be yours and yours alone.

If your "colony" is not a coastal one, then it is not at all unlikely that the ships will be *displaced* onto dry land – which ruins them as transport, but which makes their fabric available as raw materials (all that *iron!)* as well as giving everybody relatively easy access to their cargoes as well.

*WW2 era vessels, even civilian merchantmen, will quite possibly have a selection of automatic weapons and medium AA/Naval guns mounted aboard, with a moderate amount of ammunition as well – and these could be vital defensive resources for the **Displaced** community in its early days.*

Some modern US Maritime Prepositioning Ships carried 30 days non-combat supplies for 100,000 men on board in around 3000 containers – but this has found to be inefficient and they are gradually being reconfigured for about half that capacity.

*That's an **awful** lot of containers – and the vessels have roll-on/roll-off capabilities for around 2/3rds of their cargo, and heavy lift cranes for the rest. Of course, such ships carry no offensive or defensive weapons beyond,*

Victory Ship Cargo Manifest C

Below Deck Cargo

C Rations, 102672 cartons(1) (1815 tons)
Locomotive, Steam, 5(2) (500 tons)
Rail, 30 lb(3), 18 ¾ miles, 30 km (2075 tons)
Rail Ties(4), 18 ¾ miles, 30 km (2250 tons)
Rolling Stock, Assorted, 55(5) (1100 tons)
Stores, Railroad, 212 crates (1067 tons)
Telegraph Equipment(6), 112 boxes (25 tons)
Tools, Locomotive, 175 crates(7) (652 tons)
Wire, Telegraph, 312½ miles, 500 km(8) (75 tons)

Deck Cargo

Flatcars, Narrow Gauge, 8 (160 tons)

(1) 8 Ration Packs per Carton (3 meals per pack).
(2) Narrow Gauge (3'6") 2-6-0 Locomotives.
(3) Narrow Gauge (3'6") track.
(4) Wooden ties, 1125 per kilometer.
(5) Narrow Gauge (3'6") Flatcars, Boxcars etc.
(6) Morse Telegraph equipment.
(7) Machine tools for Locomotive maintenance, they also have limited construction capacity
(8) At 113 kg per kilometer/400 lbs per mile

Note: Some key items of equipment needed to allow the above materiel to be used, either effectively or at all, are *not* included in above manifest and would have to be manufactured locally. These include telegraph poles (easy enough to procure in most places) and insulators (rather more complex) for the telegraph equipment and, of course, the coal for the Steam locomotives.

LANDING SHIP, TANK, TYPE 2
Length: 327'9" (~100 m)
Beam: 50'1½" (~15¼ m)
Draft (Seagoing): 14'1" (~4.3 m) aft, 8'3" (~2.5 m) for'ard.
Draft (Beaching): 9'6" (~2.9 m) aft, 3'1" (~0.93 m) for'ard
Displacement (Full Load): 4080 tons
Displacement (Beaching): 2100 tons
Cargo: 1600-1900 tons (sea), 500 tons (beach)
Speed: 10-11½ knots
Endurance: 19000 nm @ 10 kts (full load), 21000 nm @ 10 kts (empty), 23000 nm @ 8½ kts (607 tons fuel, beaching; additional 890 tons, full load; 10 tons/day @ 10 kts plus generators; 2 tons/day @ stationary, auxiliary power only)

Propulsion: 2 x GM 900 hp diesels, two shafts, twin rudders.
Generators: 3 x 6 cylinder diesels producing 100 kW at peak load.
Vehicles: 2 or 4 x LCVP.
Armament: 2 x Twin 40 mm gun mounts w/Mk. 51 directors; 4 x Single 40 mm gun mounts; 12 x Single 20 mm gun mounts
Crew: 7 officers, 104 enlisted
Troops: 16 officers, 147 enlisted

The Vehicle deck is 262' long, but has a "hump" aft of the bow ramp to prevent bow door leakage entering. Maximum vehicle height at the hump was 11'3", though for most of the vehicle deck the overhead was a minimum of 12'.

The Vehicle and Weather decks combined could take up to 70 trucks of varying size (the entire Weather deck had a maximum load of 130 tons).

The Vehicle deck could take 29 2½ ton trucks or Halftracks or 22 DUKWs (or 20 M4 Sherman Medium, or 39 M3/M5 Stuart Light tanks or 17 LVT Amtracs).

The vessel also has space for 21 tons of galley supplies (90 days worth).

Seakeeping qualities were poor and, coupled with the design intention of a short life expectancy *plus* lots of hard use meant they were rarely in top condition.

presumably, some small arms kept under the control of the Commanding Officer, with limited amounts of ammunition – perhaps slightly more so at wartime manning levels than at the reduced peacetime levels that they are normally manned at.

*A more conventional **civilian** container vessel may carry more containers (4000 plus, for some), but may not be able to unload them efficiently – or, indeed, **at all**.*

*Which might force your **Displaced** community to do some hard work and fancy thinking to get access to the goodies they can read about in the vessel's manifest. And what's the likelihood that the **very most important** stuff is **right at the bottom?***

LOCOMOTION

This could be a variation on the *Trucker Convoy* theme, except the cargo containers (or Boxcars, in pre-container times) on the train shunted into a local siding contains the same Christmas stocks being shipped to a regional *Distribution warehouses*.

The difference is that the cargo train consist is *fifty* 40' containers, carrying *2000 tons* of cargo – and that the cargo is more "concentrated." That is, each container tends to be loaded with the same sort of item – so if you have a consignment of Freeze Dried Rations, there will be at least a whole container load (40-50 *tons*) of the stuff.

Of course, a considerable proportion of the cargo will probably include a variety of industrial products – subassemblies intended to be part of larger, more complex, products or simply unitary components (for example, wire of various gauges, screws and other fasteners, nails, industrial and domestic piping and, well, pretty much anything you can think of).

There is also the added bonus of the locomotive (perhaps two if the line was running through rough terrain and more power was needed), the rail line itself, any switching equipment, telegraph/telephone wire and so on.

If the *displaced* community is *really* lucky, then perhaps the siding is part of a long abandoned spur line which provides even more rail and related equipment that can be recycled to their advantage.

RESOURCES
BURIED AND NOT SO BURIED TREASURES

Mining (and resource gathering in general) is tough, dirty, and dangerous – and isn't anything your players would care much about under normal circumstances.

Displaced campaigns aren't entirely normal – even for role playing games, as they involve integrating at least the *idea* of resource management into play at *some* level.

Which means mining is something that has to be taken quite seriously if the players want to have access to any of the goodies that players *really*, *truly* like to possess – the best weapons, the fastest vehicles and the neatest technology.

As noted in previous chapters, until the Renaissance, and quite late even then, mining was generally done on a small scale, with minimal equipment, and was limited to sites above the local water table even when they did excavate shafts in pursuit of ore bodies rather than rely on shallow surface workings.

Gunpowder made it easier, and the Steam Engine did more to allow it to expand, but these were almost chicken and egg developments.

Getting there from the start required the resources that you were actually trying to mine *before* you mined them! In most cases.

What *actually* happened was some *very* expensive bootstrapping coupled with some damn good luck.

Early "industrialisation" often occurred in places where there were, purely by happenstance, a closely co-located selection of key industrial resources.

These fortunate locations rarely had deposits that would even be noticed by modern geologists looking for massive ore bodies to fuel the maw of modern industry ... and if they *did*, it would only be to reject them out of hand as being too small to be economic.

Of course, that is *now* – *Displaced* is all about *then* (or, with alternate dimensions, *there*).

NATURALLY SPEAKING

Some key resources are found, sometimes in quite large amounts even by today's standards – and *certainly* in large amounts by the standards of pre-modern societies – in nature.

Some of these deposits played an important part in the development of several pre-modern civilisations.

NATURALLY METAL

Most people probably think that gold is the only metallic element that appears in a pure state in the environment – but this is entirely wrong!

GOING NATIVE

Copper is *also* found in nature in its metallic form – often in large chunks, even boulders!

The well known deposits in Michigan's *Upper Peninsula* (USA) are a case in point (the largest known "nugget" of native copper found came from there, and weighed in at ***400 tons***), and the copper there was widely used by pre-Colombian Indian societies throughout the US.

Relatively speaking, native copper deposits are rarely large, however, and those that remain are simply not economically viable to mine – it is actually cheaper to mine and process tens of thousands of tons of low grade ore because of economies of scale.

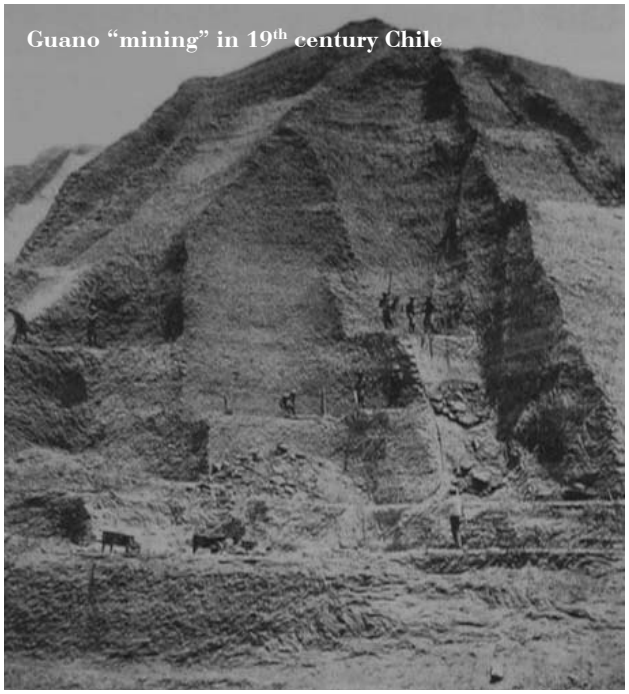
However, to a *displaced* community, being on or near a deposit of native copper would be a godsend as it attempts to develop a modern industrial economy.

Since the late 1770's the Michigan deposits as a whole (not all of which were native copper, of course) have produced around 6 million tons of refined metal.

A TIN EAR

The natural companion, historically speaking, to Copper was *Tin* – the earliest copper smelting was unable to produce pure copper and, as a result, it gradually

A nugget of *pure* native Copper


Guano "mining" in 19th century Chile

dawned on the smelters that the addition of some impurities made some coppers stronger than others.

These were, in fact, largely bimetallic alloys where copper was the larger proportion – the best of these, from a mechanical point of view, was an alloy of anywhere 5-10% tin (the very earliest bronzes) to 40% tin (modern bronzes).

The problem with tin is that deposits are not widespread – the first Bronze age in the Middle East effectively collapsed late in the second millennium BC because, it seems, all known local sources of tin had been exhausted and tin had to be imported from, it is thought, as far away as Thailand/Burma and Cornwall – with Bronze Age transport technology!

Hence it would be quite useful for a displaced settlement to either be dumped on a source of tin or for one to be displaced with it.

Most tin mining, even today, is of alluvial deposits, as the ore (cassiterite) is hard enough to make it expensive to process, and alluvial deposits could be justified just about anywhere as part of a displacement scenario!

Note: Bronze won't strike a spark when hit against metal – perhaps important if the characters or their industrial base want to get into ***gunpowder*** *production!*

No shit, Sherlock

Want a way to boost local agricultural production in the course of a single year?

Interested?

Even ancient and medieval farmers knew the answer to this one! ***Shit*** *... and lots of it.*

In the ancient and medieval west the problem was that there simply wasn't enough of it ... not *animal* manure, anyway, and there was a cultural thing about using *human* waste (possibly because *composting* was not understood and this meant that human originating manure was, by its very nature, full of human pathogens ... only *proper* composting achieves a high enough temperature to kill these off).

Since agricultural productivity was so low, keeping lots of animals competed for agricultural land needed for (and more efficient at) feeding humans.

This meant that animal stocks were, by necessity, far too small for any real use of fertiliser – though what *was* available was hoarded and used like gold.

Sure, you can introduce the use of *proper* composting – but that would take a while to get over the aforementioned cultural inertia.

So what is the next best (by far) alternative – ***guano!***

Bird droppings, preferably deposited in a climate with little rainfall (rain tends to either wash the droppings away *completely* if there's enough of it or, if there isn't, it *leaches* the best nutrients from the guano), in fact.

With the discovery of huge deposits (mostly along the Chilean coast) during the 19th century *and* the discovery that it was damn near the perfect natural fertiliser, there was at least one *war* fought over it.

Historically the use of guano fertiliser increased crop yields (already high as the *agricultural revolution* progressed) by 30% to as much as *300%!*

With pre-modern agricultural technology, the same sort of increases would be expected on a lower base ... and would seem little short of miraculous to the recipients of such shitty largesse.

So, perhaps the *displacement* effect dumps a guano island ... or section of guano plain ... on or near to the displaced community.

This immediately gives it a huge trading advantage – one that will need to be protected from locals who will see it as a huge temptation.

This brings us to the other use of guano – it can be processed, relatively simply, into *potassium nitrate*, one of the components of *black powder* – and the component that was, historically, the most difficult to source (and competed with agriculture in this respect).

So a lot of shit would, paradoxically it might seem, give

the displaced community a lot of "shit" in return!

Seeping giant

Petroleum products are likely going to be vital to any *Displaced* group of any size – keeping their vehicles and other internal combustion or diesel engines running gives them a vital technological edge.

While it is *possible* to create fuel from organic sources, the *quality* and *quantity* that can be procured from those sources is not always going to be enough, except as a stopgap.

So there will be a need for petroleum products – and many players will assume that they simply don't have the technology to drill for them in the way that we commonly do today. They'd be right.

However, petroleum products have been used for a variety of reasons by civilisations dating back to the very earliest ones ... and by cultures at no better than hunter-gatherer level.

They didn't drill for it as we do today, so how did they get the stuff in the first place?

Easy. Geology.

In some places oil bearing formations are close enough to the surface that natural fissures and fractures in the rock formations mean that the oil actually seeps out *naturally!*

Many of these sites are underwater and, therefore, of little use except as a sign that there is oil to be drilled for *if you have the technology to do so*.

Of course, there are sites on land where the oil, in one form or another, seeps to the surface – think the famous *La Brea Tar Pits* in California (USA) for a start.

The very first civilisations in the Near East used naturally occurring tar/bitumen to seal pottery at the very least and many civilisations had were able to do some crude refining of material from such seeps to gain small amounts of flammable liquids.

Such seeps can "produce" anywhere from several hundred to several thousand (or more, perhaps) barrel equivalents *per day* – and even with the crude refining methods a *displaced* group will be likely limited to, this will provide a significant source of petroleum fuels and lubricants, as well as chemical feedstocks.

No one is entirely certain, but it seems very likely that the late (Eastern) Roman Empire's ***Greek Fire*** *was based on crudely refined natural petroleum products.*

If the Romans could do it at their technological level, why can't a displaced group?

Estimates of the rate of seep for the Gulf of Mexico fields is around 140,000 tons per year – for a vast oilfield, of course. The Coal Oil Point seep in California produces an estimated 150 barrels per day, on the other hand.

In areas of oil seepage, as noted, the oil bearing formations are close to the surface – the Chinese "drilled" wells to such deposits very early in the classical period (c. 350 AD) with nothing more than bamboo poles tipped with iron bits to depths of c. 250 meters!

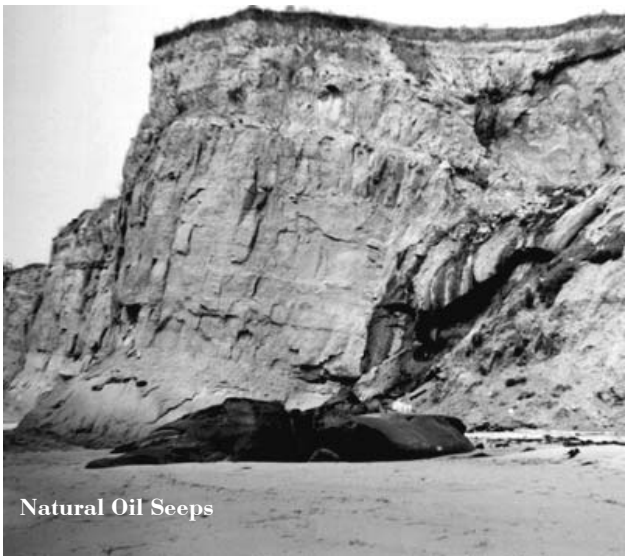
If you don't believe the Chinese records, Marco Polo witnessed the Persians hand-digging for oil at depths of up to 35 meters in the Baku area during his travels in the mid 13th century AD.

Likewise, the first oil well in the US was drilled in an area known for its oil seeps and used extremely crude technology – and oil was "struck" at quite a shallow depth (20 meters) but oil wells had been drilled in Poland some years before at depths of 50-60 meters.

If the players are ***displaced*** *close to an area with natural oil seeps they are likely to be able to produce some petroleum products very quickly, even with minimal levels of technological investment.*

One important factor to note is that, even though there are a number of very well known, *very* large, oil producing areas in the world, many *smaller* ones – often *much* smaller ones – were the mainstay of early production.

Most European countries, for example, prior to WW2 had small oilfields producing part of their domestic requirements (and it was seizing these that made the Nazi blitzkrieg partly self-sustaining until they overextended themselves by invading Russia).



Natural Oil Seeps


The Hoba West Meteorite

There is, therefore, a reasonable chance that a *displaced* group can make use of such locally significant resources.

Unnaturally Speaking

Not everything the *displaced* could end up in the way of resources with needs to be *natural* (though the *really* unnatural stuff will be dealt with in the chapter on ***Uniquities***), at least not in the sense that it the result of ordinary terrestrial geological processes.

Meteoric Success

If the *displaced* group has been transported to a time and/or place where they cannot easily access iron or do not initially have the technological base to produce (or, perhaps, the geological knowledge to recognise its ores) it, then there *are* alternatives ... *meteoric* iron.

The largest known iron meteor was the *Hoba West*, found near *Grootfontein*, South Africa and massing 60 metric tons.

The second largest, *Campo del Cielo*, found in Argentina, and masses 37 metric tons. The third largest is the *Ahnighito* found in Greenland and massing just over 33 tons.

There have been claims that a much larger nickel-iron meteorite has been found (and then lost) in the sands of the Sahara in *Mauretania*, which, if the stories and descriptions are not mistaken (100 meters long and 40 meters high!) or fanciful, must mass *thousands (perhaps **tens** of thousands)* of tons.

Iron from these meteorites was worked by ancient peoples, *even in the stone age*, though its use in anything other than jewellery or amulets before the advent of civilisation is uncertain at best. Certainly the first examples of meteoric iron *weapons* date back to ancient Egypt.

Such artifacts were not, as far as we can tell, smelted ... they were hand hammered from the meteor.

Modern types, even those with limited access to technology, should be able to manage to at least smelt the iron which, as it is normally mixed with some nickel, means that it is rust resistant (which is why meteoric iron tools/weapons from ancient times often survive many millennia or centuries even when buried in conditions that would leave little more than a rust stain from ordinary iron items.

*Of course, there is no particular reason why the cause of (or area affected by) a displacement event need be **originally** on a planetary surface, though it might involve a real stretch of the imagination to believe that, say, a huge nickel-iron asteroid was translated to a planetary surface **by** such an event ... perhaps even with the characters on the mining plant based on said asteroid?*

Stockpiles and Junk Piles

Companies (and nations!) often keep *things*, and keep ***lots*** of things.

This may be because they believe that the supply may be interrupted and, therefore, they need to ensure that whatever it is they need whatever it is for *won't be affected* by such a disruption.

As mentioned elsewhere, this would include the many nations that keep a strategic Oil reserve.

Alternately, it may be that they are simply loathe to throw things away – think of the US and their mothballed WW2 Liberty/Victory ships, or their aircraft "graveyard" (Davis Monthan AFB near Tucson, AZ).

Or think of your local auto-junkyard.

Imagine what a source of high tech items, or even merely recoverable materials, such a junkyard would be! Just the thing for a group of displacees, surely?

UNIQUITIES
IT'S MORE THAN UNIQUE – IT'S ONE OF A KIND!

A *Displaced* campaign has room for all sorts of *weirdness* – after all, the whole basis for such a campaign is that the *cause* is never *really* understood or, in the very least, *entirely* explained (even the GM can leave it unexplained in their own mind).

As noted elsewhere, there is a chance that the "explanation" (such as it is) *isn't a scientific one* – after all, if your *displaced* community ends up in what amounts to a "fantasy" world where magic and (*now* at least) technology *both* work that leaves a *lot* of leeway.

This means that some of what may be available to the players and the *displaced* community can be placed in the class of *uniquities*.

Things that are not *just* weird, but which really aren't even available at *either* the technology level that the *displaced* came *from*, but *also* isn't available at the technology level of the time/place they end up *in*.

It will often be the case that, whatever they are, it is likely that, wherever and whenever they came from, they *weren't* unique – and that they merely represent an advanced level of scientific (or magical) technology *way* beyond that which is known to *anyone*, whether *displaced* ***or*** *local*.

Beyond that, the scope for what they might be is *huge* – and, as GM, you want to carefully consider whatever it is that you decide to give them ... is it likely to be too unbalancing? Care is needed.

Depending on the scale of the campaign, you may decide that ***uniqities*** *are simply* ***superfluous*** *– there's enough manufacturing capacity and resources available such that the players will be faced with privations but should be able to* ***make do****.*

However, if the situation they face is serious enough, even a large and (relatively) well equipped group may require some ***unique*** *help. Just make sure that you don't go overboard – it may be difficult, indeed it may be* ***impossible****, for you to change things once you've gone ahead.*

VON NEUMANN MACHINES

First proposed as a *thought experiment* by mathematician John von Neumann in the late 1940's an eponymous *von Neumann Machine* is a machine capable of reproducing both itself and, by later extrapolation, anything less complex *than* itself.

A ***half vNM*** *would, in contrast, only be able to reproduce anything less complex than itself – it might be able to repair itself, or might depend on outside intervention for such depending on the level of technology it represents* ***and*** *its ultimate purpose.*

Such machines would be a prime candidate for a *Uniquity* – whether technologically based (perhaps on *nanotechnology*, perhaps merely on very complex computers) or based on some other principle, such as *magic* (something like the mythical *Cornucopia*).

Such machines are versatile and could solve any number of problems conceivably faced by a *displaced* group – the problem is that they are potentially *far* too powerful to allow player characters to possess.

As any experienced GM will tell you, if it *can* be abused, PCs *will* abuse it!

So how do we make such technology available and yet *not* allow it to get out of hand?

Some tough ground rules, obviously!

OBVIOUS LIMITATIONS

There are, I hope, some fairly obvious problems that will believably limit the utility of vNMs to manageable levels. Some of the more obvious ones include –

PAYING THE PIPER

What's wrong with this picture?

You need a new widget for your thingumajig, so, of course, you head for the local widget store, waltz in, pick the right size, colour and shape widget off the shelves

A 3D Printer – not *quite* a von Neumann Machine!

Nope – Credit Cards won't help!

and head right back out again.

Could it be the alarms going off as you try to leave without having the eTag neutralised when you pay – which there was no mention of, mind you? Or the screaming sirens of the police cars called by the store owner for much the same reason?

That's what ***I*** would say is missing.

***Everything* has a Cost:** Thing is, we live in a society (even if it's a socialist dysto ... er *utopia*) where there is a *cost* for *everything*.

So, no matter what, ***someone** has to pay*.

That will apply as much for things produced by/from vNMs and/or Cornucopiae *regardless*.

First of all, the manufacturer of the device (if that isn't a meaningless term, given the possible proclivities of a vNM) will want payment *for* the device.

Even if the machines essentially reproduce themselves, then *some* of the resources that they use to do so will likely belong to *someone* – and *they* will want payment for the use of *their* property.

Likewise, the *designer* of the vNM will want payment for the *intellectual property* that the vNM represents – and so will the designer of the items that the vNM *produces!*

Then there's the *opportunity cost* – or the premium you're prepared to pay to get the item *now* (or a reasonable facsimile of *now*) as opposed to waiting in a production queue behind others with a higher priority (or those who have merely made a higher *bid* for prioritising *their* projects – think *time sharing* for either computers or condos, in effect).

Payment: So how do the users of the vNM pay? Well, if you assume advanced technology, then probably by some sort of secure electronic funds transfer.

See the problem?

It is unlikely in the extreme that your *LocalBank (tm) Debit Card* will be compatible with the system, or, if by some miracle it *is*, there is a minimal chance that the funds in it will be represented in the future that the vNM has come from – and, in any case, they're unlikely to be worth very much *in* that future (compound interest is fine, but with government taxes and inflation, you lose every time).

The chance of the machine taking cash money (notes or coin) is minimal – and, as noted, the reality of inflation is such that any coins or notes you have, if they are recognised as legal tender by the machine at all, will have minimal real value.

When decimal currency was introduced locally (1966) the smallest coin was a copper (really a copper alloy) 1¢ coin.

You could actually go to the Corner Store (tm) and get a couple (at least) lollies/sweets for 1¢ then, The smallest value banknote was the $1 note.

Today (2006) the smallest coin is a 5¢ "silver" (really a silvery alloy) and there is not only no $1 note, there is no $2 note either – both have been replaced with "gold" (gold coloured alloy, of course) coins.

*The smallest note is now the 5$ note. You **might** still get a couple of lollies at the supermarket for 5¢. All that change in only forty years.*

*When my parents were growing up in the late 1920's and early 1930's, a **penny** (5/6^{ths} of a cent for conversion purposes in 1966) could buy a **bag** of lollies at the General Store, and the smallest coin was the **Halfpenny** (½d) or, possibly, the **farthing** (¼d).*

*All **that** change in almost 80 years.*

Security: Some people (and most players!) will immediately be looking for ways to subvert the payment system – *hack it*, in effect – so that they can get all they want *for free*.

Step back a moment.

Think about it. How believable would you find the idea of one of the Pilgrim Fathers (or First Fleeters, locally) subverting a modern ATM (sure, the PF's wouldn't try, being honest salt-of-the-earth types ... First Fleeters? *In a second!*)?

Sure, they could blow the damn thing up with enough gunpowder. Possibly. But they'd destroy it in the process – and most likely destroy the contents that they wanted to get at to boot!

These vNMs are from the *future*, and they will incorporate security technology we can only *guess* at.

*With no knowledge of the underlying security technology, let alone of the underlying technology that allows the vNM to work at all, the chances of one of the PCs working out how to subvert it without **destroying** its usefulness (or just shutting it **off**) is, I would strongly suggest, believably nonexistent.*

Gameable Solutions: So, if all the above is likely true – and it is – then how on earth can we get a vNM of any sort to be of any use to the PCs in a *Displaced* game?

There are a number of possibilities.

Even assuming a pretty awful *laissez faire* capitalist future, there would most likely be *some* allowance for what "welfare benefits" – I mean, vNMs theoretically make producing *things* so cheap that "welfare" would be minimal and still allow the recipient to live a reasonable lifestyle *in 20th century terms.*

Impoverished and deprived by *future* terms, of course. – *they're lazy bums who won't work for ...* well, you get the idea.

How would this work? The vNMs could be set to provide only certain staples to the indigent – so, for example, they could provide basic food items to each individual who operated them, free of charge.

Since the cost is essentially nothing (or very close to it) for such items, *any* type of food could be produced – even exotic rarities.

Of course, they would be *machine produced* and this might mean they aren't quite of the quality of the real, natural, product – or it might simply mean that *natural* foods are the preserve of the wealthy in this hypothetical future!

Would the machines be sophisticated to recognise each indigent person and "insist" on rationing meals at the rate of three (or whatever the accepted cultural norms of the future might be) a day?

Or would they merely be set to produce meal size portions of such "basic foods" for each activation? The latter would be more obviously useful campaign wise.

What other "basic products" would such a machine possibly produce for the indigent?

Clothing? Plain and serviceable rather than fashionable. Or maybe, like the food, simply and obviously *machine made* – whereas *human made* clothing is an expensive luxury for the wealthy?

Basic Household items. Basic furniture. Basic electrical items. Probably no better than 20th century equivalents – the cutting edge, state of the art, products would be reserved for the *paying* customers.

*Even with these limitations, this would be a godsend. Basic Household items – Ballpoint Pens and Writing Paper are obviously of use to any literate society (or to any literate group **in** a society); Household Cleaners and Antiseptics, not to mention basic first aid equipment such as Band Aids etc. have obvious public health applications – and this category may include basic "over the counter" medicines such as aspirin etc.*

*Basic Electrical items – **batteries**, even if disposable, would be |obviously useful; Electric Torches, probably LED models; LED/LCD Clocks; Digital Message Recorders. All would be of great value.*

Of course, the vNM isn't going to simply turn out unlimited quantities of these items every day. Why? Well, see the very next section!

Resource Availability

Another problem that you will have to consider is *where will the resources to make the items come from anyway?*

Modern day 3D printers use polymers (and probably other things) built up *one layer at a time* – but the polymers have to be *replenished* of course.

VNMs and the like will *also* need to be replenished regardless of the materials they use might be.

True vNMs should be able to literally mine and process all the resources they need to construct themselves or, indeed, anything less complex.

Domestic (Shopfront) vNMs: For practical reasons it is unlikely that domestic vNMs would have the capacity to "mine" the resources they need to operate (though they would *probably* be able to process household wastes for some *limited* re-use). It simply wouldn't be particularly wise to have processing and mining machines (even nanotech ones) wandering around town looking for unused materials to recycle!

The most likely scenario is that commercial (i.e. *shopfront* machines) vNMs would be *Half vNMs* – and

Palm and DNA Scanners?

would need regular refilling with resources as they exhaust their onboard supplies actually *making* things.

Industrial and Commercial (Heavy Duty) vNMs: *Industrial* level vNMs are *more* likely to be *Full vNMs*, and be sited well away from major urban areas for that reason.

There will likely be some sort of intermediate stage of *Commercial* grade vNMs or Half vNMs which can process household and factory waste fed into them for *some* of the materials used, but which *still* rely on shipments of refined resources in bulk or "cartridges."

*Of course, if you posit that the vNMs are being run by **nanotechnology**, it would not be inherently unbelievable for such technology to be much less destructive in its "mining" processes.*

So there is likely going to be some problem when the ***formal*** "resource tanks" on the machine runs out – except for the fact that you can probably assume that the thing runs in some ways like an inkjet printer.

*Sure, you **can** keep buying those gold plated manufacturers brand ink cartridges – or you can buy some bulk ink and some simple tools and keep on refilling the one cartridge.*

Likewise, why buy the manufacturers brand resource cartridge – just add the right raw materials into the empty cartridge!

What is their Capacity: How *big* an item can they produce, in other words?

Household vNMs aren't likely to be able to produce terribly large items – or not ones that mass a lot, anyway.

What's the largest item that you would normally use in the course of a day at home if there was no need to make "supply runs" to the local store to bring it home?

A kilo or two, perhaps? Probably not much more.

Shopfront vNMs will have more variation (and these will represent *"hobbyist"* vNMs as well), as they should be capable of producing most consumer items short of large consumer durables.

Think something that can produce anything up to the size of a television, say – perhaps 20-30 kilos?

Some will be able to produce larger, but possibly less complex, items such as furniture or internal fittings for houses/commercial premises – perhaps a 100-200 kilos at most.

Industrial and Commercial vNMs will have much larger capacities – perhaps up to thousands, or even tens of thousands, of tons.

However, such *really* large vNMs are likely to be rare even in the future – and, in any case, letting the characters have one (without some pretty severe restrictions on it) ... well, do you *really* want to risk it?

Knowing how players can twist things to their own advantage in ways you simply didn't see coming?

*A good **gameable** maximum is probably 1000-2000 kilos capacity.*

*The sort of thing that you might find the need for at a local Mall (assuming, for example, that they produce something like, say, a Motorcycle on site rather than ship it in from wherever the large **industrial** level vNMs are).*

Third Party Refills: Problem is, the manufacturers won't want you to be able to do *that* (that is, buy the "Third Party" refills or, equally, bypass the refill system entirely and simply use household and/or industrial waste) – so, most likely, the commercial (storefront) grade *Half vNMs* will only be able to use *"brand name"* refills easily.

Any "third party" refills the characters come up with will have to be highly refined and in a form that the machine can digest. Not impossible, but somewhat difficult at the very least!

Industrial Grade vNMs will not be as likely to have this problem – but, of course, they would have cost more in the "real world" that they came from to reflect this.

Gameable Solutions: These are already hinted at. It is likely that *"third party"* refills exist – and, therefore, it is likely that the *displaced* group can probably provide the key components processed *enough* so that

the vNMs can handle them.

The processing involved will be less than would be required to produce the desired end product by a considerable degree, but would still be nontrivial.

Another possibility, perhaps more likely, especially if vNMs are *nanotech based*, would be that the machine would be limited in either *a) the amount of end product it could produce in a single day* **or** *b) there might be limits as to how much material it could produce for* ***indigents*** (i.e. as **welfare**) *per day ...* or there might be a third option, *c)* ***both***.

How this would be determined would be up to ***you***. *The vNMs could have biometric sensors and only provide a limited amount of stuff* ***per person per day***.

However, there would presumably be some sort of default ***disaster*** *setting (more on which below) that would allow bulk items to be produced, but with a limit on value or mass (most likely mass) – which will be further limited by the maximum size (or mass) of a single item that a vNM can produce (see above).*

UBIQUITY

Then there is the issue of *just what are these machines* ***set*** *to produce.*

In the future from which they come they are presumably connected to (or presumably *can be* connected to) the future equivalent of the *internet* and can produce *anything.*

Perhaps you've noted the "slight" problem – since the vNM has been *displaced*, it's *no longer* ***connected*** to that future internet equivalent! So what, *if anything*, can it produce when disconnected?

Onboard Buffers: Realistically? Probably whatever was most recently in its "buffer" – that is, the last thing (perhaps the last *several* things, depending on the size of the buffer!) it was used to produce. This could, of course, range from the completely useless to the moderately useful – but *how* you classify the things such a disconnected vNM can produce would be *extremely* situational.

OK. Say the last five things a disconnected vNM was used to produce are still in the buffer – a bottle of Disinfectant, some "Feminine Hygiene Products", a bright yellow "Rubber Ducky" toy, a deck of standard Playing Cards and a box of 12 Ballpoint Pens (Blue).

What's useful and what's not? "Obviously" the Rubber Ducky us the least useful ... or ***is*** *it?*

It's probably ***plastic*** *(if it is actually* ***rubber***, *so much the better!), which means that it can possibly be recycled into something more useful if the* ***displaced*** *have any sort of industrial base set up!*

How about the Playing Cards, then? Well, depending on the time and place you've been displaced ***to*** *you may well have started a whole new entertainment industry(Playing Cards* ***may*** *have originated in 11th century AD China, but the "modern" deck came to Europe from Mameluke Egypt in the 13th century AD).*

And think of the mischief the PCs ***will*** *get up to with them!*

I hope it's fairly obvious that the Household Disinfectant is probably the ***most*** *useful item listed – for medicine and public health, though I expect that the semi-mythical female roleplayers amongst the audience would dispute this and claim (with some justification) that the "Feminine Hygiene Products" are* ***far*** *more important!*

Personally? My vote would be for the Ballpoint Pens.

Anything that makes writing easier is going to have ***very*** *far reaching effects. Even more so than disinfectant or tampons.*

Dedicated vNMs: Which, really, aren't *true* vNMs – but we'll deal with them as if they are since they will work in much the same way, even though they are more limited.

A *Dedicated vNM* will be set up to produce either a single item *or, less likely, a relatively small range of* related *items.*

These might be used in industrial applications – it is likely that specialisation will still be efficient even with vNM technology – and vNMs that can process large quantities of raw materials (ores, industrial or domestic waste, seawater – whatever) into "cartridges" or feedstock for Shopfront, Commercial and Industrial vNMs would be quite likely to exist.

So, for example, a vNM Processor that can turn any organic material into petrochemical feedstock for other true vNMs would have obvious uses!

In effect it is a permanent fuel supply for your internal combustion engines ***for a start***.

Or a vNM processor that can turn any organic material

Some sort of ID *will* be required

*into a variety of packaged foods. Makes the worst food problems – for the **displaced** community, at the very least – "go away" and may have wider implications.*

Of course.

*The problem of capacity and payment (as discussed in previous sections of this chapter) would still be issues – more likely capacity rather than payment, though, as these units produce the stuff which is then possibly sold by **another** level of the operation. Possibly.*

Military or Exploration vNMs: These are likely to have *extensive* onboard databanks that will allow *anything* the could conceivably be required by a military unit or exploration group operating away from major resupply sources. In fact, the existence of vNMs would tend to eliminate the *need* for a long supply chain for such operations.

Such units will also likely be able to reprocess wastes or damaged equipment for raw materials for their production cycles, though the scale of support they are intended to supply may well mean that they will rely on dedicated processors to supply "cartridges" and only supplement these with reprocessed waste.

*A Military vNM intended to supply high intensity operations (conventional manoeuvre combat operations, for example) would not be able to reprocess waste **and** produce the mass of supplies needed at full efficiency. One intended to support commando or guerilla operations would be more likely to work that way.*

*The problem is that military vNMs would be highly secured and password (or other security means) protected to prevent them from being (mis)used by just **anyone** – after all, they can produce weapons and munitions!*

*Only authorised personnel would have access to them – though this category would probably mean **all soldiers** (you don't want a disaster a la **Isandlwana** where a desire not to damage the cartridge boxes by the QM personnel possibly led to the entire British force being wiped out because they ran out of ammunition when their was actually plenty available).*

*Of course, you'd also expect that any military planner worth their salt would want to make sure a **captured vNM** wouldn't/couldn't be turned against them, too.*

Exploration quality vNMs would probably not have the same restrictions as to who could use them, but would have to abide by intellectual property rules in some way even if there was no "on the spot" cost for operating them.

*Exploration quality (sometimes called **Colonisation** quality) vNMs would likely cost **much** more than standard shopfront models, and probably more than most commercial models.*

Only industrial models would likely be more expensive. Why?

*The simple reason would be that they need to be able to produce **unlimited** quantities of whatever is in their databanks, otherwise they are of limited utility in their intended role.*

*This would mean one of two (or, more likely, a **combination** of two) things – an expensive "unlimited" production license would be part of the purchase price **or** they would be limited to producing obsolete models for which the designer's IP ("Intellectal Property") license had expired. Neither is a particular problem for game purposes.*

*A **third** possibility is that Exploration/Colonisation vNMs would be able to produce a limited number of items free of charge, but would be able to **copy** items brought to them, even to the extent of divining if (and how) they are broken and how to produce an operating copy.*

*There would presumably be some sort of IP protection mechanism to prevent **new** copies of IP'ed items being produced, unless the machine's licensed databank includes the stats, though it should be able to **repair** an IP'ed item with no complaint.*

Gameable Solutions: Military grade vNMs are inherently dangerous to allow players access to – unless *severely* restricted.

Exploration/Colonisation grade vNMs are less dangerous, but still open to abuse, and you need to carefully think of the restrictions that might apply.

*Of course, Military grade vNMs have to be **accessible** – which is, on security grounds, extremely unlikely.*

There are, however, possible explanations for such a vNM to be found in an operational condition – most

*obviously it could be a **captured** vNM that has been **hacked**, which would explain it being quirky and limited in the range and amount of materiel it can produce.*

*Another possibility is a **guerilla** vNM – a vNM designed to be used by stay-behind forces or, equally likely, by insurrectionist forces.*

Such a vNM would produce a limited range of mainly obsolete supplies that would, however, still be of great use in a guerilla or partisan struggle – and if it falls into the hands of the "enemy", little matter, as it can't produce state of the art stuff that might be useful to them!

Exploration/Colonisation grade vNMs would have fewer inherent limitations,

In fact, the main operational limitation for such vNMs is the need to replenish raw material stocks and the total mass they can "manufacture" per day as well as the maximum mass a single item can be.

*Civilian vNMs, well, again, they are probably accessible through "welfare access" **and** for the limited amount of items they can produce from whatever happens to be in their buffer at the time they were forcibly disconnected from their network.*

*If you are feeling generous, you could allow the **displaced** group access to a **Hobbyist** vNM which doesn't actually produce IP'ed designs but which **can** produce anything that a CAD/CAM program (or other similar program for, say, chemical engineering or whatever) can design.*

Again, limitations in availability of "refill cartridges" and the maximum daily throughput capacity as well as the maximum size capacity will have an impact on such a device's utility.

Biotechnology

In a sense, biotechnology from the future is a sort of organic vNM – though one that is probably limited to producing raw materials rather than finished products.

Biotech products have the great benefit that they are likely to be self-reproducing as well as inherently useful.

Food Related Biotech

The most obvious possible biotech enhancements could be made to food crops – consider the difference in productivity per acre of wheat, wetland rice and Maize as the sort of increases that could reasonably be expected.

Biotech enhancements to make the desired crop self-fertilising, disease resistant, insect resistant, and to boost overall yields are very likely ... and of obvious use to a *displaced* group, both directly for themselves and indirectly for their allies.

*The obvious problem is that current practise would suggest that the makers of such products would **try** and make them hybrids that would not breed, or not breed true, in order to force the farmers to buy the seeds (at a premium cost) anew each year.*

*If, however, they are merely IP ("Intellectual Property") protected, then they would breed true **and** be infinitely reproducible as far as a displaced group was concerned.*

*In short, does your group need a "one off" assistance or does it need an **ongoing** boost?*

*Such biotech created crops could be represented by taking the yields of an existing food plant listed in this book and modifying it appropriately **upward**.*

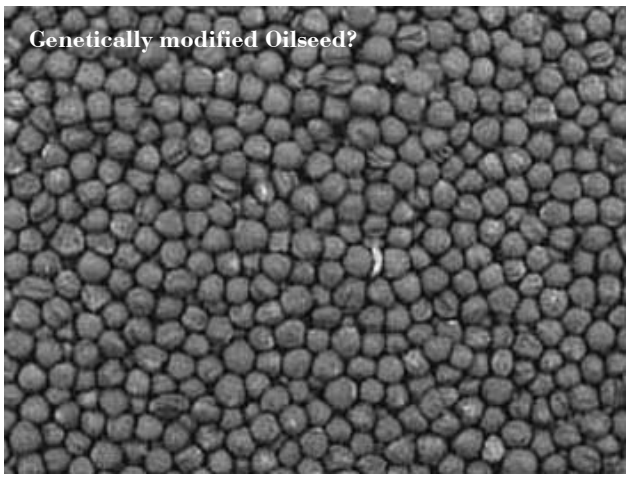
For example, you could take the modern expected output for Maize and increase it in the same proportion Maize output is an increase over Wheat output – but explain that this is because it grows fast enough to have two or three crops per growing season instead of the "normal" one crop.

*Another possible enhancement would be in relation to **edible oil** producing crops – similar sorts of increases in yields could be posited.*

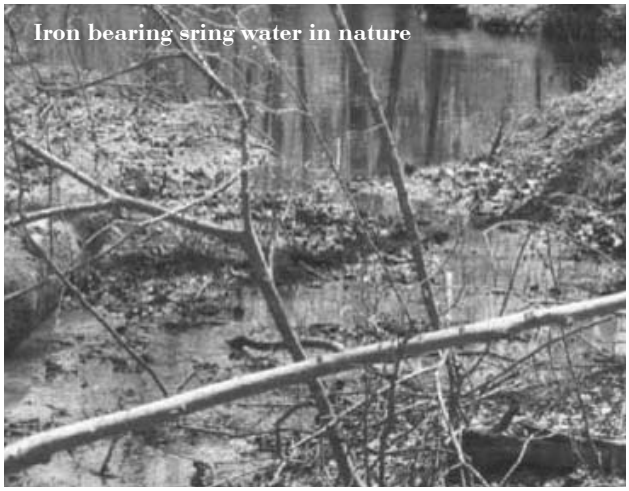
*This would allow the oil produced to not only be used for food, but also to create **biodiesel** in quantity.*

Biotech might even make it possible for plants to produce quantities of complex hydrocarbons that could be used as lubricating oils or fuel for internal combustion engines.

*Or at least you could make a case for it and your players are probably not going to argue to much as it gives **them** an advantage!*



Genetically modified Oilseed?


Iron bearing sring water in nature

Materials Related Biotech

Another possible biotech development would be plants or organisms that extract metals – either as a pure metal or in a form easily smelted.

Historically, the peoples of pre-modern Scandinavia "mined" most of their iron from **bogs** where it was biochemically by the anaerobic bacteria *Gallionella* and *Leptothrix* as part of their normal life cycle reduced from iron rich water (from springs running through iron deposits).

Such deposits (as noted elsewhere) were renewable, but could only be "harvested" perhaps once a generation. Biotech manipulation could change this and make the process an annual – perhaps even a monthly – operation.

Other anaerobic bacteria are known to be able to *attack* refined metals, so it is entirely believable that they could be manipulated in a way that would make them usable in an actual *mining* situation.

Other bacteria metabolise *other* useful things – for example, *Acidithiobacillus ferrooxidans* metabolises sulphur in sulphates (most commonly *iron pyrites*) to form *sulphuric acid!*

Clostridium acetobutylicum was used commercially to produce *Acetone*, *Butanol* and *Ethanol* from starch as part of the chemical production processes for Gunpowder and TNT – though it was replaced by access to cheap crude oil in the 1950's it would still be viable in a *displaced* scenario.

Using *Clostridium tyrobutyricum* you can produce mostly butyric acid from a "bioreactor" (basically a bed of household and industrial waste seeded with the bacteria) and this can then converted into **butanol** by *Clostridium acetobutylicum.*

*Butanol **can** work in **unmodified** internal combustion engines (though it has the same negative effects on some fuel system components as do other alcohols **and** it does best in engines with certain types – or no – computerised fuel control systems) and produces **almost** as much energy as petrol (approximately 91% compared to only 61% for ethanol and 50% for methanol).*

Certain *fungi*, for example *Aspergillus niger* and *Penicillium simplicissimum*, can also leach metals – the two mentioned are good for Copper and Tin, which could make them extremely valuable in a Bronze age *displaced* scenario (and even in an *Iron age* one, as, historically, Bronze remained the dominantly available metal).

Pharmaceutical Biotech

A number of companies and universities have investigated the possibility of modifying both animals and plants to produce a wide variety of pharmaceutical products – from vaccines and antibiotics through to insulin and cancer antibodies.

Many, if not most, of these projects are still in the testing phases, but it is reasonable to assume that some will work – and that transgenic crops or animals could be part of any items transferred as part of a *displaced* scenario.

The exact nature and use of such materials would be entirely dependent on what the GM feels are the *needs* of his players (not their *wants*) and of the background he has created for them to adventure in.

THE MALL

When the characters are *displaced* they eventually take stock of their immediate surroundings – and, lo and behold, there's a structure within the area of effect that *wasn't there when they "left."*

It's a large enclosed structure with several entrances and a large asphalt area surrounding it on all sides.

It's a *Mall!* Maybe the shopping's good?

*Alternatively it may be a **strip mall** – stand alone, of course, with only a half a dozen or so shops and a row of parking spaces out front (and, possibly, the back).*

Simply model whatever sort of Mall you desire on one you and your players are familiar with in your local area.

MALL STATUS

The first thing you need to do is to determine whether the Mall was *operational* or not at the time it was *displaced.*

If it was, then you'll need to determine what stores were located there (easy *if* you model it on a local mall!) and work out a rough idea of what contents they are likely to have.

OPERATIONAL MALLS

The contents – the stock on the shelves and in the (generally minimal) storerooms – is a bonus for the players and their community **if** it was operational.

If it was an **abandoned** (or semi-abandoned) mall, then things are less happy – no bonus stocks.

*It is probably best to have the Mall **displaced** at night, in the wee small hours, so that there will be few, if any, people displaced with it – and the few security personnel and shelf-stackers can be assumed to have had time to flee from the event, so its **all yours!***

This means that there are likely to be very few vehicles in the parking areas – but still some – and, of course, there may well be semi-trailers and delivery vehicles which were caught in the loading bays in the process of restocking their specific store – their contents are valuable as are the vehicles themselves.

However, the real treasure – if we assume that it is from a time and place where VNMs exist, will be the vNMs in the stockrooms of the stores in the mall.

These will almost all be storefront vNMs and will probably fall back on emergency programming when cut off from their controlling network.

*As noted elsewhere, this will probably mean that the vNMs will be limited to producing whatever designs were in their onsite databanks at the time they were cut off (which will depend on your decision, based on what sort of store it was) – and other limitations relating to the Intellectual Property of the products may apply (of course, very basic products **probably** have no **current** IP rights attached and it would be possible to produce them in whatever quantities you desire ... over time).*

The vNMs will also probably require electric power to operate, but it is reasonable to allow as how the Mall has an Emergency Generator that has its own biomass converter that allows it to make its own fuel – enough to keep the vNMs running for part of the day at least.

How much each vNM would be able to produce per day and the size/mass of the largest item they will be able to produce will depend on your decision again.

The amount of goodies a Mall can generate will depend *entirely* on your judgement of the initial and ongoing needs of the *displaced* group – and how easy you want to make things for them.

Small groups should probably only be presented with a *Strip Mall* with a capacity of maybe a 100 kilos per day, perhaps double that if they can provide refined raw materials for the vNMs and/or the electrical power needed to run them 24/7.

*Remember, shopfront vNMs are almost certainly not self-repairing – they **will** break down/wear out.*

A reasonable expectation would be 5-10000 hours MTBF (mean time between failures) – perhaps a year's operation 24/7.

Or possibly they have a counter showing the maximum kilo throughput – at 100 kilos per day for three years of 8/24 operations, that would be around 36 tons.

If you run the machines 24/7 you'd get triple that, around 100 tons, but they would break down around that mark give or take – perhaps sooner, as this would exceed their normal operational parameters.


The customers could almost be back any moment

However, it is likely that storefront vNMs will be like the Print on Demand process for books.

Most of a store's stocks will come by regular shipments from regional vNM centers and the storefront vNM will only be expected to make up shortfalls **or** manufacture items it is not normally worth the management's time to have in stock.

*For example, a Hardware store wouldn't be likely to stock a mid-sized electrical generator ... sure, it has **small** ones on hand (1-2 kW or so); **large** ones (100 kW and bigger) come from the regional vNM center.*

But if you want a 20 kW gennie set, then the plans may be on file for the store's shopfront vNM.

*An Electronics store will probably have the usual Mobile Phones, Walkie Talkies and CB Radios – but wouldn't be likely to have a Ham Radio set on the shelves. But their Shopfront vNM **might** have the plans for one on file!*

Larger Malls will have more vNMs and those that they do have will have larger capacities, which makes them suitable for a moderately to *very* large displaced community.

Even so, it would probably not be wise for all except the largest to have access to more than 1-2 metric tons of capacity per day, assuming 8/24 operations (or triple that for 24/7 operations).

*The idea of allowing characters and their community access to vNMs is to allow them a **small** capacity to build or repair mission critical technologies for a period longer than they could normally be expected to last after being cut off from a source of spare parts.*

*It is **not** meant to be a smorgasbord of goodies that will allow them to easily run roughshod over their local competition.*

*Because of their strategic value, the PCs will **not** be likely y to have unfettered access to the output of the vNMs – they will have to make submissions to whatever controlling body their community is run by and try and justify why **their** needs should be given access to such a vital, and not entirely renewable, resource in place of those projects that the **controlling body** has deemed to be important.*

Dead Malls

If it the Mall was an **abandoned** (or semi-abandoned) mall, then things are less happy – no, or much reduced, bonus stocks.

Like an operational Mall, it is best to assume that any personnel who might have been in or near the dead mall when it was displaced had enough warning to flee.

Dead Malls will have no goodies on the shelves – but some of the shopfittings may be worth something.

The smaller shopfront vNMs will probably have been removed from most stores – but those most recently abandoned (especially if they went bankrupt rather than simply closed down and moved) might still have them installed.

The same limitations and problems would apply to Dead Malls as are discussed for Operational Malls, but it is likely that they will have lesser capacity.

*However, since the vNMs that they do have will probably be older models, and their databanks will probably contain only older items the IP rights on them will possibly have expired. This **could** mean that the displaced community would have **less** restricted access to whatever it is they **can** produce.*

Down on the Pharm

It just happens that one of the local farms (if your community is large enough!) is a corporate/university co-effort run by *SomeBigUniversity* and *Biologicals R' Us* (or whoever) – it may even be the case that the farm was, in fact, co-located with the experimental center that "malfunctioned" and caused the *displacement* (in which case, the community may consist of whomever happened to be on the site at the time).

The facility is *partly* experimental and *partly* an operational testbed – or even a specific source for seed grown for pre-release "sales" and so has a variety of projects running at any given time.

Some or all of these may be of direct, immediate, use to a *displaced* community, while others may have more long term implications ... depending on what *you*, as GM, determine is available.

Old MacDonald's Farm

This is a more or less "traditional" operation that grows crops for food and other commercial needs

rather than some of the more exotic possibilities.

The crops that are being grown and/or developed here might include some or all of the following –

- **Olive Trees** that bear a full sized crop *every year*, consistently (rather than one full sized crop every *other* year) *and* which reach commercial maturity for crop yields in *three to five years* rather than the more normal *fifteen to twenty years*.

  The actual oil yields from the fruit has also been increased by 20-50% over the standard per hectare rates listed elsewhere in this book.

- **Nitrogen Fixing Wheat** capable of being grown year after year in the same field without exhausting the natural nutrients in the soil, in the same way as wetlands Rice can be grown. This could equally well be Barley or some similar crop with the same sort of yield increase over base levels.

  In pre-medieval times/places, where half of the arable land had to be left fallow every year, this means an automatic 100% increase in harvest size as *all* the land can be planted *every* year.

  In medieval times/places, where *one third* of the arable land was left fallow every year, this means an automatic 33% increase in harvest size every year for the same reason.

  A possible variant could boost crop yields by 100% *on top of* the above increases providing its own fertiliser as does rice, whereas low medieval and pre-medieval crop yields were as much because of a lack of manure as much as anything else.

- **Fast Growing** crops which, in a typical temperate (Western European) climate, can grow two full crop cycles per year and, in a mediterranean climate (with sufficient water) at least three cycles per year ... or a *minimum* of one crop cycle more per year than is *currently* possible for that crop.

- **Insecticidal Crops** which produce natural, but harmless, pyrethrum analogs targetting harmful insects, killing *them*. A particularly valuable development in a *displaced* situation where the availability of insecticides will otherwise be *extremely* restricted – if any are available *at all*.

  This would provide a 10-25% boost in crop yields for classical and medieval periods and *also* close to total immunity to events such as locust plagues.

- **Self Fermenting Grapes** which says it all! The grapes actually ferment internally and, when harvested, already consist of 3-5% alcohol by volume.

  Not intended for making "instant wine", these grapes were intended as a way to produce economically viable alcohol for fuel or chemical feedstock purposes – the possibility of "instant wine" *might* be achievable, though ... of course, you might well get "instant rotgut!"

  *A variation might be a geneered bacterium that is much more efficient than natural types in converting starches into alcohols suitable for use as fuel. Perhaps it is even capable of breaking down **any** decaying plant matter and turning it into quantities of alcohol? Just be careful to ensure that it doesn't spread **too** easily and that it only works in a **controlled** environment, or you might have problems!*

- **Plastic Maize** (**Sweet Corn**) are two complementary crops capable of producing commercially valuable plastics in large amounts, all in an easily processable form as part of the inedible husk, while leaving the kernels recoverable for food.

  The plastic so produced is a *thermosetting* plastic that needs only to be powdered, the two sorts mixed and moulded, and then left to cure.

These are merely crops that either exist or could *reasonably* be seen as a commercially viable line of research.

The farm also has a standard collection of farm vehicles and farm equipment which have been converted to run on gasohol or biodiesel produced by the crops grown there and, of course, has sufficient processing and storage capacity to create enough fuel from them as needed.

Old McDonald's Ranch

OMR specialises in raising transgenic or biomodified animals, though it may also grow a sideline in some of the biomodified crops mentioned above, mainly as feed for the animals.

Like Old McDonald's *Farm*, the Ranch has some capacity to process the materials produced by the animals that are raised there.

The animals that are being raised and/or developed

here might include some or all of the following –

- **Insulin Producing Pigs** genetically modified to produce human insulin in viable quantities.

  While this may not be directly useful to the *player characters*, it could have interesting ramifications in dealings with the locals (assuming that Type I, insulin-dependent, diabetes was *at least* as common in the past as it was in the early part of the 20th century).

- **Antibiotic Producing Milk Cows** which produce antibiotics in their milk which can then either be consumed directly *or* dried and stored for later use (and, coincidentally, increases survival rates for their calves as well as yields – though eventual antibiotic resistant strains of common diseases of cattle will be bred as a result of the "always on" nature of the production).

  It is possible that there might be more than one sub-type of such cow, each producing a different strain or type of antibiotic, and kept (of course) in separate herds – or that *cows* might not be the animal being used.

  Goats might be preferable under some circumstances, being generally hardier and more able to forage widely – though, as a downside, producing less milk.

- **Blood Pigs** which are transgenically modified to produce human compatible Type O Blood to supplement available blood donors.

  Sooner or later you're going to have fighting, probably beyond any level that you're going to be able to store blood products to support, given the technology restrictions. And your population will only have so many donors.

  Sometimes it will be *damn* handy to have a "reserve" supply available that you don't have to worry about draining dry – you can *eat* it once it's been "emptied"!

- **Disease Resistant Strains** which could be of *any* commercially valuable animal, bred with a resistance to common diseases afflicting their breed, whatever they might be.

  Unfortunately, as with human diseases, there is no guarantee that immunity to *modern* diseases will necessarily provide immunity to *pre-modern* diseases of the same species, as they mutate and change over time and new strains develop while old strains disappear.

  If that is the case, and it's likely to be *at least some of the time*, then these animals might be only *partly* protected ... still, it's better than *no protection at all.*

- **Modified Organisms:** Self-shearing sheep, for example – the wool actually *sheds*, as a whole, at the end of the growing season, meaning it can be simply pulled off rather than needing to be shorn off, is one obvious possibility.

  Normally horned species that have been geneered to *not* have horns grow on maturity, saving veterinarian costs in having to have them polled.

  Wool or hair producing species that have been genetically modified to produce coloured wool or hair (other than the normal cream/white, black and brown) – which saves on the use of chemical dyes.

Campaign Home

"Home is the place where when you have to go there, They have to take you in."
– Robert Frost

"It's when you're safe at home that you wish you were having an adventure. When you're having an adventure you wish you were safe at home."
– Thornton Wilder

"Ah! There is nothing like staying at home for real comfort."
– Jane Austen

"My home is not a place, it is people."
– Lois McMaster Bujold, "Barrayar"

When you go there
They have to take you in

***Home** (noun) a house, apartment, or other shelter that is the usual residence of a person, family, or household; the place in which one's domestic affections are centred.*

– Random House Unabridged Dictionary, © Random House, Inc. 2006.

All campaigns require a base of operations – somewhere the characters can at least *feel* safe and comfortable and which, of course, they will inevitably *work* to **make** so.

Not all *Displaced* campaigns will start with the characters *at* their homes – especially (but not exclusively) small groups.

They may be travelling – *to* or *from* work, for example, or, perhaps, merely on *holiday* – or they may be *at* work when the event occurs.

They may be able, if the group is large enough and the facilities they are *displaced* with are adequate, be able to *make* a home out of wherever they are. Or they may need to move themselves and their equipment somewhere *else* – either close by, or, perhaps, a considerable journey distant.

Regardless, as the dictionary definition indicates, they will eventually come to have or require a place where their "domestic affections" are centred ... and, just as importantly, where the vital modern infrastructure they rely on to support their activities will be based.

Basing your Operations

The easiest option is to have the *displaced* scenario you create arrive with their own support infrastructure – an entire small town or circumscribed part of a larger town or city would be the optimum (as discussed elsewhere), though an industrial estate or research facility during normal working hours would be almost as good.

There are, however, some problems that you need to consider –

Power

Most small towns do not have an independent power supply, unless they are *really* isolated ... *really*, *really* isolated ... they are normally connected to a wider (statewide, perhaps nationwide) electrical grid.

Unless your particular situation is quite unusual, it is most unlikely that there will be much in the way of emergency power generation facilities, either.

The local Hospital, if there is one, will *probably* have a generator with sufficient capacity to allow *minimal* operations – just about enough to finish whatever surgery they might be in the middle of and then to transfer the patients to an unaffected facility is the most likely situation.

In the US, some older government (even local government) facilities *may* have generators dating back to the cold war era, and maintained (or not) simply because they are *there*.

Some businesses *may* have emergency power supplies (internet companies offering secure server backup, for example, freezer storage companies, and some industrial operations where damage could result to the plant if power was cut off).

The reality is, however, that if they *do* have emergency power, the generators are rarely 24/7 rated – they cannot be expected to provide a full and continuing baseline load – *and* they will rarely have more than a day or so's operations worth of fuel storage.

Since pretty much *everything* that you need to have operational to make your *displaced* scenario viable needs power to keep it running long enough for it to be able to provide *alternative* generator capacity, this is a considerable problem.

Fuelling the Generators

Then there's the related issue of *what do the generators run on?*

It is unlikely that your typical small town has a hydroelectric plant or coal burning thermal, for a start – if they have any sort of local power supply at all.

The most likely answer is that they have *diesel* generators – and requite diesel fuel.

If the town has its own independent of the grid diesel power plant, then it likely has at least a week's worth of fuel for 24/7 operations, perhaps several weeks. No more.

It is unlikely that this supply would provide enough

capacity for the town to be able to kludge together some sort of replacement, alternative, fuel supply.

Maintenance and Repairs

This is also a serious issue. The larger the generator plant the less likely it is that locally available industry (either existing or creatable in a realistic time frame) will be able to manufacture *all* of the required parts.

Diesels can probably be repaired and rebuilt more or less indefinitely by a moderate sized industrial base, if fuel can be acquired for them.

Large Thermal or Hydro plants will have a stock of critical parts – smaller ones anyway – and one can assume that you will probably get a year or two's worth of operations before something *large* and critical breaks down and cannot be replaced.

Even then, of course, this may only affect *part* of the generation capacity – hydro plants have more than one turbine, for example – but *eventually* the whole shebang will irrepairably break down.

Even alternative power plants (with the possible exception of solar panels) will suffer from the same problem – eventually, key and irreplaceable parts will break down.

Nuclear plants will are somewhat more problematic – they will notionally last at least as long as thermal or hydro plants, but the consequences of a catastrophic breakdown are *nasty* – and there will be a real temptation to run them even when they are no longer entirely safe.

In the meantime the *displaced* had better get alternative power generators up and running.

Solutions

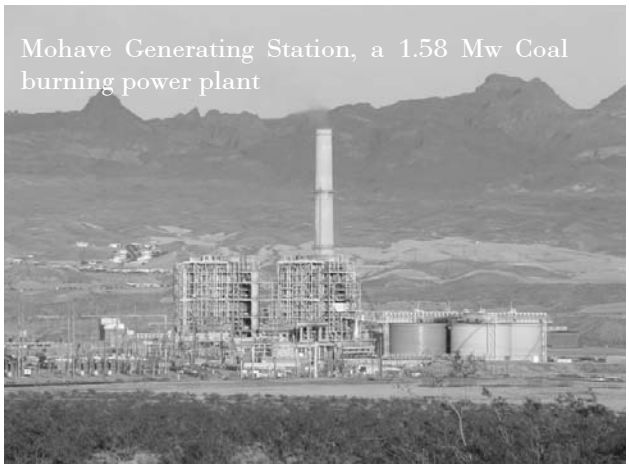
What are some possible solutions – some **believable** solutions?

- **Hydro and Thermal:** Most large power generation plants are situated well away from major population centers. So, perhaps, the town *does* have a hydroelectric plant/dam close by, and included in the area *displaced?*

  Or maybe it has a thermal power plant (coal fired) that is also close by?

  There are problems with both these "solutions," however – the *displacement* effect may not provide the dam with a link to the required runoff to keep it filled.

  Indeed, it may be that the dam is now located in such a position as to *drain* it quite quickly.



Mohave Generating Station, a 1.58 Mw Coal burning power plant

Coal fired power plants are not *always* co-located with coal mines.

Which means that whatever coal there is in their stockpiles is *it*, given the severe unlikelihood of there being an *operational* coal mine of the required capacity nearby to where the plant is *displaced* – and there is even less likelihood that there is an existing transport infrastructure to move coal in the required amounts anyway.

Still, it is *possible* that the dam might just happen to be fed by local rivers or for your thermal power plant to actually be close by to an existing *displaced* coal mine.

- **Nuclear or Fusion** plants could, theoretically, be *displaced* along with a nearby small community and have the advantage, in the former case at least, of having at least a year's supply of fuel onboard, maybe more if run at reduced capacity.

  The problem is that not all countries have a nuclear power program (for a US based campaign this is less of a problem, of course).

  Fusion plants, since they don't currently exist, are more problematic in some ways – presumably they need more high tech support (more on which below) and less so in others – they could presumably operate for at least as long as a typical nuclear plant and not have the problem of radioactive waste as an undesirable end product.

- **Alternative Energy:** Many governments around the world are showing an interest in alternative energy sources – especially those that use renewable and non-polluting energy to run – and they support research projects into such power sources.

  These research projects are often at a stage where they are being tested for economic viability and, to do so, they are often located in relatively out of the way places – like small towns – where they are

intended to provide part or all of the baseline power on an experimental basis.

Thus, when the normal connections to the Electricity grid are cut by the *displacement* event, they will be able to automatically step in and carry the load – or, perhaps, some work will be needed to hook them up to the local grid.

What sources are likely to be under test? Wind power turbines? Tidal Power turbines? Geothermal steam generators (a thermal plant with no coal)? Solar turbines or Solar Panels? These are just *some* of the possibilities.

Fuel and Transport

The mater of *fuel* has been discussed in some detail elsewhere – and it is a major problem.

Though, with rationing, it is likely that *some* vehicles could be kept operational long enough for the community to develop alternative fuel sources, as described elsewhere – assuming they can maintain some sort of power supply to keep their "industry" running.

Rural communities and industrial facilities are likely to have larger fuel stocks than your typical suburban agglomeration – so your planned *displaced* community should be planned with this in mind.

The other, connected, issue is one of access to *transportation* – not just personal transportation, which will be a big issue in car-oriented societies, but also the transport *infrastructure* needed to move raw materials from where they are produced to where they are needed, and then to move the finished products from the factories to the stores.

It is unlikely that your community will be *displaced* just right smack-dab in the middle of existing transportation networks – or, if it *is*, that those networks will be up to the demands that your community will be placing on them.

Unless it is *really* isolated, however, trade and transport links, even in the pre-modern world, did have *some* inherent flexibility and they can move to include this new source of exotic goods ... and, equally, this new market for all sorts of local products!

The basic problem will be that they will simply not have the *capacity* that you will probably need – even sea transport in ancient times did not move huge tonnages around, compared to modern expectations.

Personal transportation *within* the *displaced* community will also be an issue – most modern communities have been designed around the expectation that shoppers and commuters will have their own personal transport ... cars.

But the fuel situation in a *displaced* scenario makes it unlikely that this can be maintained in the short term – and even when alternative fuels become available the problem of ongoing maintenance will arise.

Basically, the more modern the vehicle the more likely it is to break down irrepairably when it does break down.

Then there is the issue of supporting infrastructure – maintenance and repair facilities are going to be concentrated *in* the *displaced* community as, of course, will fuel supplies – using modern transport much beyond the immediate confines of the home community will be problematic at best.

Still, there will be an interim period when there will be problems that will require some luck or ingenuity to overcome.

Solutions

Solutions have already been addressed in previous chapters – at least as far as fuel sources and possible replacement vehicle types are concerned. There are, however, other issues that can be addressed –

- **Vehicle Stocks:** The USA has 820 motor vehicles of all types per 1000 population, of which around 90% are passenger rather than freight or service vehicles (60% of those are passenger cars other than light trucks).

  The median age for vehicles in the US is 8.9 years (with pickup style vehicles having the highest median, 9.1 years, and SUVs the lowest, 6.1 years).

  Australia has around 690 per thousand (and about 80% are passenger vehicles); average vehicle age is 10.5 years (9.9 years for sedans, 9.6 years for motorcycles and 18.9 years for camper vans).

  Car ownership rates in European countries varies between around 400 per thousand and 600 per

thousand (Denmark, c. 430 per thousand, average age 8.6 years; Germany c. 590 per thousand, average age c. 7-8 years). Canada has around 580 per thousand.

Assuming a dead average number, a small town of around 3000 people would have around 2500 vehicles of all sorts (and 1350 passenger vehicles) in the USA, 2000 in Australia and between 1300 and 1800 in Europe.

Of course, a small rural town is likely to have more per capita for the simple reason that the locals have greater distances to travel and much less in the way of a public transport network to substitute for motor vehicles.

Likewise, a regular suburb that is part of, or linked to, a major conurbation will likely have fewer vehicles per capita as the residents have access to a public transport network of considerable size and scope.

- **Junkers and Junkyards:** Of course, vehicle numbers relate to *operational* vehicles – and in the suburbs or major cities this will likely be close to the total number of vehicles available (though, as mentioned elsewhere, some suburbs or industrial areas may have auto wrecker yards with a concentration of junkers).

  In rural areas there is, perhaps, less likelihood of a junkyard but more likelihood that there will be junked vehicles in barns, back (or front!) yards or scattered around the place in general.

  These will often be as scavengable for spares as cars in a regular junkyard – and may, indeed, have been partly mothballed with the intention of later restoration or use.

  Junkyards and derelict vehicles will, in the aftermath of a *displacement* event obviously form an important part of the logistics chain – they will be a source of a spare parts of all sorts and, in fact, may actually be more valuable than more modern cars which computerised parts make uniquely vulnerable to irrepairable breakdown.

- **Commuters:** If the *displaced* community is a dormitory community for a larger nearby conurbation, then it is quite possible that there might be a rail or other commuter link *to* that conurbation.

  If this *is* the case, then there is a reasonable likelihood that there might be a parking area for a *much* larger number of cars than the community *alone* might warrant on a purely per-capita basis as the train or bus station might serve a much larger

geographical area than is actually *displaced*. Sometimes you can be lucky, eh?

- **Trucking Companies and Distribution Centers:** Large trucking and/or parcel delivery companies generally have large parking areas for their vehicles – and if one of these is located in the *displaced* community, then it would mean that they would have access to a much larger number of commercial vehicles than would normally be the case.

  Such a facility is also likely to have some maintenance and repair facilities and stocks of basic spares for the vehicles based there, which could be a real bonus!

  Even if there is no trucking company there may be a distribution center – large warehouses where stocks for supermarkets and chain stores are distributed *from* and, of course, if the *displacement* event is during normal operational hours (whatever *they* may be), then a considerable number of trucks may be caught up.

  Also possible is the presence of a truck stop – and, especially at night, there might be a considerable number of truckers eating and/or sleeping there – and they and their vehicles could all be *displaced* as well.

  Small rural towns may have a general transport contractor with large vehicles which serve the surrounding communities, which would provide a smaller, but still significant, boost to numbers.

  Government authorities may also have facilities – such as those required for road maintenance, including specialised vehicles – based in some small towns as well.

Food

As noted in previous chapters, this will be a fairly immediate problem. If the *displaced* community is a rural one, then there *might* be a fairly easy and

immediate solution – *if* conditions are right.

It would need to be *either* just before harvest, and the local climate conducive to the survival and/or actual harvesting of whatever crops are being grown, *or*, perhaps, just *after* harvest, with the entire crop still in Silo storage – in which case it probably doesn't matter what the local season is as, with modern agriculture, the amount available is likely to be more than enough to last until the next planting season.

If the climate/seasons are out of whack and the local crops are *not* in, then there are going to be problems. Severe ones.

If the *displaced* community is *not* a farming community, and if no (or inadequate) farmland is *not* displaced with them, then there are also serious, and immediate, problems – as, even if their new locale has just brought in the harvest, much of it is already spoken for given the generally low levels of pre-modern agricultural productivity ... and the transport infrastructure to move quantities over long distances is, at best, rudimentary and limited in capacity.

SOLUTIONS

Again, there are a number of believable possibilities –

- **Harvest Time:** Your *displaced* community *is* a rural one and it *is* harvest time – the crops that are about to be harvested, or which have *just* been harvested, are more than adequate to feed the whole community till the next *local* harvest season with plenty left over for seed crop in the next *local* planting season .... and probably a lot left over for trade as well.

- **Storage:** The *displaced* community is a storage facility *for* harvested foods. This could simply mean that it is on a rail line or port (sea or river) which has large grain silos where the harvest from a large area around the community is brought and stored for much of the year (or for *enough* of the year for it to be reasonable for them to be at least *partly* filled).

Depending on the time of the year, these storage facilities could range from completely full to only partly stocked ... still, even in the latter case, a small *displaced* community will probably be able to make do with what is left of a *much* larger geographical area's harvest.

- **Production:** The *displaced* community might be a point source of food canning, packaging or production – and even with "just in time" inventory control, with luck the plant will have *far* larger quantities on hand, either ready to be processed/packaged or not yet shipped *after* being processed/packaged, than the local population will need before the next *local* harvest.

- **Location:** It just so happens that the *displaced* community is fortuitously relocated onto a river or sea port where it can trade more easily with local communities for whatever food needs they have.

  This assumes that the community has some shipping assets that can be used to either carry on the trade involved or which can be used to arrange for local shipping to undertake.

  Alternatively, depending on the ruthlessness of the *displaced* community, they may simply use their superior technology (and, theoretically, superior firepower) to *take* what they need from the locals.

  Of course, there is an obvious downside to this – it won't do your reputation any good at all, and will also make the likelihood of future co-operation considerably less likely.

The Estate

The ***Oaklands Industrial Estate*** is a typical smaller commercial project which may as likely be situated in an industrial or commercial suburb of a larger town or city or on rural or semi-rural outskirts of the same.

Such estates typically have from a dozen to two dozen small to medium sized businesses ensconced within their precincts.

The Tenants

A selection of *suggested* companies that *could* be quartered here is provided below, along with some indication of the staff, supplies and facilities that they will have on hand. Mix and match to your heart's content – and, of course, *add* anything you deem reasonable!

- **Automotive Electrician:** A small workshop primarily servicing passenger cars and light trucks. There is space for 6 vehicles to be worked on under cover at any one time. ***Staff:*** 6 Auto Electricians, 1 Office staff. ***Facilities:*** C Type Electrical Tools, 3 man, x 5 multiplier (6 kW); B Type Electrical Tools, 6 man, x 2 multiplier (9 kW). ***Supplies:*** Limited stock of electrical parts; 100 x 12 Volt Batteries, 50 x 24 Volt Batteries. ***Vehicles:*** 5 + 1d vehicles in various states of repair; 1 Delivery Van.

- **Auto Upholsterer:** A small workshop capable of handling up to 6 vehicles under cover at one time. ***Staff:*** 6 Upholsterers, 1 Office staff. ***Facilities:*** C Clothworking Tools, 2 man, x 2 multiplier (4 kW); B Clothworking Tools, 6 man, x 2 multiplier (6 kW). ***Supplies:*** Several hundred to several thousand meters of assorted heavy duty cloth and interior fabric. ***Vehicles:*** 5 + 1d vehicles in various states of repair; 1 Delivery Van.

- **Automotive Workshop:** A small garage primarily servicing passenger cars and light trucks. There are four hydraulic lifts and space for 8 vehicles to actively worked on at the same time. ***Staff:*** 8 Mechanics, 2 Office Staff. ***Facilities:*** C Mechanical Tools, 4 man, x 5 multiplier (40 kW); B Mechanical Tools, 8 man, x 2 multiplier (40 kW); 1.5 kW diesel generator (hooked up to power the hydraulic lifts in case of blackout). ***Supplies:*** A limited stock of standard spare parts. ***Vehicles:*** 11 + 1d vehicles in various states of repair; ½d-1 Courtesy Cars; 1 Delivery van.

- **Body Shop:** A small smash repair facility capable of handling passenger cars and light trucks. There is space for 10 vehicles to be worked on under cover at the same time. ***Staff:*** 16 Panelbeaters, 2 Office Staff. ***Facilities:*** C Metalworking Tools, 8 man, x 5 multiplier (56 kW); B Metalworking Tools, 16 man, x2 multiplier (32 kW). ***Supplies:*** A limited stock of repair parts and materials. ***Vehicles:*** 18 + 2d vehicles in various states of repair; 1d-1 Courtesy Cars; 1 Delivery Van.

- (**Micro**) **Brewery:** Produces and bottles a variety of boutique beers. ***Staff:*** 5 Brewers, 10 Storemen, 2 Office Staff. ***Facilities:*** 4 x 3000 gallon (c. 13,000 liter) units. Bottling plant. ***Supplies:*** Enough yeast, hops and other requisites for about 60000 gallons (220,000 liters) of beer. 36000 x 22 oz. (650 ml) bottles. 3000 x 12 bottle crates. ***Vehicles:*** 4 Forklifts (2 x small, 2 x large, diesel), 2 Trucks (modified to carry beer crates)

- **Bronze Foundry:** Started as a sideline to the owner's bronze cast sculpture career, this small operation produces a variety of cast bronze and cast brass items, some for the garden ornament market, some for the hardware market and some for the electrical market. They have a profitable sideline in producing short run steam engine and yacht fittings as well. ***Staff:*** 12 Technical Staff, 2 Office Staff. ***Facilities:*** D Metalworking Tools, 4 man, x 5 multiplier (60 kW); C Metalworking Tools, 4 man, x 5 multiplier (70 kW); B Metalworking Tools, 4 man, x 2 multiplier (20 kW); C Mechanical Tools, 4 man, x 5 multiplier (40 kW); B Mechanical Tools, 4 man, x 2 multiplier (20 kW); Foundry can handle castings of up to 100 kilos weight as currently structured. ***Supplies:*** Enough metal stock (Copper and Tin and Zinc) for 2 tons of product, bronze or brass; about 1 ton of "finished product" ready for shipping. ***Vehicles:*** 3 Forklifts (2 light, 1 heavy, diesel); 1 Flatbed truck; 1 Delivery Van.

- **Carpenter and Joiner:** Does shop fitting, interior carpentry and some construction carpentry. ***Staff:*** 10 Carpenters, 5 Storemen/Drivers, 2 Office Staff. ***Facilities:*** C Woodworking, 5 man, x 5 multiplier (25 kW); B Woodworking, 10 man, x 2 multiplier (25 kW); B Construction, 2 man, x 2 multiplier (10 kW). ***Supplies:*** Several tons of assorted lumber, a ton or so of assorted hardware. ***Vehicles:*** 2 x Forklifts (one large, one small, diesel), 2 Flatbed Trucks (one 5 ton, one 8 ton).

- **Commercial Printer:** A small jobbing printer who normally does advertising fliers and posters, pamphlets, newsletters etc. ***Staff:*** 10 Printers and Storemen; 2 Office Staff. ***Facilities:*** Small Offset Printer with 10 times the speed of an *Improved Flatbed Press* (as described in the equipment section) with integral *Perfect Binding* machinery (including guillotine). High Speed Photocopier (Black and White). Old Flatbed press and type (equivalent of *Improved Flatbed Press* in the equipment section, but with double the operational speed). ***Supplies:*** 2500 x A0 reams (assorted colour) paper and card (for offset printing), Offset ink for 12500 reams of A0 paper. Photocopier consumables to print 5000 reams, plus 500 reams A4 and 250 reams A3 paper (various colours). ***Vehicles:*** Delivery Van, Small Forklift (Diesel).

- **Courier Express:** A local courier company or a franchise of a national chain. ***Staff:*** 4 Office Staff or Dispatchers, enough drivers for all vehicles present during the day, 1d+1 drivers at night. ***Facilities:*** Limited Warehouse space. Base Station Radio (functional equivalent to the *Radio Receiver*, *Valve*, *Semi Portable* described in the equipment section, but transistorised and more reliable). ***Supplies:*** One dozen Handheld CB radios; Solar Battery Chargers and Rechargeable batteries. A limited amount of cargo/packages in storage (could be almost anything). In ground 12000 gallon/55000 liter Fuel Tank (Petrol). ***Vehicles:*** 1d+1 Courier Pickup Vans, ½d+1 Courier Vans, 1 Courier Truck (double these numbers at night).

- **Deus Ex Machina, Incorporated:** This operation was always something of a mystery to the other occupants of the Estate, centrally located, but with its own chain link fence and 24 hour security. Needless to say, it *seems* as if it is the source of the predicament the locals now find themselves in – even if not directly; the fact that the central building has, well, *disappeared* and under strange circumstances would be a dead giveaway for most people ... though whether it was the active cause or merely a passive result of the *displacement* even will probably never be known.

  Those who witnessed the event said that the whole central block of the site winked in and out of visibility several times before, quite soundlessly, crumpling in on itself as if it was being sucked down a whirlpool – leaving nothing behind but a few twisted pieces of metal and a 20 meter deep crater with perfectly hemispherical sides.

However, there remain a number of buildings and structures on the site. ***Staff:*** 4 Security Guards, 3 Mechanics, 6 Storemen, 2 Cooks, 2 Office Staff. ***Facilities:*** Generator Building with 1 x 500 kW diesel generators, 1 x 100 kW diesel generators. Tank Farm (fully bermed) with 2 x 60,000 liter (c. 15,000 gallon) diesel fuel tanks. Workshop Building with D Electrical Tools, 2 man, x 5 multiplier (100 kW); D Mechanical Tools, 2 man, x 5 multiplier (60 kW); D Metalworking Tools, 2 man, x 5 multiplier (60 kW); C Woodworking Tools, 2 man, x 5 multiplier (10 kW); C Optical Tools, 1 man, x 5 multiplier (5 kW); C Glassblowing Tools, 1 man, x 5 multiplier (7 kW). Staff Canteen with full equipped kitchen capable of serving 25 people at a sitting (with a week's supply of food for 20). Security Office with CCTV monitors covering the whole site, externally, and all except the main building, internally, Base Station Radio (functional equivalent to the *Radio Receiver*, *Valve*, *Semi Portable* described in the equipment section, but transistorised and more reliable). 2 x 15000 gallon (c. 60,000 liter) in ground gasoline tanks. ***Supplies:*** Bulk fuel tanks are, essentially, full. In ground gasoline tanks are also full. Stores Building has a large quantity of assorted mechanical, electronic, and housekeeping stores. Security Office has an armoury with 4 Automatic Rifles, 4 Pump Action Shotguns, 14 Automatic Pistols, 2 Tasers, 144 road Flares. 3000 rounds of ammunition for the Rifles, 1000 for the Shotguns, and 1000 for the Automatic Pistols. 12 Walkie Talkie radios and several gross of batteries, some rechargeable. 4 Kevlar Vests. ***Vehicles:*** 1 All Sedan (with *DEMCorp* logo and full 2 way radio communications, 1 Automatic Rifles [300 rounds] and 1 Shotguns [50 rounds], roof mounted searchlight), 3 Cross Country Motorcycles (also with 2 way comms, Shotgun mounting, 50 round of ammo); 1 Flatbed truck, 2 Delivery Vans, 4 Pickups (all with *DEMCorp* logo); 25 assorted personal vehicles (some belonging to surviving staff).

*None of the surviving staff know **exactly** what DEMCorp was up to – some sort of high tech whizzbangery is the best guess. All of the hotshot science types kept to themselves in the main building.*

*The survivors are the support staff. They **do** know that whatever it was, the number of staff had been drastically downsized recently – most of them are on a month's notice of termination, and more were let go weeks ago.*

The "eggheads" were evidently getting desperate – which may, or may not, "explain" things.

The Security staff are mostly ex-Police or ex-Military and all carry a sidearm and wear a kevlar vest at all times (extra to those in the armoury).

- **Electrician:** A medium sized commercial electrical operation mainly doing household and industrial wiring and installation. ***Staff:*** 10 Electricians, 2 Office Staff. ***Facilities:*** D Electrical Tools, 3 man, 5 x multiplier (9 kW); C Electrical Tools, 9 man, 5 x multiplier (10 kW); B Electrical Tools, 14 man, 2 x multiplier (15 kW). ***Supplies:*** A limited supply of electrical parts and equipment. Local franchise agent for "Gennies 'R Us", with 24 x 2 kW, 12 x 5 kW, 12 x 10 kW, 6 x 60 kW and 3 x 100 kW generators. ***Vehicles:*** 2 Heavy Trucks (each fitted with D Electrical, 1 man; C Electrical, 2 man; 10 kW diesel Generator); 3 Vans (each fitted with C Electrical Tools, 1 man; B Electrical tools, 2 man; 5 kW diesel Generator*).*

  The equipment on the Heavy Trucks and Vans is part of what is listed under "Facilities" – leaving D Electrical Tools, 1 man; C Electrical Tools, 2 man and B Electrical Tools, 4 man at the base. ***Note:*** *Not all of these vehicles will be onsite except at night.*

- **Electrical Engineers:** This firm specialises in the manufacture and production of small scale independent power systems including solar, wind, and hydro along with inverters and other equipment. It also does some general electrical engineering work to fill in the odd spots. ***Staff:*** 6 Electricians; 4 Mechanics; 2 Office Staff. ***Facilities:*** D Electrical, 3 man, x 5 (50 kW); C Electrical, 3 man, x 2 (20 kW); C Metalworking, 2 man, x 2 (28 kW); C Mechanical, 2 man, x 2 (20 kW). ***Supplies:*** 36 kW worth of assorted Solar Panels; 20 x 400 Watt Wind Turbine kits, 10 x 800 Watt Wind Turbine kits, 5 x 1 kW Wind Turbine kits; 20 x 1 kW Hydro turbine kits; 50 x 500 Watt Hydro Turbine Kits; 1000 x 24v Lead-Acid Batteries; 2500 x 12 Volt Batteries. ***Vehicles:*** 2 x Forklifts (1 small, 1 large, diesel), 1 Flatbed truck, 1 Delivery Van.

- **Engineering Jobbers:** A small jobbing machinist and metal fabricator. Does prototyping, "one off" and short run production of metal items – but the customer generally has to provide the metal required for any such work, only minimal stocks are held onsite. ***Staff:*** 12 Machinists, 2 Office Staff. ***Facilities:*** D Metalworking, 3 man, x 5 multiplier (30 kW); C Metalworking, 3 man, x 2 multiplier (14 kW); D Mechanical, 3 man, x 5 multiplier (30 kW); C Mechanical, 3 man, x 2 multiplier (20 kW). ***Supplies:*** A small amount of metal stock (customers are generally expected to supply their own).

Vehicles: 2 Forklifts (1 small, 1 large, diesel), 1 Flatbed truck.

- **Hardware and Building Supplies:** A medium sized hardware store supplying the building trades on a wholesale basis. ***Staff:*** 6 Sales Staff, 12 Storemen/Drivers, 2 Office Staff. ***Facilities:*** A big warehouse. Rental Equipment that is equivalent to D Construction, 5 man, x 5 multiplier (250 kW); C Construction, 10 man, x 2 multiplier (50 kW). ***Supplies:*** A warehouse full of assorted hardware and building supplies. Diesel Generators (rentals), 2 x 60 kW and 1 x 100 kW. Fuel Tank, 12000 gallons/55000 liters diesel fuel. ***Vehicles:*** 4 Forklifts (2 small, 2 large, diesel), 2 Flatbed trucks (8 ton), 3 Delivery Vans.

- **Jeweller (Manufacturing):** A medium scale operation that produces mass produced and relatively cheap jewellery for chain jewellery stores. ***Staff:*** 4 Jewellers, 1 Office Staff. ***Facilities:*** C Metalworking, 4 man, x 5 multiplier (28 kW); B Mechanical, 2 man, x 2 multiplier (40 kW). ***Supplies:*** 3200 troy ounces of silver, 120 troy ounces of gold, 25 ounces of platinum, 500 troy ounces of bronze; several thousand carats of assorted cut gemstones (mostly quite small, 1-2 carat); around 100 kilos (by weight) of finished product; Automatic Pistol and Shotgun, 100 rounds each. ***Vehicles:*** Delivery Van.

- **Plumber & Gasfitter:** A medium sized plumbing operation specialising in household and commercial fitouts and repairs. ***Staff:*** 6 Plumbers, 1 Office Staff. ***Facilities:*** C Construction Tools, 3 man, x 5 multiplier (15 kW); B Construction Tools, 12 man, x 2 multiplier (12 kW); B Metalworking Tools, 12 man, x 2 Multiplier (12 kW). ***Supplies:*** A limited amount of plumbing supplies. ***Vehicles:*** 2 Large Work Trucks (C Construction Tools, 1 man; B Construction Tools, 2 man, B Metalworking Tools, 2 man; 10 kW Diesel Generator); 4 Standard Work Trucks (B Construction Tools, 2 man; B Metalworking Tools, 2 man; 20 kW Diesel Generator).

The equipment on the Heavy Trucks and Vans is part of what is listed under "Facilities" – leaving C Construction Tools, 1 man; C Construction Tools, 2 man and B Metalworking Tools, 2 man at the base. ***Note:*** *Not all of these vehicles will be onsite except at night.*

- **Security & Locksmith:** A small local operation that sells and installs all sorts of locks, cuts keys, manufactures security doors and gates, and has a number of night patrol cars that provide onsite and patrol services. ***Staff:*** 4 Locksmiths, 6 Metalworkers, 2 Office Staff, 1d6+1 Security guards (double that at shift change). ***Facilities:*** C Mechanical Tools, 3 man, x 5 (50 kW); B Mechanical Tools, 12 man, x 2 (50 kW); C Metalworking Tools, 3 man, x 5 multiplier (21 kW); B Metalworking Tools, 3 man, x 2 multiplier (6 kW); Base Station Radio (functional equivalent to the *Radio Receiver*, *Valve*, *Semi Portable* described in the equipment section, but transistorised and more reliable). ***Supplies:*** A considerable number of locks and key blanks; several dozen completed standard sized security doors; around a ton of assorted metal bars/rods for more doors or grilles; 2 dozen handheld Walkie Talkies, 2 dozen heavy duty LED Flashlights, 1 gross standard Flashlight batteries. ***Vehicles:*** 2 Forklifts (1 light, 1 heavy, diesel); 2 Locksmith Vans (w. B Mechanical Tools); 1 Flatbed truck; 1d3+2 Security Patrol Cars (standard sedan cars with light bar and 2-way radio systems); 1d2+1 Security Pickup (same as sedan, but built on a SUV body for off road work).

  The equipment on the Locksmith Vans is part of what is listed under "Facilities." ***Note:*** *Depending on where your campaign originates, the security guards may or may not be armed.*

  In the US you can assume that they will have some sort of pistol and, probably, a shotgun in the car. Probably canisters of Mace or a Taser. A Riot Baton.

  It is likely that there will be a dozen to two dozen rounds for each of the firearms in the car and, perhaps, several hundred back at base, along with some extra weapons.

  In Australia and the UK, and much of Europe, the guards will be much less likely to have sidearms, tasers or mace. They may be unlikely to have Riot Batons and will likely rely on their heavy flashlight to do double duty. For game purposes assume that they have ***some*** *firearms, perhaps normally locked away at the base, except for special operational use.*

- **Tentmakers:** Manufacturers of canvas and synthetic tents, tent flies, tarpaulins, automobile and small boat covers/canopies, advertising banners and similar. ***Staff:*** 8 Tentmakers, 1 Office Staff. ***Facilities:*** D Clothworking, 4 man, x 5 multiplier, (20 kW); C Clothworking, 4 man, x 2 multiplier (8 kW). ***Supplies:*** A considerable amount of canvas and synthetic cloths in various colours and weights. ***Vehicles:*** 2 Forklifts (Large, diesel); 1 Flatbed Truck, 1 Delivery Van.

- **Transmission/Gearbox Mechanic:** A specialist in transmissions for all sizes of automobiles and trucks. ***Staff:*** 5 Machinists, 1 Office staff. ***Facilities:*** C Metalworking Tools, 2 man, x 10 multiplier (14 kW); B Metalworking Tools, 5 man, x 5 multiplier (10 kW); B Mechanical Tools, 5 man, x 2 multiplier (25 kW). ***Supplies:*** A limited stock of spare parts for a variety of standard vehicles. ***Vehicles:*** 1 Delivery Van.

Personal Vehicles

In the US and Canada all of the employees are likely to have personal vehicles parked onsite and personal gear in them (in the US this may, especially in some parts of the country, include firearms).

In Australia, New Zealand and the UK most of the employees will likely have cars parked on site, but, of course, no firearms!

In Europe, *some* of the employees will have vehicles parked on the site, but most will probably rely on public transportation (and, of course, no firearms either!).

Other Unfortunates

What, if anything, else is *also* displaced is up to you – in an urban area you could have a *Strip Mall*) with all the sorts of goodies (and trapped customers and staff) you might expect. A small chain hotel like *Motel 6* or *Motel Formule 1* could be another possibility, with rooms for perhaps 60 people. Some residential houses or flats, perhaps mostly unoccupied if during the day.

They keyword for the *Estate* scenario is *small numbers*, if run by itself, so keep that in mind when you're doing your juggling.

The Park

The Littletown Industrial Estate has been established for a number of years in a small semi-rural community situated a moderate distance outside of a major urban center.

Major Tenants

Most of the tenants of the estate are involved at least partly in servicing the needs of the wider, and larger, urban center rather than merely those of the small local community of Littletown, which is about 2½ kilometers (or miles if your campaign is in the US) from the estate.

- **Automotive Biofuel Industries:** A high tech start-up, ABI runs a pilot plant here with the capacity to produce 20,000 liters of biodiesel from soybeans or vegetable oil and a like amount of bioethanol from corn *per day*. ***Staff:*** 25. ***Facilities:*** One 5,000 gallon (about 20,000 liter) Bioreactor (bio-diesel); One 5,000 gallon (about 20,000 liter) Bioreactor (bio-ethanol). Eight 12,500 gallon (about 50,000 liter) in ground tanks (4 diesel, 4 ethanol). ***Supplies:*** Enough soybeans for 14 days production; enough corn for 14 days production. ***Vehicles:*** 2 medium Tanker trucks (5000 gallons, around 20,000 liters), 2 small Tanker trucks (2000 gallons, around 8000 liters), all converted to run on Bio-diesel; 2 Pickups (converted to run on Bio-ethanol)

- **Blue Sky Coffee:** Roasts specialty coffees for the gourmet coffee market. The plant can process and pack several tons of coffee beans a day and normally has a week's supply of raw materials on hand and up to two days worth of the finished product. ***Staff:*** 30. ***Facilities:*** Coffee Roasting Production Line (C), 20 man, x 5 multiplier (80 kW); B Mechanical Tools, 5 man, x 2 multiplier (10 kW). ***Supplies:*** 30 tons coffee beans, 5 tons packaged coffee, 20,000 x 250 g jars, 10,000 x 500 g jars, 25,000 x 1 kilo packages; 1000 liter LPG tank (fuel for the Forklifts). ***Vehicles:*** 3 x Forklifts (LPG fuelled), 2 x Delivery Trucks.

  The Coffee Roasting Production line can be reconfigured to roast any grain, nut or bean type food if any are available locally and are normally roasted.

  The packaging machinery can be separated from the roasting equipment and create a ***Food Packaging Production Line (C), 10 man, x 5 multiplier (10 kW)*** *which can run straight packaging if no glass jars are available.*

- **Cola Distributors:** This is a major local distributor, has several days supply for the supermarkets and convenience stores of the nearby city stored onsite. ***Staff:*** 40. ***Facilities:*** Warehouse space. ***Supplies:*** 20 x 40' container equivalents (about 550 tons worth) of standard Soda Cans (@ approximately 50,000 cans per container, including packaging, or about 1 million cans). About the same amount of bottled Soda by weight. In-ground Diesel fuel tank (12,000 gallons or 55,000 liters) with two bowsers; 5000 liter/20000 gallon LPG tank. ***Vehicles:*** 12 x Forklifts (LPG fuelled), 2 x Container Cranes (30 ton lift weight), ½d+1 Container Trucks with containers (50/50 full/empty), 1d+1 Delivery Vans.

  No bottling or manufacturing equipment. Just the stock on hand, including a full tank of diesel fuel, and the warehouse space.

- **ComGas:** The local agent for Welding Equipment (including welding gas), Heating and Specialty Gases. ***Staff:*** 12. ***Facilities:*** Warehouse space, B Mechanical Tools, 3 man, x 5 multiplier (6 kW). ***Supplies:*** 50,000 man days worth of welding supplies; 10 x 55000 liter/12000 gallon LPG tanks; Nitrous Oxide (for dental use), Medical Oxygen. ***Vehicles:*** ½d+1 x 8000 gallon/30000 liter LPG trucks (50/50 full/empty), 1d+1 Delivery Vans.

- **Commercial & Industrial Suppliers:** A major supplier of construction and plumbing equipment, including a selected range of construction vehicles and a comprehensive repair shop onsite. ***Staff:*** 50. ***Facilities:*** D Mechanical Tools, 25 man, x 10 multiplier (375 kW); C Metalworking Tools, 5 man, x 5 multiplier (35 kW); C Electrical Tools, 5 man, x 5 multiplier (10 kW). ***Supplies:*** 2500 tons of assorted hardware and plumbing supplies; D Construction Tools, 25 man, x 10 multiplier (6¼ Mw); C Construction Tools, 100 man, x 5 multiplier (1 Mw); B Construction Tools, 150 man, x 5 multiplier (600 kW); A Construction Tools, 1000 men, no multiplier; 1 ton of industrial explosives. ***Vehicles:*** 1d+1 Delivery Trucks; 1d+1 Bulldozers; ½d+1 Excavators/Power Shovels; 2d+1 x 50 kW Truck mounted Electrical Generators (Diesel), 1d+1 x 150 kW, 1d+1 x 100 kW, 2d+1 x 50 kW trailer mounted Electrical Generators (Diesel); ½d+1 x Tracked Cranes; ½d+1 x Graders; ½d+1 x Dump Trucks.

  Note that construction tools of type C/D can substitute vehicles for kW at 75% of the rated amount,

but requiring fuel for a full 8 hour day's worth of operations.

- **Deus Ex Machina, Incorporated:** This operation was always something of a mystery to the other occupants of the Estate, backing up onto it from a largely separate lot but, for some unaccountable reason, having its only entrance and exit *through* the estate property itself. Needless to say, it *seems* as if it is the source of the predicament the locals now find themselves in – even if not directly; the fact that the central building has, well, *disappeared* and under strange circumstances would be a dead giveaway for most people ... though whether it was the active cause or merely a passive result of the *displacement* even will probably never be known.

  Those who witnessed the event said that the whole central block of the site winked in and out of visibility several times before, quite soundlessly, crumpling in on itself as if it was being sucked down a whirlpool – leaving nothing behind but a few twisted pieces of metal and a 20 meter deep crater with perfectly hemispherical sides.

  However, there remain a number of buildings and structures on the site. ***Staff:*** 12 Security Guards, 6 Mechanics, 12 Storemen, 6 Cooks, 4 Office Staff.

  Facilities: Generator Building with 4 x 500 kW diesel generators, 2 x 100 kW diesel generators. Tank Farm (fully bermed) with 2 x 1,892,500 liter (500,000 gallon) diesel fuel tanks. Workshop Building with D Electrical Tools, 5 man, x 10 multiplier (250 kW); D Mechanical Tools, 5 man, x 10 multiplier (150 kW); D Metalworking Tools, 5 man, x 10 multiplier (150 kW); C Woodworking Tools, 3 man, x 5 multiplier (15 kW); C Optical Tools, 1 man, x 5 multiplier (5 kW); C Glassblowing Tools, 1 man, x 5 multiplier (7 kW). Staff Canteen with full equipped kitchen capable of serving 50 people at a sitting (with a week's supply of food for 50). Security Office with CCTV monitors covering the whole site, externally, and all except the main building, internally, Base Station Radio (functional equivalent to the *Radio Receiver, Valve, Semi Portable* described in the equipment section, but transistorised and more reliable). 4 x 15000 gallon (c. 60,000 liter) in ground gasoline tanks.

  Supplies: All fuel tanks are full. Stores Building has a large quantity of assorted mechanical, electronic, and housekeeping stores. Security Office has an armoury with 12 Automatic Rifles, 12 Pump Action Shotguns, 12 Automatic Pistols, 6 Tasers, 48 Tear Gas Grenades, 144 road Flares. 6000 rounds of ammunition for the Rifles, 3000 for the Shotguns, and 3000 for the Automatic Pistols. 24 Walkie Talkie radios and several gross of batteries, some rechargeable. 8 sets of SWAT body armour and 12 Kevlar Vests.

  Vehicles: 2 All Black Hummers (with *DEMCorp* logo and full 2 way radio communications, 2 Automatic Rifles [300 rounds each] and 2 Shotguns [100 rounds each], roof mounted searchlight), 2 Cross Country Motorcycles (also with 2 way comms, Shotgun mounting, 50 round of ammo); 2 Flatbed trucks, 4 Delivery Vans, 4 Pickups (all with *DEMCorp* logo); 30 assorted personal vehicles (some belonging to surviving staff); 1 Tank/Pump Fire truck, fully equipped.

  *None of the surviving staff know **exactly** what DEMCorp was up to – some sort of high tech whizzbangery is the best guess. All of the hotshot science types kept to themselves in the main building.*

  *The survivors are the support staff. They **do** know that whatever it was, the number of staff had been drastically downsized – most are on a month's notice of termination, more were let go weeks ago.*

  The "eggheads" were evidently getting desperate – which may, or may not, explain things.

  The Security staff are mostly ex-Police or ex-Military and all carry a sidearm and wear a kevlar vest at all times (extra to those in the armoury).

  *Some of the security guards and support staff have training to use the firefighting Truck and its equipment – though, at present, the crater is merely steaming, there's nothing left either **to** burn or that **is** burning.*

- **Commercial Pharmaceuticals:** Produces a wide variety of patent expired and over the counter medications for local and national sales. Much of what they produce is actually made under contract and repackaged for other well known generic/otc companies. ***Staff:*** 75. ***Facilities:*** E Chemical (Pharmaceutical) Production Line Facility, 25 man, x 10 multiplier (40 kW); D Chemical Tools, 25 man, x 10 multiplier (175 kW). ***Supplies:*** Chemical/Pharmaceutical Feedstocks for *20 tons* of drugs (of *any*

variety). About *5 tons* of finished product. ***Vehicles:*** 6 Forklifts (4 small, 2 large, electric), 1d+1 Delivery Vans.

- **Consolidated Electrical Generating:** A 6 Megawatt geothermal plant brought online partly with government funding for a commercial feasibility study of geothermal power generation. It is normally used only for peak generation (that is, not for baseline use) though it was designed for full time operations. ***Staff:*** 60 (20 per 8 hour shift). ***Facilities:*** 2 x 1 Mw and 2 x ½ Mw Steam Turbines; D Turbine Maintenance Tools (combination of Mechanical and Electrical), 5 man, x 10 multiplier (100 kW); C Electrical Tools, 5 man, x 5 multiplier, (25 kW); C Mechanical Tools, 5 man, x 5 multiplier (50 kW); 500 kW Diesel Generator, 15000 gallon (about 60,000 liter) diesel fuel tank. ***Supplies:*** Non-critical spares for 6 months at full power output. ***Vehicles:*** 2 Repair Trucks (C Mechanical and C Electrical Tools, 1 man, 15 kW; 10 kW generator); 2 Pickup Trucks.

  *Repair Truck equipment is taken from that listed under **Facilities**, leaving 3 man units of C Type Electrical and Mechanical Tools at the base, as well as all the Turbine Maintenance tools.*

- **Dynamite Trucking:** A commercial trucking company with garage and maintenance facilities on-site. ***Staff:*** 50 (not including drivers). ***Facilities:*** D Mechanical Tools, 25 man, x 10 multiplier (375 kW); C Metalworking Tools, 5 man, x 5 multiplier (35 kW); C Electrical Tools, 5 man, x 5 multiplier (10 kW). ***Supplies:*** Assorted spare parts, including some replacement tyres, enough for 30 days worth of normal operations; 10 x 55000 liter/12000 gallon Diesel tanks. ***Vehicles:*** 2d+1 Semi-Trailer Rigs, day, 2d+12, night; 4d+1 Delivery vans at any given time during the day, 24+2d at night.

  It is likely that some of the trucks may have cargoes (whole or partial) on board – 25% chance per truck during the day and 50% chance per truck at night. The nature of the cargoes is up to the GM.

  There will be one driver per delivery truck and two per Semi-Trailer rig present during the day in addition to the regular staff, at night there will be a 10% chance per vehicle of a driver (or of two for the big rigs) being present.

- **Fire Department:** A fully equipped Fire station with a Pumper/Rescue truck (1000 gallon/4000 liter per minute pump and 1000 gallon/4000 liter water tank); Ladder truck and EMT Ambulance. ***Staff:*** 20. ***Facilities:*** Bunkroom, Kitchen, Living area for on duty crew. C Mechanical Tools, 5 man, x 2 multiplier (10 kW). ***Supplies:*** Assorted rescue

and firefighting supplies and equipment (mostly stored on the trucks, with some resupply at the Station House). One 15000 gallon (approximately 60,000 liter) diesel fuel tank. ***Vehicles:*** Pumper/Rescue Truck, Ladder Truck, EMT Ambulance; Hummer SUT Captain's Command truck.

- **Geoffrey's Carpentry:** This is actually a commercial operation involved in house construction (providing prefab frames and roof joists), shopfitting, and general commercial construction carpentry. ***Staff:*** 100. ***Facilities:*** D Woodworking Tools, 60 man, x 10 multiplier (450 kW); C Woodworking Tools, 30 man, x 5 multiplier (75 kW). ***Supplies:*** 500 tons construction grade wood, 10 tons assorted hardware consumables; 1 x 12000 gallon/55000 liter LPG tank (for Forklifts). ***Vehicles:*** 12 x Forklifts (LPG), 1d+1 Flatbed Delivery Trucks.

  The company does a line of "Kit" homes and has 1d+3 completed kits for 3 or 4 bedroom homes on hand at any one time.

  The kits contain all fittings needed for construction, including hardware, electrical and plumbing parts. There are two assembled Kit homes on site, fully furnished and operational, as display sites.

  The owner and some of the carpenters also do antique furniture restoration and a line of reproduction furniture (especially American Colonial in the US or something else appropriate in another country™) as a semi-commercial by-reference-only sideline.

- **General Groceries:** A large regional grocery distributor to local (rather than national) chains and small corner store/mom and pop operations. ***Staff:*** 40. ***Facilities:*** Contains thousands of grocery lines (including stocks of over the counter medications) and around 1,000,000 ft^2 (around 100,000 m^2) of warehouse/shelf space. ***Supplies:*** Enough supplies for 250,000 people for a week. ***Vehicles:*** 2d+1 Delivery Trucks.

- **Gutenberg Printworks:** A medium sized printer who normally does small magazines, short print run books and other medium sized commercial printing. ***Staff:*** 40. ***Facilities:*** 4 x Large Offset Printers, each with 10 times the speed of an *Improved Flatbed Press* (as described in the equipment section) with integral *Perfect Binding* machinery (including guillotine). High Speed Photocopiers (2 x Black and White, 1 x Colour); High Speed Colour Card Printer and integral *Perfect Binding* machinery for use with the Photocopiers. Old Flatbed press and type (equivalent of *Improved Flatbed Press* in the equipment section, but with double the operational speed). ***Supplies:*** 250000 x A0 ream equivalents (assorted colour) paper and card (for offset printing), Offset ink for 1250000 reams of A0 paper. Photocopier consumables to print 50000 reams, plus 5000 reams A4 and 2500 reams A3 paper (various colours). ***Vehicles:*** 2 Delivery Vans, 4 Forklifts (2 small, 2 large, diesel).

- **General Medical Supplies:** GMS stocks a wide range of standard Hospital and Surgical supplies which it provides to Doctors, Medical Centers and Hospitals throughout the region, including a wide selection of generic (out of patent) and over the counter drugs. ***Staff:*** 25. ***Facilities:*** Warehouse space. C Electrical Tools, 5 man, x 5 multiplier (25 kW) for warranty service of medical electronics. ***Supplies:*** Assorted surgical supplies (including instruments and prostheses), hospital supplies (from bedpans to adjustable beds, and including *some* high tech medical electronics), and assorted drugs (around 14 days supplies for a population of 250,000 people). ***Vehicles:*** 4 Forklifts (Small, Electric), 1d+1 Delivery Vans. 1 brand new EMT Ambulance, fully equipped and ready for delivery.

- **GreasyBurger Fast Foods:** With so many workers around, there's got to be a place to eat – and *GreasyBurger's* is one of several. It doesn't belong to a national, or even local, fast food chain, but *does* provide the same limited menu – lots of Burgers of various sorts, Hot Chips (or *Fries* if you're from the US), Soft Drink (*Soda* in the US), Milk Shakes, Cake or Pie and the like. ***Staff:*** 12. ***Facilities:*** Limited on site seating space. Fast Food kitchen can serve many hundreds of meals an hour. ***Supplies:*** Enough "makings" for 12000 meals. ***Vehicles:*** None.

- **Kaleidoscope Paints:** A small regional paint manufacturer – specialising in house and automotive paints. ***Staff:*** 50. ***Facilities:*** E Chemical (Paint Production) Production Facility, 30 man, x 10 multiplier (60 kW); C Chemical Tools, 5 man, x 2 multiplier (10 kW). ***Supplies:*** Enough for 100,000 gallons of paint, enough cans (of assorted size) for half that, enough spray cans for 10%. 10,000 gallons of finished product. 5000 gallon (about 20,000 liter) LPG tank. ***Vehicles:*** 6 Forklifts (2 small, 4 large, LPG); 2 Flatbed trucks, 1d+1 Delivery Vans.

- **Littleton Automotive Sales and Repairs:** LAS is a major dealer of both new and used cars and trucks, and has a full service garage onsite. ***Staff:*** 25. ***Facilities:*** D Mechanical Tools, 15 man, x 10 multiplier (225 kW). ***Supplies:*** 125 new vehicles (65 sedans, 25 SUVs, 25 Pickups and/or Light Trucks, 10 Sports Cars); 125 used vehicles (same breakdown as for new vehicles); 6 x 12000 gallon/55000 liter fuel tanks (3 x Petrol, 2 x Diesel). ***Vehicles:*** 3 x Standard, 2 x Heavy Wreckers/Tow Trucks.

- **Littleton Self Storage:** This facility has both small spaces inside the main warehouse style facility as well as a number of individual units consisting of 20' and 40' containers outside. ***Staff:*** 10. ***Facilities:*** Warehouse Space (500,000 square feet/46451 m^2), 200 Containers (120 x 20', 80 x 40'). ***Supplies:*** 1 x 4000 gallon/18000 liter LPG tank. ***Vehicles:*** 5 Golf Buggies (LPG).

- **MegaUltraMart SuperCenter:** The chain store you love to hate (you *know* the one – or you *should*). ***Staff:*** 25. ***Facilities:*** 500,000 square feet/46451 m^2 of floor space. You name it and its probably in stock – at least in some amount. ***Supplies:*** About a week's stock for most things – but that's for a drawing population of around 50,000 people! ***Vehicles:*** 5 x Forklifts (electric).

  *See the section on **Uniquities** for some ideas of what you might – or might not – find there.*

- **Metropolis Bakeries Incorporated:** A large commercial bakery serving the whole region. Has the capacity to bake 12500 loaves per hour ***Staff:*** 25. ***Facilities:*** Bread Production Line (D) Facility, 10 man, x 5 multiplier (7 Mw). ***Supplies:*** Enough flour, yeast, oils etc. for 500,000 loaves; 2 x 12000 gallon/55000 liter fuel tanks (1 diesel, 1 petrol). ***Vehicles:*** 1d+1 delivery vans (12+2d at night).

- **Mickelson's Engineering Fabrication:** A medium sized jobbing machinist and metal fabricator.

Does prototyping, "one off" and short run production of metal items but also produces a well regarded line of hand tools. ***Staff:*** 100. ***Facilities:*** E Hand Tool Production Line Facility, 30 man, x 10 multiplier (75 kW); D Metalworking Tools, 30 man, x 5 multiplier (300 kW); C Metalworking Tools, 30 man, x 2 multiplier (140 kW); D Mechanical Tools, 30 man, x 5 multiplier (300 kW); C Mechanical Tools, 30 man, x 2 multiplier (200 kW). ***Supplies:*** A large amount of metal stock (customers are generally expected to supply their own). Several days production worth of hand tools and some of the specialist parts ordered by customers. ***Vehicles:*** 12 Forklifts (8 small, 4 large, diesel), 4 Flatbed trucks, 1d+1 Delivery vans.

*The Hand Tool Production line can produce **any** of the hand tools of Type A or B listed in the book. For Type C tools it works at only x 2 multiplier.*

- **Motel 12:** A chain motel with undistinguished cookie cutter rooms located on urban outskirts to minimise costs. ***Staff:*** 4 (cleaners come in at night). ***Facilities:*** 100 rooms, each with one double and one single bunk bed, boat shower/toilet combo, TV, Phone etc. Reception area. Vending Machine room. Self Service Breakfast room. ***Supplies:*** Limited food and sundries in the Vending Machines, limited restock in storeroom; enough food for 120 breakfasts. ***Vehicles:*** None.

- **Multi-Mould Injection Moulding Services:** A medium sized injection moulding and machining service and can produce some of the plastics needed for their services onsite. ***Staff:*** 25. ***Facilities:*** D Chemical Tools, 10 man, x 10 multiplier, (70 kW); C Chemical Tools, 10 man, x 5 multiplier (50 kW); C Mechanical Tools, 5 man, x 5 multiplier (50 kW). ***Supplies:*** Several tons of raw materials onsite. 5000 gallon (c. 20,000 liters) LPG tank. ***Vehicles:*** 4 Forklifts (3 small, 1 large, LPG)

- **Pilsner-Littleton Specialty Beers:** Produces and bottles a variety of boutique beers. ***Staff:*** 50. ***Facilities:*** 2 x 15,000 gallon (c. 60,000 liters), 4 x 5000 gallon (c. 20,000 liter) units. Bottling plant. ***Supplies:*** Enough yeast, hops and other requisites for about 600000 gallons (2,200,000 liters) of beer. 500,000 x 22 oz. (650 ml) bottles. 30,000 x 12 bottle crates. 5000 gallon (c. 20,000 liters) LPG tank. ***Vehicles:*** 12 Forklifts (8 small, 4 large, LPG), 1d+2 Trucks (modified to carry beer crates)

- **Sandwiches R' Us:** With so many workers around, there's got to be a place to eat – and *Sandwiches R' Us* is one of several. It doesn't belong to a national, or even local, fast food chain, but *does* provide the same limited menu – lots of sandwiches (mostly in long rolls) of various sorts, Soft Drink (*Soda* in the

US), Fruit Juice, Milk Shakes, Cake or Pie and the like. Unlike *GreasyBurgers*, the food served here is more or less healthy. ***Staff:*** 12. ***Facilities:*** Limited on site seating space. Kitchen can serve hundreds of meals an hour. ***Supplies:*** Enough "makings" for 12000 meals. ***Vehicles:*** None.

- **SecuriCarCo Armoured Cars:** A well known security and armoured car company providing security guards, car based security patrols, and armoured car services on a contract or casual basis. The site is surrounded by chain link fence topped with razor wire and the whole building is solidly constructed with reinforced external doors and relatively few, and all heavily barred, windows. ***Staff:*** 20 (patrol staff extra).

  Facilities: Security storage (Strong Rooms, Safe); Radio Control Center with CCTV monitors covering the whole site, externally and internally; Base Station Radio (functional equivalent to the *Radio Receiver*, *Valve*, *Semi Portable* described in the equipment section, but transistorised and more reliable).

  Supplies: Armoury with 12 Automatic Rifles (15000 rounds), 3 Standard Rifles and 1 Standard Scope-sighted Rifle (2400 rounds), 24 Shotguns (4800 rounds), 48 Pistols (20,000 rounds); 24 Kevlar Vests, 24 Kevlar Helmets, 6 sets of SWAT Armour; 48 Tear Gas Grenades and 2 Launchers. Communications Store with 48 Walkie Talkie Radios and 480 radio batteries, all rechargeable, and a dozen battery rechargers (mains powered). General Stores with 48 Heavy LED Flashlights and 480 rechargeable batteries, a dozen battery chargers (mains powered).

  Several million dollars (or whatever the local currency is) in local notes and coin. 100 kilos of gold in assorted sized ingots. Safety Storage boxes with assorted (GM's choice) jewellery, gold coins, stamp collections, stocks and bonds, cash etc. stored in them. 4 x 15000 gallon (about 60000 liter) diesel fuel tanks. 1 x 500 kW and 2 x 125 kW diesel generators.

Vehicles: ½d+1 Hummer SUTs, 1d+3 Standard Security Patrol cars, 1d Armoured Trucks.

The core Staff, as listed, are each armed with a Pistol (not drawn from the Armoury) and four magazines (or reloads if a revolver), another 4 of them also have shotguns and 2 have Automatic Rifles at least nearby (also not from the Armoury, 150 rounds for the rifles and 24 rounds for the shotguns). The staff with the Shotguns and Autorifles are centrally located within the building.

Each Hummer (1 Automatic Rifle with 150 rounds, 1 Shotgun with 24 rounds; 1 Teargas launcher and 12 shells; 2 Kevlar vests, 2 Kevlar Helmets) and Sedan (1 Rifle with 50 rounds, 1 Shotgun with 24 rounds) have two crew in addition to the core staff.

Each Armoured car (2 Shotguns, each with 24 rounds, 1 Rifle with 50 rounds) has three crew. All crew members have sidearms (3 magazines).

All vehicles have secure Vehicular radios and a Hand Held Radio transciever for each crew (and a recharger [solar/vehicular] and 3 sets of radio batteries). None of the crew or vehicular weapons or equipment come from the Armoury or Base Stores.

- **Uniform Parcel Service:** A major nodal hub for this major parcel/courier service. ***Staff:*** 50. ***Facilities:*** Sorting and warehouse facilities. ***Supplies:*** the warehouse contains an assortment of parcels with a variety of contents. Two 15,000 gallon (about 60,000 liters) Diesel tanks. ***Vehicles:*** 3d+6 UPS Vans (double at night).

- **Vulcan Specialty Steels:** Manufactures a variety of items from stainless steel and other specialty steels, including cast metal operations up to 600 pounds (about 250 kilos). ***Staff:*** 80. ***Facilities:*** D Metalworking Tools, 20 man, x 10 multiplier (150 kW); C Metalworking Tools, 40 man, x 5 multiplier (140 kW); B Metalworking Tools, 80 man, x 2 multiplier (160 kW). ***Supplies:*** About 200 tons of assorted stock. 5000 gallon (c. 20,000 liters) LPG tank. ***Vehicles:*** 8 Forklifts (4 small, 4 large, LPG); 4 Flatbed trucks, 2 Delivery vans.

Not all of the above tenants need be present (the Geothermal power plant is a real *short term* gift, of course, and you may want to change it into an Oil or Coal fired plant of similar capacity with a small tank farm or coal stockpile of fuel – enough, say, for three months at full output), you can leave out (or create alternatives to) those you feel are too much (or not quite right) for your purposes ... or add *more* for a *really* big Industrial Park.

For example, *major* industrial parks will probably have one or more factories with *hundreds* of workers, likely *several* hundreds – though *really* large manufacturing plants will likely be located by themselves.

Minor Tenants

These tenants may be more localised, or merely more specialised, than the larger tenants, and tend to operate over a more localised area within the region.

The sort of tenants that are likely include those from *The Estate* (the previous section), perhaps several of each for some particular types (such as anything to do with automotive repair).

The Workers

Assuming that the *displacement event* takes place during normal working hours (and some of the plants may operate round the clock shifts!) then the workers are likely to have some personal transport nearby (as noted in the previous chapter, more so in the US down to more likely ton use public transport in Europe).

These personal vehicles may have all sorts of unexpected items in them – though they probably won't have gun racks outside of some parts of the USA!

Transport Links

Such a major(ish) industrial facility will be served by a variety of high capacity transport links. Their nature will depend on the actual location of the Park, but some sort of rail link is almost certain and, if the Park is on a river or harbourside site, then there is a good chance of there being some sort of dockyard facilities. Generally there will be one *or* the other of the facilities described below.

Consolidated Amalgamated Tram & Rail Services

Known to friend and foe alike as *CATastRophe Rail*, CATRS provides a combined rail/road transport solution for the areas it services, including *Littleton.*

- **CATRS RailLink (Littleton):** The *Littleton Industrial Park* facility consists of a small passenger station (ticketing machines only, minimal cover, a couple of vending machines, into which commuter trains from nearby towns and the Big City run on a limited schedule – mostly around shift change. There is a small possibility that such a train – a diesel electric Loco and six to eight passenger cars might be caught in the *displacement* effect.

Staff: 32 (day shift of 16, two off-peak shifts of eight men each). ***Facilities:*** The main part of the station is a bulk freight terminal with container loading/unloading facilities as well as provision for loading/unloading bulk liquids, solids, oversized and heavy cargoes and break bulk cargoes in standard boxcars. Two 125,000 gallon (about 500,000 liter) liquid tanks, one for diesel fuel, the other for gasoline. Two 12500 gallon (about 50,000 liter) LPG tanks.

Supplies: There are usually several dozen (12 + 12d6) containers here waiting either to be picked up or to be loaded on to the trains. There may also be a similar amount of cars and a shunting engine here at the time of *displacement* bringing in or picking up (most likely a combination) cargoes for/from the businesses situated here. They will mostly have raw materials (those awaiting pickup) or finished goods (or processed) materials (those awaiting loading). The diesel, gasoline and LPG tanks are 50-100% ([4 + 1d6] x 10%) full at any given time.

Vehicles: 4 Large forklifts (diesel), 1 Pickup truck. Possibly a Diesel Shunter and Diesel Electric locomotive and assorted cargo rail cars and passenger rail cars.

SINCLAIR MICHAELSON PORT & RIVERINE SERVICES
Known to friend and foe alike as *Sink 'Em Marine*, SMPRS provides a combined land/river/sea transport solution for the areas it services, which include the *Littleton Region.*

- **SMPRS PortLink (Littleton):** The *Littleton Industrial Park* facility consists of a barge/ship handling facility with road and rail links.

Staff: 48 (day shift of 24, two off-peak shifts of 12 men each). ***Facilities:*** There is one wharf capable of handling barges (up to four, *total*) with mobile (running on tracks) cranes capable of handling fully loaded 40' cargo containers and shifting them to the dockside for movement to trans-shipment areas by specialised container-movers. Two 125,000 gallon (about 500,000 liter) liquid tanks, one for diesel fuel, the other for gasoline. Two 12500 gallon (about 50,000 liter) LPG tanks.

Supplies: There are usually 40 + 10d6 containers here waiting either to be picked up or to be loaded on to the trains, trucks, barges or ships. These containers will mostly have raw materials (those awaiting pickup) or finished goods (or processed) materials (those awaiting loading), but some may well be empty (the US has many more containers used for imports each year than it sends abroad with its exports). The diesel, gasoline and LPG

tanks are 50-100% ([4 + 1d6] x 10%) full at any given time.

Vehicles: 4 Large Container Movers. 4 Large Forklifts (diesel). 2 Dockyard cranes (100 ton capacity). There may also be a Diesel Shunter and/or Diesel Electric locomotive and assorted cargo rail cars and passenger rail cars. Ditto 6 + 2d6 Tractor-Trailer rigs.

The Small Town

A typical small town, based on *Nyngan* (NSW, Australia) in *Bogan Shire* and about 583 km northwest of Sydney.

***Detailed** information on Nyngan is hard to come by, the following has been gleaned from a variety of sources, and is supplemented by (hopefully helpful) comments in italic like **this** paragraph. **Note:** Business names have mostly been changed to avoid potential legal problems.*

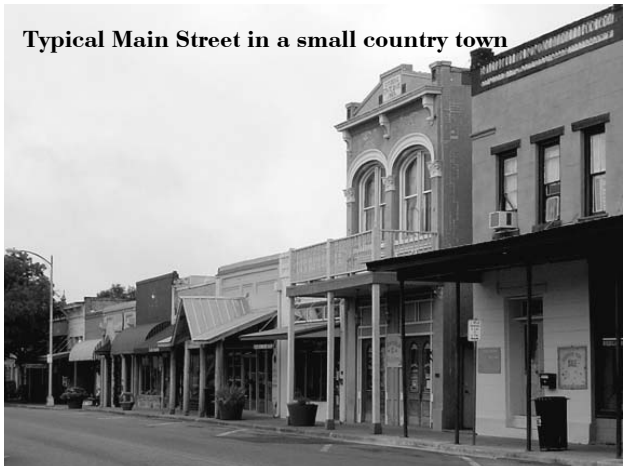
Population: 2500 (approximate), about 11% are Aboriginal people.

*The sad fact is that Aboriginal Australians have lower life expectancy (close to 20 years less), lower educational attainments, are more likely to be unemployed or in gaol (or to **have** been in gaol) and generally get the short end of life's stick, so to speak. This is not always due to **active** racism, but to **structural** problems as much as anything else. Still, it is a fact of life that must be taken into account.*

Accommodation: Tall Poppies Boutique Hotel (4 Rooms, Cafe); The Alice Motor Inn, Country Estate Motor Inn, Black Stump Motor Inn; Canowindra *(pronounced **Canowndra**)* Hotel, Ghost Gum Hotel, Burke & Wills Hotel; Riverbank Caravan Park, Bogan Caravan Park.

Motor Inns are often called Motels and are normally located along major roads, and cater to travellers with their own motor vehicles. Hotels, on the other hand, are in this instance) Public Houses (Bars, in US parlance) that simply happen to have accommodation (a typical, but by no means universal arrangement in Australian and UK Public Houses).

Ag Expo: Every year Nyngan hosts Ag Expo at the beginning of August. Hundreds of exhibitors and their staff (and thousands of visitors) with anything and everything you can think of (and lots more you probably can't) that would be of use on a farm or in the country generally.



Typical Main Street in a small country town

*Check out the website at http://www.nynexpo.com and see the list of exhibitors for some idea of what could be available if you decide to set the **displacement** event around the time of the Ag Expo (which is, of course, the last month of **winter** in the southern hemisphere, or that part of it which includes NSW).*

Agriculture: Cereal Crops, Wool, Beef & Sheep Meat.

During harvest season there will be extra trains run into Nyngan to transport the crops – Nyngan's railside grain silos can store c. 80,000 tons and there will be more (smaller capacity) storage on the bigger farms.

Airport: Nyngan airport is situated close to the town from which three flights to Sydney via Dubbo are conducted each week.

The airport is also used extensively for charter and private flights and is capable of handling Hercules size aircraft.

There are two runways 5390 x 98 feet (1643 x 30 meters [asphalt]); 3484 x 98 feet (1062 x 30 meters [grass]), terminal building (with Air Link Dubbo signs) and a hangar and one underground 5000 litre fuel tank (Avgas).

There is no firm indication of what, if any, aircraft are based at Nyngan airport, but at least **some** light aircraft have been, but probably only a handful at most.

The scheduled flights are almost certainly in twin engine light aircraft such as the Piper Navajo Chieftain (8 seats) operated by Airlink Dubbo. During the summer fire season water-bombing aircraft (possibly helicopters) may be based out of the airport.

Automobile Sales/Service/Parts: Nyngan Central Garage, Nyngan Auto Bodies, Nyngan Auto Electrical and Air Conditioning, Nyngan Exhausts, Nyngan Panel & Paint, Oldbridge Service Station (NRMA), Nyngan Toyota.

These will be similar in size and facilities to those described in The Estate. The Toyota Dealership will also have a small display of new vehicles, probably with an emphasis on Utility Trucks (Pickups in the US) and a somewhat larger stock of spares.

Bakeries: Fred & Helen's Hot Bake.

The bakery will have a capacity of only a couple of hundred loaves of bread a day, as most of the bread on sale in town will be trucked in every couple of days from Dubbo (the nearest large regional center).

Banks: Commonwealth Bank, National Australia

Bank, Westpac.

All of these will have limited staff, though the senior staff will probably have some Accounting qualifications. Limited services will be available – and relatively limited amounts of cash will be kept on hand.

Bogan Shire Council: Provides Library services, Community Services, Road construction and maintenance services, Waste Management services and provides reticulated water for the local (town) community.

The council will have a variety of vehicles available – Garbage trucks, Graders, Asphalt Layers, Bulldozers, Dump trucks, Work trucks, Utilities (Pickups) and the like as it contracts out for road maintenance of the two major highways through the town as well as being responsible for maintaining local roads. How much of this capacity will be in town at ***displacement*** *will be variable.*

Boy Scouts/Girl Guides: A troop of members of each of these youth organisations meets regularly.

Butchers: Nyngan Butchery, Bogan Butchery, William's Butchery.

Like most country butchers, they probably slaughter their own meat rather than buying it wholesale.

CB Radio Repeater/Amateur Radio: UHF CB Repeater, call sign NYN01.

This is operated by a small number of enthusiasts who have clubbed together to purchase better equipment communally than they could have hoped to individually.

Chemist (**Pharmacy**)**:** Nyngan Pharmacy.

A limited selection of common prescription drugs are on hand, and restock is normally done once or twice a week. There is a better stock, relatively speaking, of common over the counter medications, cosmetics, and basic medical and personal grooming supplies.

Churches: Anglican Church, Baptist Church, Catholic Church, Uniting Church.

Clothing: Geoff's Menswear, Dee Dee's Clothing, Court's Clothing.

Clubs: Nyngan Bowling Club, Nyngan Golf Club, Nyngan RSL Civic Club.

"Clubs" in Australian parlance are not at all like US Clubs. They are not nightclubs. They usually have a connection to whatever facility they are named after (so the Bowling Club will have Lawn Bowls facilities and the Golf Club will be associated with the local Golf Course) and have a mix of Bar (alcohol), Dining (restaurant) and

entertainment as well (inevitably with Poker machines in some numbers, SkyTV broadcasting sports events, Cable TV and some occasional live entertainment, they will often run Movie nights with either proper 16mm Films or, more likely these days, large LCD projectors).

The RSL (Returned Servicemen's League) is not connected with sport, but is similar in facilities to a regular "Club" as described above, but the core membership (those who can vote and serve on the board) must be returned soldiers (i.e. they must have served overseas, rather like the American Legion or VFV in the, or British Legion in the UK).

Coachworks: Nyngan Coachworks (Council Depot).

The coachworks builds and repairs old horse-drawn Cobb & Co and Royal Mail coaches (based on the classic American stagecoach design) using original tools and techniques. Includes an operational Blacksmith's forge.

Computers: Bleeding Edge Computers.

This is probably the local ISP, for what little use that will be in a ***displaced*** *situation.*

Court: Nyngan Courthouse.

The Courthouse is still in use two days a week and is heritage listed (1880).

The magistrate normally comes out from Dubbo as, commonly, does the prosecutor, if needed (one of the local Police acts as Police Prosecutor mostly).

Dentist: Dr J. Wilson

The average age of medical and dental practitioners in rural Australia is higher than the national average and it is difficult to replace them when they retire.

Dry Cleaners: Nyngan Dry Cleaners

Fabrics/Manchester: Wattle Cottage.

Manchester is what it's called in Australia – linen and cloth goods, basically.

Fire Brigade: Station House.

There is no indication what equipment is available here or how many personnel man it. There is probably a combined pump/rescue truck and half a dozen men. Most of the firefighting and rescue equipment will be on the truck, with some stocks for resupply kept at the station house.

Fuel Outlets: BP Service Station, Shell Service Station, Mobil Service Station, Oldbridge Service Station (NRMA), Nyngan Truck & Traveller Stop, Eastern Fuel Service Station.

Each of these Fuel Outlets has two 15000 gallon (about 60000 liter) in ground tanks for gasoline and four for diesel. They also have a single 5000 gallon (about 20 liter) LPG tank each.

Oldbridge and Eastern Fuels are major distributors for the local farming community and have eight 15000 gallon (about 60000 liter) above ground tanks (two of gasoline and six of diesel each on separate sites).

All of the service stations and the two fuel depots have 10 kW generators to enable the fuel pumps to be worked during a power outage.

NRMA (National Roads and Motorists Association) provides breakdown service by subscription to members. They will probably have at least one or two service vans capable of fixing minor problems (a broken fan belt, leaky radiator or jump-starting a flat battery) and at least one light and one heavy Tow Truck capable of bringing in trucks and other heavy vehicles.

Funeral Directors: Simpson's Funerals.

Operates the town's only crematorium.

Furniture and Electrical: Nyngan Electrics, Nyngan Pharmacy, Nyngan Video Parlour (agents for Retravision & Capper's Furniture).

Retravision is a national electrical appliance store.

Giftware: Nyngan Giftware.

Government Agencies: Home Care Service, Meals on Wheels, Department of Family and Community Services (FACS), Centrelink, Motor Registry.

Home Care and Meals on Wheels provide services to the elderly or invalid in their own homes. FACs is what would probably be called "Welfare Services" in the US. Centrelink (Commonwealth Government) is the agency responsible for all Pensions and Unemployment benefits.

The Motor Registry also acts as an agent for the Registrar of Births, Deaths and Marriages; Department of Housing, National Parks and Wildlife and a variety of other State Government instrumentalities.

Greengrocers: Nyngan Fresh Food, Dave and Denise's Fruit Shop.

Greengrocers sell fresh fruit and vegetables. Most of this will be trucked in from Dubbo (the nearest big regional centre) rather than being grown locally.

Hairdressers: Big Clips, Paris Hair Salon, Bluey's Hair Salon.

Hardware & Rural Suppliers: Edward's Transport & Ag-N-Vet Services, FarmLink Rural, Nyngan Rural Agencies.

These are "stock and station" agents as well as hardware suppliers – they carry agricultural machinery, chemicals, seed and arrange the purchase and sale of livestock.

Homes and Hostels: Mick Glennie Hostel, Nyngan Community Homes.

Accommodation and services for the Aged and Disabled.

Hotels: Australian Hotel, Bingham's Hotel, Cobb & Co Hotel.

*A cross between an English Pub and an American Bar, unless also listed under **Accommodation** they do not have any, though they may serve simple meals.*

Industry: Welding, Light Engineering, Concreting, Saw milling, Agricultural and Mining machinery maintenance.

Most of these "industries" are of the sort listed in "The Estate" section.

Local Government: Bogan Shire Council, Town Hall.

The Town Hall is heritage listed (built 1897) and has the Council's business and administrative offices.

Library: The library has a comprehensive Reference Collection including Encyclopaedias (print and CD-

ROM), Dictionaries, Year Books, Local History and a collection of HSC (University Matriculation Exam) study materials. There is also an extensive range of fiction and non-fiction books, music and talking book tapes and CDs, and a small selection of movies on DVD. There are public access computers with internet connection available.

***Nyngan CTC** (Nyngan's only ISP) is co-located with the Library. They have 8 Public Access PCs, CD Writer, 10 PC Training Lab, A4/A3 Professional Colour Printer, Photocopier, Colour Scanner, Colour Laser Printer, Videoconferencing equipment, Fax, Digital Camera & Data Projector.*

Medical: Nyngan Health Service (Hospital) providing 24/7 Emergency Services, Acute Care and General Beds, X Ray and Pathology onsite, Ambulance, Staff accommodation; Nyngan Health Service (Community Health), Dr Wong, Nyngan Medical Centre (Dr Black).

All medical practitioners are in short supply in rural Australia. The two listed Doctors are probably the only doctors in town and will handle all of the work at the Hospital as well as being on call 24/7.

*There **might** be a registrar (duty doctor) available at the Hospital, but don't count on it (GM's choice).*

There will be enough nurses to man the Emergency Room, assist in Surgery and do ward duty 24/7 as well. There will likely be a Pathology technician to perform the simpler procedures onsite, and their will also be a radiologist/technician.

Mine: *Girilambone* Copper Mine (45 km north). Full production of grade A copper cathodes was started in mid 1993.

*A little tweaking and there's no reason the Mine can't be much closer and within the **displacement zone**.*

Production is 900,000 tons per year of 2.7% copper ore, or around 24-25,000 tons of copper metal and is done in an onsite refining plant.

Enough consumables are held onsite for 30 days operations (90 days operations if you want to stretch it).

The mine will have many heavy vehicles and a lot of heavy equipment onsite (and a big chunk of explosives).

Museum: Nyngan and District Museum (in Railway Station).

The displays include the old Telephone Exchange which could undoubtedly be put back into service as needed.

Newsagents: Nyngan Newsagency.

In the country these will sell a wide variety of magazines newspapers (regional, capital city and national), books, stationery and gifts.

Newspaper: Nyngan *Observer* (Every Wednesday; Circulation, 912; Readership, 2182).

*This is actually printed in Dubbo (at least the Editorial address is there, so it seems that's where the printer is), but there's no reason why that **has** to be the case. So there **may** be a small jobbing printer in town – like the one described in The Estate at your discretion.*

Alternately there may be an old, abandoned, flatbed or hot metal press left behind when the last printer went out of business many years ago and never sold for scrap.

Nurseries and Florists: Flower Point, Simpson's Shrub, Wattle Nursery.

Opportunity Shops: St. Mark's Opportunity Shop, St. Vincent de Paul Society.

Opportunity Shops sell donated second hand goods – everything from clothing to furniture.

Police: Police Station, Cells, 6 Officers.

How many vehicles? A couple of standard Sedan Patrol Cars (one probably a Highway Patrol interceptor), one Motorcycle (Highway Patrol), one 4WD/SUV. All are equipped with vehicular radios and all the officers have personal radios.

What weapons? Sidearms for the Officers. Probably a couple of Rifles and Shotguns in the Station.

*Probably no more than several hundred rounds for all of the weapons combined (this is **not** the USA!).*

There are probably Kevlar vests in the station and a variety of other basic equipment, but most heavy duty policing will be done out of Dubbo (the major regional center).

***Note:** Unlike the USA, there is only one police force in Australian states, in this case, the NSW Police (no Town*

police, County Police and State Police).

Post Office: Licensed Post Office.

Contracted out by Australia Post, does mail, parcel post, courier, bill paying, some stationery sales, some gift sales (mostly philatelic and numismatic) and whatever else the contractors decide will make them some money.

Radio Station: 2 WEB (100.7 FM), ABC Regional (95.1 FM).

*These are only repeaters for programming originating elsewhere. The ABC Regional station has a local repeater, 2 WEB actually doesn't, but Nyngan is in range of its transmissions (you could assume that it actually **does** have a retransmitter locally).*

There are currently plans, at Federal Government level, to allocate a frequency for possible use by a community broadcaster in Nyngan. It is not too unlikely that it could actually have been set up for game purposes with semi-professional studio and broadcast facilities.

Rail: Nyngan is located on the Main Western Rail Line linking the town to Dubbo and Sydney. The major outwards products are wheat and Iron Ore from Cobar.

No passenger rail services stop at Nyngan, which is now served only by CountryLink buses (daily to Cobar and Broken Hill, daily to Lithgow and Dubbo, four times weekly to Bourke.

A number of freight trains run through every day in both directions, as this main line connects through to South Australia and, eventually, to Western Australia and back to Sydney. There is passenger service several times a week running along the line to Broken Hill and Adelaide and points west originating in Sydney, but it no longer stops in Nyngan, as noted.

Restaurants: Nyngan RSL Civic Club Bistro, Sundowner Motor Inn.

Rural Fire Service: Purpose built station house.

The RFS is an almost entirely volunteer organisation.

There is no indication how many vehicles there are, but there are probably at least two tanker/rescue vehicles and, possibly, one 4WD command vehicle. All with radio communications equipment.

Schools: Nyngan Public (Nyngan Public School has 14 teachers, 214 students, K-6); Nyngan High School (12 teachers, 182 students, 7-12). St Joseph's (Catholic) Primary School (K-6). TAFE Campus (Agriculture, Business, Accountancy, Computers); Early Childhood Services & Mothers Group.

Unlike the USA and UK, government schools in Australia are all controlled and staffed directly by the State government.

TAFE (Technical and Further Education) is a system of technical schools providing certificate level education (as opposed to a University degree) usually in trade or business areas.

Social & Service Clubs: Nyngan Arts Council, Nyngan & District Historical Society, Lions, Rotary Club, VIEW club, and the CWA (Country Women's Association).

*Unlike the Clubs mentioned elsewhere, these generally meet in community halls (or perhaps **in** function rooms made available by the **other** Clubs), these are genuine social and cultural clubs. Lions and Rotary are well known around the world.*

VIEW (Voice, Interest and Education of Women) was established by the Smith Family (something like the Salvation Army, but not specifically Christian) in the 1960s and are intended to support and help women lobby for issues that are of particular interest to them. The CWA is something like the DAR (Daughters of the American Revolution – though not as snooty) and is well known for working to improve the life of country women and children, especially those in rural and remote Australia.

Solicitors: Judge & Co.

In such a small town, there is probably only a single solicitor with, possibly, an articled clerk (trainee).

Stock Raising: The Nyngan district is home to many world famous sheep and cattle studs.

*At least some of these will be **displaced** along with the town itself.*

Stock & Station/Real Estate Agents: Elders, Raine & Horne, Westfarmers Landmark.

Not only do they act as Real Estate Agents, they also act as agents for bulk rural supplies – and have some stock

*on hand for immediate delivery (how much will depend on the time of year) ... this could include fertilisers and pesticides, seed grain, veterinary supplies, and farm machinery and equipment, all at **your** discretion.*

Supermarkets/Convenience Stores: Open All Hours, Kelso's IGA Supermarket, Kerry's Corner Shop, Green's IGA Everyday.

The IGA (Independent Grocer's Alliance) is the third largest grocery chain in Australia (by a long way) and, as the name suggests, deals with independent local owners, especially in small country towns.

Takeaway Food: Andrew's Takeaway, Canowindra Hotel/Motel, Porpoise Takeaway, Open All Hours, Kerry's Corner Shop, Nyngan Bowling Club Chinese Restaurant, Nyngan Fresh Food, Nyngan Truck & Traveller Stop, Burke & Wills Hotel/Motel.

*Depending on the time of day these businesses may have a number of out-of-town travellers eating there when the displacement transition occurs ... most likely the **Truck & Traveller Stop**. While you aren't likely to have an entire SAS ("Special Air Service") Squadron "just passing through" you **could** justify **some** "special appearances" to make the town's survival a little easier (or a little more likely) and certainly more pleasant.*

Taxation Consultants: Priest and Daughter, Ingold's Accounting, Angus Scott, McWilliam's & Associates.

*These will also be Accountants and business advisors in such a small town and **may** do basic legal work such as conveyancing (property transfer).*

Telephone: Normal landline service is available in the town and nearer rural properties. Digital mobile phone service coverage is available in Nyngan proper and corridors along the Mitchell and Barrier highways. CDMA mobile phone service is still available throughout the shire.

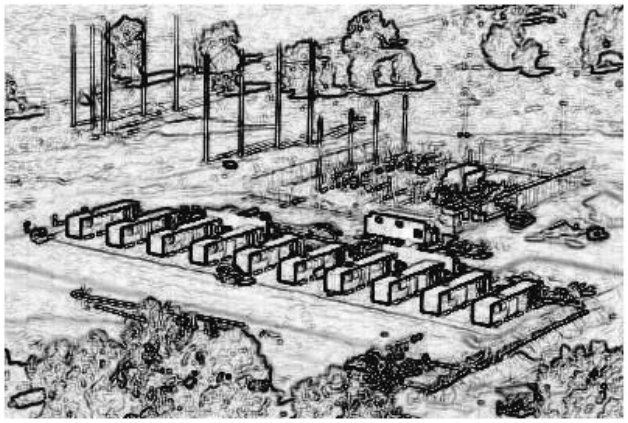
Landline phones will be run through an automatic exchange locally (the old exchange in on display in the local museum, and can likely be refurbished at need). Mobile phone towers are situated in town and along the highways.

Television: ABC 3, CWN6 (Prime), WIN (retransmitters).

The Australian Broadcasting Commission, Prime (CWN) and WIN have retransmitters in Nyngan, though their "local" programming originates in Dubbo. Cable TV is available through the Telstra phone system (more or less) and satellite.

*Not much of which helps in a **displaced** situation.*

Western Comet Gas Electrical Power Plant



*Theoretically, of course, some sort of lashup using camcorders and DVD/VCR players **might** be workable, and give the town some sort of Television broadcasting capacity.*

Transport: Black's Transport (Grain & General), Bugge's Transport (Heavy), Bogan Transport (Light – Daily cargo and passenger services to Dubbo), Ward's Transport (General).

*Black's and Bugge's will be heavily involved in moving the grain harvest into town during harvest season – which may mean that a significant portion of their truck fleet will be **out of town** at the time of displacement, **unless** the effect takes hold during the night time hours.*

During the rest of the year vehicles will likely be off far afield (within Bogan Shire and adjacent areas) and will be less likely to be on the premises even at night time – exactly how many vehicles they have is up to you.

Of course, not all of the vehicles will be heavy haulers – there will be smaller and lighter (relatively, anyway) trucks and delivery vans that will move goods between Nyngan and Dubbo on a regular (probably daily) basis as well as between Nyngan and other regional centers. These vehicles are more likely to be in town at night, regardless of the time of year.

Veterinarian: G J Connaught; Nyngan Ag'nVet.

Connaught's does double duty as a small animal practise and as a rural vet, and is assisted by his daughter. Nyngan Ag'nVet has three Vets on staff and concentrates on agricultural work – and has the NSW Department of Agriculture contract for all disease outbreak handling as well as on hand stocks for the more common problems. They also act as agents and distributors for the larger agrivet chemical suppliers to local stock farmers.

Video Hire: Nyngan Video Parlour, Riverside Video and Gift Shop.

Both these stores have a reasonable selection of the latest Video tapes and DVDs as well as older titles to round out

modest collections. They also sell and provide some basic service support for VCRs and DVDs and similar small items of consumer electronics.

Power Supply

Western Comet Gas operates a natural gas fired power station just outside of Nyngan (and within the *displacement* zone) using gas wells drilled into the PEL 242 Field co-located with the town.

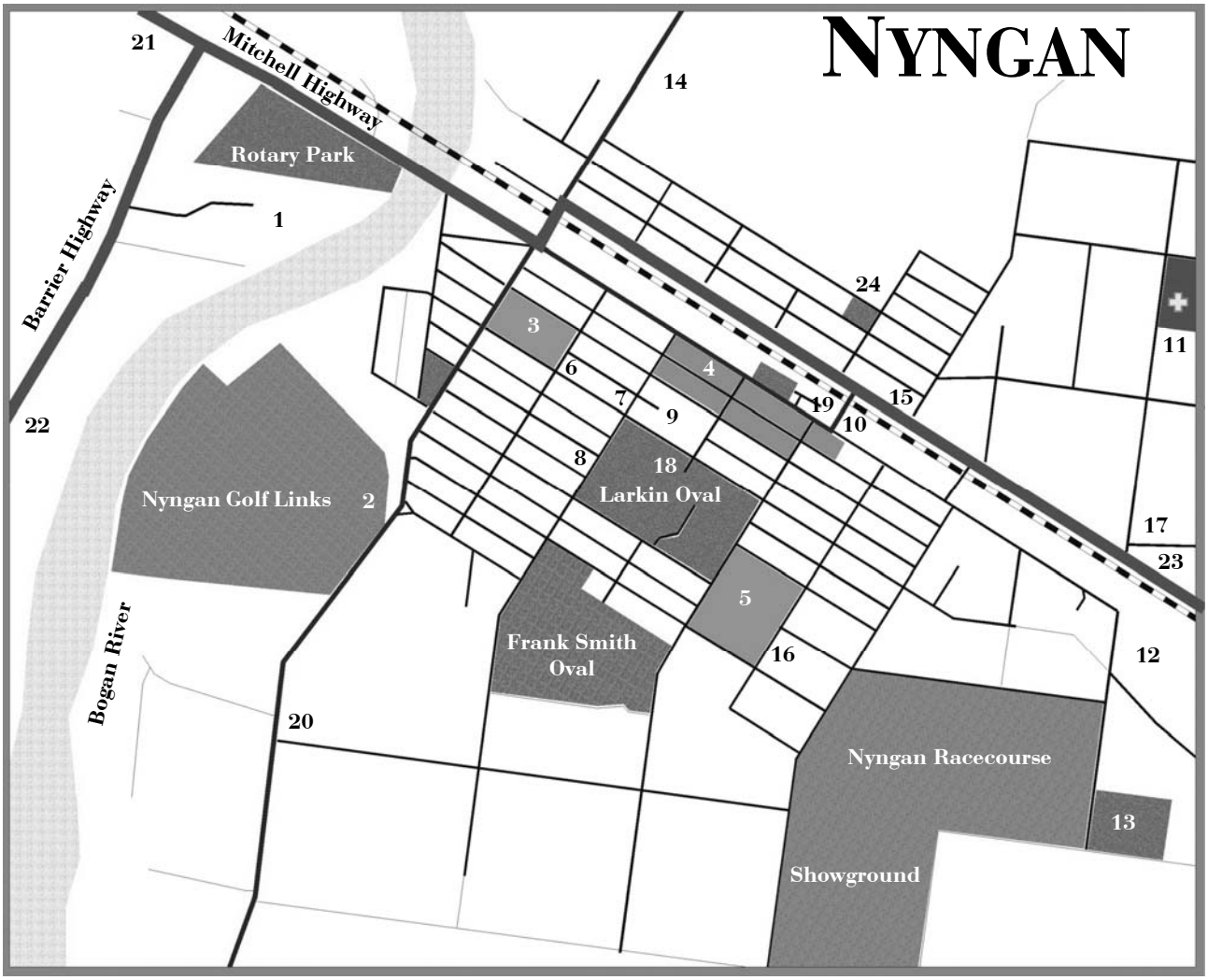
The Generator plant consists of 10 separately housed one megawatt computer controlled generator sets connected to the electricity grid and providing base-line load to the state grid.

Nyngan actually has no power station (and no gas field) nearby, but the WCG power facility is based on a gas powered plant (also of 10 Mw capacity) at Narrabri (population around 8000), also in NSW.

Since the displacement effect transfers a spherical chunk of ... whatever ... this means that the gas supply is also likely transferred, or enough of it for a longer period of operation than the generators are likely to last for before the very last one suffers a critical component failure that cannot be repaired locally nor replaced with scavenged parts from one of the others.

Map Key

(1) Caravan Park
(2) Nyngan Golf Club (Club House)
(3) Nyngan High School
(4) Business & Shopping District
(5) Nyngan Public School
(6) Church of England Church
(7) Catholic Church
(8) St Joseph's Primary School
(9) Fire Station, Ambulance Station, Courthouse, Library and Police Station
(10) RSL Club
(11) Nyngan and District Hospital
(12) Grain Silos and Grain Storage Area
(13) Nyngan Cemetery
(14) To Nyngan Airport and Radio/TV Repeaters
(15) Girl Guide Hall
(16) Scout Hall
(17) Caravan Park
(18) Swimming Pool
(19) Old Railway Station & Museum
(20) Rural Fire Service
(21) To Bourke and Girilambone Copper Mine
(22) To Cobar
(23) To Sydney
(24) Mechanix Machining & Hydraulics



The Antarctic Base

McMurdo Station is the largest facility in the Antarctic with in excess of 100 buildings (including the *Albert P Crary Science and Engineering Center* and a Bowling Alley), a 9 hole Golf Course (of sorts), a harbour, three airfields (two of which are seasonal), and heliport.

During the summer season there are are around 1000 residents, but this drops back to a around 200-250 during the winter. Most of the personnel are there to support the relatively few scientific personnel at the base, and provide operations, logistics, information technology, construction, and maintenance support.

Only two miles away from McMurdo base is the New Zealand *Scott Base*.

Transport Links

Williams Field: Williams Field is a groomed snow surface that can only support ski-equipped aircraft and is situated on the Ross Ice Shelf, approximately seven miles from Ross island. It is operational between December and February each year.

Pegasus Blue Ice Runway: Can handle heavy conventional undercarriage aircraft, but is 27 klicks from McMurdo. It is normally used only when Williams Field and the seasonal *Sea Ice Airstrip* are unavailable and only from March to November.

Sea Ice Airstrip: The Sea Ice Airstrip is active from mid year to November every year and handles heavy conventional undercarriage aircraft (up to the size of the C-5 Galaxy).

Ground Transport: About 400 motor vehicles are used at McMurdo. There are a selection of diesel powered heavy vehicles such as front-end loaders, caterpillar tractors, cranes and scrapers. There are also more mundane vehicles – trucks, vans, tracked-vehicles, a hovercraft and a number of snowmobiles.

Port Facilities: An icebreaker (USCG Polar Star), a fuel tanker, and a cargo ship arrive during January and February. Other research vessels and excursion ships may arrive during the summer season.

The base is isolated from about March 1st to about October 1st each year.

Facilities

Note that all of the buildings are numbered in the *order in which they were constructed* and numbers are evidently not re-used, so even though there are over 100 structures, the building numbers run much higher. Many buildings are named, and those names so commonly used that they are given in preference.

Albert P Crary Science and Engineering Center (CSEC): The CSEC consists of five "pods" with a total of 46,500 ft^2 of working area supporting Biology, Geology, Meteorology as well as having an Aquarium – all under the one roof.

The CSEC houses a local area network of internet-linked (through the satellite uplink at the NSF Chalet) computers; a Videoconference Room (capable of linking with any facility connected to the internet) and fully equipped Library; Environmental and Microbiological rooms; a Faraday Cage; an Electronics workshop, a Photographic Darkroom; Freezers for processing ice cores and other frozen specimens; Radarsat Control Room; Mount Erebus Seismic Observatory; Antarctic Meteorological Research Center (AMRC); and penetrations through the roof to accommodate instruments such as a LIDAR unit.

These facilities were intended to replace outdated lab facilities in the *Eklund Biological Center (EBC)* and *Thiel Earth Science Laboratory (TESL)*, but, of course, the latter facilities were kept in commission to supplement the more advanced CSEC facilities.

One office is dedicated for use by the *NSF Science Representative*, Antarctica. Other laboratories and

McMurdo Station, Antarctica

offices are dedicated to ASA specialists supporting basic and applied research conducted in the McMurdo region, such as a *Science Technician*, *Analytical Chemist*, *Analytical Technician*, as well as the *Laboratory and Computer Ops* support staffs.

Antarctic Support Associates (**Building 77**)**:** This houses the ASA Personnel, Housing Coordination and Finance offices.

Aquarium (**Building 187**)**:** This facility supplements the aquarium in the CSEC and contains several tanks with marine organisms from McMurdo Sound held here for research purposes.

Armoury: The navy maintains a smallarms locker with a dozen Automatic Pistols, two shotguns, three Bolt Action Rifles and three M-16s with several hundred rounds for each.

What? You expected a major arsenal? In ***Antarctica?*** *What for? This is probably* ***far*** *more than is actually held – and only likely since there are naval personnel at the base.*

Arrival Heights Lab: Located around two miles from McMurdo near the Kiwi Earth Station. This lab investigates magnetospheric and ionospheric phenomena, monitors UV radiation and makes UV spectroscopic measurements as part of ozone depletion research. The lab itself and a large area around it are ***Off Limits*** because the experiments located here are *extremely* sensitive.

ASA Accommodation: Dorms 207 through 211, and the 600-series Jamesway buildings (sectional wooden frames covered by insulated fabric) house most of ASA's staff. There is some overflow civilian accommodation on the first floor of Building 155.

There are 14 dormitories and most are quite full during the summer season. Of course, not all operate during the winter.

Barber Shop (**Building 155**)**:** Free haircuts are available by appointment.

Berg Field Center (**Building 160**)**:** The BFC issues food and equipment (including scientific equipment) to field parties. The staff also offer a variety of field safety training courses to new personnel.

Building 173, located next to the BFC, is used as a general storage area and also for specific science items shipped in for Science Teams. It is also used as a storage area for civilian cargo operations including outgoing cargo.

Cafeteria (**Building 155**)**:** McMurdo's main dining dining area. Apart for occasional specialty foods, portions are not supervised and there are vegetarian selections for most meals.

Being the largest gathering area on the base, the Dining area is used for movie screenings and, during the summer, for science lectures on weekend evenings.

Central Supply (**Building 140**)**:** Provides common use items such as office and cleaning supplies.

Chapel of the Snows (**Building 007**)**:** A small nondenominational chapel for religious services is available onsite. During the summer season there are full time navy chaplains (Catholic and Protestant) who provides normal religious and non-religious counselling on the base and who have, on occasion, performed weddings as well! Over the winter, the on-base staff organise their own religious activities.

Clubs: There are three navy-run clubs at McMurdo – the *Erebus Club* which offers alcohol, soft drinks and fast food are available; the *Southern Exposure* (smoke-free) which also serves alcohol and soft drinks; and the *Coffee House which* serves specialty non-alcoholic beverages.

Cosmic Ray Monitoring Lab: This is located along the road to Scott Base and houses the neutron monitoring equipment necessary for the long-term observation and study of the cosmic ray flux.

Dive Locker (**Building 144**)**:** This facility houses research dive equipment, including an air compressor for filling tanks and other maintenance equipment.

Dorm 209: This is also used for scientific personnel staying briefly at McMurdo between extended field ops.

Fire Department: Fire is a grave danger in the antarctic – not in the least because of the lack of water to fight it with. McMurdo base has a fully equipped Fire Department with a wide variety of vehicles ranging from two standard fire trucks modified slightly for the cold conditions and tracked vehicles of various types for use during extreme winter conditions.

Fuel Supplies: McMurdo station tank farm has storage for 13 million US gallons (approximately 50 million liters) of fuel. Annual fuel consumption is on the order of 6.5 million gallons (including the provision of fuel to the Polar Station and Scott Base) – providing a year's operational buffer in case the station is cut off from resupply.

The actual fuel storage capacity is around 8 million gallons (32 million liters) – still leaving some operational reserve. The NSF is currently looking into ways to cut down fuel consumption and, therefore, fuel costs – but the assumption here is that an expanded antarctic science (and, perhaps, mineral exploration?) program is, instead, the result.

Greenhouse: This provides some fresh fruit and vegetables to supplement the mostly canned, frozen, or dried food that comprises the bulk of the rations. Artificial lighting and heating has to be used, however, and production is limited and strictly rationed.

Ham Radio (**Building 186**)**:** This facility is operated by the navy and is staffed by qualified volunteers for the community's use. Atmospheric conditions permitting, it can make phone links to family and friends in the US.

Helicopter Pad (**Building 129**)**:** All helicopter operations are based out of this facility.

McMurdo Station operates four helicopters, two are AS350B2 ("Squirrels" or "A-Stars") and two are Bell 212s, civilian versions of the Huey.

Hospital & Clinic (**Building 142**)**:** Medical care is available year-round here. Sick-call hours are posted and emergencies will be admitted anytime. A dentist is available during the summer only. The infirmary has a fully equipped EMT ambulance available for use within the base.

Hotel California (**Building 166**)**:** This building is mainly used by scientific personnel moving between field ops and McMurdo and is intended for short term stays.

Information Systems (**Building 133**)**:** All computers onsite (*except* those in the CSEC, which has its own techs) are supported by Information Systems. This includes installation, repair, software training, and a Help Desk (the latter open 24 hours per day, seven days per week).

Library (**Building 155**)**:** The *general* library (the specialist collection is in the CSEC) contains a collection of books on Antarctic Exploration and Sciences, Technical Books, and a selection of novels and non-fiction books of general interest. It also has a

USCG Polar Star (WAGB-10)

The *Polar Class* are the second largest cutters operated by the Coast Guard and are specifically designed for open-water icebreaking.

They have reinforced hulls, special icebreaking bows, and a system that allows rapid shifting of ballast to increase the effectiveness of their icebreaking (6' @ 3 knots continuous, 21' by backing and ramming).

The Polar Star has four sizable lounges, a library, a gymnasium, and a small ship's store. It also has its own US Post Office, satellite pay telephones, amateur radio equipment, a computer lounge (for internet access, distance learning) and movie library. It is decorated in bright colours and modern decor unlike traditional military "decoration." It also has accommodation for 20 scientists and five laboratories for their use.

Crew: 139-141 *
Beam: 84'
Length: 399'
Draft: 32'
Displacement: 13,400 tons
Speed: 15-20 knots
Range: 28000 miles
Endurance: 100 days

Potable water: 26,586 gallons
General cargo: 400 tons
Cargo volume (**upper/lower hold**)**:** 350/250 m3
Maximum cargo dimensions: 7' x 11' x 7'

Aircraft: 2 x HH-65 Dolphin helicopters

The crew is specially chosen so that it is capable of self-sufficient operations a *long* way from any repair and maintenance facilities in some of the most hostile and unforgiving waters on the planet.

Partly decommissioned from late 2006 because of age-related maintenance issues (built 1976).

USCG Polar Star

Our Lady of the Snows Chapel

selection of Movies on DVD/VHS which can be viewed on layers located in several lounges.

Maintenance & Engineering: The base has a Heavy Workshop which does all mechanical and vehicle maintenance, a Carpentry workshop, Plumbing & Pipe fitting workshop and an Electrical workshop.

Mammoth Mountain Inn (Building 188): As with the *Hotel California*, this is intended for scientific personnel moving between the field and McMurdo and is for short stays.

Mechanical Equipment Center (Building 58): The MEC issues and maintain snowmobiles, generator sets, gas-powered ice augers, rock drills, chain saws, portable dive compressors, and 12v batteries and battery chargers used by science groups. They also control a fleet of "pool" pickups and tracked vehicles for use by the science community. The personnel also train science groups in the field maintenance and use of the equipment that they have on hand.

Movement Control Center (Building 140): The MCC handles all antarctic cargo and passenger movements and is extremely busy during the short summer season.

A speed of 20 mph applies to all travel in and around McMurdo station (including to and from the runways), except where lower speeds are posted. All vehicles are radio equipped and there are strict log-in procedures for all vehicles leaving the immediate base vicinity – which is extended to Scott Base and the airfields – co-ordinated by the MEC staff.

NSF Accommodation: Most NSF personnel and some program guests live in Buildings 125 and 137.

National Science Foundation Chalet (Building 167): This is the administrative hub of the base and the antarctic HQ of the *National Science Foundation* which has oversight of all the scientific and support activities at McMurdo, at the South Pole, and in the field.

The NSF's Resident Manager and Senior Manager have their offices here, as does the Chief Liaison Officer from *Antarctic Support Associates*, the main support contractor. Though the main point of contact for all scientific groups is through Reception at the NSF, the main administrative facilities are located elsewhere.

The NSF Chalet has an SSB Radio for emergency contact with the Polar station and foreign national stations in the antarctic. It also has a satellite uplink connected to geostationary communication satellites and is the official (if not technical) terminus of the fiber optic link that connects McMurdo and the polar station.

The Chalet also has a fully networked Conference room as well as a Meeting Room for presentations and official functions.

Penguin Power and Water: McMurdo's baseline power needs are provided by eight diesel generators rated at 500 kW each. Normal power requirements are such that only four need to be run at any given time, so running time is rotated between them to allow for extended maintenance.

The base also has five specially designed 100 kW wind turbines in a "wind farm" of which four are in use at any one time, providing 25% of expected requirements.

The Firehouse, NASA facility, CESC and the airfield have their own emergency backup generators.

Daily energy requirements at McMurdo is about 1.6-1.9 Mw. The diesel generators burn around 1100 gallons of diesel a day at peak load. Note that approximately 2/3rds of the power generated is needed for heating the whole facility and making normal operations possible.

There are actually only six generators, all around 20 years old, though well maintained, and there are only **plans** for a single wind turbine to be installed as a test bed. The assumption is that funding to replace the generators and install the wind turbines is forthcoming from Congress – perhaps to implement an expanded scientific program, or equally, to start a minerals exploration program.

Post Office (Building 140): McMurdo has a navy-run APO/FPO on the ground floor. Letter mail has a high priority and is allotted aircraft space on a routine basis, package mail does not (so bring anything you need *with* you on deployment!).

Public Access Computer Room (Building 155): This has a dozen computers and a colour laser printer available for general public use and which have internet access to "civilisation" via the satellite uplink at the NSF facility.

The PAC actually has 6-7 computers only, but in this

slightly uprated version of McMurdo, it rates more.

Recompression Chamber (Building 85): Located next to the Dispensary it houses a chamber for the treatment of dive-accident patients and others needing hyperbaric oxygen therapy.

Recreation (Buildings 63, 75, 78): The Morale, Welfare, and Recreation (MWR) Department is run by the navy. Facilities include a Recording Center (from which Radio/TV McMurdo is run – a cable "radio" and "television" setup), Fitness Center (with additional fitness equipment in Building 78), Bowling Alley, Leather and Ceramics workshops. It also has Musical instruments and Skiing gear for rent and a selection of Tapes, CDs and DVDs for loan.

There is a Gym with Basketball, Racquetball and Volleyball facilities as well as a Climbing Wall in Building 75. Aerobics training takes place there several times a week.

Ship's Store (Building 155): The commissary sells a limited range of toiletries, stationery, soft drinks, alcohol, electronics, jewellery, food, tobacco, confectionery, cameras, film and souvenirs. Stocks are limited and items such as film may not be available.

Alcohol is rationed. Individuals may purchase one bottle of liquor or two bottles of wine or one case of beer weekly. Field parties may requisition their ration in advance for the period they will be in the field. There are two ATMs outside the store.

Shuttle Service: During the summer only there is a scheduled bus service running between McMurdo, Scott Base, Williams Field and the ice runway. Priority space is for those travelling to and from work, space available seating is available for others.

Supplies: There are several materials warehouses for hardware, wood, steel, electrical and other supplies.

*The supplies carried at the base are both limited and extensive. The **choice** is limited, but a real attempt is made to ensure that the **amount** is enough for several years of expected consumption, especially for critical maintenance and construction supplies.*

The base has enough food for 1250 personnel brought in for the three month summer season and for 250 personnel for the nine month winter season every year.

The Station also has another two years reserve supplies (actually one year's supplies are kept, but this has been notionally upgraded for campaign planning purposes along with the base facilities as a whole) spread around several sites on the base to ensure that fire damage does not damage them all.

USNS Paul Buck (T-AOT 1122)

The *Paul Buck* is one of the USN's *Champion Class* tankers, all of which have double hulls and are ice-strengthened for protection against damage during missions in extreme climates (they are used to resupply Thule AFB and other Arctic bases as well as McMurdo)

Builder: American Ship Building Co., Tampa, FL.
Propulsion: 1 Sulzer 5RTA 76 diesel; 18,400 hp sustained; 1 shaft.
Length: 615 feet (187.58 meters).
Beam: 90 feet (27.45 meters).
Displacement: 39,624 tons (40,257.98 metric tons) full load.
Speed: 16 knots (18.42 mph).
Crew: 24 civilians.
Load: 237,766 barrels of oil fuel (approximately 10 million gallons or 40 million liters).

American Tern (T-AK 4729)

Replaced the *Green Wave* as the cargo resupply ship for the US base at McMurdo in 2005.

The *American Tern* is rated for Finnish ice class 1A, the highest ice rating for cargo vessels that are not actually icebreakers.

Though *American Tern* carries 1000 TEUs of containers, it is as a *general cargo* ship as it can carry bulky and extra-heavy items such as vehicles, construction equipment and materials, pipes and the like.

The vessel has two on-board cranes rated at 60 and 40 metric tons separately or 90 metric tons when used in tandem, which is important because there are no dockside cranes at McMurdo (the "dock" being of ice created every summer).

Power Plant: diesel, single propeller
Length: 521'
Beam: 76'
Draft: 33'
Displacement: 17350 displacement tons, 52,898 tons, full load
Speed: 16 knots
Crew: 21


Scott Base from the Air

Trouble Desk (**Building 140):** The ASA Trouble Desk provides information, deals with questions, and handles maintenance or work requests. It also distributes civilian mail 24 hours a day (during summer).

Water Supplies: Fresh water is provided by a salt-water distillation plant producing around 80,000 gallons (c. 320,000 liters) per day. Demand can often outstrip supply, so water conservation is in force.

Clothing may be washed once a week and showers (no more than two minutes of running water) may be taken every other day (or as posted). If restrictions are in force, this may be further reduced.

Scott Base

Scott Base is the main New Zealand base in the Antarctic, and accommodates 85 people over summer, and a skeleton staff of 15 over the winter (accommodation is in hostel style shared rooms during the summer). All of its eight buildings are linked by all weather corridors and have a total of 2340 m^2 of floorspace (570 m^2 of accommodation and 1800 m^2 in the new *Hillary Field Center*).

The base itself is only 3 klicks from the *much* larger US McMurdo Station, and is connected by road – and a regular shuttle service, at least during the summer season. During the summer season an AB-212 Helicopter is based here and co-operates with the US transport efforts at McMurdo under a pool agreement.

Transport: Traverse/field tracked tractor(s): Cat D6H, Cat D5B, Cat D3B; Tracked personnel carriers: Hagglunds ATV (personnel); Kassbohrer PB170/Hiab crane, Kassbohrer PB100; Snowmobiles; 4x4 Yamaha ATVs; Cat D8H tracked loader; Kubota B1550, Cat 926E wheeled loaders; Toyota 1 Ton Utility, two Toyota double cab Utility, Toyota Landcruiser Troopcarrier, Isuzu 5 tonne 4x4 7000 liter fuel carrier.

Fuel: There is a single insulated diesel tank with two separate 28,000 liter compartments. Only one compartment is normally in use at any given time, which contains a 20 day supply (resupply is by purchase from McMurdo Base via), the other is kept in reserve and rotated.

Around 1300 litres of diesel is used per day during Winter. Summer consumption rates are around 900 litres per day. The AN8 diesel is used by the Helicopters and Twin Otter Aircraft as well (and by all aircraft stationed in the antarctic).

A third, much smaller, tank contains around 2000 liters of unleaded petrol for use in some of the ground vehicles and portable generators.

Power Generation: Scott Base has three 300 kW generators, two for regular use and one as a backup.

NAS McMurdo

After the infamous *McMurdo Massacres* of 2011, where a co-ordinated al Quaeda maritime and air assault caused the deaths of 452 civilian and military personnel and the complete destruction of McMurdo station, the US resolved to rebuild the facility from the ground up.

The facilities were rebuilt in a massive effort by Navy Seabees and civilian contractors over the next several years and basically reprise those that existed before the attack, with some changes.

The al Quaeda attack (24 Feb 2011)

The boldest terrorist attack of the 21st century, *al Quaeda* operatives managed to insert themselves aboard a cruise ship and a supposedly civilian airliner which declared an emergency and landed at Williams field at the same time the terrorists from the cruise ship swept ashore in Zodiac inflatables and via the ship's on-board helicopter.

Surprise was almost total, and many of the base personnel were caught in their dorms which were, with brutal efficiency, simply torched ... anyone attempting to escape being shot down like dogs.

The terrorists then torched or blew up all the buildings and set alight the tank farm to top it all off.

By the time SAS forces from Australia and New Zealand had been flown in, they were hunkered down in the ruins and had to be dug out with equally brutal measures. No quarter was asked for or given and there were, essentially, no terrorist survivors by the time the US Marine task force was flown in some days later.

It is estimated that between 70 and 110 terrorists were involved in the operation, but the nature of the fighting meant that it is not certain, and many of them had to be blown to smithereens rather than dug out man to man.

The **Anzac Memorial Park** with a bronze statue of an Australian/New Zealand soldier defending the prone form of a wounded civilian and a plaque with the

names of the 15 Australian and 12 New Zealand soldiers who died in the operation along with flag poles for their national flags is situated opposite the rebuilt McMurdo HQ Building.

The remembrance ceremony every ANZAC Day (April 25th) is held by the remaining ANZAC troops on base and is attended by all of the Scott Base personnel who are on base as well as representatives of the US Forces and civilian personnel on base at the time.

US forces and personnel hold their remembrance ceremonies on February 24th at a memorial obelisk carved from locally quarried stone opposite the rebuilt ***Our Lady of Snows*** *chapel.*

The Garrison

McMurdo Station was renamed *Naval Air Station McMurdo* and is currently the southernmost active military base in the world, hosting forces drawn from the US Marines, Army, Navy, Air Force and Australian and New Zealand SAS *(Special Air Service)* and SBS *(Special Boat Squadron)* commandos.

Elements from the *French Foreign Legion* stage through McMurdo on their way to provide security and support services for French facilities in the Antarctic and also have a small permanent presence there.

1st (Provisional) Arctic Rifle & Support Company: This is a combined services force consisting of a Marine Rifle platoon, Navy Engineer Support platoon (Seabees), an Army Ranger Platoon, Medical Section (USN/USAF), Military Police Section (multi-service), HQ & Admin Section (multi-service) normally commanded by a Marine Corps Captain, seconded by a Army (Ranger) Lieutenant.

About half of the Company is present in-station at ***Byrd's Bunker*** *(or simply* ***The Bunker****) at any one time during the summer season, the rest being on operational deployment protecting other national facilities under the* ***Antarctic Defence & Anti-Terrorism Treaty (2012****). During the winter only a reinforced platoon remains – a Marine Rifle Section, Navy Engineer Support Section, and Army Ranger section plus some support personnel.*

The Rifle Company is commonly called ***Byrd's Rangers*** *after the famous US naval arctic/antarctic explorer and is equipped mostly with small arms (nothing bigger than a 60 mm Mortar). They have enough Bv-206 Arctic APCs to mount one of the Rifle Platoons and also have a single winterised LAV-25.*

ANZAC SAS & SBS: Australia and New Zealand provide a combined reinforced platoon of SAS (Australia) and SBS (New Zealand) Commandos with supporting elements as part of their commitments under the 2012 treaty, equipped with Bv-206 APCs.

The force is normally deployed under the local control of the commander of the US forces, within normal national ROEs.

About half of these will be stationed in the McMurdo/Scott Base area during the summer, with the rest in the field providing security for other national contingents. A combined squad plus some supporting elements remain over winter.

Byrd's Bunker: An earthworks and reinforced concrete fortress designed to defend NAS McMurdo and Scott Base, it has a ring of outlying bunkers connected by buried passageways to the central facility which contains satellite and radio communications facilities, vehicle garage and maintenance facilities and barracks, dining, training and entertainment facilities for the troops.

The Bunker also has a significant armoury with a plentiful supply of small arms ammunition and basic ordnance for the military forces stationed here. There are also small arms provided for the 2nd (Provisional) Antarctic National Guard Company (a reinforced platoon by TO&E though often under strength) which is formed mainly from support personnel at the base. There are enough smallarms to equip perhaps a hundred more civilians if an emergency should arise.

The Facilities (Reprised)

The *Crary Science and Engineering Center* was renamed the ***William Sherwood Science and Engineering Center (WSSEC)*** after William Sherwood, a cook (ex-Army) in the Cafeteria who managed to kill an al Quaeda attacker, take his weapons, and shepherd over fifty people to safety before he was killed heroically covering their escape.

Accommodation blocks have been scattered all over the base area to make it difficult, if not impossible, for a small force to corral and massacre the unsuspecting occupants. These structures are also provided with a greater number of improved emergency exits scattered around their outside for the same reason.

Food Supplies are now stored at three separate sites on base, and emergency supplies for 2000 men for a


Bv206 Arctic APC

year are stored within ***Byrd's Bunker***.

Outlying field stations are also equipped with emergency facilities (shelter and food) to enable the base personnel to disperse in times of crisis, and have enough accommodation (either assembled or ready to be) and supplies for 2000 men for a year between them).

Fuel & Energy Supplies: McMurdo's diesel fuel tanks are now scattered across the base rather than in one tank farm, and one of the 500,000 gallon (c. 2 million liter) tanks is part of ***Byrd's Bunker*** and is fully bermed *and* self-sealing for further security.

Penguin Power & Water: The generators are in two separate power houses, each with four 500 kW diesel units, normally two will be operational in each location with the others down for repair and maintenance.

The WSSEC, Main Admin Block, Airfield and Helicopter field all have backup generators and the Bunker has its own power house with two 500 kW diesels bermed and protected like the fuel tanks.

Likewise, the wind farm, now of six 100 kW wind turbines is in three separately located two turbine locations, and normally only one turbine at each location is operational.

Personnel: The expanded science and exploration program runs to 1500-1600 during the summer and around 400 during the winter, not including the garrison.

Scott Base (Reprised)

Like McMurdo, the original base was completely destroyed in the al Quaeda attack, but most of the personnel managed to escape in all available vehicles and were able to make an epic trek to safety. The Australian and New Zealand governments rebuilt the base and, since McMurdo has expanded in size, it is now really a "suburb" of the larger facility.

The new base has accommodation and facilities for 150 personnel over the summer, and around 30 staff winter over. Facilities (including vehicles, fuel storage, and power generation) are proportionally increased from the standard description.

Antarctica Displaced

There is no reason why McMurdo need be *displaced* **to** the geographical equivalent site in the coterminous dimension, alternate universe, or timeline.

Since *displacement* events normally effect only relatively small areas of terrain (typically no more than 5-10 klicks in diameter) even dumping the base in the tropics would have a minimal effect on the local environment in the long term.

Ice melts into water and drains away, in effect.

The most appropriate sort of *displacement* would be for the base and surrounds to be placed on or near a sea or lake coastline or, equally, to replace all or part of an existing island ... but, as long as the sea or ocean isn't deeper than, say, half the radius of the displaced sphere, the site should be stable enough for more than long enough for the base to be relocated at a leisurely pace over a period of years, perhaps generations.

Displacement Locus

The ***Arrival Heights Lab***, with its controlled access and any "Keep Out" signs is the obvious location for the epicenter of the displacement sphere – and, since it is some distance away from the main base area, its almost complete destruction as part of that effect is unlikely to cause damage to the rest of the base.

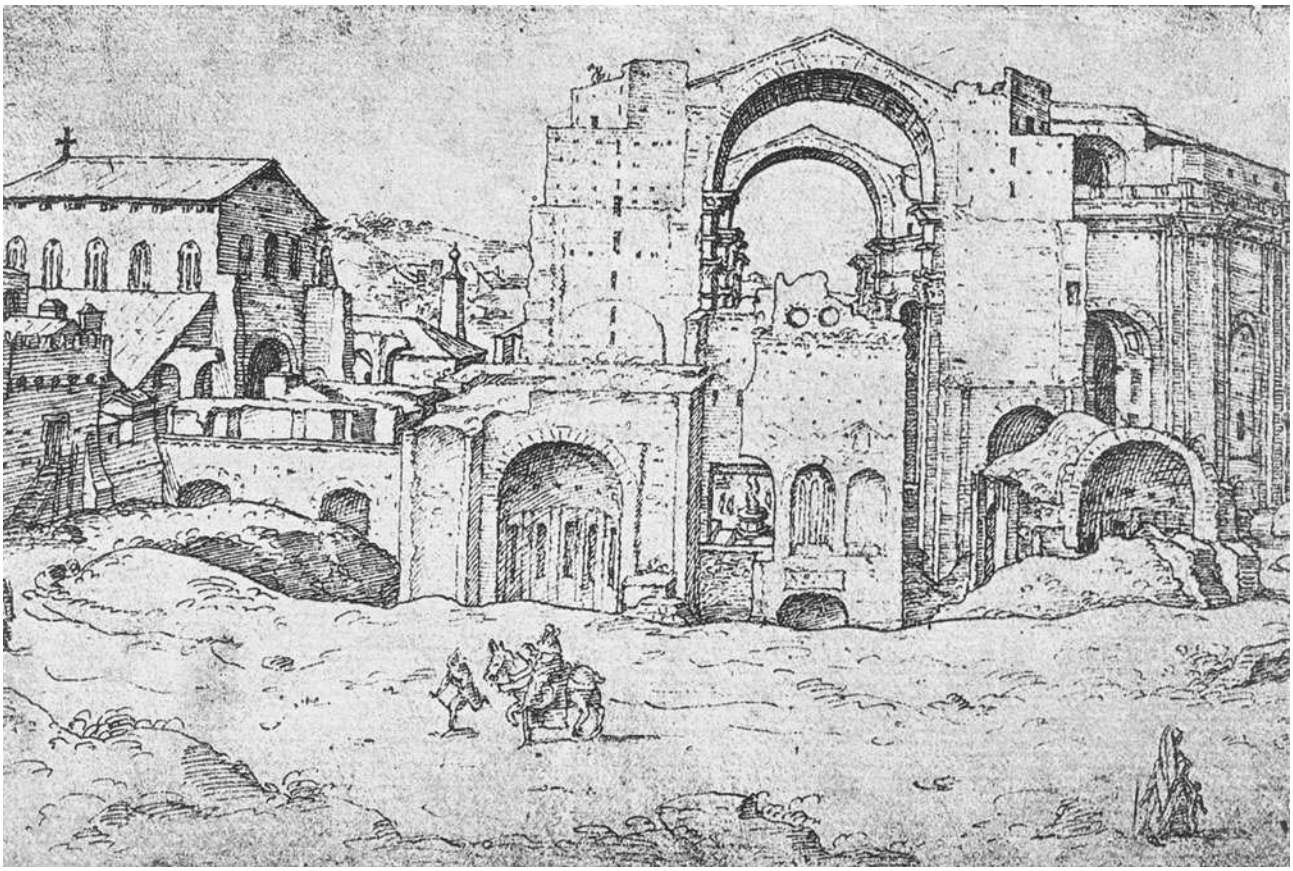
Al Quaeda

To al Quaeda (and all true fanatic muslims) the *dar al Harb ("Abode of War")* is everywhere *outside* of the *dar al Islam ("Abode of Peace" – i.e. where there is a majority muslim population and, by definition, a muslim government)*, so why *not* a surprise attack against what would have to be one of the more defenceless yet high value targets around?

Otherwise there's not much chance that the locals will have access to a lot of weaponry up front – McMurdo is way ***too hell and gone away*** *from* ***anywhere*** *for there to be many weapons in completely "real world" situation.*

So 70-80 military personnel, at most, and equipment for perhaps a couple of hundred more, with limited ammunition and no weapons heavier than a 60mm mortar is really ***not*** *going overboard – and, short of al Quaeda, why on earth would anything like this sort of force* ***be*** *there?*

APPENDICES



"History is for human self-knowledge ... the only clue to what man can do is what man has done. The value of history, then, is that it teaches us what man has done and thus what man is."
– R. G. Collingwood

"History repeats itself because nobody listens."
– Laurence Peter

"Treason doth never prosper. What's the reason? Why, when it prospers, none dare call it treason."
– Sir John Harrington

"God cannot change the past, but historians can."
– Samuel Butler

Weapons Appendices
Weapon Data for a Variety of RPGs

This chapter contains data for all of the weapons included in this book for a variety of OGL and other game systems.

The information provided is based on the conversion information provided in BTRC's *Stuff!*, *Guns! Guns! Guns!* and *More Guns* – which is problematic for some systems as they are not always internally consistent.

Action! System

This is one of the problem children. The formula provided for determining weapon damage doesn't match the actual weapon damage data in the core A!S rulebook at any point.

The mismatch between this formula derived damage value and the listed damage values gets worse as the caliber of the weapon gets larger.

The damage values provided are, therefore, the best match of formula derived values and what seems to be the logic behind the actual game values. If you don't like 'em, feel free to change them to match ... *whatever*.

Impresa Express

The weapons data listed in the core rules are not particularly extensive – naturally enough, given their intention of both universality *and* brevity and there were some difficulties in extrapolating the Heavy Weapon values for the system as the data provided to *Stuff!* for conversion wasn't actually complete enough to allow it.

Still, the system is clean *and*, at the end, it *was* an easy job to rate the weapons ... much easier than for any of the other systems other than EABA.

D20 Modern

The data available from a variety of products, is, frankly, all over the place and this made working out d20 modern stats for the weapons in this book the most difficult, and fiddly, process of the lot ... with the exception of *Sprycraft 2.0* (which was just as incoherent and even more fiddly).

The problem is that there is no discernible system to determine weapon values at all and this is made worse by the fact the the level based hit points that characters gain as part of the progression system in the game make smaller firearms increasingly irrelevant, ignoring their ultimate lethality on the modern battlefield, way and above the level of lethality mere melee weapons are capable of.

The values provided here are unrealistic, but fit in with the values provided for similar weapons in various d20 supplements and the Core Rules.

A pig's breakfast, in other words. But it's the best that can be done given what there is to work with.

Spycraft 2.0

These comments apply only to the first printing (2005), and not the second, which *allegedly* clears up *some* of the problems.

Like d20 Modern, Spycraft 2.0 is based on the inherently flawed premises of a level based character system that progressively de-lethalises firearms. It is compounded by being poorly organised and laid out from the point of view of *usability*...

It *looks* great, graphically speaking, but the data you need is scattered randomly over four or five sections of the rules, making it so unweildy as to be almost unusable (YMMV on this, of course).

Unfortunately, this makes what could, possibly, be relatively usable rule set a worse pig's breakfast in many ways than even d20 Modern! The values provided for weapons are, therefore, just as problematic and, again, it's the best that can be done with such flawed material.

EABA

This was a pleasure to work with, as usual.

The fact that *Stuff!* (the design toolkit of choice for technology and much else for role playing games as far as I am concerned) is specifically designed as an expansion of the EABA rules is the obvious reason ... all the values mesh with existing data and new weapons can be fleshed out quickly and easily.

Simplicity is, trust me, bliss for a game designer!

ACTION! SYSTEM WEAPON DATA TABLES

WEAPON NAME	CALIBRE	DAM	ACC	RMOD	STR MIN	MAX	ROF	AMMO	WT	COST
Trickster Holdout Pistol	9 mm P	3d	0	+1	3	50	4	4	1.1	€450
Four separate barrels (each must be reloaded individually), firing pin rotates automatically as each barrel is fired (SA).										
Last Chance Derringer	9 mm P	3d	-1	+1	3	25	2	2		€75
Two separate barrels (each must be reloaded individually), firing pin rotates automatically after the first barrel is fired (SA).										
Swordsman Autopistol	9 mm P	3d	0	+2	3	50	4	10	1.5	€600
Integral (non-removeable) box magazine. Loads single rounds or from 8 round stripper clip (SA)										
Swordsman Autopistol	9 mm P	3d	0	+2	3	50	4	10	1.5	€750
Removeable 10 round box magazine (SA).										
Tsarevitch Autopistol	9 mm P	3d	0	+1	3	50	4	9	0.65	€900
Removeable 9 round box magazine (SA).										
Attacker SA Revolver	9 mm P	3d	-1	+1	3	50	3	6	1.2	€450
Single action revolver (SAR) – must be cocked before firing. Rounds must be in half moon clip to be loaded.										
Volkspistole VP-44	9 mm P	3d	-1	+1	3	50	4	8	1.0	€300
Removeable 8 round box magazine (SA).										
Demon Goddess Shotgun Pistol	12 gauge	4d+2	0	0	4	25	2	2	1.2	€200
Two-barrel over-under configuration, each barrel is loaded separately. SA										
Border Reaver SMG	9 mm P	3d	+1	+1	3	75	4:30	32	3.5	€150
Uses curved, top mounted, rather than straight, side mounted magazines to reduce jamming compared to original design (FA).										
Flame Lord SMG	9 mm P	3d	+1	+1	3	75	4:30	30	3.0	€300
*Cannot use standard M=10 magazines – it will **seem** to, but jam on a 3:6 roll every burst fired (FA).*										
Red Star SMG	9 mm P	3d	+1	+1	4	75	4:30	35	3.36	€450
Can fire PPsh-41 35 round magazines, but not the 71 round drum magazines (FA).										
Cherry Tree SMG	9 mm P	3d	+1	+1	3	75	4:30	30	4.5	€450
Has a small knurled cocking lug unlike the original (FA).										
Brigadier Rifle	5.56 mm N	7d	+1	+3	4	500	4:20	20/30	4.5	€650
Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately (SA/FA)										
Field Marshall Rifle	7.62 mm N	8d	+1	+3	4	600	4:10	20/30	5.0	€750
Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately (SA/FA)										
Saint Basil Rifle	7.62 mm M43	5d+2	0	+2	4	300	4:20	32	4.03	€300
Has an integral folding spike-bayonet under the barrel (SA/FA).										
KStG 81 Autorifle	5.56 mm N	7d	0	+2	4	500	4:20	20/30	5.5	€500
Come swith 20 round magazines as standard, 30 round magazines must be purchased separately (SA/FA).										
KStG 81 Autorifle	7.62 mm M43	5d+2	0	+2	4	300	4:20	20/30	5.5	€500
Come swith 20 round magazines as standard, 30 round magazines must be purchased separately (SA/FA).										
Red Emperor Carbine	7.62 M43	5d+2	0	+2	4	300	4	10	3.9	€625
Has a 10 round internal (non-removeable) box magazine, reloads with single rounds or stripper clip (SA).										
Red Emperor Carbine	7.62 M43	5d+2	0	+2	4	300	4:20	10	3.9	€800
Comes 10 round removeable box magazine, but 15 and 30 round magazines are available separately (SA/FA).										

Action! System Weapon Data Tables

Weapon Name	Caliber	Dam	Acc	RMod	STR Min	Max	RoF	Ammo	Wt	Cost
Martini-Henry Rifle Mk. 1	8 mm	3d+1	+1	0	5	250	2	1	3.83	€150
Single shot, falling block, breechloading cartridge firing rifle (SS).										
Martini-Henry Rifle Mk 2	8 mm	3d+1	+2	+1	5	350	2	7im	4.03	€250
Lever action, falling block, breechloading tubular magainze cartridge firing rifle (SS).										
Minuteman Musket, Flintlock	12 mm	3d+0	+1	0	5	100	1/6	1	4.0	€35
Single shot muzzle-loading, rifle-musket (SS). Requires a new flint every 2d shots (provided with ammo).										
Minuteman Musket, Percussion	12 mm	3d+0	+1	0	5	100	1/6	1	4.0	€50
Single shot muzzle-loading, rifle-musket (SS). Percussion caps come with each round.										
Volcano Shotgun	12 gauge	4d+2	0	0	4	100	2	2	3.6	€185
Double barrel shotgun with break open action (SS).										
Demon Pump Action Shotgun	12 gauge	4d+2	0	0	4	100	3	6+1	4.25	€375
Pump action action shotgun (SA), may carry an extra round by inserting one in the action when the magazine is loaded.										
Lightning GPMG	7.62 mm N	8d	+2	+3	(4)	900	20	100	12.0	€1750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (FA).*										
Lightning GPMG	7.62 mm M54R	7d+2	+2	+3	(4)	900	20	100	12.0	€1750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (FA).*										
Morning Star MMG	7.62mm N	8d	+2	+4	(4)	1250	20	100	24.0	€2250
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Morning Star MMG	7.62 mm M54R	7d+2	+2	+4	(4)	1250	20	100	24.0	€2250
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Prince HMG	.50 cal BMG	14d	+2	+5	(6)	1500	20	100	55.0	€3750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Prince HMG	12.7 mm Bloc	14d+2	+2	+5	(6)	1500	20	100	55.0	€3750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Gatling Gun	7.62 mm N	8d	+1	+2	n.a.	750	20:30	30/50	38.0	€5625
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately (FA).										
Gatling Gun	. 50 cal BMG	14d	+1	+2	n.a.	1000	20:30	30/50	38.0	€5625
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately (FA).										
2.7 cm *Sturmpistole 44*	HE	2d+1	0	0	3	250	2	1	2.5	€225
Grenade Launcher	HEAT	1d+2	*Armour Piercing, reduced explosive effect (-2d per hex)*							
	Canister	1d+2 x 3	*Cone burst 1 x 6 meter from any point within range.*							
	Illumination	*Illuminates a 10 meter area for two combat turns*								
	Smoke	*Burns for 2 combat turns.*								
Thunderer 40 mm	HE	3d+1	0	0	4	500	2	1	2.67	€450
Grenade Launcher	HEDP	3d	*Armour Piercing, reduced explosive effect (-2d per hex)*							
	Canister	3d x 3	*Cone burst 2 x 10 meter from any point within range.*							
	Illumination	*Illuminates a 100 meter area for six combat turns*								
	Smoke	*Burns for 3 combat turns.*								

ACTION! SYSTEM WEAPON DATA TABLES

WEAPON NAME	CALIBER	DAM	ACC	RMOD	STR MIN	MAX	ROF	AMMO	WT	COST
Biter 60 mm DRL	HE	8d	0	0	3	150	1	1	3.5	€15
Rocket Launcher	HEDP	8d	*Damage decreases by 4d for each hex from point of impact.*							
	Canister	6d x 3	*Cone burst 5 x 75 meters from any point within range.*							
*Disposable RL – the round may be extracted and used in the **Viper** RL instead*										
Viper 60 mm Rocket	HE	8d	+1	+3	4	200	1	1	9.5	€300
Launcher	HEDP	8d	*Damage decreases by 4d for each hex from point of impact.*							
	Canister	6d x 3	*Cone burst 5 x 75 meters from any point within range.*							
*Re-usable launcher, can fire rounds extracted from **Biter** DRL. Requires a crew of two – but can be fired by one man.*										
Raketenpanzerbusche 54/1a	HEAT	12d	+1	+3	4	125	1	1	10	€350
Damage decreases by 4d for each hex from point of impact. Requires a crew of two – but can be fired by one man.										
Panzerfaust 150	HE	14d	0	+2	3	100	1	1	3.5	€185
Rocket Launcher	HEAT	14d	*Damage decreases by 4d for each hex from point of impact.*							
Can be fired and reloaded by the operator										
Dynamite/Gelignite	n.a.	8d	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	¼	€5
Use the standard rules for explosives. +1d6 to explosive damage for every doubling of explosive mass										
Gunpowder, Corned	n.a.	8d	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1	€4
Use the standard rules for explosives. +1d6 to explosive damage for every doubling of explosive mass										
Gunpowder, Meal	n.a.	6d	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1	€½
Use the standard rules for explosives. +1d6 to explosive damage for every doubling of explosive mass										
Mine, Antipersonnel	n.a.	12d x 3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2½	€20
Emplaced rather than fired.										
Mine, Directional	n.a.	12d x3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2½	€30
Emplaced rather than fired. Cone burst 10 x 100 meters from point of emplacement.										
Nitroglycerin	n.a.	6d	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.1	€20
Use the standard rules for explosives. +1d6 to explosive damage for every doubling of explosive mass										
HE Grenade, Offensive	n.a.	6d	0	0	3	STRx5	½	–	½	€5
Damage decreases by 1d for each hex of range from point of explosion										
HE Grenade, Defensive	n.a.	6d	0	0	3	STRx5	½	–	½	€6
Damage decreases by 2d for each hex of range from point of explosion.										
WP Smoke Grenade	n.a.	4d x 3	0	0	3	STRx4	½	–	¾	€15
Burns for 5 combat turns										
Black Powder Grenade	n.a.	6d	0	0	3	STRx4	½	–	¾	€2
Damage decreases by 3d for each hex of range from point of explosion.										
Crossbow, Pump Action	n.a.	4d	0	+1	3	100	½	1	3.5	€15
Single shot weapon must be reloaded manually.										
Crossbow, Repeater, Pump	n.a.	4d	0	+1	3	100	½	5	4	€30
Internal magazine feeds from bottom – loaded through open action.										
60 mm Mortar	HE	10d	+1	+4	Crew	1200	½	1	*	*

Action! System Weapon Data Tables

Weapon Name	Caliber	Dam	Acc	RMod	STR Min	Max	RoF	Ammo	Wt	Cost
60 mm Mortar	Smoke	*Burns for 20 phases*								
	Illumination	*Illuminates 500 meter radius for 10 combat turns.*								
** Kicker costs €1500 and masses 12kg; Noisy costs €2875 and masses 25 kg. Double range is possible with Forward Observer.*										
81/82 mm Mortar	HE	12d	+1	+4	Crew	1800	½	1	50	€4675
	Smoke	*Burns for 20 phases*								
	Illumination	*Illuminates 1200 meter radius for 20 combat turns.*								
Double listed range is possible with a Forward Observer calling fire.										
120 mm Mortar	HE	24d	+1	+4	Crew	2500	½	1	520	€6750
	Smoke	*Burns for 50 combat turns*								
	Illumination	*Illuminates 1500 meter radius for 40 combat turns.*								
Double listed range is possible with a Forward Observer calling fire.										
75 mm Recoilless Rifle	HE	16d	+1	+2	Crew	500	½	1	145	€1875
	HEDP	16d	*Damage decreases by 4d for each hex from point of impact.*							
	Canister	12d x 3	*Cone burst 5 x 200 meters from any point within range.*							
	Illumination	*Illuminates 500 meter radius for 20 combat turns*								
	Smoke	*Burns for 20 combat phases*								
Weight includes a light wheeled field mount.										
105 mm Recoilless Rifle	HE	18d	+1	+1	Crew	750	½	1	550	€2500
	HEDP	18d	*Damage decreases by 4d for each hex from point of impact.*							
	Canister	12d x 3	*Cone burst 10 x 250 meters from any point within range.*							
	Illumination	*Illuminates 500 meter radius for 30 combat turns*								
	Smoke	*Burns for 20 combat phases*								
Weight includes a light wheeled field mount.										
106 mm Recoilless Rifle	HE	20d	+1	+3	Crew	1000	½	1	165	€3375
	HEDP	20d	*Damage decreases by 4d for each hex from point of impact.*							
	Canister	15d x 3	*Cone burst 150 x 400 at up to 3000 meters.*							
	Illumination	*Illuminates 500 meter radius for 40 combat turns*								
	Smoke	*Burns for 40 combat turns*								
Weight includes a wheeled field mount.										
20 mm Autocannon	API	10d	+2	+3	Crew	800	8	20/60	70	€3750
	HE	4d	*Damage decreases by 4d for each hex from point of impact.*							
Weight is for weapon only. Field mount is extra.										
37 mm Autocannon	API	13d	+2	+4	Crew	1000	8	8	250	€5675
	HEDP	6d	*Damage decreases by 4d for each hex from point of impact.*							
Weight is for weapon only. Field mount is extra.										
15 mm Autocannon, Manual	HE	4d	+1	+2	Crew	500	4	100	55	€1875
15mm Autocannon, Electric	HE	4d	+1	+2	Crew	500	8	100	75	€3375
Weight is for weapon only. Field mount is extra.										

Action! System Weapon Data Tables

Weapon Name	Caliber	Dam	Acc	RMod	STR Min	Max	RoF	Ammo	Wt	Cost
Bulldog Gun-Mortar	60 mm	*	+1	+1	Crew	600	1	1	75	€2250
** Fires any 60 mm Mortar shell.*										
Sabre Rapid Fire Cannon	60 mm	*	0	+1	Crew	600	3	6	250	€7500
** Fires any 60 mm Mortar shell.*										
Wolfhound Gun-Mortar	81/82 mm	*	+2	+2	Crew	900	1	1	200	€3750
** Fires any 81/82 mm Mortar shell.*										
Spiteful Rapid Fire Cannon	81/82 mm	*	+1	+1	Crew	900	3	3	1000	€11250
** Fires any 81/82 mm Mortar shell.*										
75 mm Howitzer	HE	16d	+2	+4	Crew	3750	1	1	375	€25000
	Canister	12d	*Cone burst 5 x 250 meters from any point within range.*							
	Illumination	*Illuminates 1000 meter radius for 20 combat turns*								
	Smoke	*Burns for 20 combat turns*								
Weight includes field mount.										
90 mm Smoothbore Cannon	Shot	12d	0	+2	Crew	500	½	1	*	*
	HE	12d	*Damage reduces 3d each meter from burst hex.*							
	Shrapnel	9d	*Damage reduces 1d each meter from burst hex*							
	Case Shot	12d x 3	*Cone 5 x 100 meters from muzzle*							
** Bronze = 1200 kg, €1000; Iron = 900 kg, €250.*										
90 mm Rifled Cannon Shell	HE	10d	+1	+3	Crew	1500	½	1	*	*
	Shrapnel	8d	*Damage reduces 1d each meter from burst hex*							
	Case Shot	10d x 3	*Cone 5 x 100 meters from muzzle*							
** Bronze = 1000 kg, €2250; Iron = 800 kg, €450.*										
120 mm Smoothbore Cannon	Shot	16d	+1	+3	Crew	750	½	1	*	*
	HE	12d	*Damage reduces 3d each meter from burst hex.*							
	Shrapnel	10d	*Damage reduces 1d each meter from burst hex*							
	Case Shot	16d x 4	*Cone 5 x 200 meters from muzzle.*							
** Bronze = 1400 kg, €1500; Iron = 1000 kg, €300.*										
120 mm Rifled Cannon	HE	14d	+2	+4	Crew	2250	½	1	*	*
	Shrapnel	12d	*Damage reduces 1d each meter from burst hex*							
	Case Shot	14d x 4	*Cone 5 x 200 meters from muzzle.*							
** Bronze = 1200 kg, €3000; Iron = 900 kg, €600.*										
150 mm Coehorn Mortar	HE	20d	0	+4	Crew	750	¼	1	*	*
	Shrapnel	15d x 4	*Damage reduces 1d each meter from burst hex*							
** Bronze = 200 kg, €600; Iron = 175 kg, €150.*										
15 mm Puckle Gun	Slug	6d	+1	+2	Crew	100	3	6	65	*
	Shot	6d x 2	*Cone 2 x 20 meters from muzzle.*							
** Flintlock = €150; Percussion = €175*										

Impresa Express Weapon Data Tables

Weapon Name	Cal	Rcl	Max Acc	Dmg	PBR	SR	MR	LR	ER	Mag	Mass	Cost
Trickster Holdout Pistol	9mm P	–	0	3i	5	10	20	35	50	4im	1.1	€450
Four separate barrels (each must be reloaded individually), firing pin rotates automatically as each barrel is fired (SA).												
Last Chance Derringer	9mm P	-1	0	3i	2	5	10	15	25	2im		€75
Two separate barrels (each must be reloaded individually), firing pin rotates automatically after the first barrel is fired (SA).												
Swordsman Autopistol	9mm P	–	+1	3i	5	10	40	75	100	10im	1.5	€600
Integral (non-removable) box magazine. Loads single rounds or from 8 round stripper clip (SA)												
Swordsman Autopistol	9mm P	–	+1	3i	5	10	40	75	100	10m	1.5	€750
Removable 10 round box magazine (SA).												
Tsarevitch Autopistol	9mm P	–	+1	3i	5	10	40	75	100	9m	0.65	€900
Removable 9 round box magazine (SA).												
Attacker SA Revolver	9mm P	–	+1	3i	5	10	40	75	100	6im	1.2	€450
Single action revolver (SAR) – must be cocked before firing. Rounds must be in half moon clip to be loaded.												
Volkspistole VP-44	9mm P	–	+1	3i	5	10	40	75	100	8m	1.0	€300
Removable 8 round box magazine (SA).												
Demon Goddess S'gun Pistol	12 g	-1	-1	5i	2	5	10	15	25	2im	1.2	€200
Two-barrel over-under configuration, each barrel is loaded separately. SA												
Border Reaver SMG	9mm P	-1	+2	3i	5	10	40	100	150	32m	3.5	€150
Uses curved, top mounted, rather than straight, side mounted magazines to reduce jamming compared to original design (FA).												
Flame Lord SMG	9mm P	-1	+1	3i	5	10	40	100	150	30m	3.0	€300
*Cannot use standard M=10 magazines – it will **seem** to, but jam on a 3:6 roll every burst fired (FA).*												
Red Star SMG	9mm P	-1	+1	3i	5	10	40	100	200	35m	3.36	€450
Can fire PPsh-41 35 round magazines, but not the 71 round drum magazines (FA).												
Cherry Tree SMG	9mm P	-1	+2	3i	5	10	40	100	150	30m	4.5	€450
Has a small knurled cocking lug unlike the original (FA).												
Brigadier Rifle	5.56 N	-1	+2	6i	5	10	50	300	600	*	4.5	€650
** Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately (SA/FA)*												
Field Marshall Rifle	7.62 N	-2	+2	8i	5	10	50	500	1000	*	5.0	€750
** Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately (SA/FA)*												
Saint Basil Rifle	7.62 M43	-2	+2	7i	5	10	50	300	600	32	4.03	€300
Has an integral folding spike-bayonet under the barrel (SA/FA).												
KStG 81 Autorifle	5.56 N	-1	+2	6i	5	10	50	300	600	*	5.5	€500
** Comes with 20 round magazines as standard, 30 round magazines must be purchased separately (SA/FA).*												
KStG 81 Autorifle	7.62 M43	-2	+2	7i	5	10	50	500	1000	*	5.5	€500
** Comes with 20 round magazines as standard, 30 round magazines must be purchased separately (SA/FA).*												
Red Emperor Carbine	7.62 M43	-2	+2	7i	5	10	50	300	600	10im	3.9	€625
Has a 10 round internal (non-removable) box magazine, reloads with single rounds or stripper clip (SA).												
Red Emperor Carbine	7.62 M43	-2	+2	7i	5	10	50	300	600	*	3.9	€800
** Comes 10 round removable box magazine, but 15 and 30 round magazines are available separately (SA/FA).*												

Impresa Express Weapon Data Tables

Weapon Name	Cal	Rcl	Max Acc	Dmg	PBr	Sr	Mr	Lr	Er	Mag	Mass	Cost
Martini-Henry Rifle Mk. 1	8 mm	-2	+2	4i	5	10	50	300	600	1im	3.83	€150
Single shot, falling block, breechloading cartridge firing rifle (SS).												
Martini-Henry Rifle Mk 2	8 mm	-2	+2	4i	5	10	50	300	600	7im	4.03	€250
Single shot, falling block, breechloading cartridge firing rifle (SS).												
Minuteman Musket, Flintlock	12 mm	-2	+1	4i	5	10	50	300	600	1im	4.0	€35
Single shot muzzle-loading, rifle-musket (SS). Requires a new flint every 2d shots (provided with ammo).												
*Minuteman*Musket, Perc'ssion	12 mm	-2	+1	4i	5	10	50	300	600	1im	4.0	€185
Single shot muzzle-loading, rifle-musket (SS). Percussion caps come with each round.												
Volcano Shotgun	12 gauge	-1	+1	5i	5	10	20	40	50	2im	3.6	€185
Double barrel shotgun with break open action (SS).												
Demon Pump Action Shotgun	12 gauge	-1	+1	5i	5	10	20	40	50	6+1im	4.25	€375
Pump action action shotgun (SA), may carry an extra round by inserting one in the action when the magazine is loaded.												
Lightning GPMG	7.62 N	-2	+3	8i	5	10	50	500	1000	100	12.0	€1750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (FA).*												
Lightning GPMG	7.62 M54R	-2	+3	8i	5	10	50	500	1000	100	12.0	€1750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (FA).*												
Morning Star MMG	7.62 N	-2	+3	8i	5	10	50	500	1000	100	24.0	€2250
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*												
Morning Star MMG	7.62 M54R	-2	+3	8i	5	10	50	500	1000	100	24.0	€2250
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*												
Prince HMG	.50 cal	-4	+3	17i	10	50	250	1000	3000	100	55.0	€3750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*												
Prince HMG	12.7 Bloc	-4	+3	18i	10	50	250	1000	3000	100	55.0	€3750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*												
Gatling Gun	7.62 mm	-2	+3	8i	5	10	50	500	1000	*	38.0	€5625
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately (FA).												
Gatling Gun	. 50 cal	-4	+3	17i	10	50	250	1000	3000	*	38.0	€5625
** Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately (FA).*												
2.7 cm *Sturmpistole 44*	HE	-1	+1	3i	10	25	50	100	250	1im	2.5	€225
Grenade Launcher	HEAT	-1	+1	2a/1e	*Armour piercing round, treat as STR|A 1*							
	Canister	-1	+1	2i x 2	*Cone burst 1 x 6 meters from any point within range*							
	Illumination	*Illuminates a 10 meter area for one combat turn*										
	Smoke	*Burns for 1 combat turn.*										
Thunderer 40 mm	HE	-1	+2	4i	10	50	100	250	500	1im	2.67	€450
Grenade Launcher	HEDP	-1	+2	4a/2e	*Armour piercing round, treat as STR|A 1*							
	Canister	-1	+2	3i x 3	*Cone burst 2 x 10 meters from any point within range*							
	Illumination	*Illuminates a 100 meter area for four combat turns*										
	Smoke	*Burns for 2 combat turns.*										

Impresa Express Weapon Data Tables

Weapon Name	Cal	Rcl	Max Acc	Dmg	PBR	SR	MR	LR	ER	Mag	Mass	Cost
Biter 60 mm DRL	HE	-1	+1	10i	10	25	75	150	200	1im	3.5	€15
Rocket Launcher	HEDP	-1	+1	10a/5e	*Damage reduces by 4i for each hex from target hex*							
	Canister	-1	+1	6i	*Cone burst 5 x 75 meters from any point within range.*							
*Disposable RL – the round may be extracted and used in the **Viper** RL instead*												
Viper 60 mm Rocket	HE	-1	+2	10i	15	35	100	200	300	1im	9.5	€300
Launcher	HEDP	-1	+2	10a/5e	*Damage reduces by 4i for each hex from target hex*							
	Canister	-1	+2	6i	*Cone burst 5 x 75 meters from any point within range.*							
*Re-usable launcher, can fire rounds extracted from **Biter** DRL. Requires a crew of two – but can be fired by one man.*												
Raketenpanzerbusche 54/1a	HEAT	-1	+2	14a/7e	8	20	60	125	175	1im	10	€350
Damage decreases by 5i for each hex from target hex/												
Panzerfaust 150	HE	-1	+1	18e	6	15	50	100	150	1im	3.5	€185
Rocket Launcher	HEAT	-1	+1	17a/8e	*Damage reduces by 5i for each hex from target hex*							
Can be fired and reloaded by the operator												
Dynamite/Gelignite	n.a.	n.a.	n.a.	10e	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	¼	€5
-2i per hex from blast hex. +1i for each doubling of explosive mass.												
Gunpowder, Corned	n.a.	n.a.	n.a.	10e	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1	€4
-2i per hex from blast hex. +1i for each doubling of explosive mass.												
Gunpowder, Meal	n.a.	n.a.	n.a.	6e	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1	€½
-2i per hex from blast hex. +1i for each doubling of explosive mass.												
Mine, Antipersonnel	n.a.	n.a.	n.a.	14i x 3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2½	€20
-2i per hex from blast hex.												
Mine, Directional	n.a.	n.a.	n.a.	14i x 3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2½	€30
Emplaced rather than fired. Cone burst 10 x 100 meters from point of emplacement.												
Nitroglycerin	n.a.	n.a.	n.a.	7i	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.1	€20
-2i per hex from blast hex. +1i for each doubling of explosive mass.												
HE Grenade, Offensive	n.a.	n.a.	n.a.	6i	3	6	12	15	20	n.a.	½	€5
-2i per hex from target hex.												
HE Grenade, Defensive	n.a.	n.a.	n.a.	7e	3	6	12	15	20	n.a.	½	€6
-1e per hex from target hex.												
WP Smoke Grenade	n.a.	n.a.	n.a.	6i x 3	3	6	12	15	18	n.a.	¾	€15
Burns for 5 combat turns.												
Black Powder Grenade	n.a.	n.a.	n.a.	6e	3	6	12	15	18	n.a.	¾	€2
-3i per hex from target hex.												
Crossbow, Pump Action	n.a.	-1	+2	6i	6	25	50	70	100	1im	3.5	€15
Single shot weapon must be reloaded manually.												
Crossbow, Repeater, Pump	n.a.	-1	+2	6i	6	25	50	70	100	5im	4.0	€30
Internal magazine feeds from bottom – loaded through open action.												
60 mm Mortar	HE	n.a.	+3	12e	175	500	1000	2000	3000	1im	*	*

Impresa Express Weapon Data Tables

Weapon Name	Cal	Rcl	Max Acc	Dmg	PBr	Sr	Mr	Lr	Er	Mag	Mass	Cost
60 mm Mortar	Smoke	*Burns for 12 combat turns*										
	Illumination	*Illuminates 500 meters for 6 combat turns*										
** Kicker costs €1500 and masses 12 kg (half listed range at all marks); Noisy costs €2875 and masses 25 kg. HE -3e per hex*												
81/82 mm Mortar	HE	n.a.	+3	24e	180	600	1200	2400	3600	1im	50	€4675
	Smoke	*Burns for 12 combat turns*										
	Illumination	*Illuminates 1200 meters for 12 combat turns*										
Double listed range is possible with a Forward Observer calling fire. HE does -3e damage per hex from blast.												
120 mm Mortar	HE	n.a.	+3	36e	500	875	1750	3500	5000	1im	520	€6750
	Smoke	*Burns for 30 combat turns*										
	Illumination	*Illuminates 1500 meters for 24 combat turns*										
Double listed range is possible with a Forward Observer calling fire. HE does -2e damage per hex from blast												
75 mm Recoilless Rifle	HE	n.a.	+3	18e	30	75	150	300	500	1im	145	€1875
	HEDP	n.a.	+3	18e/9a	*-6e damage per hex from blast*							
	Canister	n.a.	+3	12i	*Cone burst 5 x 200 meters from any point within range*							
	Illumination	*Illuminates 500 meter radius for 12 combat turns*										
	Smoke	*Burns for 12 combat turns*										
Weight includes a light wheeled field mount. HE does -3e damage per hex from blast												
105 mm Recoilless Rifle	HE	n.a.	+3	24e	50	110	225	450	700	1im	550	€2500
	HEDP	n.a.	+3	24e/12a	*-7e damage per hex from blastx*							
	Canister	n.a.	+3	16i	*Cone burst 10 x 250 meters from any point within range*							
	Illumination	*Illuminates 500 meter radius for 18 combat turns*										
	Smoke	*Burns for 12 combat turns*										
Weight includes a light wheeled field mount. HE does -3e damage per hex from blast												
106 mm Recoilless Rifle	HE	n.a.	+3	26e	60	135	375	550	800	1im	165	€3375
	HEDP	n.a.	+3	26e/13i								
	Canister	n.a.	+3	17i	*Cone burst 155 x 400 at up to 3000 meters*							
	Illumination	*Illuminates 500 meter radius for 24 combat turns*										
	Smoke	*Burns for 24 combat turns*										
Weight includes a light wheeled field mount. HE does -3e damage per hex from blast												
20 mm Autocannon	API	n.a.	+3	28a	50	110	225	450	700	20c/60b	70	€3750
	HE	n.a.	+3	14e	*Does -10e damage per hex from blast*							
Weight is for weapon only. Field mount is extra.												
37 mm Autocannon	API	n.a.	+3	50a	180	450	900	1800	2700	8c	250	€5675
	HEDP	n.a.	+3	25a/12e	*Does -10e damage per hex from blast*							
Weight is for weapon only. Field mount is extra.												
15 mm Autocannon, Manual	HE	-4	+3	12e	60	150	300	600	1000	100b	55	€1875
15 mm Autocannon, Electric	HE	-4	+3	12e	60	150	300	600	1000	100b	75	€3375
Weight is for weapon only. Field mount is extra. HE does -10e damage per hex from blast.												

Impresa Express Weapon Data Tables

Weapon Name	Cal	Rcl	Max Acc	Dmg	PBR	SR	MR	LR	ER	Mag	Mass	Cost
Bulldog Gun-Mortar	60 mm	n.a.	+3	*	80	200	400	800	1200	1im	75	€2250
* *Fires any 60 mm Mortar shell.*												
Sabre Rapid Fire Cannon	60 mm	n.a.	+3	*	80	200	400	800	1200	6c	250	€7500
* *Fires any 60 mm Mortar shell.*												
Wolfhound Gun-Mortar	81/82 mm	n.a.	+3	*	120	300	600	1200	1800	1im	200	€3750
* *Fires any 81/82 mm Mortar shell.*												
Spiteful Rapid Fire Cannon	81/82 mm	n.a.	+3	*	120	300	600	1200	1800	3c	1000	€11250
* *Fires any 81/82 mm Mortar shell.*												
75 mm Howitzer	HE	n.a.	+3	18e	500	1750	2500	5000	7500	1im	375	€25000
	Canister	n.a.	+3	30i	*Cone burst 5 meters wide from any point within range.*							
	Illumination	*Illuminates 100 meter radius for 12 Combat Turns*										
	Smoke	*Burns for 12 Combat Turns.*										
Weight includes field mount. HE does -2e damage per hex from burst point. Canister does -3i per 25 meters.												
90 mm Smoothbore Cannon	Shot	n.a.	+3	28i	35	90	175	350	500	1im	*	*
	HE	n.a.	+3	9e	*Does -3e damage per meter from burst*							
	Shrapnel	n.a.	+3	18i	*Does -4i damage per meter from burst*							
	Case Shot	n.a.	+3	12i	*Cone 2 meters wide. Does -2i damage per 25 meters.*							
* *Bronze = 1200 kg, €1000; Iron = 900 kg, €250.*												
90 mm Rifled Cannon Shell	HE	n.a.	+3	30e	100	250	500	1000	1500	1im	*	*
	Shrapnel	n.a.	+3	20i	*Does -5i damage per meter from burst*							
	Case Shot	n.a.	+3	15i	*Cone 2 meters wide. Does -2i damage per 25 meters*							
* *Bronze = 1000 kg, €2250; Iron = 800 kg, €450. HE does -10e damage per meter from burst.*												
120 mm Smoothbore Cannon	Shot	n.a.	+3	45i	50	125	250	500	750	1im	*	*
	HE	n.a.	+3	15e	*Does -3e damage per meter from burst*							
	Shrapnel	n.a.	+3	30i	*Does -5i damage per meter from burst*							
	Case Shot	n.a.	+3	23i	*Cone 3 meters wide. Does -2i per 25 meters from muzzle*							
* *Bronze = 1400 kg, €1500; Iron = 1000 kg, €300.*												
120 mm Rifled Cannon	HE	n.a.	+3	50e	150	375	750	1500	2250	1im	*	*
	Shrapnel	n.a.	+3	30i	*Does -5i damage per meter from burst*							
	Case Shot	n.a.	+3	23i	*Cone 3 meters wide. Does -2i per 25 meters from muzzle*							
* *Bronze = 1200 kg, €3000; Iron = 900 kg, €600. HE does -10e damage per meter from burst.*												
150 mm Coehorn Mortar	HE	n.a.	+3	60e	50	125	250	500	750	1im	*	*
	Shrapnel	n.a.	+3	40i	*Does -3i per meter from burst*							
* *Bronze = 200 kg, €600; Iron = 175 kg, €150. HE does -10e damage per meter from burst*												
15 mm Puckle Gun	Slug	-3	+3	10i	10	20	35	70	100	6im	65	*
	Shot	-3	+3	10i	*Cone 1 meter wide. Does -2e damage per 5 meters from burst*							
* *Flintlock = €150; Percussion = €175*												

d20 Modern Weapon Data Tables

Weapon Name	Cal	Dam	Crit	Dam Type	Range Inc	RoF	Mag	Size	Weight	Cost
Trickster Holdout Pistol	9mm P	2d6	20	Ballistic	20	S	4 im	Tiny	2.42	€450
Four separate barrels (each must be reloaded individually), firing pin rotates automatically as each barrel is fired										
Last Chance Derringer	9mm P	2d6	20	Ballistic	20	S	2 im	Tiny		€75
Two separate barrels (each must be reloaded individually), firing pin rotates automatically after the first barrel is fired										
Swordsman Autopistol	9mm P	2d6	20	Ballistic	30	S	8 box	Small	3.3	€600
Integral (non-removable) box magazine. Loads single rounds or from 8 round stripper clip										
Swordsman Autopistol	9mm P	2d6	20	Ballistic	30	S	10 box	Small	3.3	€750
Removable 10 round box magazine										
Tsarevitch Autopistol	9mm P	2d6	20	Ballistic	30	S	9 box	Small	1.43	€900
Removable 9 round box magazine										
Attacker SA Revolver	9mm P	2d6	20	Ballistic	30	S	6 im	Small	2.64	€450
Single action revolver – must be cocked before firing. Rounds must be in half moon clip to be loaded.										
Volkspistole VP-44	9mm P	2d6	20	Ballistic	30	S	8 box	Small	2.2	€300
Removable 8 round box magazine										
Demon Goddess S'gun Pistol	12 g	2d8	20	Ballistic	20	2	2 im	Medium	1.2	€200
Two-barrel over-under configuration, each barrel is loaded separately										
Border Reaver SMG	9mm P	2d6	20	Ballistic	40	S, A	32 box	Medium	7.7	€150
Uses curved, top mounted, rather than straight, side mounted magazines to reduce jamming compared to original design										
Flame Lord SMG	9mm P	2d6	20	Ballistic	40	S, A	30 box	Medium	6.6	€300
*Cannot use standard M=10 magazines – it will **seem** to, but jam on a 3:6 roll every burst fired*										
Red Star SMG	9mm P	2d6	20	Ballistic	50	S, A	35 box	Medium	9.9	€450
Can fire PPsh-41 35 round magazines, but not the 71 round drum magazines										
Cherry Tree SMG	9mm P	2d6	20	Ballistic	40	S, A	30 box	Medium	9.9	€450
Has a small knurled cocking lug unlike the original										
Brigadier Rifle	5.56 N	2d8	20	Ballistic	80	S, A	*	Large	9.9	€650
** Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately*										
Field Marshall Rifle	7.62 N	2d10	20	Ballistic	90	S, A	*	Large	11	€750
** Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately*										
Saint Basil Rifle	7.62 M43	2d8	20	Ballistic	80	S, A	30 box	Large	8.87	€300
Has an integral folding spike-bayonet under the barrel										
KStG 81 Autorifle	5.56 N	2d8	20	Ballistic	80	S, A	*	Large	11	€500
** Comes with 20 round magazines as standard, 30 round magazines must be purchased separately*										
KStG 81 Autorifle	7.62 M43	2d8	20	Ballistic	90	S, A	*	Large	11	€500
** Comes with 20 round magazines as standard, 30 round magazines must be purchased separately*										
Red Emperor Carbine	7.62 M43	2d8	20	Ballistic	70	S	10 im	Large	8.58	€625
Has a 10 round internal (non-removable) box magazine, reloads with single rounds or stripper clip										
Red Emperor Carbine	7.62 M43	2d8	20	Ballistic	70	S, A	*	Large	8.58	€800
** Comes 10 round removable box magazine, but 15 and 30 round magazines are available separately*										

d20 Modern Weapon Data Tables

Weapon Name	Cal	Dam	Crit	Dam Type	Range Inc	RoF	Mag	Size	Weight	Cost
Martini-Henry Rifle Mk. 1	8 mm	2d8	20	Ballistic	80	S	1 im	Large	3.83	€150
Single shot, falling block, breechloading cartridge firing rifle.										
Martini-Henry Rifle Mk 2	8 mm	2d8	20	Ballistic	80	S	7 im	Large	4.03	€250
Lever Action, falling block, breechloading tubular magazine cartridge firing rifle.										
Minuteman Musket, Flintlock	12 mm	2d10	20	Ballistic	60	S	1 im	Large	4.0	€35
Single shot muzzle-loading, rifle-musket. Requires a new flint every 2d shots (provided with ammo).										
Minuteman Musket, Percussion	12 mm	2d10	20	Ballistic	70	S	1 im	Large	4.0	€185
Single shot muzzle-loading, rifle-musket. Percussion caps come with each round.										
Volcano Shotgun	12 g	2d8	20	Ballistic	30	*	2 im	Large	3.6	€185
** Double barrel shotgun with break open action, may fire both barrels in a single phase. -1 damage per Range Increment.*										
Demon Pump Action Shotgun	12 g	2d8	20	Ballistic	30	S	6	Large	4.25	€375
May carry an extra round by inserting one in the action when the magazine is loaded. -1 damage per Range Increment.										
Lightning GPMG	7.62 N	2d10	20	Ballistic	100	A	Link	Large	12.0	€1750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt.*										
Lightning GPMG	7.62 M43	2d8	20	Ballistic	100	A	Link	Large	12.0	€1750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt.*										
Morning Star MMG	7.62 N	2d10	20	Ballistic	100	A	Link	Large	24.0	€2250
*May fire disintegrating link belt **or** re-useable 50 round cloth belt.*										
Morning Star MMG	7.62 M43	2d8	20	Ballistic	100	A	Link	Large	24.0	€2250
*May fire disintegrating link belt **or** re-useable 50 round cloth belt.*										
Prince HMG	.50 cal	2d12	20	Ballistic	110	A	Link	Huge	55.0	€3750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt.*										
Prince HMG	12.7 Bloc	2d12	20	Ballistic	110	A	Link	Huge	55.0	€3750
*May fire disintegrating link belt **or** re-useable 50 round cloth belt.*										
Gatling Gun	7.62 N	2d10	20	Ballistic	110	A	Link	Huge	38.0	€5625
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately.										
Gatling Gun	. 50 cal	2d12	20	Ballistic	110	A	Link	Huge	38.0	€5625
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately.										
2.7 cm *Sturmpistole 44*	HE	3d6	–	Slashing	50	Single	1 im	Medium	2.5	€225
Grenade Launcher	HEAT	3d6	–	Slashing	*5' burst radius; Reflex Save, 14*					
	Canister	5d4	–	Ballistic	5	*-1d damage per range increment*				
	Illumination	*Illuminates a 10 yard area for one combat turn*								
	Smoke	*Burns for 1 combat turn.*								
Thunderer 40 mm	HE	3d6	–	Slashing	70	Single	1 im	Large	2.67	€450
Grenade Launcher	HEDP	3d6	–	Slashing	*10' burst radius; Reflex Save, 15*					
	Canister	5d8	–	Ballistic	10	*-1d damage per range increment*				
	Illumination	*Illuminates a 100 yard area for four combat turns*								
	Smoke	*Burns for 2 combat turns.*								

d20 Modern Weapon Data Tables

Weapon Name	Cal	Dam	Crit	Dam Type	Range Inc	RoF	Mag	Size	Weight	Cost
Biter 60 mm DRL	HE	3d6+2	20	Concussion	60	Single	1 im	Medium	3.5	€15
Rocket Launcher	HEDP	2d6+2	*Damage decreases by 1d per hex from point of impact*							
	Canister	3d6	*Cone burst 5 x 75 meters from any point within range against all in cone*							
*Disposable RL – the round may be extracted and used in the **Viper** RL instead. HE damage decreases -1d per hex from impact*										
Viper 60 mm Rocket	HE	3d6+2	20	Concussion	60	Single	1 im	Large	9.5	€300
Launcher	HEDP	2d6+2	*Damage decreases by 1d per hex from point of impact*							
	Canister	3d6	*Cone burst 5 x 75 meters from any point within range against all in cone*							
*Re-usable launcher, can fire rounds extracted from **Biter** DRL. Requires a crew of two – but can be fired by one man.*										
Raketenpanzerbusche 54/1a	HEAT	4d6	20	Concussion	60	Single	1 im	Large	10	€350
Damage decreases by -1d for each hex from target hex.										
Panzerfaust 150	HE	6d6	20	Concussion	60	Single	1 im	Large	3.5	€185
Rocket Launcher	HEAT	6d6	*Damage decreases by 2d per hex from point of impact*							
Can be fired and reloaded by the operator. HE damage decreases by -1d per hex from point of impact.										
Dynamite/Gelignite	n.a.	3d12	–	Concussion	–	–	–	Tiny	¼	€5
10' burst increment, -1d per increment.										
Gunpowder, Corned	n.a.	4d6	–	Concussion	–	–	–	Small	1	€4
5' burst radius, –1d per increment.										
Gunpowder, Meal	n.a.	3d6	–	Concussion	–	–	–	Small	1	€½
5' burst radius, -1d per increment. -1d per increment.										
Mine, Antipersonnel	n.a.	3d8	–	Concussion	–	–	–	Medium	2½	€20
Emplaced rather than fired. 5' burst radius. -1d per increment.										
Mine, Directional	n.a.	5d10	–	Concussion	–	–	–	Medium	2½	€30
Emplaced rather than fired. 30' burst increment. -1d per burst increment.										
Nitroglycerin	n.a.	2d12	–	Concussion	–	–	–	Tiny	0.1	€20
5' burst radius. -1d per burst increment.										
HE Grenade, Offensive	n.a.	3d6	–	Concussion	–	–	–	Small	½	€5
5' burst radius, -1d per burst increment										
HE Grenade, Defensive	n.a.	4d6	–	Slashing	–	–	–	Small	½	€6
10' burst radius, -1d per burst increment.										
WP Smoke Grenade	n.a.	6d6	–	Fire	–	–	–	Small	¾	€15
Burns for 5 combat turns. Burst radius, 5', -2d per burst increment										
Black Powder Grenade	n.a.	4d6	–	Concussion	–	–	–	Small	¾	€2
5' burst radius, -1d per burst increment.										
Crossbow, Pump Action	n.a.	1d10	19-20	Piercing	40	S	1 im	Medium	3.5	€15
Single shot weapon must be reloaded manually.										
Crossbow, Repeater, Pump	n.a.	1d10	19-20	Piercing	40	S	5 im	Medium	4.0	€30
Internal magazine feeds from bottom – loaded through open action.										
60 mm Mortar	HE	6d6	20	Concussion	500	S	1 im	Large	*	*

d20 Modern Weapon Data Tables

Weapon Name	Cal	Dam	Crit	Dam Type	Range Inc	RoF	Mag	Size	Weight	Cost
60 mm Mortar	Smoke	*Burns for 12 combat turns*								
	Illumination	*Illuminates 500 yards for 6 combat turns*								
** Kicker costs €1500 and masses 12 kg; Noisy costs €2875 and masses 25 kg. HE round has 10' burst radius*										
81/82 mm Mortar	HE	8d6	20	Concussion	600	S	1 im	Large	50	€4675
	Smoke	*Burns for 12 combat turns*								
	Illumination	*Illuminates 1200 yards for 12 combat turns*								
Double listed range is possible with a Forward Observer calling fire. HE round has 15' burst radius										
120 mm Mortar	HE	16d6	20	Concussion	750	S	1 im	Huge	520	€6750
	Smoke	*Burns for 30 combat turns*								
	Illumination	*Illuminates 1500 yards for 24 combat turns*								
Double listed range is possible with a Forward Observer calling fire. HE round has 20' burst radius										
75 mm Recoilless Rifle	HE	6d6	20	Concussion	150	S	1 im	Large	145	€1875
	HEDP	5d6	20	Concussion	*5' burst radius for HEDP, 10' for HE*					
	Canister	6d10	20	Ballistic	*Cone burst 5 x 200 yards from any point within range*					
	Illumination	*Illuminates 500 yard radius for 12 combat turns*								
	Smoke	*Burns for 12 combat turns*								
Weight includes a light wheeled field mount. HE round has 10' burst radius										
105 mm Recoilless Rifle	HE	5d8	20	Concussion	200	S	1im	Huge	550	€2500
	HEDP	5d6	20	Concussion	*10' burst radius for HEDP, 15' for HE*					
	Canister	7d10	20	Ballistic	*Cone burst 10 x 250 yards from any point within range*					
	Illumination	*Illuminates 500 yard radius for 18 combat turns*								
	Smoke	*Burns for 12 combat turns*								
Weight includes a light wheeled field mount. HE round has 15' burst radius										
106 mm Recoilless Rifle	HE	6d8	20	Concussion	300	S	1 im	Huge	165	€3375
	HEDP	6d6	20	Concussion	*10' burst radius for HEDP, 15' for HE*					
	Canister	7d10	20	Ballistic	*Cone burst 155 x 400 at up to 3000 meters*					
	Illumination	*Illuminates 500 meter radius for 24 combat turns*								
	Smoke	*Burns for 24 combat turns*								
Weight includes a light wheeled field mount. HE round has 15' burst radius										
20 mm Autocannon	API	4d6	–	Ballistic	120	A	20/60	Huge	70	€3750
	HE	3d6	–	Concussion	*5' burst radius*					
Weight is for weapon only. Field mount is extra.										
37 mm Autocannon	API	3d12	–	Ballistic	180	A	8	Huge	250	€5675
	HEDP	6d6	–	Concussion	*5' burst radius*					
Weight is for weapon only. Field mount is extra. API round has 5' burst radius										
15 mm Autocannon, Manual	HE	2d8	–	Ballistic	120	A	100	Large	55	€1875
15 mm Autocannon, Electric	HE	2d8	–	Ballistic	120	A	100	Large	75	€3375
Weight is for weapon only. Field mount is extra. HE round has 5' burst radius										

d20 Modern Weapon Data Tables

Weapon Name	Cal	Dam	Crit	Dam Type	Range Inc	RoF	Mag	Size	Weight	Cost
Bulldog Gun-Mortar	60 mm	*	20	*	200	S	1 im	Huge	75	€2250
** Fires any 60 mm Mortar shell.*										
Sabre Rapid Fire Cannon	60 mm	*	20	*	200	A	6 clip	Huge	250	€7500
** Fires any 60 mm Mortar shell.*										
Wolfhound Gun-Mortar	81/82 mm	*	20	*	300	S	1 im	Huge	200	€3750
** Fires any 81/82 mm Mortar shell.*										
Spiteful Rapid Fire Cannon	81/82 mm	*	20	*	300	A	3 clip	Huge	1000	€11250
** Fires any 81/82 mm Mortar shell.*										
75 mm Howitzer	HE	8d6	20	Concussion	375	Single	1 im	Huge	375	€25000
	Canister	6d10	*Cone burst 5 x 250 yards from any point within range. -1d per 50 yards*							
	Illumination	*Illuminates 1000 yard radius for 20 combat turns*								
	Smoke	*Burns for 20 combat turns*								
Weight includes field mount. HE round has 10' burst radius										
90 mm Smoothbore Cannon	Shot	4d12	20	Ballistic	60	Single	1 im	Huge	*	*
	HE	4d12	20	Concussion	*5' burst radius*					
	Shrapnel	8d6	*10' burst radius*							
	Case Shot	8d6	*Cone 15 x 200', –4d per 100' from muzzle*							
** Bronze = 1200 kg, €1000; Iron = 900 kg, €250.*										
90 mm Rifled Cannon Shell	HE	4d12	20	Concussion	180	Single	1 im	Huge	*	*
	Shrapnel	8d6	*10' burst radius*							
	Case Shot	8d6	*Cone 15 x 200', -4d per 100' from muzzle*							
** Bronze = 1000 kg, €2250; Iron = 800 kg, €450. HE round has 5' burst radius*										
120 mm Smoothbore Cannon	Shot	5d12	20	Ballistic	90	Single	1 im	Huge	*	*
	HE	5d12	20	Concussion	*10' burst radius*					
	Shrapnel	10d6	*15' burst radius*							
	Case Shot	10d6	*Cone 15 x 300', –4d per 100' from muzzle*							
** Bronze = 1400 kg, €1500; Iron = 1000 kg, €300.*										
120 mm Rifled Cannon	HE	5d12	20	Concussion	270	Single	1 im	Huge	*	*
	Shrapnel	10d6	*15' burst radius for Shrapnel, 10' burst radius for HE*							
	Case Shot	10d6	*Cone 15 x 300', –4d per 100' from muzzle*							
** Bronze = 1200 kg, €3000; Iron = 900 kg, €600.*										
150 mm Coehorn Mortar	HE	8d12	20	Concussion	60	Single	1 im	Huge	*	*
	Shrapnel	16d6	*15' burst radius*							
** Bronze = 200 kg, €600; Iron = 175 kg, €150. HE round has 20' burst radius*										
15 mm Puckle Gun	Slug	3d6	20	Ballistic	15	Single	6 im	Large	65	*
	Shot	3d8	20	Ballistic	*Cone burst 2 x 30 yards. -1d damage per 10 yards.*					
** Flintlock = €150; Percussion = €175*										

SPYCRAFT 2.0 WEAPON TABLES

WEAPON NAME	CAL	DAM	E/T	AMMO	RECOIL	RANGE	SZ/HAND	COMP	WEIGHT	COST
Trickster Holdout Pistol	9mm P	1d10+1	1/20	4 im	17	10	F/1h	17/+0	1.1	€450
Four separate barrels (each must be reloaded individually), firing pin rotates automatically as each barrel is fired										
Last Chance Derringer	9mm P	1d10	1/20	2 im	17	10	F/1h	17/+0		€75
Two separate barrels (each must be reloaded individually), firing pin rotates automatically after the first barrel is fired										
Swordsman Autopistol	9mm P	1d10+1	1/20	8 im	12	25	D/1h	15/+0	1.5	€600
Integral (non-removable) box magazine. Loads single rounds or from 8 round stripper clip										
Swordsman Autopistol	9mm P	1d10+1	1/20	9 m	12	25	D/1h	15/+0	1.5	€750
Removable 10 round box magazine										
Tsarevitch Autopistol	9mm P	1d10+1	1/20	9 m	12	25	D/1h	15/+0	0.65	€900
Removable 9 round box magazine										
Attacker SA Revolver	9mm P	1d10+1	1/20	6 im	13	25	D/1h	15/+0	1.2	€450
Single action revolver – must be cocked before firing. Rounds must be in half moon clip to be loaded.										
Volkspistole VP-44	9mm P	1d10+1	1-3/20	8 m	13	20	D/1h	17/+0	1.0	€300
Removable 8 round box magazine										
Demon Goddess S'gun Pistol	12 g	5d4	1/20	2 im	18	10	D/2h	17/+0	1.2	€200
Two-barrel over-under configuration, each barrel is loaded separately										
Border Reaver SMG	9mm P	1d10+1	1-3/20	32 m	5	30	T/2h	22/+1	3.5	€150
Uses curved, top mounted, rather than straight, side mounted magazines to reduce jamming compared to original design										
Flame Lord SMG	9mm P	1d10+1	1-3/20	30 m	5	25	D/1h	22/+1	3.0	€300
*Cannot use standard M=10 magazines – it will **seem** to, but jam on a 3:6 roll every burst fired*										
Red Star SMG	9mm P	1d10+1	1-3/20	35 m	11	60	D/1h	20/+1	3.36	€450
Can fire PPsh-41 35 round magazines, but not the 71 round drum magazines										
Cherry Tree SMG	9mm P	1d10+1	1-3/20	32 m	3	40	T/2h	20/+1	4.5	€450
Has a small knurled cocking lug unlike the original										
Brigadier Rifle	5.56 N	4d4	1-2/20	*	10	125	S/2h	22/+1	4.5	€650
** Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately*										
Field Marshall Rifle	7.62 N	4d4+2	1-2/20	*	18	175	S/2h	25/+1	5.0	€750
** Comes with 20 round magazines on purchase, but 30 round magazines may be purchased separately*										
Saint Basil Rifle	7.62 M43	3d6	1-2/20	30 m	11	125	S/2h	22/+1	4.03	€300
Has an integral folding spike-bayonet under the barrel										
KStG 81 Autorifle	5.56 N	4d4	1-3/20	*	10	125	S/2h	25/+1	5.5	€500
** Comes with 20 round magazines as standard, 30 round magazines must be purchased separately*										
KStG 81 Autorifle	7.62 M43	3d6	1-3/20	*	12	175	S/2h	27/+1	5.5	€500
** Comes with 20 round magazines as standard, 30 round magazines must be purchased separately*										
Red Emperor Carbine	7.62 M43	3d6	1/20	10 im	12	100	S/2h	17/+0	3.9	€625
Has a 10 round internal (non-removable) box magazine, reloads with single rounds or stripper clip										
Red Emperor Carbine	7.62 M43	3d6	1-2/20	*	12	100	S/2h	20/+0	3.9	€800
** Comes 10 round removable box magazine, but 15 and 30 round magazines are available separately*										

SPYCRAFT 2.0 WEAPON TABLES

WEAPON NAME	CAL	DAM	E/T	AMMO	RECOIL	RANGE	SZ/HAND	COMP	WEIGHT	COST
Martini-Henry Rifle Mk. 1	8 mm	2d8	1/20	1 im	14	100	S/2h	15/+0	3.83	€150
Single shot, falling block, breechloading cartridge firing rifle (SS).										
Martini-Henry Rifle Mk 2	8 mm	2d8	1/20	7 im	14	100	S/2h	17/+0	4.03	€250
Single shot, falling block, breechloading cartridge firing rifle (SS).										
Minuteman Musket, Flintlock	12 mm	2d10	1-4/20	1 im	16	75	S/2h	12/+0	4.0	€35
Single shot muzzle-loading, rifle-musket (SS). Requires a new flint every 2d shots (provided with ammo).										
Minuteman Musket, Percussion	12 mm	2d10	1/20	1 im	16	90	S/2h	12/+0	4.0	€185
Single shot muzzle-loading, rifle-musket (SS). Percussion caps come with each round.										
Volcano Shotgun	12 g	5d4	1/20	2 im	25	30	S/2h	17/+0	3.6	€185
Double barrel shotgun with break open action (SS).										
Demon Pump Action Shotgun	12 g	5d4	1/20	6 im	25	30	S/2h	17/+0	4.25	€375
Pump action action shotgun (SA), may carry an extra round by inserting one in the action when the magazine is loaded.										
Lightning GPMG	7.62 N	4d4+2	1-4/19-20	*	7	175	S/2h	25/+1	12.0	€1750
** May fire disintegrating link belt **or** re-useable 50 round cloth belt (FA).*										
Lightning GPMG	7.62 M43	3d6+1	1-4/19-20	*	7	175	S/2h	25/+1	12.0	€1750
*8 May fire disintegrating link belt **or** re-useable 50 round cloth belt (FA).*										
Morning Star MMG	7.62 N	4d4+2	1-4/19-20	*	5	175	M/2h	22/+1	24.0	€2250
** May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Morning Star MMG	7.62 M43	3d6+1	1-4/19-20	*	5	175	M/2h	22/+1	24.0	€2250
** May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Prince HMG	.50 cal	2d12+2	1-3/18-20	*	6	300	M/2h	22/+1	55.0	€3750
** May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Prince HMG	12.7 Bloc	2d12+2	1-3/18-20	*	6	300	M/2h	22/+1	55.0	€3750
** May fire disintegrating link belt **or** re-useable 50 round cloth belt (SA/FA).*										
Gatling Gun	7.62 N	4d4+2	1-5/17-20	*	9	150	M/2h	27/+1	38.0	€5625
** Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately.*										
Gatling Gun	. 50 cal	4d4+2	1-5/17-20	*	9	250	M/2h	27/+1	38.0	€5625
** Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum magazines purchased separately.*										
2.7 cm *Sturmpistole 44*	HE	3d6	1-4/ammo	1 im	–	30	S/2h	20/+1	2.5	€225
Grenade Launcher	HEAT	3d6	*HE/HEAT have 5' blast radius*							
	Canister	5d4	*5 x 5 cone, -1d damage per range increment*							
	Smoke	2d4	*Burns for 1 combat turn*							
	Illumination	*Illuminates a 10 yard area for one combat turn*								
Thunderer 40 mm	HE	4d10	1-3/ammo	1 im	–	50	S/2h	22/+1	2.67	€450
Grenade Launcher	HEDP	3d8	*HE/HEDP have 10' blast radius.*							
	Canister	5d8	*5 x 20' cone, -1d damage per range increment*							
	Smoke	3d6	*Burns for 2 combat turns.*							
	Illumination	*Illuminates a 100 yard area for four combat turns*								

SPYCRAFT 2.0 WEAPON TABLES

WEAPON NAME	CAL	DAM	E/T	AMMO	RECOIL	RANGE	SZ/HAND	COMP	WEIGHT	COST
Biter 60 mm DRL	HE	2d10	1-4/19-20	1 im	–	75	S/2h	12/+0	3.5	€15
Rocket Launcher	HEDP	2d8	*5' burst radius*							
	Canister	3d6	*15 x 225 feet cone. -1 d damage per 75' from point of impact.*							
*Disposable RL – the round may be extracted and used in the **Viper** RL instead*										
Viper 60 mm Rocket	HE	2d10	1-4/19-20	1 im	–	75	S/2h	15/+0	9.5	€300
Launcher	HEDP	2d8	*5' burst radius*							
	Canister	3d6	*15 x 225 feet cone. -1 d damage per 75' from point of impact.*							
*Re-usable launcher, can fire rounds extracted from **Biter** DRL. Requires a crew of two – but can be fired by one man.*										
Raketenpanzerbusche 54/1a	HEAT	2d10	1-4/ammo	1 im	–	75	S/2h	15/+0	10	€350
5' Burst Radius										
Panzerfaust 150	HE	3d10	1-4/ammo	1 im	–	75	S/2h	12/+0	3.5	€185
Rocket Launcher	HEAT	3d8	*5' Burst radius*							
Can be fired and reloaded by the operator. HE round has 5' Burst radius.										
Dynamite/Gelignite	n.a.	3d12	1-5/–	–	–	10	D/–	15/+0	¼	€5
-2i per hex from blast hex. +1d for each doubling of explosive mass.										
Gunpowder, Corned	n.a.	4d6	1-4/–	–	–	5	F/–	12/+0	1	€4
-2i per hex from blast hex. +1i for each doubling of explosive mass.										
Gunpowder, Meal	n.a.	3d6	1-4/–	–	–	5	F/-	10/+0	1	€½
-2i per hex from blast hex. +1i for each doubling of explosive mass.										
Mine, Antipersonnel	n.a.	3d8	1-3/–	–	–	5	F/–	20/+1	2½	€20
-2i per hex from blast hex. +1i for each doubling of explosive mass.										
Mine, Directional	n.a.	5d10	1-2/–	–	–	30	D/–	20/+1	2½	€30
Emplaced rather than fired. Cone burst 10 x 100 meters from point of emplacement.										
Nitroglycerin	n.a.	2d12	1-8/–	–	–	5	F/–	12/+0	0.1	€20
-2i per hex from blast hex. +1i for each doubling of explosive mass.										
HE Grenade, Offensive	n.a.	4d10	1-4/–	–	–	15 x 4	F/1h	25/+1	½	€5
-2i per hex from target hex.										
HE Grenade, Defensive	n.a.	8d4	1-4/–	–	–	15 x 4	F/1h	22/+1	½	€6
-1 per hex from target hex.										
WP Smoke Grenade	n.a.	3d6	1-4/–	–	–	10 x 4	F/1h	25/+1	¾	€15
Burns for 5 combat turns.										
Black Powder Grenade	n.a.	4d6	1-5/–	–	–	10 x 2	F/1h	20/+1	¾	€2
-3i per hex from target hex.										
Crossbow, Pump Action	n.a.	2d6	1/19-20	1 im	–	90 x 2	D/2h	22/+1	3.5	€15
Single shot weapon must be reloaded manually.										
Crossbow, Repeater, Pump	n.a.	2d6	1/19-20	5 im	–	90 x 2	D/2h	25/+1	4.0	€30
Internal magazine feeds from bottom – loaded through open action.										
60 mm Mortar	HE	4d12	1-3/20	1 im	–	550	S/2h	12/+0	*	*

SPYCRAFT 2.0 WEAPON TABLES

WEAPON NAME	CAL	DAM	E/T	AMMO	RECOIL	RANGE	SZ/HAND	COMP	WEIGHT	COST
60 mm Mortar	Smoke	3d6	*Burns for 12 combat turns, 10' burst radius*							
	Illumination	*Illuminates 500 yards for 6 combat turns*								
** Kicker costs €1500 and masses 12 kg; Noisy costs €2875 and masses 25 kg.*										
81/82 mm Mortar	HE	5d10	1-3/19-20	1 im	–	600	S/2h	12/+0	50	€4675
	Smoke	3d6	*Burns for 12 combat turns*							
	Illumination	*Illuminates 1200 yards for 12 combat turns*								
Double listed range is possible with a Forward Observer calling fire.										
120 mm Mortar	HE	8d10	1-3/19-20	1 im	–	750	S/2h	15/+0	520	€6750
	Smoke	3d6	*Burns for 30 combat turns*							
	Illumination	*Illuminates 1500 yards for 24 combat turns*								
Double listed range is possible with a Forward Observer calling fire.										
75 mm Recoilless Rifle	HE	6d6	1-2/19-20	1 im	–	150	S/2h	20/+1	145	€1875
	HEDP	5d6	*5' burst radius for HE, 10' for HE*							
	Canister	6d10	*Cone burst 5 x 200 yards from any point within range*							
	Smoke	3d6	*Burns for 12 combat turns*							
	Illumination	*Illuminates 500 yard radius for 18 combat turns*								
Weight includes a light wheeled field mount.										
105 mm Recoilless Rifle	HE	5d8	1-2/19-20	1 im	–	200	S/2h	20/+1	550	€2500
	HEDP	5d6	*10' burst radius for HEDP, 15' for HE*							
	Canister	7d10	*Cone burst 10 x 250 yards from any point within range*							
	Smoke	3d6	*Burns for 12 combat turns*							
	Illumination	*Illuminates 500 yard radius for 18 combat turns*								
Weight includes a light wheeled field mount.										
106 mm Recoilless Rifle	HE	6d8	1-3/19-20	1 im	–	300	S/2h	20/+1	165	€3375
	HEDP	6d6	*10' burst radius for HEDP, 15' for HE*							
	Canister	7d10	*Cone burst 155 x 400 at up to 3000 meters*							
	Smoke	3d6	*Burns for 24 combat turns*							
	Illumination	*Illuminates 500 meter radius for 24 combat turns*								
Weight includes a light wheeled field mount.										
20 mm Autocannon	API	4d6	1-3/19-20	20/60	–	300	S/2h	22/+1	70	€3750
	HE	3d6	*5' burst radius for HE.*							
Weight is for weapon only. Field mount is extra.										
37 mm Autocannon	API	3d12	1-3/18-20	8	–	500	S/2h	22/+1	250	€5675
	HEDP	6d6	*5' burst radius for HEDP.*							
Weight is for weapon only. Field mount is extra.										
15 mm Autocannon, Manual	HE	2d8	1-2/19-20	120	9	150	M/2h	20/+1	55	€1875
15 mm Autocannon, Electric	HE	2d8	1-3/17-20	120	9	150	M/2h	25/+1	75	€3375
Weight is for weapon only. Field mount is extra. HE Burst radius is 5'.										

Spycraft 2.0 Weapon Tables

Weapon Name	Cal	Dam	E/T	Ammo	Recoil	Range	Sz/Hand	Comp	Weight	Cost
Bulldog Gun-Mortar	60 mm	*	1-2/19-20	1 im	–	200	S/2h	15/+0	75	€2250
* *Fires any 60 mm Mortar shell.*										
Sabre Rapid Fire Cannon	60 mm	*	1-3/19-20	6 clip	–	200	S/2h	18/+1	250	€7500
* *Fires any 60 mm Mortar shell.*										
Wolfhound Gun-Mortar	81/82 mm	*	1-2/19-20	1 im	–	300	S/2h	15/+0	200	€3750
* *Fires any 81/82 mm Mortar shell.*										
Spiteful Rapid Fire Cannon	81/82 mm	*	1-3/19-20	3 clip	–	300	S/2h	18/+1	1000	€11250
* *Fires any 81/82 mm Mortar shell.*										
75 mm Howitzer	HE	8d6	1-3/19-20	1 im	–	375	S/2h	20/+1	375	€25000
	Canister	6d10	*Cone burst 5 x 250 yards from any point within range. -1d per 50 yards*							
	Smoke	3d6	*Burns for 20 combat turns*							
	Illumination	*Illuminates 1000 yard radius for 20 combat turns*								
Weight includes field mount. HE round has 10' burst radius										
90 mm Smoothbore Cannon	Shot	4d12	1-4/20	1 im	–	60	S/2h	12/+0	*	*
	HE	4d12	*5' burst radius*							
	Shrapnel	8d6	*10' burst radius*							
	Case Shot	8d6	*Cone 15 x 200', –4d per 100' from muzzle*							
* *Bronze = 1200 kg, €1000; Iron = 900 kg, €250.*										
90 mm Rifled Cannon Shell	HE	4d12	1-5/19-20	1 im	–	180	S/2h	15/+0	*	*
	Shrapnel	8d6	*10' burst radius*							
	Case Shot	8d6	*Cone 15 x 200', -4d per 100' from muzzle*							
* *Bronze = 1000 kg, €2250; Iron = 800 kg, €450. 5' burst radius for HE.*										
120 mm Smoothbore Cannon	Shot	5d12	1-4/20	1 im	–	90	S/2h	12/+0	*	*
	HE	5d12	*10' burst radius*							
	Shrapnel	10d6	*15' burst radius*							
	Case Shot	10d6	*Cone 15 x 300', –4d per 100' from muzzle*							
* *Bronze = 1400 kg, €1500; Iron = 1000 kg, €300.*										
120 mm Rifled Cannon	HE	5d12	1-5/19-20	1 im	–	270	S/2h	15/+0	*	*
	Shrapnel	10d6	*15' burst radius*							
	Case Shot	10d6	*Cone 15 x 300', –4d per 100' from muzzle*							
* *Bronze = 1200 kg, €3000; Iron = 900 kg, €600. 20' burst radius for HE.*										
150 mm Coehorn Mortar	HE	8d12	1-4/18-20	1 im	–	60	S/2h	12/+0	*	*
	Shrapnel	16d6	*15' burst radius for Shrapnel, 20' burst radius for HE*							
* *Bronze = 200 kg, €600; Iron = 175 kg, €150.*										
15 mm Puckle Gun	Slug	3d6	1-5/19-20	6 im	–	30	M/2h	18/+0	65	*
	Shot	3d8	*Cone burst 5 x 150'. -1d damage per 50'*							
* *Flintlock = €150; Percussion = €175*										

EABA Weapon Data Tables

Weapon Name	Cal	Acc	Dam	Mag	Wt	Cost	Arm	Hits
Trickster Holdout Pistol	9mm P	1	2d+1	4 im	1.1	€450	1d+1	2
Four separate barrels (each must be reloaded individually), firing pin rotates automatically as each barrel is fired. Reliable (3).								
Last Chance Derringer	9mm P	-1	2d+0	2 im		€75	1d+0	2
Two separate barrels (reloaded individually), firing pin rotates automatically after the first barrel is fired. Reliable (3).								
Swordsman Autopistol	9mm P	2	2d+1	10 im	1.5	€600	1d+1	2
Integral (non-removable) box magazine. Loads single rounds or from 8 round stripper clip. Reliable (3).								
Swordsman Autopistol	9mm P	2	2d+1	10/15 m	1.5	€750	1d+1	2
Removable 10 round box magazine. Reliable (5).								
Tsarevitch Autopistol	9mm P	0	2d+1	9 clip	0.65	€900	1d+1	2
Removable 9 round box magazine. Reliable (5).								
Attacker SA Revolver	9mm P	2	2d+1	6 im	1.2	€450	1d+1	2
Single action revolver – must be cocked before firing. Rounds must be in half moon clip to be loaded. Reliable (3).								
Volkspistole VP-44	9mm P	1	2d+1	8 clip	1.0	€300	1d+1	2
Removable 8 round box magazine. Reliable (4).								
Demon Goddess S'gun Pistol	12 g	-1	3d+2	2 im	1.2	€200	1d+1	2
Two-barrel over-under configuration, each barrel is loaded separately								
Border Reaver SMG	9mm P	1	2d+1	32 clip	3.5	€150	1d+2	2
Uses curved, top mounted, rather than straight, side mounted magazines to reduce jamming. Reliable (4). Autofire capable.								
Flame Lord SMG	9mm P	1	2d+1	30 clip	3.0	€300	1d+1	3
*Cannot use standard M=10 magazines – it will **seem** to, but jam on a 3:6 roll every burst fired. Reliable (4) Autofire capable.*								
Red Star SMG	9mm P	1	2d+1	35 clip	3.36	€450	1d+1	3
Can fire PPsh-41 35 round magazines, but not the 71 round drum magazines. Reliable (5). Autofire capable.								
Cherry Tree SMG	9mm P	2	2d+1	32 clip	4.5	€450	1d+1	3
Has a small knurled cocking lug unlike the original. Reliable (4). Autofire capable.								
Brigadier Rifle	5.56 N	2	4d+1	*	4.5	€650	1d+1	4
** Comes with 20 round magazines on purchase, 30 round mags may be purchased separately. Reliable (5). Autofire capable.*								
Field Marshall Rifle	7.62 N	3	4d+2	*	5.0	€750	1d+1	4
** Comes with 20 round magazines on purchase, but 30 round mags may be purchased separately Autofire capable.*								
Saint Basil Rifle	7.62 M43	2	4d+0	20/30 clip	4.03	€300	1d+1	4
Has an integral folding spike-bayonet under the barrel. Reliable (4). Autofire capable.								
KStG 81 Autorifle	5.56 N	2	4d+1	*	5.5	€500	1d+1	4
** Comes with 20 round magazines as standard, 30 round mags purchased separately. Reliable (5). Autofire capable.*								
KStG 81 Autorifle	7.62 M43	2	4d+0	*	5.5	€500	1d+1	4
** Comes with 20 round magazines as standard, 30 round mags purchased separately. Reliable (5). Autofire capable.*								
Red Emperor Carbine	7.62 M43	2	4d+0		3.9	€625	1d+1	4
Has a 10 round internal (non-removable) box magazine, reloads with single rounds or stripper clip. Reliable (4).								
Red Emperor Carbine	7.62 M43	2	4d+0	*	3.9	€800	1d+1	4
** Comes 10 round removable box magazine, but 15 and 30 round magazines are available separately. Reliable (4).*								

EABA Weapon Data Tables

Weapon Name	Cal	Acc	Dam	Mag	Wt	Cost	Arm	Hits
Martini-Henry Rifle Mk. 1	8 mm	2	4d+0	1 im	3.83	€150	1d+2	4
Single shot, falling block, breechloading cartridge firing rifle. Reliable (3).								
Martini-Henry Rifle Mk 2	8 mm	2	4d+0	7 im	4.03	€250	1d+2	4
Lever action, falling block, breechloading tubular magainze cartridge firing rifle. Reliable (4).								
Minuteman Musket, Flintlock	12 mm	2	3d+0	1 im	4.0	€35	1d+2	4
Single shot muzzle-loading, rifle-musket. Requires a new flint every 2d shots (provided with ammo). Unreliable.								
Minuteman Musket, Percussion	12 mm	2	3d+2	1 im	4.0	€185	1d+2	4
Single shot muzzle-loading, rifle-musket. Percussion caps come with each round. Reliable (5)								
Volcano Shotgun	12 gauge	-1	3d+2	2 im	3.6	€185	1d+2	4
Double barrel shotgun with break open action.								
Demon Pump Action Shotgun	12 gauge	0	3d+2	6 + 1 im	4.25	€375	1d+1	4
Pump action action shotgun, may carry an extra round by inserting one in the action when the magazine is loaded. Reliable (4)								
Lightning GPMG	7.62 N	3	4d+2	100 b	12.0	€1750	1d+1	4
*May fire disintegrating link belt **or** re-useable 50 round cloth belt. Autofire capable. Reliable (6).*								
Lightning GPMG	7.62 M43	3	4d+2	100 b	12.0	€1750	1d+1	4
*May fire disintegrating link belt **or** re-useable 50 round cloth belt. Autofire capable. Reliable (6).*								
Morning Star MMG	7.62 N	4	4d+2	100 b	24.0	€2250	1d+1	4
*May fire disintegrating link belt **or** re-useable 50 round cloth belt. Autofire capable. Reliable (6)*								
Morning Star MMG	7.62 M43	4	4d+2	100 b	24.0	€2250	1d+1	4
*May fire disintegrating link belt **or** re-useable 50 round cloth belt. Autofire capable. Reliable (6).*								
Prince HMG	.50 cal BMG	4	6d+1	100 b	55.0	€3750	1d+1	4
*May fire disintegrating link belt **or** re-useable 50 round cloth belt. Autofire capable. Reliable (6).*								
Prince HMG	12.7Bloc	4	6d+1	100 b	55.0	€3750	1d+1	4
*May fire disintegrating link belt **or** re-useable 50 round cloth belt. Autofire capable. Reliable (6)*								
Gatling Gun	7.62 N	1	4d+2	*	38.0	€5625	2d+0	7
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum mags purchased separately. Autofire capable.								
Gatling Gun	. 50 cal BMG	1	6d+1	*	38.0	€5625	2d+0	7
Comes with 30 and 50 round stick magazines, 100 and 250 round clockwork drum mags purchased separately. Autofire capable.								
2.7 cm *Sturmpistole 44*	HE	0	2d+0	1 im	2.5	€225	1d+1	4
Grenade Launcher	HEAT	*1d+2 AP (lethal) plus 1d+1 explosion (half lethal)*						
	Canister	*3d+1 (lethal) – small cone.*						
	Illumination	*10 meters radius, 10 seconds duration.*						
	Smoke	*3 meters radius, 10 seconds duration*						
Thunderer 40 mm	HE	2	3d+2	1 im	2.67	€450	1d+1	4
Grenade Launcher	HEDP	*4d+2 AP (lethal) plus 2d+1 explosion (half lethal)*						
	Canister	*6d+0 (lethal) – small cone.*						
	Illumination	*100 meters radius, 10 seconds duration*						
	Smoke	*6 meters radius. 10 seconds duration.*						

EABA Weapon Data Tables

Weapon Name	Cal	Acc	Dam	Mag	Wt	Cost	Arm	Hits
Biter 60 mm DRL	HE	2	11d+2	1 im	3.5	3.5	0d+2	2
Rocket Launcher	HEDP	*9d+2 AP (lethal) plus 3d+2 explosion (half lethal)*						
	Canister	*12d+1 lethal – small cone.*						
*Disposable RL – the round may be extracted and used in the **Viper** RL instead. Reliable (2).*								
Viper 60 mm Rocket	HE	4	11d+2	1 im	9.5	9.5	1d+1	3
Launcher	HEDP	*9d+2 AP (lethal) plus 3d+2 explosion (half lethal)*						
	Canister	*12d+1 lethal – small cone.*						
*Re-usable launcher, can fire rounds extracted from **Biter** DRL. Requires a crew of two – but can be fired by one. Reliable (3).*								
Raketenpanzerbusche 54/1a	HEAT	2	*		10	10	1d+2	4
11d+1 AP (lethal) plus 4d+0 explosion (half lethal). Requires a crew of two – but can be fired by one. Reliable (2).								
Panzerfaust 150	HEAT	1	12d+1	1 im	3.5	3.5	1d+2	4
Rocket Launcher	HE	*5d+2 explosion (half lethal).*						
Can be fired and reloaded by the operator								
Dynamite/Gelignite	n.a.	–	3d+1	–	¼	¼		
Damage is half lethal. Regular rules for explosives apply.								
Gunpowder, Corned	n.a.	–		–	1	1		
Damage is half lethal. Regular rules for explosives apply.								
Gunpowder, Meal	n.a.	–		–	1	1		
Use the standard rules for explosives. +1d6 to explosive damage for every doubling of explosive mass								
Mine, Antipersonnel	n.a.	–	6d+1	–	2½	2½		
Damage is half lethal. Range is circle. Use the standard rules for explosives.								
Mine, Directional	n.a.	–	6d+1	–	2½	2½	1d+2	4
Damage is half lethal, range is wide cone. Use the standard rules for explosives.								
Nitroglycerin	n.a.	–	3d+1		0.1	0.1		
Damage is half lethal. Range is circle. Use the standard rules for explosives.								
HE Grenade, Offensive	n.a.	–	3d+0	–	½	½	1d+2	4
Damage is half lethal. Range is circle. Use the standard rules for explosives.								
HE Grenade, Defensive	n.a.	–	3d+2	–	½	½	1d+2	4
Damage is half lethal. Range is circle. Use the standard rules for explosives.								
WP Smoke Grenade	n.a.		3d+1	–	¾	¾	1d+2	4
Damage is half lethal (explosive and fire) and 1d+1 continuing (fire). Range is circle. Use the standard rules for explosives.								
Black Powder Grenade	n.a.				¾	¾		
Damage is half lethal. Range is circle. Use the standard rules for explosives.								
Crossbow, Pump Action	n.a.				3.5	3.5		
Single shot weapon must be reloaded manually.								
Crossbow, Repeater, Pump	n.a.				4.0	4.0		
Internal magazine feeds from bottom – loaded through open action.								
60 mm Mortar	HE	0	10d+1	1 im	*	*	2d+0	4

EABA Weapon Data Tables

Weapon Name	Cal	Acc	Dam	Mag	Wt	Cost	Arm	Hits
60 mm Mortar	Smoke	*25 meter radius, burns for 60 seconds.*						
	Illumination	*500 meters radius, burns for 30 seconds*						
** Kicker costs €1500,masses 12kg, Range is 50/1000; Noisy costs €2875,masses 25 kg. Range is 50/3000 meters.*								
81/82 mm Mortar	HE	0	12d+2	1 im	50	€4675	2d+0	4
	Smoke	*30 meter radius, burns for 60 seconds.*						
	Illumination	*1200 meters radius, burns for 60 seconds*						
Range is 200/4000 meters. HE damage is explosive (half lethal)								
120 mm Mortar	HE	0/8	14d+1	1 im	520	€6750	2d+0	4
	Smoke	*60 meter radius, burns for 150 seconds.*						
	Illumination	*1500 meters radius, burns for 120 seconds*						
Range is 200/4000 meters. HE damage is explosive (half lethal)								
75 mm Recoilless Rifle	HE	6	10d+1	1 im	145	€1875	1d+2	4
	HEDP	*10d+1 AP (lethal), 4d+0 explosion (half lethal)*						
	Canister	*7d+2 lethal (wide cone).*						
	Illumination	*250 meters, 60 seconds.*						
	Smoke	*20 meters, 60 seconds.*						
Weight includes a light wheeled field mount. HE damage is explosive (half lethal)								
105 mm Recoilless Rifle	HE	7	12d+1	1 im	550	€2500	1d+2	4
	HEDP	*12d+1 AP (lethal), 6d+0 (half lethal)*						
	Canister	*9d+2 lethal, wide cone.*						
	Illumination	*500 meters, 120 seconds.*						
	Smoke	*30 meters, 120 seconds.*						
Weight includes a light wheeled field mount. HE damage is explosive (half lethal)								
106 mm Recoilless Rifle	HE	8	13d+2	1 im	165	€3375	1d+2	4
	HEDP	*13d+2 AP (lethal), 6d+0 (half lethal)*						
	Canister	*10d+1 lethal, wide cone.*						
	Illumination	*500 meters, 120 seconds.*						
	Smoke	*30 meters, 120 seconds.*						
Weight includes a wheeled field mount. HE damage is explosive (half lethal)								
20 mm Autocannon	API	4/7	7d+1	20/60 m	70	€3750	2d+0	4
	HE	*3d+0 explosion (half lethal)*						
Weight is for weapon only. Field mount is extra.								
37 mm Autocannon	API	3/7	8d+1	8 m	250	€5675	2d+0	4
	HEDP	*8d+1 AP (lethal), 4d+0 explosion (half lethal).*						
Weight is for weapon only. Field mount is extra.								
15 mm Autocannon, Manual	HE	2/5	4d+0	120 b	55	€1875	1d+2	3
15 mm Autocannon, Electric	HE	2/5	4d+0	120 b	75	€3375	1d+1	2
Weight is for weapon only. Field mount is extra. Damage is explosive (half lethal).								

EABA Weapon Data Tables

Weapon Name	Cal	Acc	Dam	Mag	Wt	Cost	Arm	Hits
Bulldog Gun-Mortar	60 mm	2/4	*	1 im	75	€2250	2d+0	4
** Fires any 60 mm Mortar shell.*								
Sabre Rapid Fire Cannon	60 mm	1/3	*	6 clip	250	€7500	1d+2	3
** Fires any 60 mm Mortar shell.*								
Wolfhound Gun-Mortar	81/82 mm	2/4	*	1 im	200	€3750	2d+0	4
** Fires any 81/82 mm Mortar shell.*								
Spiteful Rapid Fire Cannon	81/82 mm	1/3	*	3 clip	1000	€11250	1d+2	3
** Fires any 81/82 mm Mortar shell.*								
75 mm Howitzer	HE	7	12d+2	1 im	375	€25000	2d+0	4
	Canister	*8d+2 lethal (wide cone)*						
	Illumination	*1000 meter radius, burns for 120 seconds*						
	Smoke	*30 meters, burns for 120 seconds.*						
Weight includes field mount. HE damage is explosive (half lethal)								
90 mm Smoothbore Cannon	Shot	0	7d+1	1 im	*	*	2d+0	4
	HE	*4d+2 explosive (half lethal)*						
	Shrapnel	*4d+1 non-AP (lethal)*						
	Case Shot	*4d+0 non-AP (lethal), narrow cone*						
** Bronze = 1200 kg, €1000; Iron = 900 kg, €250.*								
90 mm Rifled Cannon	HE	4	7d+1	1 im	*	*	2d+0	4
	Shrapnel	*4d+2 non-AP (lethal)*						
	Case Shot	*4d+1 non-AP (lethal), narrow cone*						
** Bronze = 1000 kg, €2250; Iron = 800 kg, €450. HE explosive (half lethal)*								
120 mm Smoothbore Cannon	Shot	0	8d+2	1 im	*	*	2d+0	4
	HE	*6d+0 explosive (half lethal)*						
	Shrapnel	*5d+2 non-AP (lethal)*						
	Case Shot	*5d+1 non-AP (lethal), wide cone*						
** Bronze = 1400 kg, €1500; Iron = 1000 kg, €300.*								
120 mm Rifled Cannon	HE	4	8d+2	1 im	*	*	2d+0	4
	Shrapnel	*6d+0 non-AP (lethal)*						
	Case Shot	*5d+2 non-AP (lethal), wide cone*						
** Bronze = 1200 kg, €3000; Iron = 900 kg, €600. HE damage is explosive (half lethal)*								
150 mm Coehorn Mortar	HE	2	9d+1	1 im	*	*	2d+0	4
	Shrapnel	*7d+2 non-AP (lethal)*						
** Bronze = 200 kg, €600; Iron = 175 kg, €150. HE damage is explosive (half lethal)*								
15 mm Puckle Gun	Slug	2	4d+2	6 im	65	*	1d+1	3
	Shot	*4d+0 non-AP (lethal), narrow cone*						
** Flintlock = €150; Percussion = €175*								

VEHICLE APPENDICES
VEHICLE DATA FOR A VARIETY OF RPGS

This chapter contains data for all of the vehicles included in this book for a variety of OGL and other game systems.

The information provided is based on the conversion information provided in BTRC's *Stuff!* – which is problematic for some systems as they are not always internally consistent.

Basic data on *Access*, *Armament*, *Special Equipment*, *Engine*. *Fuel (Type)*, *Fuel Consumption*, *Fuel Tank*, *Maintenance Interval*, *Maintenance Time*, and *Cost* are provided for all vehicles listed.

ACTION! SYSTEM
There is, essentially, no vehicle system in the basic *Action! System*, so the only game specific data provided are *Armour* and *Hits*.

IMPRESA EXPRESS
Impresa Express doesn't have a vehicle system, as written, either – *however*, the closely compatible *Gdi (Genre Diversioni)* **does.**

The values for *Speed* & *Handling* and *Frame* & *Shields* are taken from that game system.

D20 MODERN
As with weapons, there is no *system* for creating vehicles from scratch in *d20 Modern* – so the values provided are somewhat problematic, based on the closest *similar* vehicles that exist in the basic *d20 Modern* and supplements (such as *d20 Past*).

All the relevant *d20 Modern* values are provided. *Speed* 5 foot squares/50 foot squares.

Initiative, *Maneuver*, *Size*, *Defence*, *Hardness* and *Hits* are used with the vehicle combat/pursuit system.

SPYCRAFT 2.0
Spycraft 2.0 **also** has no *system* for creating vehicles from scratch – and, as with *d20 Modern*, the values provided are estimates based on comparison with the most similar vehicles described in the core rulebook.

All the relevant *Spycraft 2.0* values are provided. *Acceleration*, *Turning*, *Defence*, *Damage Save* are used in the vehicle combat/pursuit system.

Complexity and *Error* are related to the maintenance and modification rules.

Qualities are special attributes that idiosyncratise the vehicles.

EABA
EABA has an *outstanding* design system including a design system for *vehicles*, in their *Stuff!* Rules.

The vehicle data is based on real world values, but described in *EABA Stuff!* Values as far as is possible (reverse engineered, in effect) – so you probably cannot get an exact match by trying to design them from the ground up using those rules.

Speed (Maximum Speed/Acceleration/Deceleration in meters/second) Maneuver and *Suspension* are related to vehicular movement and combat as are *Armour (possible Hull Front*, *Hull Side*, *Hull Rear*, *Hull Bottom*, *Hull Top* and *Turret)* and *Damage*.

Ground Vehicles

Bicycle

Access: Open Frame (rider sits astride vehicle). **Armament:** nil. **Special Equipment:** nil.

Speed (Strategic): 16 kph (10 mph).

Speed & Handling *(Impresa Express/GDi)*: 0/+2. **Speed:** 12/2 *(d20)*; 4/1/3 *(EABA)*. **Initiative *(d20)*:** +1. **Maneuver:** +2 *(d20)*; 3d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** per driver/6. **Suspension *(EABA)*:** Enhanced (Offroad).

Weight (Unloaded): 13 kg. **Cargo:** see notes. **Weight (Loaded):** 90 kg (see notes). **Size*:*** S *(d20)*; M (1x1) *(Spycraft)* . **Crew:** 1.

Engine: n/a. **Fuel:** n/a. **Fuel Consumption:** n/a. **Fuel Tank:** n/a. **Maintenance Interval:** 1000 hours. **Complexity & Error *(Spycraft):*** 12/+0.

Armour: 9 *(Action! System);* 1d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 10/+5. **Hits:** 6 *(Action! System)*; 12 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 0/0. **Damage *(EABA):*** 5/7.

Qualities *(Spycraft):* Muscle, Off Road, Open.

Cost: €200.

Notes: *Normally carries rider and personal equipment. Up to 90 kg and performance is as listed, up to 135 kilos (rider + 50 kg cargo) may be carried at 12 kph and 180 kilos (no rider who walks alongside, pushing, 165 kg cargo) may be carried at 8 kph.*

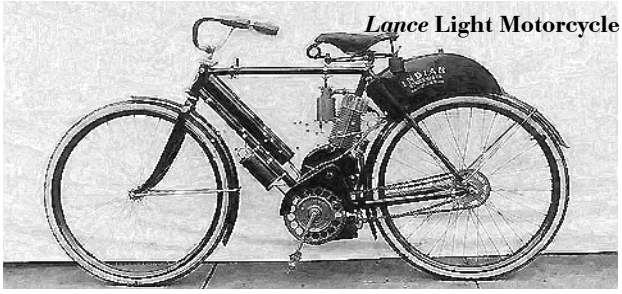
*Speed in combat/chase situations is based on the stats of the **Rider** for **Spycraft**.*

Moped

Access: Open Frame (rider sits astride vehicle). **Armament:** nil. **Special Equipment:** nil.

Speed (Strategic): 32 kph (20 mph).

Speed & Handling *(Impresa Express/GDi)*: +1/+1. **Speed:** 24/3 *(d20)*; 9/2/4 *(EABA)*. **Initiative *(d20)*:** +1. **Maneuver:** +1 *(d20);* 3d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 3/6. **Handling *(EABA)*:** Enhanced (offroad).



***Lance* Light Motorcycle**

Weight (Unloaded): 20 kg. **Cargo:** see notes. **Weight (Loaded):** 90 kg (see notes). **Size*:*** S *(d20)*; M (1x1) *(Spycraft)* . **Crew:** 1.

Engine: IC. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** ¼ liter/hour. **Fuel Tank:** 5 liters. **Maintenance Interval:** 100 hours (motor), 1000 hours (frame). **Maintenance Time:** 1 hour (motor). **Complexity & Error *(Spycraft):*** 15/+1.

Armour: 9 *(Action! System)*; 1d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 10/+6. **Hits:** 6 *(Action! System);* 14 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 0/0. **Damage *(EABA):*** 5/7.

Qualities *(Spycraft):* Open.

Cost: €250.

Notes: *Normally carries rider and personal equipment. Up to 90 kg and performance is as listed, up to 135 kilos (rider + 50 kg cargo) may be carried at 16 kph.*

*Speed in combat/chase situations where the Moped is being **pedalled** is based on the **Rider's** stats for **Spycraft**.*

Conestoga Waggon

Access: Open Frame (Bench seat at front)). **Armament:** nil. **Special Equipment:** nil.

Speed (Strategic): 18-22 klicks (11-14 miles) per *day*.

Speed & Handling *(Impresa Express/GDi)*: 0/0. **Speed:** 3/¼ *(d20)*; 2/¼/½ *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -6 *(d20);* ?d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/0. **Suspension *(EABA)*:** Normal (road).

Weight (Unloaded): 1500 kg. **Cargo:** 4000 kg. **Weight (Loaded):** 4500 kg. **Size*:*** H *(d20)*; L (2x5) *(Spycraft)*. **Crew:** 1 + 2 passengers.

Engine: n/a. **Fuel:** n/a. **Fuel Consumption:** n/a. **Fuel Tank:** n/a. **Maintenance Interval:** 500 hours. **Complexity & Error *(Spycraft):*** 15/+0.

Armour: 9 *(Action! System);* 1d+2 *(EABA)*. **Defence & Hardness *(d20)*:** 6/4. **Defence & Damage Save *(Spycraft)*:** 9/+7. **Hits:** 36 *(Action! System);* 24 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** +1/0. **Damage *(EABA):*** 2d+0.

Qualities *(Spycraft):* Off Road, Open (¼ cover).

Cost: €250.

Notes: *Speed is determined by the stats of the Horse (or other draft animals) pulling the waggon for* ***Spycraft****.*

Lance Motorcycle

Access: Open Frame (rider sits astride vehicle). **Armament:** nil. **Special Equipment:** Headlights; Push-button starter; Sidecar (€90, 55 kg unloaded, 1 Passenger or 100 kg cargo).

Speed (Strategic): 105 kph (66 mph).

Speed & Handling *(Impresa Express/GDi)*: +1/+2. **Speed:** 77/8 *(d20)*; 29/6/11 *(EABA)*. **Initiative *(d20)*:** +0. **Maneuver:** +2 *(d20);* 3d+2 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 6/7. **Suspension *(EABA):*** Enhanced (offroad).

Weight (Unloaded): 145 kg. **Cargo:** 125 kg. **Weight (Loaded):** 350 kg. **Size:** M *(d20);* M (1x2) *(Spycraft)*. **Crew:** 1.

Engine: 15 kW IC. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 3 liters/hour. **Fuel Tank:** 18 liters. **Maintenance Interval:** 500 hours. **Maintenance Time:** 1 hour. **Complexity & Error *(Spycraft):*** 20/+1.

Armour: 9 *(Action! System);* 1d+2 *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+5. **Hits:** 33 *(Action! System);* 15 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 0/0. **Damage *(EABA)*:** 8/7.

Qualities *(Spycraft):* Open.

Cost: €5750.

Notes: *Speed reduced to 62½ kph (40 mph) with sidecar.*

Lord ½ Ton Utility (IC Model)

Access: Two doors (at front driver/passenger seats); rear tray. **Armament:** Pintle mount between front seats (Can take MMG or HMG). **Special Equipment:** Headlights, Towing Hitch (~1000 kg).

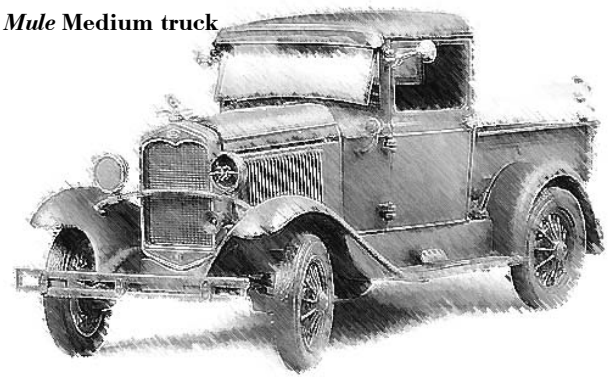
Speed (Strategic): 90 kph (56 mph).

Speed & Handling *(Impresa Express/GDi)*: +1/+1. **Speed:** 66/7 *(d20)*; 25/7/13 *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 3/2. **Suspension *(EABA)*:** Enhanced (offroad).

Weight (Unloaded): 1050 kg. **Cargo:** 500 kg. **Weight (Loaded):** 1800 kg. **Size:** H *(d20)*; L (2x3) *(Spycraft)*. **Crew:** 1 + 1 plus 4 passengers.

Engine: 35 kW IC. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 11 liters/hour. **Fuel Tank:** 88 liters. **Maintenance Interval:** 500 hours. **Maintenance Time:** 1 hour. **Complexity & Error *(Spycraft):*** 17/0.

***Mule* Medium truck**



Armour: 9 *(Action! System);* 2d+2 (HF), 1d+2 (HS), 1d+2 (HR), 1d+2 (HB) *(EABA)*. **Defence/ & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+9. **Hits:** 45 *(Action! System);* 24 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA)*:** 12/5.

Qualities *(Spycraft):* Off Road.

Cost: €15000.

Lord ½ Ton Utility (Steam Model)

Access: Two doors (at front driver/passenger seats); rear tray. **Armament:** pintle mount between front seats (Can take MMG or HMG). **Special Equipment:** Headlights, Towing Hitch (~1000 kg).

Speed (Strategic): 80 kph (50 mph). **Startup Time:** 60 seconds.

Speed & Handling *(Impresa Express/GDi)*: +1/+1. **Speed:** 59/6 *(d20);* 22/6/12 *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 3/2. **Suspension *(EABA):*** Enhanced (offroad).

Weight (Unloaded): 1475 kg. **Cargo:** 500 kg. **Weight (Loaded):** 2225 kg. **Size:** H *(d20)*; L (2x3) *(Spycraft)*. **Crew:** 1 + 1 plus 4 passengers.

Engine: 35 kW Steam. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 6½ liters/hour. **Fuel Tank:** 52 liters. **Maintenance Interval:** 250 hours. **Maintenance Time:** 1 hour. **Complexity & Error *(Spycraft):*** 15/0.

Armour: 9 *(Action! System);* 2d+2 (HF), 1d+2 (HS), 1d+2 (HR), 1d+2 (HB) *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+9. **Hits:** 45 *(Action! System);* 24 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA)*:** 12/5.

Qualities *(Spycraft):* Dependable, Low Observable (Sound), Off Road.

Cost: €8750.

Knight Light Armoured Car (IC Model)

Access: Two doors (front driver/passenger); split door, hull rear; split hatch, turret top/rear. **Armament:** Full traverse powered Turret with 1 x HMG (800 rounds) and 1 x MMG (2400 rounds). **Special Equipment:** Headlights, Towing Hitch (~1000 kg rated).

Speed (Strategic): 72 kph (45 mph).

Speed & Handling *(Impresa Express/GDi)*: +1/0. **Speed:** 53/5 *(d20);* 20/5/10. **Initiative *(d20)*:** -2. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 2/2. **Suspension *(EABA)*:** Enhanced (off-road).

Weight (Unloaded): 1650 kg. **Cargo:** 250 kg. **Weight (Loaded):** 2000 kg. **Size:** H *(d20)*; L (2x4) *(Spycraft)*. **Crew:** 1 + 2.

Engine: 70 kW IC. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 22 liters/hour. **Fuel Tank:** 176 liters. **Maintenance Interval:** 500 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 20/+1.

Armour: 18 *(Action! System);* 4d+2 (HF), 3d+2 (HS), 2d+2 (HR), 2d+2 (HB), 2d+2 (HT), 4d+2 (Turret) *(EABA)*. **Defence & Hardness *(d20)*:** 12/10. **Defence & Damage Save *(Spycraft)*:** 9/+18. **Hits:** 54 *(Action! System);* 48 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 3/0. **Damage *(EABA)*:** 12/5.

Qualities *(Spycraft):* Off Road.

Cost: €40000.

Knight Light Armoured Car (Steam)

Access: Two doors (front driver/passenger); split door, hull rear; split hatch, turret top/rear. **Armament:** Full traverse powered Turret with 1 x HMG (800 rounds) and 1 x MMG (2400 rounds). **Special Equipment:** Headlights, Towing Hitch (~1000 kg rated).

Speed (Strategic): 65 kph (40 mph). **Startup Time:** 95 seconds.

Speed & Handling *(Impresa Express/GDi)*: +1/0. **Speed:** 48/5 *(d20);* 18/5/10 *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 2/2. **Suspension *(EABA)*:** Enhanced (offroad).

Bulldozer variant of *Farmer Tracked Utility*

Weight (Unloaded): 2150 kg. **Cargo:** 250 kg. **Weight (Loaded):** 2500 kg. **Size:** H *(d20)*; L (2x4) *(Spycraft)*. **Crew:** 1 + 2.

Engine: 70 kW Steam. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 13 liters/hour. **Fuel Tank:** 96 liters. **Maintenance Interval:** 250 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 18/0.

Armour: 18 *(Action! System);* 4d+2 (HF), 3d+2 (HS), 2d+2 (HR), 2d+2 (HB), 2d+2 (HT), 4d+2 (Turret) *(EABA)*. **Defence & Hardness *(d20)*:** 12/12. **Defence & Damage Save *(Spycraft)*:** 9/+18. **Hits:** 54 *(Action! System);* 48 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 3/0. **Damage *(EABA)*:** 12/5.

Qualities *(Spycraft):* Dependable, Low Observable (Sound), Off Road.

Cost: €25000.

Farmer Tracked Utility (IC Model)

Access: Two doors (driver/passenger). **Armament:** nil. **Special Equipment:** Headlights, Towing Hitch (~5000 kg).

Speed (Strategic): 48 kph (30 mph).

Speed & Handling *(Impresa Express/GDi)*: 0/-1. **Speed:** 35/4 *(d20);* 13/4/8 *(EABA)*. **Initiative *(d20)*:** -4. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/2. **Suspension *(EABA)*:** Very Enhanced (tracked)

Weight (Unloaded): 2000 kg. **Cargo:** 3500 kg. **Weight (Loaded):** 6000 kg. **Size:** H *(d20)*; H (4x5) *(Spycraft)*. **Crew:** 1 + 1, plus 12-14 passengers.

Engine: 35 kW IC. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 11 liters/hour. **Fuel Tank:** 320 liters. **Maintenance Interval:** 500 hours. **Maintenance Time:** 4 hours. **Complexity & Error *(Spycraft):*** 22/+1.

Armour: 12 *(Action! System)*; 2d+2 (HF), 2d+2 (HS), 2d+2 (HR), 2d+2 (HB) *(EABA)*. **Defence & Hardness *(d20)*:** 12/6. **Defence & Damage Save *(Spycraft)*:** 8/+16. **Hits:** 24 *(Action! System);* 36 *(d20)*. **Frame/ & Shields *(Impresa Express/GDi)*:** 3/0. **Damage:** 15/5.

Qualities *(Spycraft)*: Open (½ cover), Tracked.

Cost: €45000.

Farmer Tracked Utility (Steam Model)

Access: Two doors (front driver/passenger). **Armament:** nil. **Special Equipment:** Headlights (Carbide), Towing Hitch (~5000 kg rated).

Speed (Strategic): 42 kph (26 mph). **Startup Time:** 60

seconds.

Speed & Handling *(Impresa Express/GDi)*: 0/-1. **Speed:** 31/3 *(d20);* 11/4/8. **Initiative *(d20)*:** -4. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/2. **Suspension *(EABA)*:** Very Enhanced (tracked).

Weight (Unloaded): 2500 kg. **Cargo:** 3500 kg. **Weight (Loaded):** 6750 kg. **Size:** H *(d20)*; H (4x5) *(Spycraft)*. **Crew:** 1 + 1, plus 12-14 passengers.

Engine: 35 Kw Steam. **Fuel:** P, A, S. **Fuel Consumption:** 6½ liters/hour. **Fuel Tank:** 200 liters. **Maintenance Interval:** 250 hours. **Maintenance Time:** 4 hours. **Complexity & Error *(Spycraft):*** 20/+1.

Armour: 12 *(Action! System)*; 2d+2 (HF), 2d+2 (HS), 2d+2 (HR), 2d+2 (HB) *(EABA)*. **Defence & Hardness *(d20)*:** 12/6. **Defence & Damage Save *(Spycraft)*:** 8/+16. **Hits:** 24 *(Action! System);* 436 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 3/0. **Damage *(EABA)*:** 15/5.

Qualities *(Spycraft)*: Dependable, Low Observable, Open (½ cover), Tracked.

Cost: €25000.

Mule Medium Truck (IC Model)

Access: Two doors (front driver/co-driver). **Armament:** nil (pintle mount over co driver, can take MMG or HMG). **Special Equipment**: Headlights (Electric), Towing Hitch (~5000 kg), canvas tilt/wooden sides (rear tray).

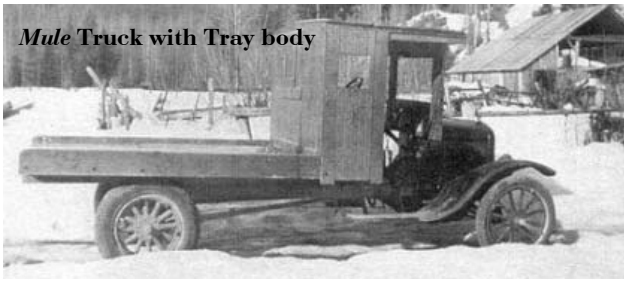
Speed (Strategic): 60 kph (38 mph).

Speed & Handling *(Impresa Express/GDi)*: 0/0. **Speed:** 44/4 *(d20);* 17/8/14 *(EABA)*. **Initiative *(d20)*:** -4. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 2/2. **Suspension *(EABA)*:** Enhanced (offroad).

Weight (Unloaded): 4000 kg. **Cargo:** 3250 kg (offroad), 4250 kg (onroad). **Weight (Loaded):** 8500 kg. **Size:** H *(d20)*; L (2x4) *(Spycraft)*. **Crew:** 1 + 1, plus 10-12 passengers.

Engine: 50 kW IC. **Fuel:** Petrol, Alcohol. **Fuel Consumption:** 16 liters/hour. **Fuel Tank:** 240 liters. **Maintenance Interval:** 500 hours. **Maintenance Time:** 4 hours. **Complexity & Error *(Spycraft):*** 20/+1.

Armour: 12 *(Action! System);* 2d+2 (HF), 1d+2 (HS), 1d+2 (HR), 1d+2 (HB) *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+9. **Hits:** 48 *(Action! System);* 28 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 2/0. **Damage *(EABA)*:** 13/5.



***Mule* Truck with Tray body**

Qualities *(Spycraft):* Off Road.

Cost: €45000.

Mule Medium Truck (Steam Model)

Access: Two doors (front driver/co-driver. **Armament:** nil (pintle mount over co driver takes MMG or HMG). **Special Equipment**: Headlights (Carbide), Towing Hitch (~5000 kg), canvas tilt and wooden sides (for rear tray).

Speed (Strategic): 55 kph (34 mph). **Startup Time:** 75 seconds.

Speed & Handling *(Impresa Express/GDi)*: 0/0. **Speed:** 40/4 *(d20);* 15/8/14 *(EABA)*. **Initiative *(d20)*:** -4. **Maneuver:** -4 *(d20);* 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 2/2. **Suspension *(EABA)*:** Enhanced (offroad).

Weight (Unloaded): 5000 kg. **Cargo:** 4000 kg (offroad), 5000 kg (onroad). **Weight (Loaded):** 10000 kg. **Size:** H *(d20)*; L (2x4) *(Spycraft)*. **Crew:** 1 + 1, plus 10-12 passengers.

Engine: 50 kW Steam. **Fuel:** Petrol, Alcohol, Solid. **Fuel Consumption:** 10 liters/hour. **Fuel Tank:** 150 liters/kilos. **Maintenance Interval:** 250 hours. **Maintenance Time:** 4 hours. **Complexity & Error *(Spycraft):*** 18/0.

Armour: 12 *(Action! System);* 2d+2 (HF), 1d+2 (HS), 1d+2 (HR), 1d+2 (HB) *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+9. **Hits:** 48 *(Action! System);* 28 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 2/0. **Damage *(EABA)*:** 13/5.

Qualities *(Spycraft):* Dependable, Low Observable (Sound), Off Road.

Cost: €25000.

Water Vehicles

Wind Steam Gig

Access: Over the side. **Armament:** nil. **Special Equipment:** Survival Supplies (63 man days).

Speed (Strategic): 32 kph (20 mph). **Startup Time:** 60 seconds.

Speed & Handling *(Impresa Express/GDi)*: +2/+1. **Speed:** 23/2 *(d20)*; 9/3/9 *(EABA)*. **Initiative *(d20)*:** -4. **Maneuver:** -4 *(d20)*; 2d+2 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 1/1. **Suspension *(EABA)*:** Watercraft.

Weight (Unloaded): 700 kg. **Cargo:** 1350 kg. **Weight (Loaded):** 2100 kg. **Size*:*** H *(d20)*; L (2x6) *(Spycraft)* . **Crew:** 1 + 8 passengers.

Engine: 10 kW Steam. **Fuel:** Petrol, Alcohol, Solid. **Fuel Consumption:** 8 liters/hour. **Fuel Tank:** 80 liters. **Maintenance Interval:** 2000 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 16/+1.

Armour: 10 *(Action! System);* 2d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+8. **Hits:** 24 *(Action! System)*; 12 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** 4/12.

Qualities *(Spycraft):* Open (½ cover).

Cost: €1875.

Storm Steam Gig

Access: Over the side, Pilothouse (rear door). **Armament:** nil. **Special Equipment:** Survival Supplies (84 man days).

Speed (Strategic): 24 kph (15 mph). **Startup Time:** 120 seconds.

Speed & Handling *(Impresa Express/GDi)*: +1/+1. **Speed:** 18/2 *(d20)*; 7/3/7 *(EABA)*. **Initiative *(d20)*:** +1. **Maneuver:** +2 *(d20)*; 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 1/1. **Suspension *(EABA)*:** Watercraft.

Weight (Unloaded): 2350 kg. **Cargo:** 2500 kg. **Weight (Loaded):** 5100 kg. **Size*:*** H *(d20)*; H (3x10) *(Spycraft)* . **Crew:** 2 + 10 passengers.

Engine: 20 kW Steam. **Fuel:** Petrol, Alcohol, Solid. **Fuel Consumption:** 20 liters/hour. **Fuel Tank:** 760 l. **Maintenance Interval:** 2000 hours. **Maintenance Time:** 4 hours. **Complexity & Error *(Spycraft):*** 16/+1.

Armour: 12 *(Action! System);* 2d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 9/+8. **Hits:** 36 *(Action! System)*; 12 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 2/0. **Dam-age *(EABA):*** 2/14.

Qualities *(Spycraft):* Open (½ cover).

Cost: €5625.

Dolphin Cargo Steamer

Access: Assorted doors in superstructure; two hatches to 2x60 ton Cargo Holds (one fore/one aft). **Armament:** nil. **Special Equipment:** 4 x *Wind* Steam Gigs, 2 x *Storm* Steam Gigs, 8 x Carley Floats; Vehicular Radio, 2 x Searchlights, Aldiss Lamp; 2x Steam Cranes (1 @ 15 tons capacity; 1 @ 7½ tons capacity).

Speed (Strategic): 20 kph (12½ mph). **Startup Time:** 30 minutes.

Speed & Handling *(Impresa Express/GDi)*: 0/0. **Speed:** 15/1 *(d20)*; 6/1/2 *(EABA);* 18 (Hull), 12 (Deck/Deckhouse) *(CORPS)*. **Initiative *(d20)*:** +1. **Maneuver:** +2 *(d20)*; 1d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/1. **Suspension *(EABA)*:** Watercraft.

Weight (Unloaded): 250 tonnes. **Cargo:** 200 tonnes. **Weight (Loaded):** 500 tonnes. **Size*:*** C *(d20)*; C (5x25) *(Spycraft)* . **Crew:** 12 + 20 passengers.

Engine: 2 x 300 kW Steam. **Fuel:** Petrol, Alcohol, Solid. **Fuel Consumption:** 300 liters/hour. **Fuel Tank:** 100,000 liters. **Maintenance Interval:** 12000 hours. **Maintenance Time:** 16 hours. **Complexity & Error *(Spycraft):*** 14/+0.

Armour: 14 *(Action! System);* 2d+2 *(EABA)*. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 6/+12. **Hits:** 48 *(Action! System)*; 12 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 4/0. **Damage *(EABA):*** 0/28.

Qualities *(Spycraft):* Dependable, Living Quarters.

Cost: €750,000.

Dolphin Cargo-Passenger Steamer

Access: Assorted doors in superstructure; one hatch to a single 60 ton Cargo Hold (fore), doors in extended Deckhouse (Passenger accommodation) aft. **Armament:** nil. **Special Equipment:** 4 x *Wind* Steam Gigs, 2 x *Storm* Steam Gigs, 8 x Carley Floats; Vehicular Radio, Searchlight, Aldiss Lamp; Steam Crane (7½ tons capacity).

Speed (Strategic): 20 kph (12½ mph). **Startup Time:**

30 minutes.

Speed & Handling *(Impresa Express/GDi)*: 0/0. **Speed:** 15/1 *(d20)*; 6/1/2 *(EABA)*. **Initiative *(d20)*:** +1. **Maneuver:** +2 *(d20)*; 1d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/1. **Suspension *(EABA)*:** Watercraft.

Weight (Unloaded): 250 tonnes. **Cargo:** 100 tonnes. **Weight (Loaded):** 500 tonnes. **Size:** C *(d20)*; C (5x25) *(Spycraft)* . **Crew:** 12 + 20 passengers.

Engine: 2 x 300 kW Steam. **Fuel:** Petrol, Alcohol, Solid. **Fuel Consumption:** 300 liters/hour. **Fuel Tank:** 100,000 liters. **Maintenance Interval:** 12000 hours. **Maintenance Time:** 16 hours. **Complexity & Error *(Spycraft)*:** 14/+0.

Armour: 14 *(Action! System);* 2d+2 *(EABA)*.. **Defence & Hardness *(d20)*:** 8/5. **Defence & Damage Save *(Spycraft)*:** 6/+12. **Hits:** 48 *(Action! System)*; 12 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 4/0. **Damage *(EABA)*:** 0/28.

Qualities *(Spycraft)*: Dependable, Living Quarters.

Cost: €900,000.

AIRCRAFT

SPIRIT HANG GLIDER

Access: sling attached to frame beneath delta wing. **Armament:** nil. **Special Equipment:** nil.

Speed (Strategic): *up to* 64 kph (40 mph) depending on thermals/wind strength.

Speed & Handling *(Impresa Express/GDi)*: 0/+1. **Speed:** 70/7 *(d20)*; 18/1/7 *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -2 *(d20)*; 2d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/2. **Suspension *(EABA)*:** Aircraft.

Weight (Unloaded): 50 kg. **Cargo:** 100 kg (includes pilot). **Weight (Loaded):** 150 kg. **Size:** L *(d20)*; L (1x1; Wing 8) *(Spycraft)* . **Crew:** 1.

Engine: nil. **Fuel:** nil. **Fuel Consumption:** nil. **Fuel Tank:** n/a. **Maintenance Interval:** 1 flight. **Maintenance Time:** ½ hour. **Complexity & Error *(Spycraft)*:** 15/+0.

Armour: 2 *(Action! System);* 1d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/2. **Defence & Damage Save *(Spycraft)*:** 9/+2. **Hits:** 9 *(Action! System)*; 6 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA)*:** ?/?.

Qualities *(Spycraft)*: Flammable (no blast), Low Observable (Radar Small, Thermal Fine), Open (No Cover), Unpowered.

Cost: €75.

SPARROW ULTRALIGHT

Access: over side. **Armament:** nil. **Special Equipment:** nil.

Speed (Strategic): 96 kph (60 mph).

Speed & Handling *(Impresa Express/GDi)*: 0/+1. **Speed:** 70/7 *(d20)*; 27/4/4 *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -2 *(d20)*; 1d+2 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/1. **Suspension *(EABA)*:** Aircraft.

Weight (Unloaded): 135 kg. **Cargo:** 20 kg. **Weight (Loaded):** 250 kg. **Size:** L *(d20)*; L (2x1, Wing 12) *(Spycraft)* . **Crew:** 1.

Engine: 20 kW IC. **Fuel:** Petrol, alcohol. **Fuel Consumption:** 6 liters/hour. **Fuel Tank:** 24 liters. **Maintenance Interval:** 1 flight. **Maintenance Time:** 1 hour. **Complexity & Error *(Spycraft)*:** 17/+1.

Armour: 2 *(Action! System);* 1d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/2. **Defence & Damage Save *(Spycraft)*:** 9/+2. **Hits:** 12 *(Action! System)*; ? *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA)*:** ?/?.

Qualities *(Spycraft)*: Flammable (no blast), Low Observable (Radar Small, Thermal Fine), Open (No Cover), Unpowered.

Cost: €3750.

CUCKOO ULTRALIGHT

Access: two open seats. **Armament:** The passenger (if carried) would find it possible to drop grenades (not very accurately!). **Special Equipment:** nil.

Speed (Strategic): 72 kph (45 mph) depending on thermals/wind strength.

Speed & Handling *(Impresa Express/GDi)*: +1/+1. **Speed:** 53/5 *(d20)*; 20/3/3 *(EABA)*. **Initiative *(d20)*:** -2.

Maneuver: -2 *(d20)*; 1d+2 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 1/6. **Suspension *(EABA)*:** Aircraft.

Weight (Unloaded): 165 kg. **Cargo:** 80 kg. **Weight (Loaded):** 340 kg. **Size:** L *(d20)*; L (1x2; Wing 5) *(Spycraft)* . **Crew:** 1.

Engine: 20 kW IC. **Fuel:** Petrol, alcohol. **Fuel Consumption:** 8 liters/hour. **Fuel Tank:** 24 liters. **Maintenance Interval:** 1 flight. **Maintenance Time:** 1 hour. **Complexity & Error *(Spycraft):*** 17/+1.

Armour: 4 *(Action! System);* 2d+0 *(EABA)*. **Defence & Hardness *(d20)*:** 8/4. **Defence & Damage Save *(Spycraft)*:** 9/+3. **Hits:** 24 *(Action! System)*; 8 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** ?/?.

Qualities *(Spycraft)*: Flammable (No explosion), Open.

Cost: €5625.

JUDGE POWERED GLIDER

Access: Rear sliding bubble canopy. **Armament:** Hardpoints for up to 12 x 60mm or 8 x 81 mm Mortar Bombs. **Special Equipment:** Radio (optional, takes up part of cargo space).

Speed (Strategic): 36 kph (22½ mph) *powered*, as ***Spirit** Hang Glider* unpowered.

Speed & Handling *(Impresa Express/GDi)*: +1/+2. **Speed:** 26/3 *(d20)*; 10/3/3 *(EABA)*. **Initiative *(d20)*:** -2. **Maneuver:** -2 *(d20)*; 1d+2 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/6. **Suspension *(EABA)*:** Aircraft.

Weight (Unloaded): 535 kg. **Cargo:** 205 kg (including pilot and passenger). **Weight (Loaded):** 750 kg. **Size:** L *(d20)*; L (1x2; Wing 11) *(Spycraft)* . **Crew:** 1 + 1 passenger.

Engine: 20 kW IC. **Fuel:** Petrol, alcohol. **Fuel Consumption:** 10 liters/hour. **Fuel Tank:** 90 liters. **Maintenance Interval:** 100 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 17/+2.

Armour: 6 *(Action! System);* 2d+2 *(EABA)*. **Defence & Hardness *(d20)*:** 8/6. **Defence & Damage Save *(Spycraft)*:** 9/+8. **Hits:** 36 *(Action! System)*; 12 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** ?/?.

Qualities *(Spycraft)*: nil.

Cost: €15000.

MAGICIAN LIGHT AIRCRAFT

Access: Semi-enclosed Cockpit for Pilot; internal cargo/passenger area behind cockpit with access through left side door. **Armament:** 2 x MMG mounts (top wing, 1500 rounds each); plus 250 kg ordnance centerline. **Special Equipment:** Radio.

Speed (Strategic): 290 kph (181 mph).

Speed & Handling *(Impresa Express/GDi)*: +3/+3. **Speed:** 213/21 *(d20)*; 81/6/12 *(EABA)*. **Initiative *(d20)*:** -1. **Maneuver:** +1 *(d20)*; 3d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 3/4. **Suspension *(EABA)*:** Aircraft.

Weight (Unloaded): 1250 kg. **Cargo:** 500 kg (including pilot and passenger). **Weight (Loaded):** 1750 kg. **Size:** H *(d20)*; H (2x4; Wing 6) *(Spycraft)* . **Crew:** 1 + 1 passenger (or 1 + 2 passengers with no ordnance or cargo).

Engine: 120 kW IC. **Fuel:** Petrol, alcohol. **Fuel Consumption:** 40 liters/hour. **Fuel Tank:** 280 liters. **Maintenance Interval:** 50 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 17/+2.

Armour: 8 *(Action! System);* 2d+2 *(EABA)*. **Defence & Hardness *(d20)*:** 8/8. **Defence & Damage Save *(Spycraft)*:** 8/+9. **Hits:** 50 *(Action! System)*; 30 *(d20)*. **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** ?/?.

Qualities *(Spycraft):* Forgiving.

Cost: €150000.

RAIL VEHICLES

GIANT 2-2-0 LOCOMOTIVE

Access: Two doors (left/right). **Armament:** Nil. **Special Equipment:** 5 Kw Electric Generator (run off waste steam), Driving Lights, Searchlight.

Speed (Strategic): 48 kph (30 mph).

Speed & Handling *(Impresa Express/GDi)*: +1/+0. **Speed:** 35/4 *(d20)*; 13/5/16 *(EABA)*. **Initiative *(d20)*:** -4. **Maneuver:** 0 *(d20)*; 0d+0 *(EABA)*. **Acceleration & Turning *(Spycraft)*:** 0/0.

Weight (Unloaded): 3200 kg. **Cargo:** 500 kg (not including fuel). **Weight (Loaded):** 5500 kg. **Size:** H *(d20)*; H (2x10) *(Spycraft)* . **Crew:** 2.

Engine: 400 kW Internal Combustion. **Fuel:** Petrol,

alcohol, solid. **Fuel Consumption:** 100 liters/hour. **Fuel Tank:** 1400 liters. **Maintenance Interval:** 2000 hours. **Maintenance Time:** 12 hours. **Complexity & Error *(Spycraft):*** 22/+1.

Armour: 8 *(Action! System);* 2d+2 *(EABA).* **Defence & Hardness *(d20)*:** 8/8. **Defence & Damage Save *(Spycraft)*:** 6/+18. **Hits:** 90 *(Action! System)*; 48 *(d20).* **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** ?/?.

Qualities *(Spycraft):* Dependable, Forgiving, High Observable (Thermal, G).

Cost: €87500.

Tiny Tender

Access: Doors, front and rear; Sliding Door, right side. **Armament:** Nil. **Special Equipment:** 15 Kw Electric Generator (run off waste steam from Locomotive), Internal Electric Lights, Radio, Storage Batteries.

Speed (Strategic): n/a.

Speed & Handling *(Impresa Express/GDi)*: n/a. **Speed:** n/a. **Initiative *(d20)*:** n/a. **Maneuver:** n/a. **Acceleration & Turning *(Spycraft)*:** n/a.

Weight (Unloaded): 2500 kg. **Cargo:** 900 kg (not including fuel). **Weight (Loaded):** 3750 kg. **Size:** G *(d20)*; G (2x15) *(Spycraft)* . **Crew:** 2.

Engine: nil. **Fuel:** nil. **Fuel Consumption:** nil. **Fuel Tank:** 2600 liters (connected to Locomotive). **Maintenance Interval:** 2000 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 10/+0.

Armour: 8 *(Action! System);* 2d+0 *(EABA).* **Defence & Hardness *(d20)*:** 6/5. **Defence & Damage Save *(Spycraft)*:** 8/+12. **Hits:** 48 *(Action! System)*; 30 *(d20).* **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** ?/?.

Qualities *(Spycraft):* Unpowered.

Cost: €45000.

5 ton Rail Cars

Access: var. **Armament:** nil. **Special Equipment:** nil.

Speed (Strategic): n/a.

Speed & Handling *(Impresa Express/GDi)*: n/a. **Speed:** n/a. **Initiative *(d20)*:** n/a. **Maneuver:** n/a. **Acceleration & Turning *(Spycraft)*:** n/a.

Passenger & Troop Models
Weight (Unloaded): 2500 kg. **Cargo:** 1000 kg (not including fuel). **Weight (Loaded):** 5000 kg. **Size:** G

(d20); G (2x15) *(Spycraft)* . **Crew:** by type.

Flatcar & Boxcar Models
Weight (Unloaded): 4500 kg. **Cargo:** 8500 kg (not including fuel). **Weight (Loaded):** 13000 kg. **Size:** G *(d20)*; G (2x15) *(Spycraft)* . **Crew:** nil.

Tanker Models
Weight (Unloaded): 5000 kg. **Cargo:** 10000 kg (not including fuel). **Weight (Loaded):** 15000 kg. **Size: Size:** G *(d20)*; G (2x15) *(Spycraft).* **Crew:** nil.

Engine: nil. **Fuel:** nil. **Fuel Consumption:** nil. **Fuel Tank:** nil. **Maintenance Interval:** 2000 hours. **Maintenance Time:** 2 hours. **Complexity & Error *(Spycraft):*** 10/+0.

Armour: 8 *(Action! System);* 2d+0, Passenger/Troop and Flatcar/Boxcar, 3d+0, Tanker *(EABA).* **Defence & Hardness *(d20)*:** 6/5. **Defence & Damage Save *(Spycraft)*:** 8/+12. **Hits:** 48 *(Action! System)*; 30 *(d20).* **Frame & Shields *(Impresa Express/GDi)*:** 1/0. **Damage *(EABA):*** ?/?.

Qualities *(Spycraft):* Unpowered.

Cost: €15000 (Passenger), €12500 (Troop), €7500 (Flatcar), €10000 (Boxcar), €15000 (Tanker).

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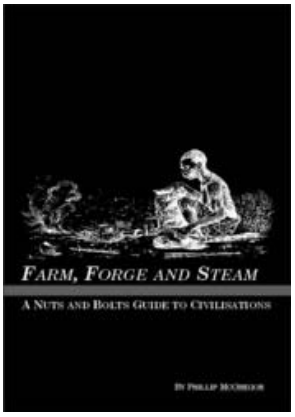


FARM, FORGE AND STEAM

Farm, Forge and Steam is a campaign design aid for GMs who want a realistic and logical background.

It provides information and guidelines for key areas of campaign design including -

* Population distribution and growth
* Diseases and Demographics (the biggest retarding factor on pre-modern population growth after food supplies)
* Food sources, productivity and supply (how many people are needed to grow the food, and how many non-farmers they can support)
* Transport effects (or why the biggest metropolises are port cities)
* Technology effects (or why even magic can't prevent technological progress)
* Magic effects (how magic would really affect a world over a long period of time)
* Common design faults and mistaken assumptions (why technological and social stasis for millennia doesn't work, why "universal empires" don't make much sense, and why it's a bad idea to price technology for "game balance" reasons ... and unneccessary to boot).

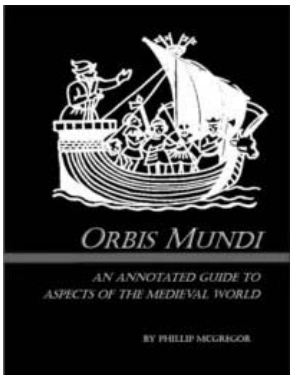
If you are designing a new campaign world, or overhauling an existing one (whether commercially published or home brew), then you can't go far wrong by using FFnS to ensure that the whole creation hangs together.

Farm, Forge and Steam is usable with *any* game system, as it is a ***meta*** product ... it provides the underpinnings for the campaign without affecting the actual game system.

The "rules" that are detailed in ***Farm, Forge and Steam*** are general ones, ***not*** universal mathematical formulae (though some of them come with mathematically applicable data), and enable you to provide broad and medium level application for your campaign.

Farm, Forge and Steam is exclusively available as an eBook download from ***RPGNow.com*** at *www.rpgnow.com* and is currently a ***Silver Pick*** for popularity.

RRP US$9.99



ORBIS MUNDI

Most fantasy role playing games use elements of the middle ages in their background but provide little or nothing in the way of real background – and what they *do* provide is generally anachronistic or wrong.

Orbis Mundi is intended to bridge that gap.

Chapter 1, **Hard Times**, covers Medieval and Feudal Government, Law and Justice; Chapter 2, **Hard Money**, deals with Money, Coinage, Prices, Economics and Guilds; and Chapter 3, **Hard Knocks**, provides information on Medieval Life, Serfdom, Living Conditions, and Legal Status and Rights (including Women's rights).

The last chapter, **The Market**, is an extensive annotated Price List for goods likely to be available during the later middle ages, specifically the 14th and 15th centuries. From Alchemetical Supplies to Missile Weapons, from Armour to Libraries ... and much, much, more.

If you think your favourite FRPG has a background that is the most accurate representation of the middle ages ***since*** the Middle Ages, then **Orbis Mundi** is ***not*** for you.

If you don't ***care*** about historical accuracy in even the slightest respect, then **Orbis Mundi** is not for you.

If you ***do*** care about historical accuracy, and historically accurate prices and, for example, wish to understand why Longbows do ***not*** cost more than Longswords and much more, then **Orbis Mundi *is*** for you.

RRP US$9.99

What would you do if you found yourself suddenly – and permanently – cut off from everyone and everything you ever knew?

Thrust into an alien society lacking the accoutrements of the modern world? Where you are faced with a potentially deadly struggle to merely survive?

One of the more popular tropes of modern day Science Fiction deals with that very question – moderns being *displaced* in time and, sometimes, in space (or *dimension*) as well ... where they find that they are faced with the awful (and *aweful*) reality of the past or, equally, an alternate dimension where history and technology has not progressed the same way as it has in *our* version of reality.

Typically the *displaced* will find themselves faced with a need to *change things* – perhaps for their own comfort, perhaps from a sense of altruism (or, more than likely, from a desire to become wealthy and powerful beyond any dreams of avarice), or, most likely, because they find themselves faced with a threat to their very survival.

***Displaced: Survival and Rebirth* is intended to provide a solid structure for a GM and players to build their own campaign world on.**

Using the tools and information provided herein you will be able to structure a realistic background in which they can stage their adventures *and* get their chance to fight the good fight against tremendous odds ... and, of course, also get a chance to become wealthy, respected, and powerful.

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