

# FRONTIER EXPLORER



**ISSUE 27**  
**WINTER 2020**

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## LOOKING FOR SUBMISSIONS

Do you have material you'd like to see published in the Frontier Explorer? We accept submissions of any fan material for Star Frontiers, FrontierSpace, or any other sci-fi role-playing game whether it is new races, equipment, vehicles, setting material, play reports, or anything else.

If you have something you'd like to share, head on over to the [Frontier Explorer website](#) and hit the gold "Submit New Content" button. We'll help you get the material ready for publication and into a future issue of the magazine.

## GETTING THE RULES & BACK ISSUES

The published rules and modules for Star Frontiers and FrontierSpace, as well as all back issues for the Frontier Explorer and the Star Frontiersman (including print-on-demand physical copies of the Frontier Explorer) are available for purchase or download on DriveThruRPG.

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# LETTER FROM THE EDITOR

Hello Explorers!

And welcome to issue 27 of the Frontier Explorer. I want to start this issue with a big shout out to our cover artist, Jerry Boucher. This issue's cover (pictured below) is amazing and I'm excited to have it. It's a sathar version of Larry Elmore's original Star Frontiers cover. He had planned to submit it as the cover for issue 25 but due to a miscommunication on my part, he didn't have the correct deadline and it wasn't ready on time. Not wanting to run two sathar covers in a row, I decided to save it for this issue along with his article that didn't make it in time for the sathar issue either. You can check out [his Art-Station page](#) for more of his great work.

While I'm on the topic of art, I want to give a shout out to our other primary artists as well. It is something we have always struggled with and can always use more of. Tom Verreault specifically took up developing his drawing skills to contribute when we first started the magazine.

Scott Mulder has been with us from the very beginning and still does the comics in each issue. I have a huge collection of images he's created over the past seven and a half years that we can use whenever we need to fill in space in an article.

More recently, Jerry Boucher, Aaron O'Brian, and Brian Phongluangtham have joined to team to provide art for the various articles. All I can say is that these guys are absolutely amazing. They can whip up images with a really short turnaround time and every one is great. Now I just need to get ahead of the editing queue to give them more time to work. Something I started working on with this issue but got hampered by the holidays.

This issue contains a grab bag of articles including Jerry's that didn't make it into our Sathar-themed issue 25 and the continuation of Joseph Cabadas's *Things That Go Boom* series. This issue that series looks at the demolitions skills and all the different types of explosives you might encounter across the Frontier.

We have our usual report from the Jurak Hangna Foundation with another Frontier Creature as well as our regular comics. We round out the issue with a look at Spacefleet as compared to the US Navy, some new vruskian melee weapons, paper minis for the core four Star Frontiers races, and an adventure for the Traveller game that

will look really familiar to those familiar with the Star Frontiers Alpha Dawn rules.

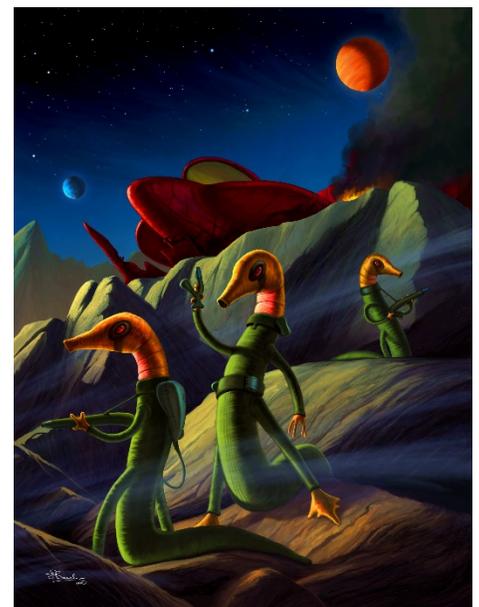
With the holiday season, there hasn't been a lot of community news to mention although the [Star Frontiers Facebook community](#) continues to grow with over 2550 members.

One thing of note that did happen over the last few months is that I moved the magazine's website off of a shared hosting service back to my newly upgraded home server. I was having issues with the hosting provider and this allowed me to take better control of the website and add HTTPS compliance to the website. There will be other upgrades to the website over the next year, hopefully making it more mobile friendly.

This issue was a bit of a struggle to produce due to both the holidays and other real-life issues that come up during production. But we managed to get it finished and released on time.

That's enough rambling from me. Sit back, settle in, and enjoy this issue of the Frontier Explorer. And as always, keep exploring.

- Tom Stephens  
Senior Editor



# REORGANIZING SPACEFLEET

## ALONG THE LINES OF THE U.S. NAVY

BY TOM VERREULT

We all know that Hollywood tends to get military things wrong and it would be no surprise if game designers did the same. We are also talking about a game designed 35 years ago with an eye to being playable as a sector wide campaign game of space battles involving fleets of spaceships, so it would be no surprise if the designers fudged things to make that playable. Now, if the game designers did what they did for playability, then what I'm about to propose, in theory, could negatively impact the game and its playability.

With that in mind, I would contend that an air of realism is also a consideration in a game and imposing a veneer of realism can enhance the game experience. The suggestions that follow might lead to new scenarios and gaming experiences different from those of the Knight Hawks campaign game and are presented as optional.

### A BIT ABOUT THE U.S. NAVY

The "Fleet" is a bit of an organizational fiction. All ships belong to the fleet, but ships encountered at sea will be organized into task elements, task units, task groups, and task forces. Ships are assigned to a task force for a mission and when the mission is done the force dissolves back into the fleet.<sup>1</sup>

Note: there has only ever briefly been the rank of Commodore in the US Navy. Due to interservice concerns and some commodores being treated as senior captains, not the flag officer they were, the

rank was abolished in 1899. This is the reason for the U.S. Navy tradition of rear admirals having two grades similar to 1<sup>st</sup> & 2<sup>nd</sup> lieutenants.

### A BIT ABOUT THE KH MILITIAS

In the Knight Hawks game, the planetary defense forces are all designated as militia. By U.S. Navy standards, many militia organizations don't even rate a task element and only 3 might rate as two task elements with the caveat that we are treating frigates and destroyers as large ships when they typically would be escort vessels. I would put an asterisk next to Outer Reach's militia which is known to be pirates operating under the Outer Reach flag. I have doubts that these pirate vessels can effectively operate together but one might point to the historic example of Captain Morgan (same guy as the Rum) who assaulted Panama with 30 English and French ships and managed to command his fleet quite well. Thus, by U.S. Navy standards, no Frontier militia would rate a Rear Admiral although the overall commander of a militia force might hold the equivalent rank of a U.S. Navy rear admiral.

### A BIT ABOUT THE KH SPACEFLEET

There are some obvious differences between Spacefleet and the U.S. Navy. The

rank structure does not match and the area of operation does not match: wet navy vs space navy. The game details the officer rank structure in the campaign material. It also describes the order of battle for two task forces and one strike force as well as 8 other unassigned ships available for the campaign game. These 3 forces represent the bulk of Spacefleet, although the book does include a paragraph that says there are many smaller strike forces and patrol groups. It also defines the size of a patrol group as a frigate and 1-2 assault scouts. We do not have a definitive list of all ships in Spacefleet, but we do know the bulk of the fleet.

Our first task is to relate Spacefleet ranks to U. S. Navy ranks. Spacefleet lacks an ensign, captain and vice admiral rank but adds a fleet lieutenant and Space Commander rank. Luckily both have the rank of Fleet Admiral so that is a good starting place. I've correlated the ranks in the following table:

\*Fleet Admirals in the U.S. Navy are a special circumstance generally associated with wartime operation and I suggest something similar for Spacefleet as well.

Personally, I would add the rank of ensign and lieutenant commander to Spacefleet, but my purpose is not to necessarily rewrite the KHs material. I will posit that Fleet Lieutenant and Commander are the "command" ranks.

### NAVY VS SPACEFLEET TASK FORCE

Task Force Cassidine with 1 battleship, 1 heavy cruiser, 1 light cruiser, and 1 assault carrier would only rate a squadron or task unit in the U.S. Navy. Task Force Prenalgar with 1 battleship and 3 light cruisers would rate the same. Strike Force Nova with 1 battleship, 2 light cruisers, and 1 destroyer rates the same as well. All told

<sup>1</sup> <http://www.projectrho.com/pub->

UNIT	COMMANDING OFFICER	DESCRIPTION
Task Element	Commander to Captain	one large vessel (plus escorts)
Task Unit or Flotilla	Rear Admiral (Upper or Lower)	3-4 task elements (no capitol ships)
Task Unit or Squadron	Rear Admiral (Upper or Lower)	3-4 task elements (with capitol ships)
Task Group	Rear Admiral (Upper Half)	2 or more task units
Task Force or Battle Fleet	Vice Admiral	2 or more task groups
Fleet	Admiral	all vessels in general region
Admiralty	Fleet Admiral	nation's entire naval force

the bulk of Spacefleet rates a task group in the U.S. Navy and not even a task force. We can assume that the dearth of hulls in Spacefleet is in part a design feature keeping the game playable but also the economy of the Frontier is certainly much different from that of the United States.

Using the U.S. Navy as a model, but also taking a cue from the Knight Hawks rule book, the basic building block of Spacefleet organization will be one large ship with escorts and is called a patrol group. The caveat will be that a frigate class starship will count as a large ship. And only 2 patrol groups will count as a task group - flotilla or squadron (depending on the presence of capital ships - in Knight Hawk terms this will mean any ships mounting class "C" drives). A Spacefleet task force will be 2-3 task groups with Strike Force being an alternate name that simply denotes a different mission and is more likely to be 2 task groups than 3. A Spacefleet Battle Fleet will comprise 2 or more Task or Strike forces.

Any being in command of a ship can be referred to as captain, despite it not being an official rank in the Spacefleet rank structure. Any being exercising overall control of a unit that is of patrol group size or larger, who lacks the specified rank for command of that unit, will receive a courtesy promotion to the next rank if in the field when he came into command of that unit, or a breveted promotion to the next rank if administratively assigned command of a unit he lacks the rank for. A breveted promotion means that the individual has the rank but not the pay of the next rank and when his command is downgraded in size, he loses the breveted rank. A courtesy promotion is simply an informal addressing of an officer with a higher rank by those he commands.

U.S. NAVY RANKS		SPACEFLEET RANKS	
01	Ensign	Junior Lieutenant	01
02	Lieutenant Junior Grade	Lieutenant	02
03	Lieutenant		
04	Lieutenant Commander	Fleet Lieutenant	03
05	Commander		
06	Captain	Commander	04
07	Rear Admiral (Lower Half)	Space Commander	05
08	Rear Admiral (Upper Half)	Commodore	06
09	Vice Admiral	Rear Admiral	07
010	Admiral	Admiral	08
011	Fleet Admiral*	Fleet Admiral	09

## GAME PLAY

The Warriors of White Light module details the beginning adventures of characters fresh out of the academy and posted to a nimble assault scout. Over the course of the module, the player characters should rise to command their own vessel. The next step would be command of a patrol group. The challenges should revolve around command and meeting the commitments of the mission with combat as a finale. This might be a good way to handle a game with only one player.

Alternately, all the players can be commanders of separate patrol groups organized into a task group under the command of a higher-ranking NPC. This would be a variant on the "big ship" campaign where the PCs are not department heads but commanders of elements in a larger fleet.

## PATROL GROUP MISSIONS

The following missions are suggested as patrol group missions for essentially one player but can be scaled up as task group

missions for multiple players as the referee sees fit.

PG 023 is detached from Task Group Theseus to investigate and report possible sathar activity in the Tristkar System. While there, you are to support and reassure the local government performing militia duties as needed. In addition, Spacefleet wants a new jump route charted from White Light to Tristkar and back.

PG 035 is assigned to patrol the Zebulon system. You are to assist and support the UPF governor of Zebulon and investigate anomalous sensor readings in the outer system as well as guard against sathar intrusion. (Note: this could be a first contact scenario with the anomalous reading being the CFM ships entering the system for the first time. This mission would be not long after the events in the Voltornus campaign.)

PG 014 Is assigned to Task Group Solar Major. Space Commander Narvak is ordering you to scout and find the route the sathar have been using to enter the Solar Major system for the past 3 decades. This is a reconnaissance in force. You may engage the enemy if you find them but are not to unduly hazard your force. Your prime responsibility is to locate the enemy's route and report.

PG 007 Is being detached from Task Force Cassidine and is assigned to the Dramune system. You will form a buffer between the Inner Reach and Outer Reach militias while regulating commerce between the two colonies. Piracy suppression is a major concern, as Spacefleet Intelligence has intel that stolen vessels are being fenced through the Dramune system.

UNIT	COMMANDING OFFICER	DESCRIPTION
Single ship	Fleet Lt. or Commander	one vessel
Patrol Group	Commander	1 large vessel and 2-3 escorts
Task Group: Flotilla or Squadron	Space Commander	2-3 patrol groups
Task Force	Commodore	2 or more task groups
Strike Force	Rear Admiral	2 or more task groups
Battle Fleet	Admiral	2 or more task or strike forces
Admiralty or Fleet	Fleet Admiral	All of Spacefleet

# SATHAR WEAPONS

BY JERRY BOUCHER

*The following article is a summary of research carried out by the team led by Dr T'Akta K'Kirz at UPF Headquarters, Port Loren, and completed shortly after the Second Sathar War:*

Sathar physiology, and the manner in which it governs the design of their weaponry, is a subject that continues to be plagued by a variety of unknowns. What follows is an attempt to describe and rationalise what is currently understood with the primary focus on those weapons generally classed as small arms (although some other infantry weapons are also discussed). This information has been gleaned from a variety of combat reports and by direct experimentation with captured examples.

The design and layout of Sathar weapons, like those of the Frontier races, is governed by ease of use and practicality. However, the Sathar only share a few basic physiological similarities (i.e. limb and digit/pseudopod flexibility) with some of those races. This means that their weapons can appear odd when first encountered, but on closer inspection several underlying principles become more obvious.

## GENERAL OVERVIEW

IMAGE BY JERRY BOUCHER



*Sathar Rifles - Gyrojet (top) and Laser (bottom)*

In outline, Sathar rifles and pistols are broadly similar and share a common silhouette. Rifles are tube-like with several bulbed handles, whilst pistols are cruciform. All are characterised by light weight and general ruggedness, and almost always a dark greyish green in colour with metallic surfaces covering certain areas. Pistols weigh around 0.5kg and are 20-25cm in length, whereas rifles weigh 1.5kg and are

55cm in length. Their ranges, rate of fire, ammunition weights, and consumption are similar to those weapons used by the UPF. The one exception is the rocket launcher (see below), which is a self-contained single-use unit that weighs only 6kg.

All weapons and ammunition can be attached to a 'belt' worn around the area just above a Sathar's upper limbs, with another sometimes worn just above the lower limbs. The former has a sling-like extension which attaches to any rifle, and there are attachment points for a rocket launcher (see below). Pouches, grenades, pistols, screens, and backpacks can be attached to any free space on either belt, whereas backpacks are always attached to the rear part of an upper-body belt. The belt is made from a material (currently being researched) that both 'sticks' to the Sathar's skin and weapons, screens, etc. they may bring into contact with it. This material itself is not sticky but seems to have certain properties which adheres to a variety of items. In a sense it is broadly similar to velcro and similar materials in use across the Frontier. The belts also have elastic properties that enable them to be worn over armour and spacesuits.



*Sathar weapon sling*

## EYESIGHT

No Sathar weapons feature gun sights of any kind. The reasons for this are not immediately clear from the outset, but by considering information gleaned from

both forensic and combat reports several theories have been developed. Sathar have not been observed bringing weapons to bear in a way that places them into line of sight - instead, all Sathar seem to fire their weapons 'from the hip' (to use a human phrase). Opportunity and general fire with rifles seem to involve a similar looseness. Despite this, no-one would claim that Sathar are generally poor marksmen. One theory as to why this is so is derived from studies of Sathar eyes and brains. It is well-known that Sathar eyesight is quite remarkable in itself, but it may also possibly mean that their depth and range perception may be acute in a way that aiming (in the sense that we understand it) is carried out in a different manner. Studies have shown that the Sathar visual cortex seems much more developed than those of the Frontier races, and that neural pathways from the eyes are much more complex. This in turn suggests that Sathar eyesight and brain visual processes may involve a very highly developed level of hand-eye coordination, although the reasons why the Sathar have evolved in such a way is not yet clear.

## WEAPON HANDLING – RIFLES AND PISTOLS



*Sathar Pistols - laser (top), gyrojet (middle), and sonic disruptor (bottom)*

In general, Sathar are usually seen to use their upper limbs and hands when performing any combat functions with their weapons. Their lower limbs seem to be used more for carrying and using heavier weapons, although such weapons appear rarely in field use. In overall outline,

Sathar rifles and pistols appear organic and it seems that this is related to the ergonomic needs and limitations of Sathar hands.

First and foremost, no pistols or rifles seem to include any obvious triggers nor safety features. Early trials of captured weapons by UPF and Star Law troops in the field were largely unsuccessful, with some weapons being fired successfully, albeit inconsistently, whilst others seemed completely inactive.

Initially, it was thought that they included some form of disabling function that prevented their use by non-Sathar. Such ideas were quickly abandoned when the weapons were scanned and dismantled. It is now apparent that safety and firing features are embedded within the weapons themselves, and that this is related to the way that Sathar hands apply grip to certain surfaces.

Sathar weapons are constructed from a rugged polymer and all feature a flexible area at one key point, roughly akin to a trigger, within the curved underside of their handle. This 'trigger' area controls several functions, as it not only initiates and prevents the firing mechanism but is also used to change power (akin to SEU) settings for laser weapons. However, the 'trigger' is not an obvious feature to both casual or close inspection and seems highly calibrated to only two digits of the Sathar hand.

The middle pair of digits on both Sathar hands appear to be the strongest and most dominant. Dissections have shown that nerve and tissue mass are concentrated in this area and close inspection of holo-vid footage of Sathar in combat also suggest as much. Although it is currently unclear as to how much pressure and twist these digits can apply in normal use, tests of the 'trigger' seem to infer that it is activated and adjusted by them. Generally speaking, a certain amount of pressure deactivates the safety catch and initiates firing, whilst twisting pressure adjusts energy settings. To date, only the pseudopods of Dralasisite researchers have been able to replicate the correct 'pull' and adjustments. That said, these results have been inconsistent and require a great deal of concentration. This means that Sathar weapons are effectively

unusable in any realistic sense for any of the Frontier races (even Dralasisites), requiring more co-ordination and attention than is practical in a combat situation.

All rifles lack anything resembling stocks. It is unclear why the Sathar eschew the use of weapons similar to automatic rifles and pistols. One theory is that, as they have become a space-faring race, they have excluded any recoil-operated weapons from their inventory or at least prefer designs with low recoil. Another is that their bodies are poorly suited to using such weapons because their upper arms lack the necessary strength and physiology to deal with such issues.

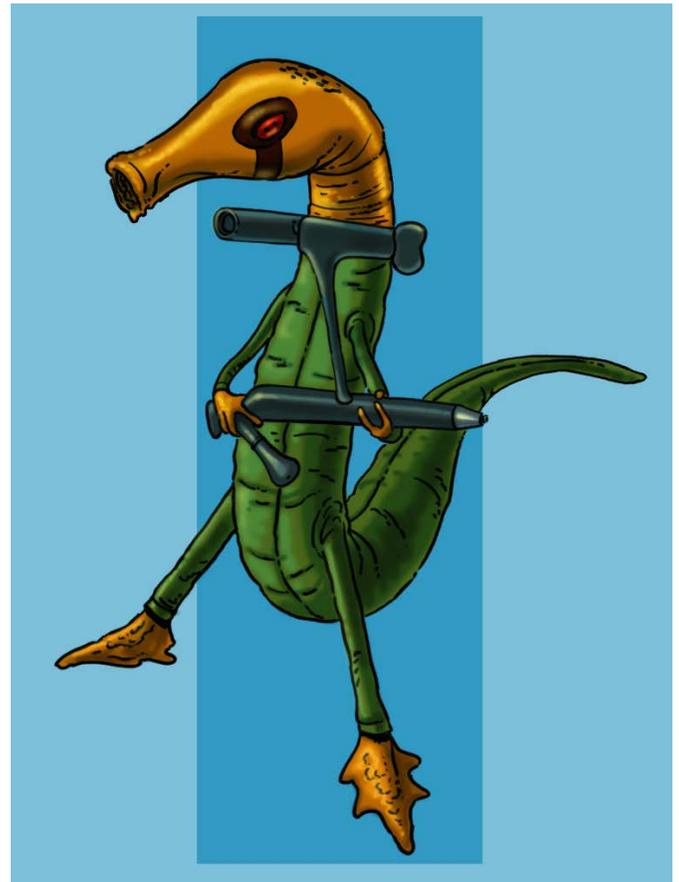


IMAGE BY JERRY BOUCHER

## WEAPON HANDLING – AMMUNITION



Sathar ammunition clips - powerclip (left) and gyrojet clip (right)

IMAGE BY JERRY BOUCHER

Ammunition clips for Sathar weapons are differentiated, like those of the Frontier races, between those that provide a power supply and those that hold some form of physical ammunition. However, Sathar clips for either type appear to be of a strikingly similar bulb-like design and thus are difficult to identify until inspected at close range. Only close inspection of the round/energy feed part of the clip reveals whether it is an energy or gyrojet clip - the former has a chamfered hole at its centre,

whilst the latter has a rectangular slot. It is not clear how the Sathar differentiate between the two, as crated clips in captured stockpiles look exactly the same until inspected more closely. Tests of both have shown that the energy clips have a slightly more bulbous cross section, although to the naked eye this difference is not visible.

All clips are easily inserted into their respective clip feed areas, and only require a small amount of twist in order to be released. This does make them seem fragile, but tests have shown that it does require a great deal of force to separate a clip from a weapon if this method is not used.

One possible but unconfirmed feature of the Sathar energy clip is that it can be made to function as short-duration incendiary device. Anecdotal reports describe Sathar occasionally using them to start fires or to burn through materials. However, tests have not revealed how this is done or whether it is actually possible, and it is unclear how this function is initiated.

Cables from backpacks and backpacks end in an attachment identical to an energy clip and are plugged into the same part of the rifle or pistol.

## FUNCTIONALITY

Although very robust designs, Sathar weapons do appear to have certain functionality problems. The most pronounced of these is the complete inability for a Sathar soldier to deal with weapon jams. The difficulties encountered during tests of the Sathar trigger mechanism has meant that it is not certain how often weapon jamming occurs, and so the assumption is that it is extremely rare or that a Sathar is expected to use some other means of attack.

Another problem is that Sathar weapons are completely self-contained units. There is no way that a Sathar soldier can disassemble their weapon. UPF testing of captured weapons has been plagued by this inconvenience, as pistols and rifles have to be almost destroyed in order to access their internal workings. Sensor scans of the internal structures have, however, gone some way in helping researchers understand how the weapons work. It seems that the Sathar consider their weapons to be disposable and/or so inexpensive to mass-produce that there is no need for their maintenance in the field.

## GRENADES AND ROCKET LAUNCHERS

Sathar grenades seem to fulfil the same roles as those used by the UPF. However, as they share a similar 'trigger' mechanism to other Sathar weapons, their use by non-Sathar is extremely limited and therefore of little practical combat use. Another problem is there is no outward difference between the shape of the different grenade types although (as with the Sathar energy clip) closer inspection has shown that

there are extremely subtle differences in the shape of each type.

Dedicated grenade rifles seemed to have been phased out in favour of a simpler system which is incorporated with gyrojet and laser rifles. A small rocket cartridge can be attached to either end of a grenade, and this can then be affixed to the rifle's muzzle. Whenever this occurs, it appears that the rifle's normal firing mechanism is disabled but that the trigger instead activates the rocket cartridge. After firing, the rifle can then fire its ammunition/energy as normal until such time that a grenade needs to be fired again. At no point does the Sathar need to make adjustments to the weapon itself before or after firing, and grenades can be used directly and indirectly. It is assumed that when fitted with a cartridge the grenade becomes impact fused. There seems to be no way of firing multiple grenades attached together using the cartridges as junctions – at least, tests have not been able to prove that this is possible, and no Sathar have been observed using this technique. It is assumed that a cartridge only has sufficient power to launch a single grenade. At the same time, on several occasions Sathar have been observed carrying grenades with the cartridges already attached, and the grenade also appears to be useable in the normal fashion even with a cartridge fitted to it.

Although uncommon, the Sathar do make some use of what could be called a rocket launcher. However, all Sathar rocket launchers are self-contained one-shot disposable weapons and mounted on attachment points on the right-hand side of Sathar 'belt' when this is worn on the upper part of the body. The launcher unit remains inert until it is attached. It is currently unclear as to how these weapons are fired once launcher and belt are united. Some Sathar have been observed

performing a dedicated task with these launchers within platoons and carry three extra rounds on a frame occupying the space usually used by a backpack. A loaded unit weighs 2.5kgs and is 55cm in length and launches a small rocket not much larger than a Sathar grenade, although with increased lethality.

## SATHAR 'SNIPERS'

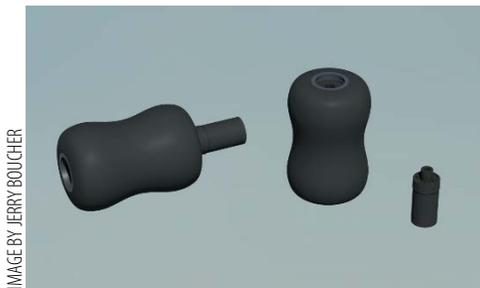
Prior to a captured example being retrieved, numerous reports suggested that there may be certain individual Sathar adept at accurate long-range fire, and almost always using laser rifles. Such reports were dismissed as rumour until one Sathar corpse was found with the remains of a peculiar wire which ran from its rifle, up along the right arm and neck and terminated at the right eye. The part attached to the rifle resembles the end part of the 'sling' fitted to the Sathar belt, and the object is made of a similar material to the belt. The other end of the wire ends in a blunt metallic 'hook' which partly slips inside the forward part of the Sathar eye socket. Even after this object was disassembled, its function and use remain a mystery.

## MELEE WEAPONS

Sathar melee weapons that use an energy source all seem to be modular in form. That is, the energy clip acts as a handle and the main body of the weapon is attached to it. Similarly, the clip-shaped adapter used by belt and backpacks performs this function.

## SUMMARY

Understanding the various mysteries presented by Sathar weaponry is a process that will continue into the foreseeable future. For the time being, the UPF can derive some assurance from the fact that these weapons are quite similar to those used by their forces, and that Sathar technology may be a potential source of new ideas, designs, and countermeasures.



Sathar grenades - with rocket cartridge (left), separated (right)



Sathar rocket launcher - launcher tube, showing belt attachments (top), rocket projectile (bottom)

IMAGE BY JERRY BOUCHER

IMAGE BY JERRY BOUCHER

# THINGS THAT GO BOOM!

## PART 3: EXPANDING THE DEMOLITIONS SKILL

BY JOSEPH CABADAS

Part art and part science, the Demolition skill in Star Frontiers provides characters with the ability to both set and defuse charges.

Often this can be useful when a party of characters needs to blow open a security door or destroy a Sathar automatic cannon with just the right amount of kaboomite, while still having enough explosives for other potential uses.

In the real world, besides its obvious military applications, explosives are used in mining operations, for clearing stumps in farmland, road construction, and razing buildings through implosion. A character with a demolition skill is well versed in safety regulations.

As a character gains experience, he should be able to not only set and defuse explosives, mines, and bombs, but also perform a number of other tasks such as analyzing a demolition site for the best place to set an explosive. Other sub-skills would include choosing the best blasting materials and techniques to handle a specific mission.

The demolitions expert will be able to detect hidden explosives, including landmines, easier than normal characters. An expert can inspect the aftereffects of an explosion to determine if a damaged structure is safe to enter as well as perform a forensic analysis of any explosive residues.

This character knows how to properly transport and store materials, timers, and other explosive devices. Besides Tornadium D-19, TD-20 and Plastid, an assortment of other volatile materials could be available including black powder, nitroglycerin, dynamite, TNT, C4/Semtex, and Det Cord.

### EXPANDING THE DEMOLITIONS SKILL

**Type:** Military PSA (Alpha Dawn), Enforcer (Zebulon)

Only a character with demolitions skill can legally buy or use explosives or detonators.

There are nine sub-skills to the demolitions skill including the basic ability set charge and defuse charge. The character can create an explosive charge that can be thrown like a grenade.

Demolitions experts can modify missile warheads to be used as mines. Setting and defusing charges or mines requires a skill check.

#### SUB-SKILL: RECOGNIZE ORDNANCE

**Success Rate:** Automatic (LOG)

With the variety of munitions on the Frontier – everything from explosive charges to tangle grenades and sonic warheads – the average citizen is not going to know what kind of unexploded bomb or grenade he is looking at. But, the demolitions expert should be able identify most grenades, bombs, missile warheads, rockets, landmines, etc. through either a glance or a careful examination.

#### SUB-SKILL: SAFE STORAGE AND TRANSPORTATION

**Success Rate:** Automatic (LOG)

This character knows how to properly transport and store materials, timers, and other explosive devices.

#### SUB-SKILL: ANALYZE DEMOLITION SITE

**Success Rate:** Automatic (LOG) or ½ LOG/INT + 10% per skill level

Analyzing a demolition site might be as easy as looking at a locked door and knowing where to apply the right amount of TD-19 or TD-20 to blow it open. That would be an automatic check.

But, when it comes to setting charges to achieve a complex desired effect, demolitions is more of a combination of art and science. Examples of when this sub-skill is employed include when a character is quarrying for valuable materials, wants to

cause a controlled avalanche of snow, sets exploratory charges for a ground penetrating radar for a geological survey, or to demolish a building without causing damage to other nearby structures,

The setup time for complex explosions may take minutes or hours or days. Even then, the referee may require the character to make his “analyze demolition site” check at the time of the explosion.

If the character fails the roll, the detonation does not happen as intended. This could result in leaving a badly damaged structure standing or, worse, throwing debris into the so-called “safety zone” that will damage other structures, vehicles, robots, or injure or kill bystanders.

#### SUB-SKILL: SETTING CHARGES

**Success Rate:** 30% + 10% per skill level

Only characters with this skill can set charges. The minimum number of turns needed to set a charge is the character’s skill level subtracted from seven. At first level, a character needs six turns to set a charge, but at sixth level he needs only one turn.

If a character fails the skill check to set and detonate the charge, the charge has not exploded and must be re-set. The referee should feel free to have the charge explode prematurely or late if the skill roll results in an automatic failure.

Charges can be detonated by timer, radio signal, weapon fire, or other devices. A timer lets the character set a time when the charge will explode. The timer can be adjusted to delay from 1 second to 60 hours. If a chronocom or subspace radio is available, charges can be set to explode when a particular signal is beamed at them. The chance to explode a charge with a radio beam is 10 percent less than normal.

Demolitions experts also can set off a charge with a laser. If the expert hits the charge, it explodes.

## **SUB-SKILL: DEFUSING CHARGES**

**Success Rate:** 50% + 10% per diffuser's skill level – 10% per setter's skill level

A demolitions expert can try to defuse a charge that was set by another character. Defusing a charge takes one turn, no matter what level the expert is. The expert's chance to succeed is his success rate modified by subtract 10 x the skill level of the person that set the charge. The character can defuse one of his own charges automatically.

A roll of "96-00" is always an automatic failure, but only a result of "00" means that the bomb immediately explodes.

## **SUB-SKILL: DEFUSE UNEXPLODED BOMB**

**Success Rate:** DEX or LOG + 10% per level – 10% per bomb level

Besides defusing a normal charge that was set by another demolitionist, the character may be called upon to defuse an unexploded dropped bomb, missile, or rocket warhead, etc. The best possible scenario is to explode such a "dud" device in place, if nothing critical around the weapon, but that is not always possible.

A robot could be used – remotely operated by the character – to move the bomb to another location, where it can be detonated safely. Sometimes the character will have to move the weapon himself either the whole way or part of the distance to the "safe" location or into an explosion containment vessel.

If the bomb cannot be moved (such as a nuclear weapon, nerve gas warhead, etc.), the character can attempt to defuse it on-site. The chance of success is the character's Dexterity or Logic score plus 10 percent per level. The referee could then apply any penalties, such as minus 10 percent per the bomb's sensor or fuze level.

Assume that most modern bombs – even nuclear warheads – have a level of 1; if it is a primitive explosive, such as a pipe bomb or an iron cannon ball with a lit fuse, assume the bomb's level is 0 or even give the character a bonus to defuse it.

If the character is trying to defuse an unexploded alien bomb, such as a Sathar device, he receives a -30 percent penalty. If the character fails his roll by 20 points or

less, the bomb does not explode and he can try to disarm it again.

If the character fails the roll by more than 20 points, he has 1-10 turns to flee – or make a second disarming attempt – before the weapon explodes. A roll of 96-00 is always an automatic failure, but only a result of "00" means that the bomb immediately explodes.

## **SUB-SKILL: CREATE EXPLOSIVE COMPOUND**

**Success Rate:** INT/LOG +5% per level

At a low level, the character has the knowledge to create simple explosive compounds including primitive black powder or nitroglycerin, while at higher levels he can mix up more sophisticated compounds. For example, a character can easily manufacture small explosives one-tenth the strength of TD-19 for about 12 Credits.

If the character fails his skill check by 20 points or less, the compound does not explode. The components must be disposed.

If the character fails the roll by more than 20 points, he has 1-10 turns to flee – or dispose of the mixture in an explosion containment vessel – before the mixture detonates. A roll of 99-00 is always an automatic failure, but only a result of "00" means that the bomb immediately explodes.

## **SUB-SKILL: DETECT HIDDEN EXPLOSIVE**

**Success Rate:** INT + 5% per level (or +10% per level – 10% per setter's level)

Because of the character's knowledge about explosives, the demolition expert has a greater chance to spot the telltale signs that a grenade, landmine, bomb, etc. has been set as a trap. The chance to find a generic explosive would be the character's Intuition score plus 5 percent per skill level.

If the referee has decided that the explosive device has been specially camouflaged, then the success rate is modified. The character has a +10 percent per skill level to detect the weapon but then subtract 10 percent per the setter's skill level.

The referee could then decide that other factors help or degrade the expert's detection capability such as the presence of holo

fields or if the character is using specialized mine/explosive detection equipment or even a "bomb sniffing dog" or bomb detecting robot.

## **SUB-SKILL: EXPLOSIVE FORENSICS**

**Success Rate:** ½ LOG/INT + 10% per skill level

When the character reaches a third level in demolitions, he becomes skilled enough to conduct a forensic examination of defused unexploded bombs. Capable of inspecting the aftereffects of an explosion to find any explosive residues, the character can ascertain if a damaged structure is safe to enter.

An investigator can determine if an explosion actually occurred by looking for telltale signs of damage. Next, the character would need to search far and wide for possible fragments because debris can be thrown far away from the epicenter of an explosion due to the kinetic energy and heat generated.

Once enough fragments have been found, including the remains of any detonators, wires, batteries, switches, etc., the character can look for things such as fingerprints (if it was set by a race that has "fingerprints") to try to find the perpetrator. A forensic examination may be able to determine if the bomb is similar to devices used by known criminals or terrorist groups.

## **REAL LIFE DEMOLITION EXAMPLES**

In 2015, according to statistics from the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) slightly less than 4.5 billion pounds of explosives were used in the United States alone for various purposes including mining, road construction, building demolition, and the like.

Explosives are used by the U.S. National Park Service for avalanche control, for creating fire breaks, removing dangerous trees, and even to blow up large animal carcasses.

Building demolition can be very spectacular.

In November 2012, just 100 kilograms of explosives – 64 charges in all – were used to bring down an old 17-story apartment tower in the city of Motherwell, Scotland. It was an example of the scientific aspects of explosives to precisely demolish a building.

Yet, the use of explosive demolitions remains part art as well, where not everything can be anticipated and sometimes is dangerous, as noted by writer Josh Sims in a 2010 story called “The art of demolition,” which was published in the UK Independent.

Some notable examples of demolition failures would include the December 2014 attempt to implode a 10-story apartment building in the city of Sevastopol. Instead the explosion left the structure dangerously leaning one way as many of the upper floors pancaked on top of the floor that was destroyed, according to a 2014 story from News.com.au.

One spectator was killed and nine other people injured when they were watching the implosion of a hospital in Australia in 1997. Shrapnel and concrete chunks rocketed 2,000 feet into the so-called “safety zone,” Sims reported in the UK Independent.

In another case, in Cankirli, Turkey, the effort to demolish an 80-foot-tall factory building went awry as the structure did a barrel roll instead of being imploding as planned. This disaster was caused by a failure to anticipate how the sandy ground would interact with the explosion, according to the website Demolition Analysis about this incident.

Along with the civil uses of demolitions, explosives have gone off accidentally, causing much destruction.

One horrendous disaster occurred in the city of Roseburg, OR, during the morning of August 7, 1959, when a fire broke out at a building supply company. The flames ignited a nearby truck that was carrying a two ton load of dynamite and four-and-a-half tons of ammonium nitrate.

The resulting explosion destroyed eight city blocks while blasting a crater that was 52-feet in diameter and 12 feet deep. Within a 32 block radius, some 300 businesses were damaged. Seventy-two of those buildings were later declared

structurally unsafe and needed major repairs while 12 buildings were so badly damaged that they were condemned.

Fortunately, only 14 people died in the event that was called “The Blast,” the city of Roseburg reported, but countless others were injured.

Criminals and terrorists have used pipe bombs, to suitcase-size bombs, and all the way up to semi-trucks loaded with explosives to target specific people, groups, or cause widespread mayhem.

A military example of explosive weapons is the GBU-43 Massive Ordnance Air Blast (MOAB) bomb. One of the most devastating conventional weapons ever made, the MOAB weighs more than 10 metric tons and contains 8,164 kilograms of explosives. When used, its explosive blast is the equivalent of 11 tons of TNT and has a blast radius of a mile wide.

## DEMOLITIONS AND BLAST EFFECTS

Explosive materials are considered to be any chemical compound, mixture, or device that causes an explosion. This “term includes, but is not limited to, dynamite and other high explosives, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, and igniters,” the ATF notes.

Great care should be taken for the transport and storage of certain types of explosives.

For purposes of comparison, TNT will remain the standard for judging the effects of other explosives. The detonation of a full stick of TNT is enough to move and split one cubic meter of rock. A cubic meter of rock weighs between 2.5 and 3 tons. A stick contains roughly 1 mega joule (MJ) of energy.

Assume that Tornadium D-19 is four times more powerful than TNT.

TNT and the like cause “high order explosions,” producing a very hot, dense, high-pressure gas. Expanding at very high velocities, the explosion’s shock wave radiates out from the source of the explosion at supersonic velocities.

As the shock wave expands, pressures decrease rapidly – with the cube of the distance – “because of geometric divergence and the dissipation of energy in heating the air,” according to information from the U.S. Department of Homeland Security. “Pressures also decay rapidly over time (i.e., exponentially) and have a very brief span of existence, measured typically in thousands of a second, or milliseconds. An explosion can be visualized as a ‘bubble’ of highly compressed air that expands until reaching equilibrium with the surrounding air.”

Only one-third of the chemical energy available in most explosives is released during the detonation. The remaining chemical energy is released more slowly causing an afterburning process.

### EXPLOSIVE BLAST AREAS

*“A 50-gram charge of TD-19 will cause 5d10 points of damage to anyone and anything within 1 meter of the explosion. Each additional 50 grams causes an additional 25 points of damage. Anyone farther from the explosion than 1 meter, but within the blast radius, takes one-half damage. The blast radius is 1 meter for every 100 grams of TD-19 used.”*

*– Star Frontiers, Alpha Dawn: Expanded Game Rules*

When high explosives detonate, the blast radius on the Weapons Table (p23, 36-37 - Frontier Explorer 26) is the immediate blast area. Every character, robot, vehicle, structure, or other item within that area will take damage. Roll individually for damage. Then determine how armor, defensive shields, and cover will modify the result.

Most explosive weapons in the Star Frontiers game have straightforward rules when it comes to determining what a blast radius is. Many grenades, for example, have a blast radius of 3 meters (6 meters in diameter) while recoilless rifle and rocket launchers apparently only affect the target, and probably the square, they hit in. But, the concept of explosives having a secondary blast area is introduced when it comes to Tornadium D-19 where targets take half damage.

The formula for handling damage and the blast radius for TD-19 – a.k.a. “kaboomite” – would work for small explosions. However, it will quickly become ridiculous seeming if a character uses greater amounts of the plastic explosive for demolition work.

For example, when a character sets a 500-gram charge, it will do 5d10 + 225 points of damage. According to the rules, it will only have a 1 meter immediate blast radius and a secondary blast area from 1 to 6 meters where characters and items will take half damage.

When a character uses a full kilogram of kaboomite, the charge will do 5d10 + 465 points within a 1 meter blast radius and have a secondary blast area from 1 to 12 meters. But what if 10 kilograms of TD-19 were used or 100 kilograms? Would it still have a 1-meter immediate blast area?

## SECONDARY BLAST AREA

Zebulon’s Guide expanded upon the rules by providing a formula for calculating the immediate and secondary blast areas.

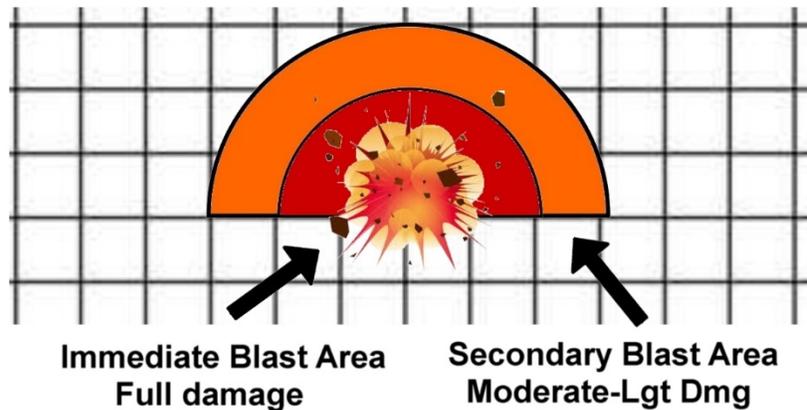
*“If the blast occurs in the open, there is a secondary blast area. The secondary blast area has 1.5 times the radius of the immediate blast area. For example, the immediate blast area has a radius of 15 meters, the secondary blast radius extends another 7.5 meters, from 15 meters to 22.5 meters from the blast point. Anyone outside the immediate blast area but within the secondary blast area must pass a Reaction Speed check. Characters who fail the check must roll on column +1 of the Resolution Table...”*

– *Star Frontiers, Zebulon’s Guide to the Frontier*

For quantities of explosives weighing 1 kilogram or more, it will have a secondary blast area. The secondary radius is equal to 1.5 times the radius of the immediate blast area. Instead of using the Zebulon’s formula, round any fractions up to the nearest whole number.

For example, if the immediate blast area of a bomb has a radius of 15 meters, the secondary blast radius extends out another 8 meters to 23 meters from the blast point.

## Immediate and Secondary Blast Areas Damage Table



### IMMEDIATE BLAST AREA

Characters within the primary blast radius can take concussive damage, where they will be knocked down and stunned for 3d10 turns, but are also injured by fragments. If a bomb has a “damage additive” and/or a “damage multiplier,” it is only applied to targets within the immediate blast area.

For example, a bomb is rated to do 15d10 + 75 points of damage with a 10-meter immediate blast radius and a 15-meter secondary area. The “+ 75” is the damage additive and is only applied to targets within the immediate blast area.

Saving throws can be made to reduce damage. Characters within an enclosed armored vehicle may be unaffected by an explosion outside of the vehicle.

### SECONDARY BLAST AREA

Anyone within the secondary blast area will take moderate to light damage and can be stunned for 1d10-2d10 turns – see the “Secondary Blast Area Resolution Table.” Moderate damage is anything from

1d10+5 to 2d10 points. Light damage is 1d5 to 1d10 points.

Characters in the secondary blast area can make a Reaction Speed check to dive for cover/go prone on the ground. They may avoid damage or reduce its effects, see the Secondary Blast Area Resolution Table for effects.

Disregard any blast additive or blast multiplier damage; it does not apply to targets within the secondary area.

Characters within enclosed, armored vehicles will avoid damage altogether.

Many Star Frontier weapons are fairly small. For example, the Type III missile warhead only weighs 3 kilograms; that mass would include the explosive and the casing. The bombs introduced in the “Tanks a lot!” vehicle combat story from Dragon magazine are also fairly tiny. The small bomb weighs 15 kilograms and the large bomb is 30 kilograms.

None of the weapons described above are in the 1,400-plus kilogram weight of the infamous “blockbuster” bombs of World War II.

SECONDARY BLAST AREA RESOLUTION TABLE		
ROLL	NORMAL RESULT	SAVING THROW RESULT
1	No Damage	No Damage
2-3	Light Dmg, 1d5 - Stun 1d5 turns	No Damage
4-6	Light Dmg, 1d10 - Stun 1d10 turns	No Damage
7-8	Moderate Dmg, 1d10+5 - Stun 1d10+5 turns	Light Dmg, 1d5 - Stun 1d5 turns
9-10	Moderate Dmg, 2d10 - Stun 2d10 turns	Light Dmg, 1d10 - Stun 1d10 turns

## WHAT ABOUT LARGER EXPLOSIONS

For bombs weighing 10 kilograms or more, in addition to a secondary blast area, add a third and a fourth blast area. See the Expanded Blast Area Damage Table and roll on the Large Bomb Blast Area Resolution Table for each target to determine the exact effects.

**Primary Blast Area** – Roll for damage as normal for targets within the immediate area and apply any damage additives and/or damage multipliers. Survivors may be stunned for 3d10 turns to 1d10 minutes!

**Secondary Blast Area** – This area extends out 1.5 times the immediate blast area; round results up to the nearest whole meter. Targets here take medium damage, which is 3d10 to 4d10 points, plus they may be stunned for 2d10 to 3d10 turns.

Do not apply damage additives or multipliers.

**Large Bomb, Third Blast Area** – The third blast ring extends out to 2 times the immediate blast area. Targets within this zone take moderate damage, 1d10+5 to 2d10 points, and may be stunned for 1d10 to 2d10 turns. Do not apply damage additives or multipliers.

**Large Bomb, Fourth Blast Area** – The fourth blast radius extends out 4 times the immediate blast area. Targets will take light damage, 1d5 to 1d10 points, and may be stunned from 1d5 to 1d10 turns.

**Large Bomb, Saving Throws** – Characters can still make saving throws in an effort to avoid or reduce damage. It will cut any damage effects in half. Please see the Large Bomb Blast Area Resolution Table.

**Damage to Objects within Blast Areas** – Every character, robot, vehicle, structure or other items within the blast areas will take damage. The referee could roll individually for important items to see if they take damage, decide that nearby items and NPCs are in a group and roll once for them, or “hand wave” the result to keep the story moving along. Do not forget to determine how armor, defensive shields, and cover will modify the result.

## HOW DOES THIS EQUATE TO REAL LIFE?

The proposed blast areas – immediate, secondary, third, and fourth rings – do approximate what happens in the real world.

“TNT is one of the most widely used explosives; therefore TNT equivalent is often used to quantify the energy released by an explosion. The blast-wave impact on a human body depends on how close to the epicenter it happens to be during the explosion,” according to a story on Sputnik International from Aug. 13, 2013.

When 1 kilogram of TNT is set off, at a 1 meter distance from the epicenter, the “incident overpressure” is at 1,000 kilopascal (kPa) or 145 pounds per square inch (psi). Normal air pressure – according to Earth standards – is 101 kPa.

With this much force, a human body could suffer severe contusions and injuries including a concussion and prolonged loss of consciousness, bone fractures, internal bleeding, and ruptured internal organs. Walls will be knocked down and metal structures warped out of shape or destroyed.

At 2.7 meters from the epicenter of a 1 kilogram explosion, the incident overpressure is 100 kPa (14.5 psi). A person could suffer severe contusions, bone fractures, loss of consciousness, bleeding from the nose and ears, and even internal injuries and bleeding. The blast may cause major damage to structures including the partial collapse of walls, pillars or ceilings. Lightweight objects would be totally destroyed.

At 11 meters from the epicenter of a 1 kilogram explosion, the incident overpressure is about 10 kPa (1.45 psi), Minor injuries may occur at this distance, but fatalities are usually ruled out. Minor damage may be caused to machinery, but will not disable it. Lightweight objects might be damaged or severely deformed.

According to information from the U.S. Defense Threat Reduction Agency, a suitcase bomb with 10 pounds – approximately 4.5 kilograms – of the equivalent of TNT would cause potentially lethal injuries at about 60 feet, which is about 18 meters. Such an explosion would cause serious injuries from 60-90 feet or 18-27 meters.

Flying glass and debris could cause severe wounds out to about 150 feet/48 meters, and minor cuts out to approximately

## LARGE BOMB BLAST AREA RESOLUTION TABLE

ROLL	PRIMARY AREA	2ND AREA	3RD AREA	4TH AREA
01-05	25% damage + stun 2d10 turns	1d10 points + stun 1d5 turns	Stun 1d5 turns	No damage
06-25	50% dmg + stun 2d10 minutes	2d10 points + stun 1d10 turns	Stun 1d10 turns	Stun 1-2 turns
26-50	75% damage + stun 2d10 turns	3d10 points + stun 1d10 turns	1d10 points + stun 1d10 turns	Stun 1d5 turns
51-75	Heavy damage + stun 2d10 turns	3d10 points + stun 2d10 turns	1d10 points + stun 2d10 turns	1d5 points + stun 1d5 turns
76-95	Heavy damage + stun 3d10 turns	4d10 points + stun 2d10 turns	2d10 points + stun 1d10 turns	1d10 points + stun 1d5 turns
96-00	Heavy damage + stun 1d10 minutes	4d10 points + stun 3d10 turns	2d10 points + stun 2d10 turns	1d10 points + stun 1d10 turns

**Stunning Damage** – A character has been knocked down and is dazed or even temporarily unconscious. They are unable to move or defend themselves.

**Light Damage** – This can range from 1d5 to 1d10 points of damage, which would come from the concussive blast along with any falling debris – which especially happened in an urban setting.

**Moderate Damage** – This ranges from 1d10+5 to 2d10 points of damage.

**Medium Damage** – This can range from 3d10 to 4d10 points of damage.

**Heavy Damage** – This is the normal damage caused by a bomb.

210 feet (64 meters). One of the best defenses against bomb – besides having an armored vehicle or building – is the distance from the source of the explosion.

## SHOCKWAVES

As noted earlier, a high order explosion creates a shockwave of compressed air that travels outward at supersonic velocities and is primary damage mechanism. This shockwave keeps expanding until it reaches equilibrium with the surrounding air, according to the U.S. Federal Emergency Management Administration (FEMA).

As the shock wave expands, the air pressure decreases rapidly with the cube of the distance due to the dissipation of energy from heating the air. The duration of the explosive force is also very short, measured in thousandths of a second or even milliseconds.

More information about blast areas, incident overpressure, and its effects on people and buildings see “Blast Range to Effects” further on.

## ABOUT STAMINA, STRUCTURE, AND HULL POINTS

Stamina (STA) is the ability that measures a character’s physical fitness and general health. When a character is wounded, points are subtracted from the character’s current STA score.

Stamina points are also used to record wounds to animals and damage to robots and other small equipment, Structure points (SP) represent the damage sustained to various walls, doors, computers, and even vehicles. Two Stamina points equals one structure point. The Expanded Structural Damage Capacity Examples table lists example structure point values for various item.

Some weapons, notably needlers, will not cause structural damage. Other weapons cause different levels of damage, this is especially true in the case of whether a fragmentation grenade is thrown at an object or placed to cause the maximum amount of damage.

Structure points for vehicles have been a part of the Star Frontiers game since the beginning. Pages 24 and 25 of the Alpha Dawn Expanded Game provide information for calculating the structure points for things from “light vehicles” to “armored vehicles,” but damage is not handled the same way as fighting a robot.

For example, an automatic rifle will do 5 structure points per shot, a gyrojet pistol 10 points, but a needler will not do any damage. Yet, these structure points are not incorporated in the normal vehicle combat rules where you have to roll on the Vehicle Damage Table or the Control Table.

Game referees need to use their judgment as to the exact effects listed with the structural damage capacity table. For example, the amount of explosive needed to blow a hole in a wall will not necessarily cause the whole wall to collapse; it depends

upon the size of the wall and the amount of explosive used.

Similarly, blowing up a single bridge support or a major structural support column could cause a bridge or building to collapse, but perhaps not right away. But, destroying several supports/columns could cause an immediate collapse.

In many ways, the Star Frontiers system shows how a vehicle can become disabled long before it is destroyed. But how do you know when a vehicle is totally destroyed?

An optional rule changes the “No Effect” result in the Alpha Dawn vehicle damage table to direct damage to the structure of a vehicle.

The number of structural points (SP) for each vehicle is listed in the Vehicle Size, Structure/STA Point Table. When the vehicle is reduced to zero structural points, it is so badly damage it is no longer fit for service and may be unrepairable. For those who do not want to use structure points, they can be converted into Stamina (STA) points.

A civilian ground cycle is considered a size 1 vehicle. It could have a maximum of 75 structure points or 150 STA. If a shot from a laser pistol penetrates the side of the cycle’s engine compartment it may hit

VEHICLE SIZE, STRUCTURE/STAMINA POINT TABLE			
Size	SP	STA	Example(s)
0	5-25	10-50	Bicycles, mopeds, 1-person transport pods, go-karts.
1	25-75	50-150	2-person cycles, ATVs, “golf” carts.
2	50-150	100-300	2-4 person small cars.
3	100-200	200-400	Mid-size cars. (Star Frontiers ground cars and hover cars)
4	150-250	300-500	Small cargo trucks or vans. (Star Frontiers transport)
5	200-300	400-600	Large cargo haulers, tractor trailers.
6	250+	500+	Truly large vehicles but excludes mass transports such as monorails, ocean freighters, etc. 250 SP/500 STA equals 1 Hull Point under Knight Hawks.

EXPANDED STRUCTURAL DAMAGE CAPACITY EXAMPLES TABLE				
-----Structure Points-----				
25+d10	50+2d10	100+d100	200+2d100	300+3d100 or more
Heavy Door	Fortified Door	Safe	Vault	Secure Vault
Sign Post	Freeway Divider	Billboard Tower	Freeway Bridge Support	Major Structural Support Column
Interior Wall	Exterior Wall	Reinforced Wall	Fortified Wall	Armored Wall
Light Flooring	Reinforced Flooring	Heavy-Duty Flooring	Avg. Building Foundation	Armored Foundation
		Small Earthen Dam	Earthen Dike	Concrete Dam

a sensitive area causing the vehicle to stop, but it may also damage the structure of the vehicle.

Note: if a character is trying to break into a vehicle, such as blowing open a door on an armored vehicle, this damage may affect the vehicle's overall integrity. But breaking into a locked glove compartment probably will not harm the rest of the vehicle.

For the purposes of this guide, 500 Stamina points or 250 structure points equals 1 Knight Hawks' starship hull point. In fact, the referee could decide that a significant fraction of damage – even 126 structure points – could represent 1 hull point of damage.

The Structural Damage Table provides examples of how various weapons may cause wreck or destroy objects. The table is based on the one from the Alpha Dawn Expanded Games rules. In some cases, such as damage that can be caused by a knife or

a sword, a referee could determine that the target is hardened enough where the weapon will not cause any significant damage.

For example, a character could take a knife or chisel or pick to chip away at a wall made of wood or brick or stone or concrete. Over time, the character may be able to open a hole through it. But, if the wall was made of Federanium, the hardest known metal in the Frontier, the average knife will not make a dent in it.

## BLAST RANGE TO EFFECTS

The following graphics are based upon information from various United States government anti-terrorism documents that provide first responders and security experts a way to quickly determine the appropriate standoff distance. Standoff distance is the space needed to evacuate civilians from a bomb threat in this case.

These charts can provide a referee a quick idea of what kind of damage an explosive of a certain weight in TNT equivalent will cause to buildings and characters. It can be used as an alternative way to determine the immediate, second, third, and fourth blast areas.

The "Blast Range to Effects" chart (page 15) is based upon one created by the U.S. Defense Threat Reduction Agency. At a glance it shows the severity of damage that, say, a 20 kilogram TNT equivalent explosive will have at a certain range and approximately how far out a blast shockwave will extend.

One could assume that anything under the "Potentially Lethal Injuries" dashed line could be considered in the immediate blast area. Anything between that line and the "Severe Injuries – Open Buildings" line would be in the second blast area. Anything under the "Glass – Severe Wounds" is in the third blast area, and anything under "Glass – Minor Cuts" would be in the fourth blast area.

The Vehicle Bomb Explosive Dangers Chart (page 16) is based off a diagram from the ATF. It is another way to visualize the destructive power of large explosions.

According to FEMA a pipe bomb has the equivalent of 5 pounds of TNT (2.26 kg), a small sedan car could carry 400 pounds (181.4 kg) of explosives, a delivery van could have 4,000 pounds (1,814 kg), and a large truck could contain 10,000 pounds (4,535.9 kg) of explosives.

STRUCTURAL DAMAGE TABLE	
Weapon	Structural Damage
Projectile weapon (auto pistols, rifles and machine guns)	5 points/shot
Gyrojet (includes pistols and rifles)	10 points/shot
Needler (includes rifles and pistol)	No damage
Laser (includes pistols and rifles)	5 points/SEU
Rafflur (includes rifles and pistol)	One-fourth damage
Maser (includes rifles and pistol)	No damage
Bolt	Half damage
Fragmentation grenade	15 points
If placed instead of thrown:	30 points
Explosives (TD-19, TD-20, TNT, dynamite, etc.)	See description
Micromissile	1d10+4/shot
High Explosive Warhead	Half damage
High Explosive Anti-Tank (HEAT) Warhead	Normal damage
Standard Explosive Warhead	Normal damage
Force Axe	1d10+2
Bombs/Artillery Shells	Normal damage
Vibroknife	1d4 or None
Javelin or Spear	1d3 or None
Knife	1 point or None
Sword	1d4 points or None

*Note: These are examples of the types of damage that these weapons can cause against normal structures. However, materials that are less dense may take more damage. A structure made from a reinforced or armored material may take less damage or none at all depending upon the referee's discretion.*

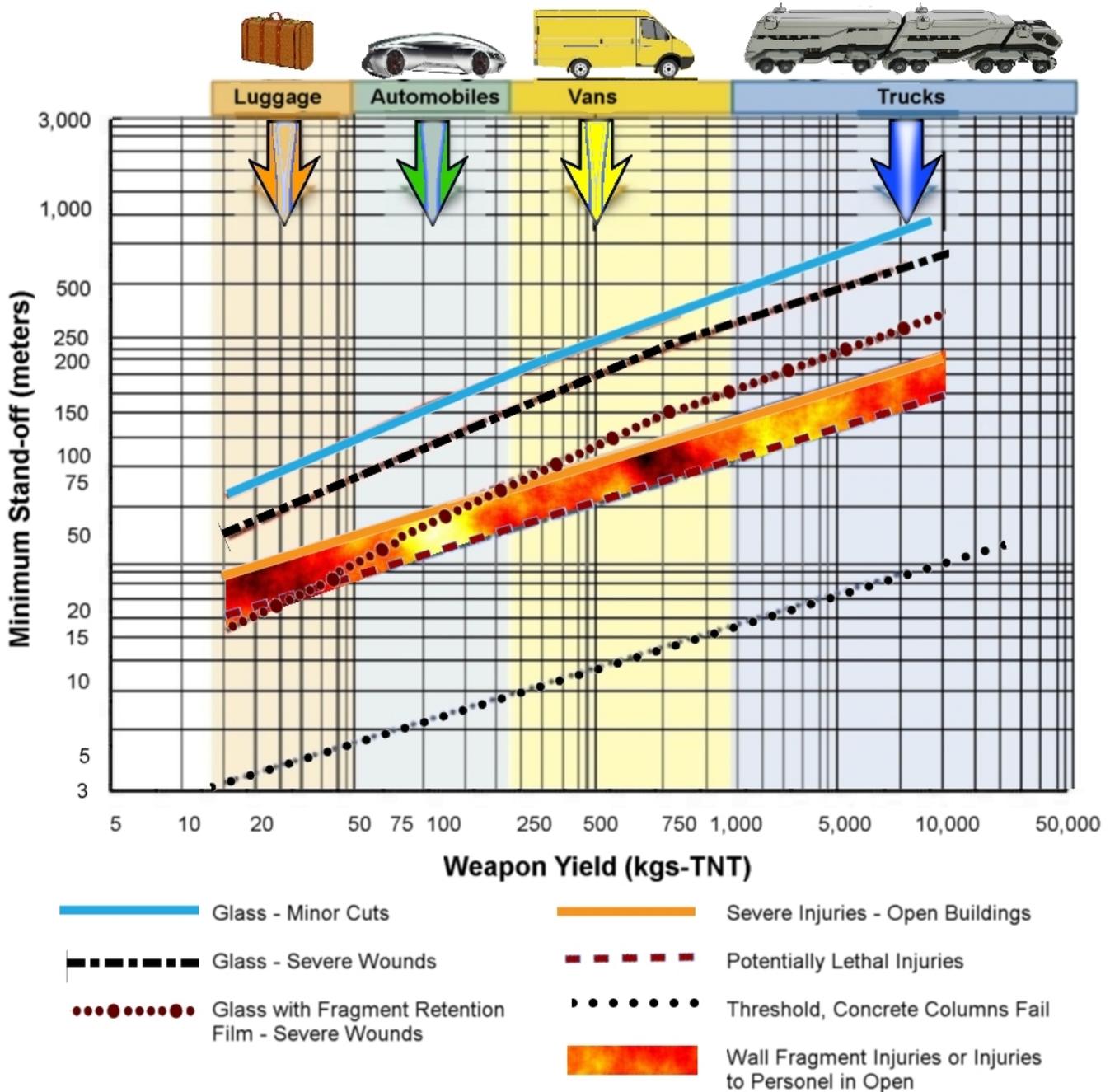
Weapon	TNT equivalent (lbs.)	TNT equivalent (kg)
Pipe bomb	5	2.26
Small sedan car bomb	400	181.4
Delivery Van	4,000	1,814.0
Large scale Truck	10,000	4,535.9

## BLAST INCIDENT OVERPRESSURE

The blast wave, also called blast incident overpressure, can cause massive damage to buildings and injure people. Traveling at the speed of sound, the pressure wave results from the energy released during explosion.

The bigger the explosion, the more damage the blast wave causes. And, obviously,

## Blast Range to Effects



on planets that have slight or no atmospheres, this pressure wave is either greatly reduced or nonexistent.

The Blast Incident Overpressure chart and Damage from Overpressure table are a compilation of information from FEMA, the U.S. National Oceanic and Atmospheric Administration, and the U.S. Department of the Army.

The blast pressure pulse varies based on the stand-off distance, angle of the incidence, and reflected pressure over the exterior of the building, according to FEMA.

This pulse is just as damaging and just as deadly as toxic gases or a fire. As it radiates outward from the center of the explosion, glass shatters and building walls can buckle and break, sending out fragments of debris that injure people inside and outside.

The Blast Incident Overpressure chart (page 16) provides a quick method for predicting the expected overpressure on a building for a specific explosive weight and distance. The chart is in pounds per square inch (psi). In the metric system, the

appropriate unit of measurement is kilopascals (kPa) are units of pressure in the metric system. A measure of 1 psi equals 6.89475729 kPa.

The sudden change in pressure can also affect pressure-sensitive organs like the ears and lungs, notes the National Oceanic and Atmospheric Administration.

Confined spaces and walls can focus and amplify the blast incident. Studies have shown that explosions near or within hard solid surfaces become amplified 2 to 9 times because of shock-wave reflection.

## VEHICLE BOMB EXPLOSEIVE DANGERS CHART

Vehicle Description	Maximum Explosives Capacity	Lethal Air Blast Range	Minimum Evacuation Distance	Falling Glass Hazard
<b>Compact Sedan</b>	500 pounds - 227 kilos (in trunk)	100 feet - 30 meters	1,500 feet - 457 meters	1,250 feet - 381 meters
<b>Full Size Sedan</b>	1,000 pounds - 455 kilos (in trunk)	125 feet - 38 meters	1,750 feet - 534 meters	1,750 feet - 534 meters
<b>Passenger Van or Cargo Van</b>	4,000 pounds - 1,818 kilos	200 feet - 61 meters	3,750 feet - 1,143 meters	2,750 feet - 838 meters
<b>Small Box Van (14 ft. box)</b>	10,000 pounds - 4,545 kilos	300 feet - 91 meters	3,750 feet - 1,143 meters	3,750 feet - 1,143 meters
<b>Box Van or Water/Fuel Truck</b>	30,000 pounds - 13,636 kilos	450 feet - 137 meters	6,500 feet - 1,982 meters	6,500 feet - 1,982 meters
<b>Semi-Trailer</b>	60,000 pounds - 27,273 kilos	600 feet - 183 meters	7,000 feet - 2,134 meters	7,000 feet - 2,134 meters

Victims positioned between the blast and a building have suffered 2 to 3 times the degree of injuries of a person in an open space.

### IN GAME TERMS

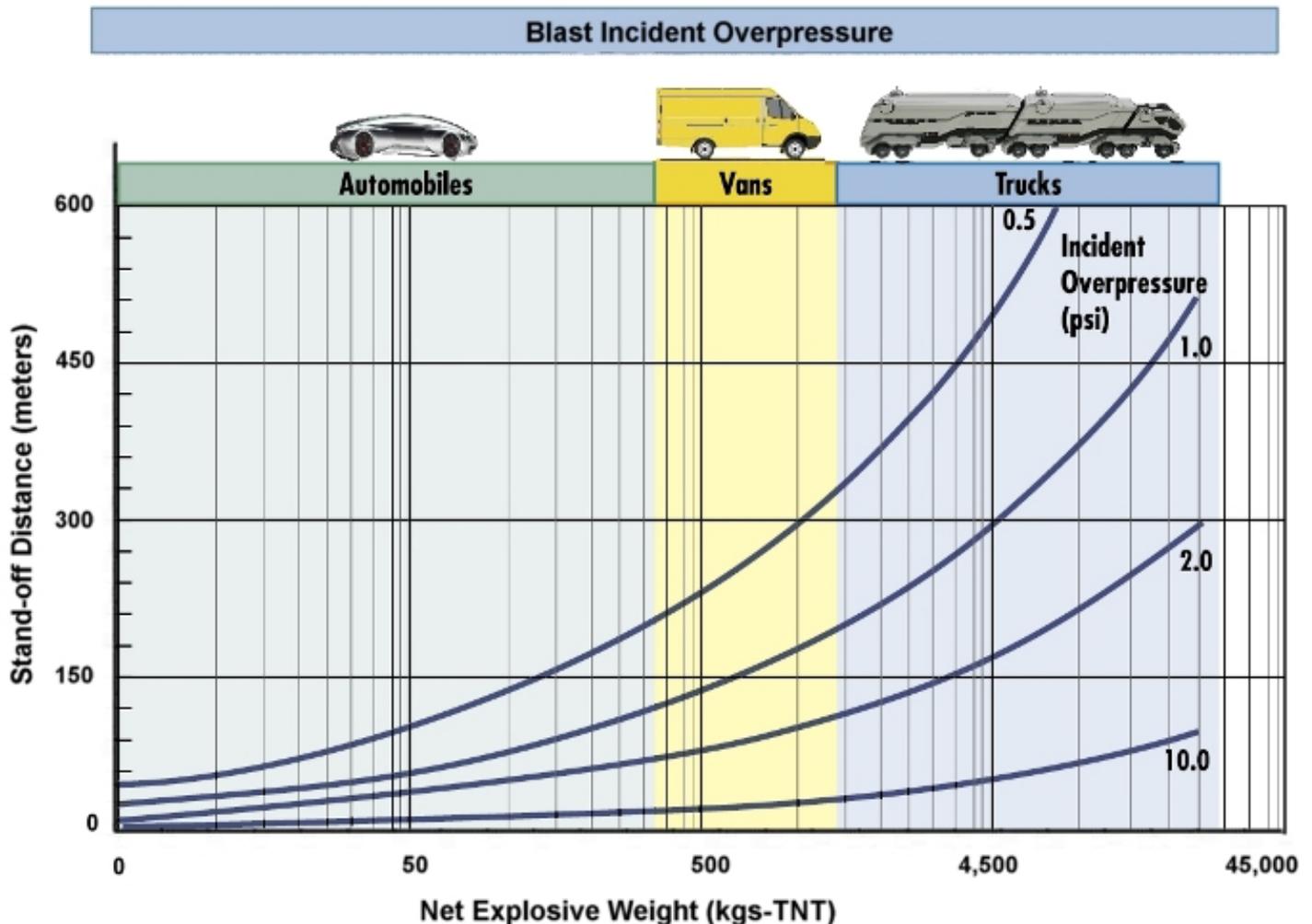
Using information from FEMA, the last two graphics: Sathar Terrorist Truck Bomb (p 17) and Sathar Terrorist Car Bomb (p 18), look at the havoc created if such weapons were used in the Frontier's capital city, Port Loren on Gran Quivera.

Beyond Sathar agents, there are actually several cults and cadres that might resort to such weapons of terror.

In the case of a car bomb, the most destruction occurs within the five meter square at the road, right near one of the monorail terminals. The face of the buildings around the blast will probably take much of the damage, but there is a danger of flying glass for any characters on the streets or near the exterior walls.

The mayhem caused by a truck bomb would be widespread across downtown Port Loren. Based on data from FEMA, the immediate blast area would decimate a portion of the main tower. The orange ring, where there are probable lethal injuries, extends out 250 meters from the center to roughly the far edge of the map.

The outer yellow ring – where one would expect severe injuries from glass – extends off the map to more than 500 meters.



## SYMPATHETIC EXPLOSIONS

A flash over or a sympathetic explosion occurs when the shock wave from a high explosive causes the detonation of other nearby explosives.

These munitions may be stored in vehicles, gun mounts, storage depots, or a ship's magazine. The impact of blast fragments may also cause a flash over.

Sympathetic detonations may even occur when the energy of a shock wave transfers through a wall or armor.

For example, during the Battle of Midway in World War II, the Japanese aircraft carrier Akagi fell victim to a series of sympathetic explosions. Bombs from American dive bombers struck a hanger inside the ship where B5N torpedo bombers were being armed for an attack against the American carriers.

The hit set off a series of explosions inside the Akagi, resulting in an unstoppable fire, forcing the Japanese to scuttle her. The Akagi was one of four Japanese carriers lost during the battle.

Militaries have developed many ways to lessen the dangers of sympathetic explosions including placing sufficient distance between stacks of munitions or by storing ammunition in containers that can reduce the effects of a high explosive shock wave.

Damage from Overpressure	Incident Overpressure (psi)	Incident Overpressure (kPa)
Loud noise (143 db); sonic boom glass failure.	0.04	0.276
Typical window glass breakage.	0.15-0.22	1.03-1.51
Minor damage to some buildings.	0.5-1.1	3.45-7.58
Minor damage to house structures.	0.70	4.83
Window glass shatters. Light injuries from fragments occur.	1	6.89
Panels of sheet metal buckle	1.1-1.8	7.58-12.41
Failure of concrete block walls	1.8-2.9	12.41-19.99
Range for 1-90% eardrum rupture among exposed populations.	2.4-12.2	16.55-84.12
Residential structures collapse. Steel frame buildings distorted and pulled away from foundation. Serious injuries are common. Fatalities may occur.	3	20.68
Wooden utility poles snap. Injuries are universal. Fatalities are widespread	5.0	34.47
Collapse of wood framed buildings.	Over 5.0	Over 34.47
Serious damage to steel framed buildings.	4-7	27.58-48.266
Severe damage to reinforced concrete structures	6-9	41.37-62.05
Loaded train cars overturned.	7.0	48.26
Loaded train box cars demolished.	9.0	62.05
Probable total destruction of most buildings	10-12	68.95-82.74
Most people (99%) are killed	14.5-29.0	99.97-199.95
Fatalities approach 100 percent	20	206.84

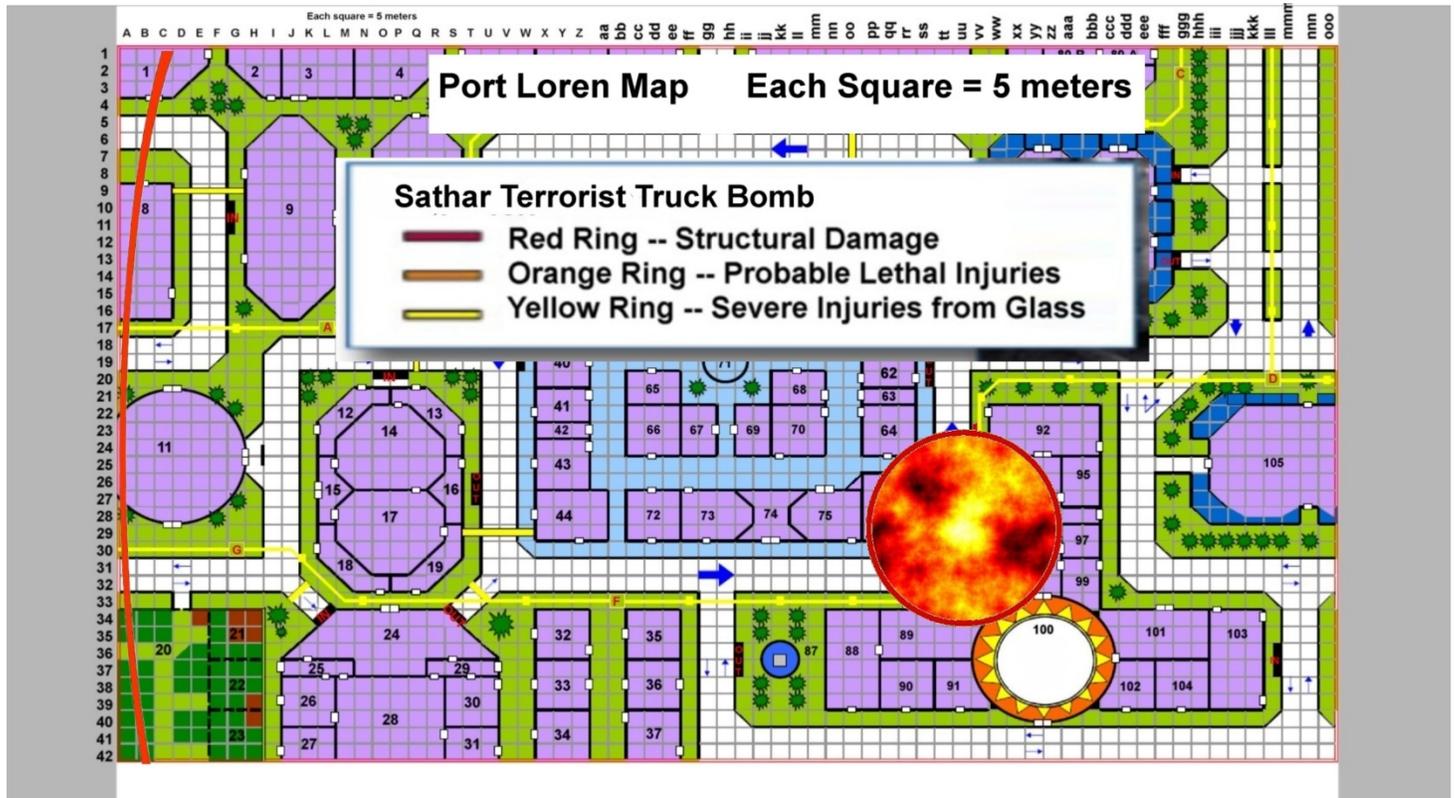


IMAGE BY JOSEPH CABADAS



Modern battle tanks, such as the U.S. Army's M-1A2C Abrams, feature armored ammunition compartments with blow-off panels to channel any detonation away from crew members.

Ammunition can also explode prematurely – aka “cooking off” – due to intense heat in the surrounding environment,

such as a fire. Black powder was known to cook off in the hot barrels of cannons.

## UP NEXT

Hopefully this information about demolitions will provide the game referee with enough “ammunition” to enhance a

campaign. The next article in this series (p 32) will look at various explosives that should be available in the Frontier including Tornadium D-19, Plastid, dynamite, and other demolition materials and detonators.

# JURAK'S TIMEON SAFARI GRAZELLE HUNT

BY ERIC WINSOR

The shuttle drop to Lossend was a fulfillment of long desires for me. I drew tags to hunt two Lossend Gazelles originally scheduled for the season the recent sathar incursion started. I was expecting that I would lose my tags because we missed the trip during the travel ban but our associate, Alex Stone, was stuck on Lossend during the sathar incursion and put in a good word with his Yazirian host who helped and got my tags deferred until now.

I sat firmly strapped in my seat during atmospheric entry, the thrill of the hunt flowing into my veins. Tik slumbered, enjoying the vibrations and G forces on his body. Dwain wrestled with Bowzer who was strapped in at a window seat and was fighting his way out of the restraints to press his hand and face against the warm glass barring him from the fiery atmospheric friction outside. I like to think that young Bowzer's maturing eyes caught their first faint glimpse of the fiery light that day.

## THE LOSSEND LIFESTYLE

Lossend is a human world with what humans call an "outdoor" lifestyle. The light population means that there are plenty of open spaces for people to live in the "country". Even Tachtion city with its starport and sprawling business complexes of Tachtion Instruments feels and appears more county than city. Dwain calls it western and outback, a yazirian might call it tree or cliff centric. People dress for the outdoors, or back country, or farm work even though they are working in offices or factories. Dwain kept pointing out the boots, work, and trekking shoes the humans favored. Even the few yazirians I encountered had thick treaded soles on their sandals. Then there was the dominance of hats and all the touching of hats that humans did as they greeted us in passing. Dwain even stopped in a hat shop to purchase a locally made one. I have a few human hats in my collection that I have worn on other worlds, but I have never seen such a high population fascination with hats on any other human world than Lossend.

Though we landed in Tachtion City, we had to fly to O'Donnal's Station to process our tags and gain entry permits for the game preserve on Fallow, the southern continent. We also had to get Bowzer collared and tagged to go with us into the game preserve. Without the permanent collar, we would have had to put Bowzer up at a kennel. The collar and leash had to be tethered to one of us at all times unless Bowzer was in his cage. Without this, the collar would stun Bowzer to prevent him from doing anything until the authorities could pick him up. Then we rented rifles for the hunt.

With everything in order, we flew out to visit our host, Mr. Theodore Livingstone. His home is a very fine, sixteen room, four story home out on the planes of Errad with a wrap-around porch at each level modeled after ancient human architecture. Theodore has been trophy hunting on Lossend his whole life and has bagged all of the top game. He holds several of the record kills including largest goalbeast and widest wingspan lossodragon. Theodore is a fine host and we publicly thank him for the excellent dinners, lodging, rifle instruction and sighting in on the back veranda, and lectures of Lossend ecology. Our success hunting Gazelles are credited to his instruction.

## GRAZELLES

The high grasslands surrounding Mount Spire support a great variety of animals. The comb pine forests carpet the peaks of the lower mountains around Mount Spire surrounding valleys of rich grasslands and mountain lakes. Animals thrive in these valleys, migrating with the seasons, spending the summers up in the peaks and going above towards the exposed slopes of Mount Spire. During the winters they congregate in the valleys. During the summer the lossodragons hunt from their dens high on Mount Spire. During the winter the lossodragons descend

to the lower surrounding peaks to prey on the animals congregated in the valleys. The lossodragons prey on all the creatures of Lossend, but the staple food in their diet is the gazelle.

Grazelles are a large antelope but not among the largest like the slackwaltzer. They favor the highland planes surrounding Mount Spire and limit their migrations to the nearby valleys where they winter. Because they favor these higher climates, they have thicker fur than most antelopes on Lossend. They follow the predominate Lossend mammalian anatomy of six limbs and a double pair of eyes. The four hind limbs are used for powerful springs and jumps which dominate the gazelle forms of running. The hips at the hind limbs are slightly wider than at the middle limbs as is common to most of the herbivores of Lossend. The forward eyes are binocular and adept at seeing for great distances. This pair of eyes move together preserving excellent depth perception. The rear eyes are independent and can move in separate directions. These eyes give the gazelle constant peripheral vision above and to the sides. Though not high acuity, this added vision makes it very hard to surprise a gazelle. A great defense against their primary predator, the lossodragon.

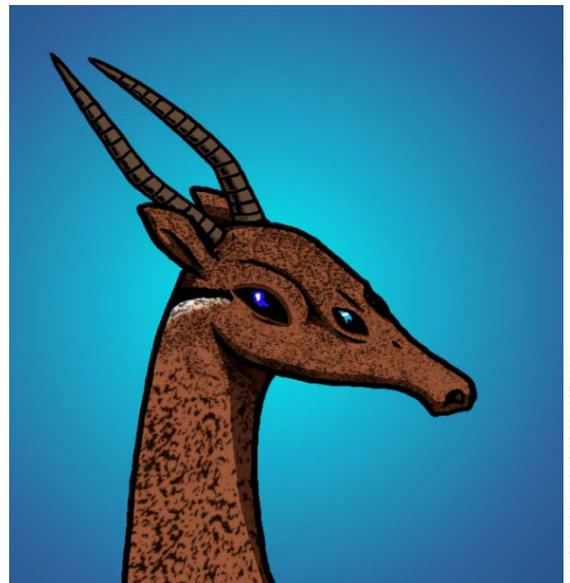


IMAGE BY BRIAN PHONG LUANGTHAM



They received their name gazelle as a combination of two human words, grazing and gazelle. The name was given by the early explorers of Lossend who visited Mount Spire before the lower grasslands; this was the first grazing gazelle animal that they cataloged on Lossend. The gazelles eat by extending their long tongues and pulling the vegetation into their mouths then snipping the vegetation free from the roots. With their diets of grasses, the gazelles are forced to venture out into the open spaces away from the comb pine trees. However, they will almost always keep a comb pine tree within running distance as a refuge against diving lossodragons.

The comb pine tree is not a pine tree like those from the human world but rather looks like a pine tree from a distance. The tree is structured more like a comb of straight, leaf-covered branches descending at sharp angles towards the ground from the central trunk. The leaves have a crumpled lichen like shape and cover the branches completely. They also function as a bark skin concealing very strong, hard wood below them. This results in a tree structure that makes for a very strong cage under the tree around the central trunk. Gazelles will flee to the safety of a comb pine whenever a lossodragon attacks.

Gazelles will birth a single calf each summer and a total of five to eight in their lifetime. The average lifespan is fourteen Lossend years. They mate early in the spring while gathered in the valleys. The females will pair up and drive a male away

from the herd until he mates with them. How the females choose a male is unknown and a current subject of study by biologists. Understanding this could allow for captive breeding agricultural use of gazelles. Gazelles have never breed in captivity. Gazelle meat could provide an abundant protein supply for a hungry Lossend eager to change from imported animals to domestic species to protect their growing native zoological industry. The native wildlife of Lossend is proving to be the financial wealth of Lossend for many and the gazelle is most promising.

## TIMEON SAFARI

We flew down to the base camp of Timeon Safari on Fallow. There we were briefed by a game warden of the Lossend Ranger Service about the laws of big game hunting. Our rifles were inspected, and we were assigned a quadrant for our hunt. Timeon Safari then introduced our guide Mandolin Bet'ani a tall muscular black skinned human with a broad smile and thick accent.

We departed for the slopes of Mount Spire the next morning. Theodore had told us that our camp would be a surprise and that a yazirian might even like it. Mandolin chuckled when we pressed him for details about our camp and after asking what Mr. Livingstone had told us just smiled and said, "You will see." The aircars brought us to a small clearing in the forest and we were directed to proceed into a comb pine and wait while our gear was unloaded. The safari had tables and chairs set up under a large comb pine and a staff member served us drinks and refreshments while our gear was carried to another tree nearby. The rustic, old-world safari feel was quite interesting; as a yazirian I liked it. Then Mandolin reappeared as the aircars left and he directed us

through the complex of trees to our tents erected under the comb pines. The base camp is a small village of tents all erected under the comb pines and blending in entirely with the environment. Dwain quite liked the camp. Tik disliked it. Bowzer attempted to climb Dwain's tree as high as his leash would allow. We assume Bowzer liked it.

We spent the next week acclimating to the altitude and taking wildlife observation treks. We saw mamamots, gambies, lorkals, lots of highbees, several limjabbers, norvals, limtuckers, holebuckers, a mating pair of dodwings, and a sail cliff stalker on the prowl among the rocks on the edge of the forest. We drilled on high altitude survival and spent a night alone practicing our skills should we become separated from the safari expedition. Most of all we learned to scan and detect any nearby lossodragons both by natural signs and by our wrist scanners. Anyone who fails to be able to detect nearby lossodragons during the base camp week is not permitted to participate in the safari expedition. No participants are allowed to trek beyond the forests and into the highland grasslands without a pair of staffer guides armed and present. Tik became the most adept lossodragon detector in a record two days. I am beginning to think that he has made protecting Dwain (and I) his life enemy.

The morning of the second week we started our safari trek to the upper camp. The guides instructed us to keep our eyes out for any norvals or gambies we saw. There are no limits on the taking of norvals or gambies and all on the expedition were allowed to shoot any that we saw. The game was collected, and we laid the carcasses out a kilometer away from our comb pine camp sites each night as diversions for lossodragons and especially any sail cliff stalkers which might be on the prowl at night. Each morning a quick check on the carcasses without magnifying glasses confirmed that the meat was taken in the night. On our third and final night we even heard what our guides informed us was the sounds of a gaggle of sail cliff stalkers feasting on the gambies we had laid out to the east.

On the fourth and final day trekking to the high camp we caught the sight of a

gazelle in the distance and I readied my rifle for a shot but Mandolin quickly grabbed me by the arm and ordered, "To the tree fast, dragon!"

Sure enough, high in the sun coming down from Mount Spire was a lossodragon diving on the gazelle with us as a likely second target if we couldn't outrun the gazelle to safety. I kept a sharp eye on my scanner as I sprinted for the nearest comb pine. We made it to the tree and turned back to watch the gazelle as it caught first sight of the lossodragon. The gazelle stopped grazing, turned its head up and scanned the horizon towards the sun seeking the lossodragon, and bolted in an instant. The entire detection and instinctual reaction took a fraction of a second. Three mighty bounds and the gazelle was at a comb pine tree to the north of us pushing its body between the thick hard branches. The lossodragon came swooping down right behind it and immediately charged at the tree. The dragon clawed and bit at the branches seeking entry but the bars of the cage nature provided the gazelle proved ample safety from the predator beyond. The lossodragon tired and crawled off towards Mount Spire to climb the lower cliffs to launch itself into the wind and catch thermals to regain a hunting altitude. We waited an hour for the lossodragon to be well on its way before continuing our trek. The gazelle returned to grazing near the tree a half hour before us. Mandolin forbade us to shoot this gazelle with a grounded lossodragon so near.

High camp was a group of five comb pines near to each other in the middle of an open slope of grassland. I strung my hammock up in the branches of a comb pine about two meters off the ground. Tik stayed ground-bound and Dwain joined him and stayed up until well after Tik fell asleep to comfort him. This also worked well with keeping Bowzer from climbing too high. Our hunt began the next morning and I almost got a shot from a nearby tree but the gazelle bolted at the movement of the tree under my weight when the wind blew. I spent the rest of the morning up in the tree with nothing in range. Range in our case is limited by how far we can allow ourselves to run to gather the dead gazelle and haul it back to a

comb pine tree before an expected lossodragon attack. The afternoon was spent concealed in some rocks near another tree waiting for another shot upwind of me.

I arose the second morning with Mandolin and hiked a few kilometers in the predawn dark to a trio of comb pine trees. Mandolin's partner scanned our perimeter the whole way with infrared goggles as Mandolin picked our path by starlight. We each climbed a separate tree and I readied for a shot. Mandolin spied a pair of gazelles further east of us as the sun was touching the horizon. I calmed myself as my father had taught me and as I have taught my hangers. The rifle was silently shouldered, and I put my cross hairs on the neck of the grezelle nearest another tree.

Mandolin whispered through my earpiece, "No sign of lossodragon. You may fire when ready." I let out my breath and squeezed the trigger. The projectile severed the windpipe of the gazelle and it went down without a noise. The companion bolted to the tree. Mandolin shouted, "Down and Clear!" and the three of us quickly descended the trees and sprinted to the kill.

Had the branches of the comb tree not been so thick and prevented me from squeezing out from above I would have glided to the kill with my zamra in hand to complete the strike. Still I kept custom and decapitated the gazelle with my zamra later that afternoon after we had carried the cleaned carcass back to the high camp. The entrails were left for the sail cliff stalkers as a distraction from our camp like the nightly norval and gambie kills. The kill was then put in freeze field and sealed in a container to keep the meat fresh and keep the scent from our camp.

## BOWZER

The second kill was bittersweet. Dwain accompanied Mandolin and I with a couple other guides to a low cliff with a cave above a comb tree growing at its base. The cave served as an excellent blind to hunt from, while the tree below a refuge for dragging the kill to after the shot. We spent the night in the cave and the whole next day waiting for a safe shot. We saw three gazelles attacked by lossodragons and

escape. Just the thrill of watching nature as it played out was a gift.

Then we saw a gazelle go down in a successful lossodragon attack. The gazelle was devoured within an hour as two other lossodragons swooped down to push in on the prize. Lossodragons do not share their meat in a friendly manner. There was much fighting and the carcass was ripped apart and dragged away so that the three could feast alone.

While the feasting was happening on our left in the east, Mandolin alerted me to a gazelle that had appeared from the tree it was hiding in to the right of the cave. We scanned the skies for other lossodragons and the only three present were busy far off to the left gnawing at the bones. Mandolin said this was the time for a shot and he went down to the tree below with the other guides to sprint for the kill while Dwain and I stayed in the cave. Dwain was ordered to watch the three lossodragons and shoot the leader if they charged after the kill. Dwain tied Bowzer's leash to a boulder at the mouth of the cave, armed himself, and took aim at the three lossodragons about a kilometer to the east. I aimed at the gazelle to the west. Mandolin took a last scan for lossodragons and cleared me to fire.

The shot was perfect, severing the spine in the neck and the beast collapsed. I took to scanning the sky for lossodragons while Dwain stayed on the other three upwind to the east who had stopped at the sound of rifle fire but not moved. Mandolin called clear and the three below sprinted to the downed gazelle and started dragging it into the tree the gazelle and come from. I had just begun to relax and relish the kill when a bullet ripped into the cave and ricocheted about the walls. Dwain and I dropped to the floor and Bowzer fell from the boulder at the mouth of the cave he had perched upon.

Mandolin called back to us, "What was that?"

I responded, "A bullet just ricocheted through our cave. Someone shot at us!"

Dwain added, "Bowzer has been shot!"

We lay motionless for several minutes and scanned the south where the shot should have originated from. We found nothing. Dwain and I rolled from our

hides to conceal ourselves behind the boulder. I kept scanning for threats while Dwain took to pulling Bowzer up to the cave by his leash. Mandolin called for aircars to extract us. When Dwain got Bowzer up to the cave we found Bowzer dead. A shot through the head had killed him instantly. When the aircars arrived, we sealed him into the freeze field case with the gazelle. This ended our safari and we flew out rather than trekking out.

Dwain and I suspect that a certain dralasite put a price on Bowzer's head and possibly ours as well. We filed our report with the Lossend Rangers of the assassination and possible foiled attempted assassinations of us. We also filed a copy of the report with the Yazirian Council of Clans listing Clan Gasar as our Voice and Advocate. While pushing out on our jump to Prenglar the following week, Clan Gasar sent us a note that a minor clan on Hargut had sent them a media article out of Minotaur that a dralasite had died performing a spacewalk during engine overhaul while in orbit. The article was annotated with a note, "A beast for a beast. Signed, Two Yazirians Nod to Clan Gasar." The message from Clan Gasar asked what this

meant. I responded that Dwain and I suspected that it meant that our report could be archived.

Sleep well Bowzer.

## GM NOTES

To learn about Clan Gasar see **For Lucco's Honor, Frontier Explorer #3**, page 40. Also see **The Infita, Frontier Explorer #4**, Page 29. The two yazirians in The Voltrunain Bowler, **Frontier Explorer #26**, page 10 are not from the minor clan on Hargut. They are not stupid enough to use their own clan to send such a message.

The game hunting on Lossend is a very controlled industry. Game populations are very healthy and monitored very closely. The government of Lossend does not want to replicate the over-hunting and habitat destruction of past worlds, and prides themselves on having an endangered species list that is blank. Illegal hunting is a very serious crime. Prison terms are set by number of illegal kills proportionate to years served on a one to one scale for the first ten kills then doubling for each ten kills after. The law is purposely written to be vague and open to

LOSSEND GRAZELLE	
TYPE:	Herbivore
SIZE:	Large: 1.5m / 200kg
NUMBER:	1-5 Open Slopes / 20-200 Winter Valleys
MOVE:	Fast, 90 m/turn
IM/RS:	6/60
STAMINA:	40
ATTACK:	35
DAMAGE:	1d10
SPECIAL ATTACK:	None
SPECIAL DEFENSE:	None
Native World:	Lossend, Timeon

interpretation about the use of a death penalty for the number of kills matching a life span. Fortunately, no one has yet been prosecuted at this level. The law also allows for attributing kills to all beings present or participating in a kill.



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STOCK GAME IMAGE FROM GO TRAVELLER

# THE HEPPLEWHITE DISASTER

BY RICHARD ROSE

– A beginning adventure for 1-3 players

**Editor's Note:** This article is a Traveller adventure, but Star Frontiers fans will most likely quickly recognize the inspiration for the adventure. I quite enjoyed reading Ricard's take on the plot. It could easily be converted back to Star Frontiers for those that want to run this version in that system.

## INTRODUCTION

Early morning before dawn, Oasis Starport (class-B starport, location TBA or simply use it on any world you see fit that has such a port) was expecting a detached duty scout/courier under contract with Hepplewhite, Incorporated to land for refueling but it never arrived. Radar contact was lost during approach several hundred kilometers to the east just minutes ago.

The party has been hired/contracted by a representative of Hepplewhite to locate the crashed ship and rescue any survivors for a cash reward (10,000Cr each or a lump sum of up to 40,000 to split as the group sees fit, the latter is open for negotiation). Local officials are also requesting that, if possible, they investigate why the ship crashed as well, as it should have had sufficient fuel for the landing. The sun will rise in four hours.

## GM NOTES

Any gear can be had at the starport at the usual prices.

If the party ventures east from the starport by way of air/raft or ATV they will eventually find the wreckage in the desert approximately 900km away, easily tracking the smoke from 300km away (600km from the crash site) by air or 500km way (400 from crash site) by land. If the group lacks transportation an ATV can be rented at 600Cr/day or an air/raft at 1200Cr per day (this can be negotiated with the Hepplewhite rep, deduction or reduction from reward, etc.).

Having lost power while on final approach for landing, the scout essentially became a 100 ton lawn dart and crashed into the desert. The ship is inverted, laying on its dorsal side half lodged into a sandy hillside, tilted about 30° to its inverted starboard side.

## ARRIVAL AT THE CRASH SITE

The group arrives to see the smoldering wreckage, the tail of the craft is raised slightly off the ground as the nose is buried into the sandy hillside. A lengthy trail of debris and skid marks extends aft from the

crash site. The ship is inverted and titled slightly down to starboard. The port drive is belching thick black smoke, although no visible fire is present. The ventral access hatch (facing skyward) is open, although the party may opt to gain access elsewhere if they can manage to force open any of the other points of entry. If investigated, one set of footprints can be found leaving the scene in a northeasterly direction.

## GM NOTES

The ship has no power so any sliding doors or iris valves will have to be forced open. Without power, none of these portals will be locked. As such, no equipment in the craft will function unless power is somehow restored. The party will have to furnish their own artificial lighting to see inside the craft, if they don't have any, they must return to Oasis Starport and acquire some (optionally a generous GM can provide some basic survival gear in the vehicle if it was rented).

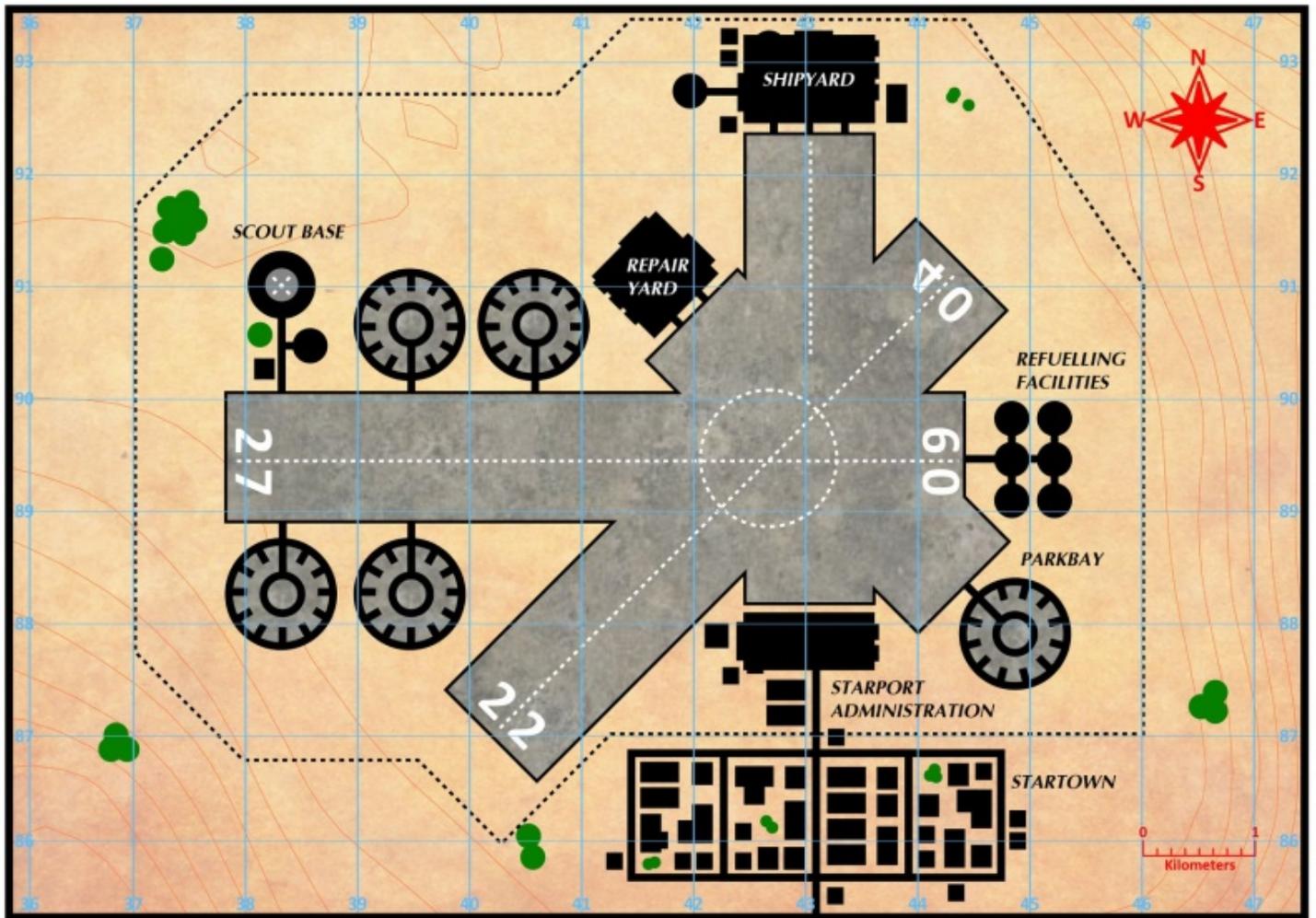
## SHIP MAP KEY

The deck plans for the ship can be found on page 25. The following sections describe the numbered areas on that map.

1) **Ventral Hatch** – This hatch remains open. Sand has poured into the hallway partially covering the inverted ceiling below. Although the adjacent landing skid has broken off and is laying nearby, the remains of the nose gear can be seen poking through the sand just fore of this hatch. Daylight from above allows for limited vision inside, but only in the accessway.

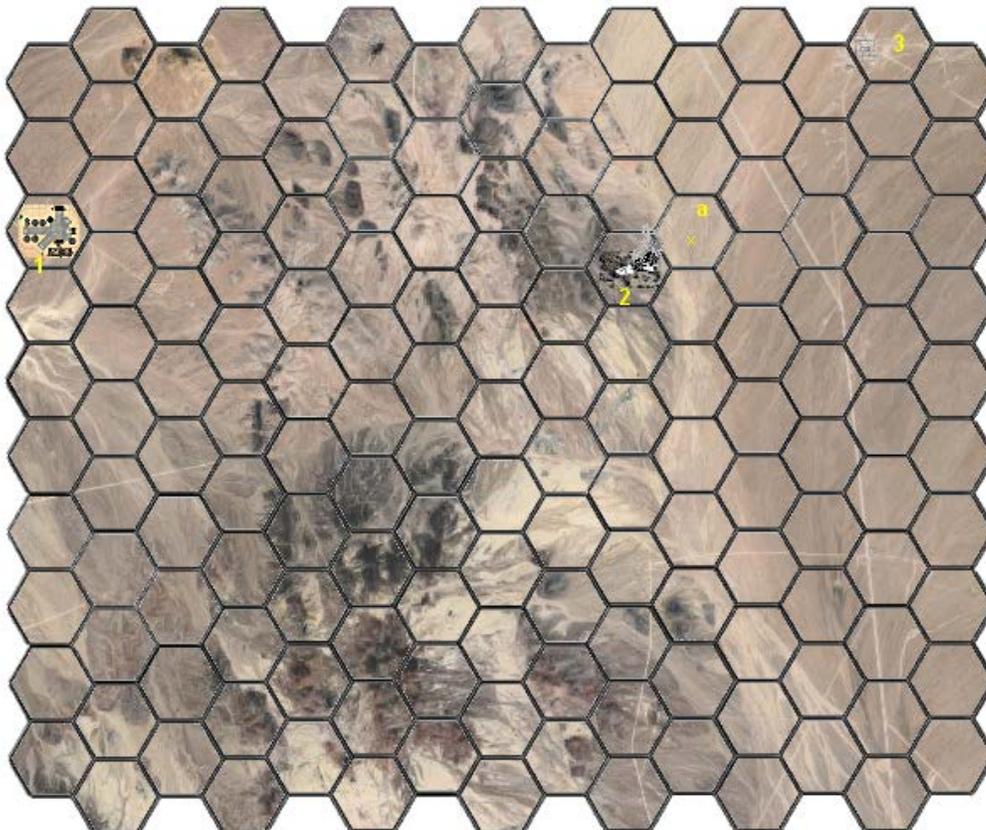
2) **Nose Gear** – This area is filled with sand since the landing gear is extended, it will have to be cleared to open the avionics access hatch below. If the maintenance panel in the accessway is removed, sand will pour into the hallway. Characters caught in this must roll their DEX or less on 2D or fall. No damage will be incurred but anything carried by hand at the time will be dropped and must be recovered from the resulting sand slide.

3) **Cargo Hold** – Several crates labelled "foodstuffs" are broken, having been tossed about during the crash. Dried food and grain litters the area, but the upper most crate on the heap is relatively intact (if investigated a hole can be seen on one



Oasis Starport (image is from the Traveller wiki site)

IMAGE IS FROM THE TRAVELLER WIKI SITE



## TERRAIN MAP

One hex = 100 km

This map shows the regions around Oasis Starport and the crash site

## TERRAIN MAP KEY

- 1 – Osiris Starport
- 2 – Crash site
- 2a – Captain Parker's location when the PC's first arrive at crash site
- 3 – Small outpost

IMAGE BY RICHARD ROSE

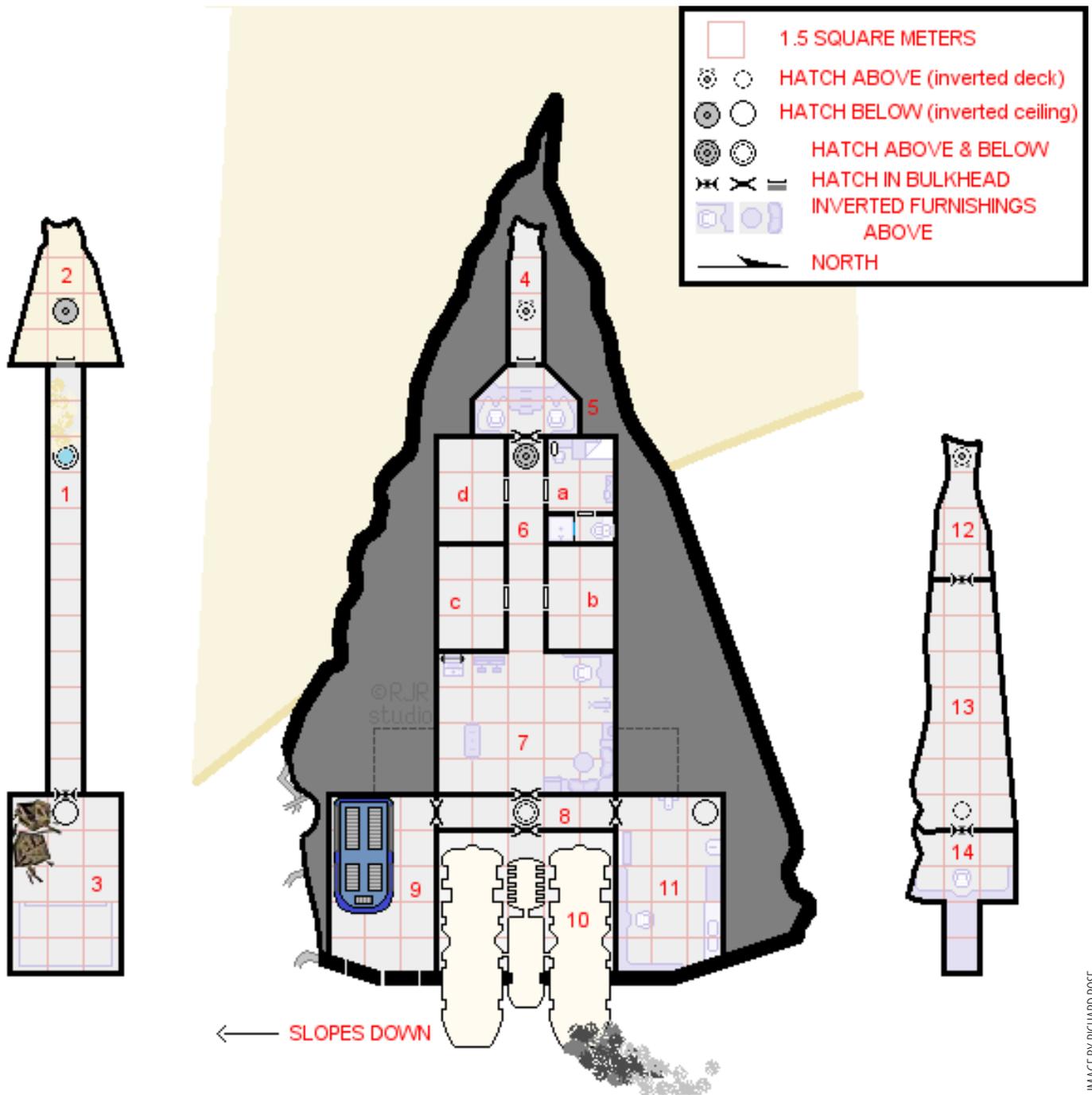


IMAGE BY RICHARD ROSE

side of the intact crate near the bottom edge). If opened, the intact crate contains grain although two gold boxes measuring 1.5m long by 1m wide and 0.5m high can also be found, one of which is broken open. Both have a crude life support device attached, if opened the intact box contains a pair of Xenoslugs (see description at end). The slugs move slowly so the box can be closed/sealed if done so right away, otherwise the slugs will crawl out in one combat turn and will have to be captured or killed accordingly. A hole in the floor (actual ceiling) has some salty residue coating it.

Another similar hole can be found near the ceiling (actual floor) on the port bulkhead.

4) **Avionics** – Although damaged, this area is vacant. If the ceiling hatch (actual floor hatch) is opened, sand from #2 above will flood into the chamber (and into the bridge if the maintenance panel is still open). Characters must throw their DEX or less on 3D to avoid being entrapped. Unaffected characters can free them in two turns, otherwise they must throw their STR or less on 3D to free themselves.

5) **Bridge\*** – Sparks intermittently fly from the panels here, igniting into a fire on

a 1 in 6 chance per turn. An exhausted fire extinguisher is laying on the floor (actual ceiling) and an unused one is secured under the pilot's command chair. The fresh one can be used to extinguish the fire (the extinguisher has 6 charges and will extinguish a fire in 1D combat turns at a rate of one charge per turn). A deceased human male wearing a Hepplewhite, Inc. uniform (equal to cloth armor) is belted into the co-pilot command chair. He has a holstered automatic pistol and two spare magazines on his belt but nothing else of value. If the control panel is investigated an electrician

will learn that the flight recorder is still intact but lacks power.

6) **Crew Cabins** – Cabins “a” through “d” are identical in contents & furnishings. Cabin “a” is the Captain's cabin and the only item of interest is a hand written note that has been slipped under the pillow in the corner, it reads:

[ "This is Captain Parker, I survived the crash landing but regret to report that Hepplewhite employees Butler and Watson are deceased. Potts' whereabouts are still unknown. I saw what appeared to be an outpost 500km to the northeast and will attempt to cross the desert by foot, taking what survival equipment I have stowed aboard. I estimate about 15 days walking time including sleep, although the harsh desert may prolong that venture. I hope to establish contact there and file my final report for this failed mission." ] - quote

Cabin “d” has a laser rifle with a bayonet mount and power pack laying on the floor (actual ceiling). The rifle is damaged but can be repaired by anyone with electronics skill. The power pack is still functional and fully charged. Any character with electronics skill can use the power pack to activate the flight recorder or computer, see the footnote at the end of this key for more information.

7) **Galley & Lounge\*** – Aside from items being tossed about here, this galley and lounge area is vacant save for another deceased human male wearing a Hepplewhite uniform (equal to cloth armor) strapped into the computer command chair. He has nothing of value, but his empty scabbard will clue players into finding his bayonet on the inverted ceiling (this will be easily found if the area is searched). The ship's model 1/bis computer is intact but lacks any power.

8) **Accessway** – A slimy mucus trail on the floor (actual ceiling) leads from near the engine room hatch leading to the port bay, culminating at the wall. Holes in the bulkheads with the same salty residue can be found at each end of the trail.

9) **Vehicle Bay** – The ship's standard open-top air/raft is laying upside down, having broken from its restraints during the crash. It is not serviceable as it simply

weighs too much for the group to lift or flip over.

10) **Engine Room** – Several small fires are smoldering in this area; the entire room is covered in soot. Smoke makes breathing uncomfortable but poses no immediate danger. An extinguisher can be found secured to the fore bulkhead. Although the fires are dying and pose no immediate danger, it can be used to put these fires out (this will utilize the entire contents of this extinguisher). The port maneuver drive has been destroyed internally, if inspected several salt-encrusted holes can be seen along the drive body. Faint “chewing” noises can be heard emanating from within one of the holes, if the access panel is removed it will expose a Xenoslug inside.

11) **Machine Shop & Engineering** – The slime trail from area 8 continues here, leading to the drive monitoring equipment. A Xenoslug is busy chewing into the monitoring equipment and will spark a fire by rolling a 1 on 1D each turn. Unless the party is already carrying one, the nearest extinguisher is in the engine room. Similar to the engine room, an access panel can be removed to expose the Xenoslug.

12) **Attic Crawlspace** – The sole surviving crew member is trapped in this forward accessway. Anyone with mechanical skills can free her with tools from the machine shop (area 11). Allison 'Rinny' Potts (fH, 679786 age:22, 1 term merchant/rank:1, Skills: Admin-1, Body Pistol-1, Computer-1, Steward-1; equipped with Hepplewhite cloth armor/uniform, body pistol, one spare magazine. She has banked 20K Cr to date) is currently unconscious but can be revived easily by anyone with medical knowledge. She will gladly reveal Hepplewhite's intent to smuggle a biological weapon (although she doesn't personally know the nature of the Xenoslugs), and can retrieve info encrypted in the ship's computer if power can be restored to the system.

13) **Attic** – Vacant, although several wall racks and personal lockers can be seen that may have once held equipment, gear, and other such small items. One locker contains a spare Hepplewhite, Inc. uniform that is equivalent to cloth armor.

14) **Dorsal Turret Station** – Vacant, the turret itself has been crushed from the crash and is useless.

\* The flight recorder can be accessed at either location, if powered with the laser power pack or other ingenious means it can be played to reveal the pilot's final report:

"This is detached duty scout ship Ferox captain Grayson Parker, currently under contract with Hepplewhite, Incorporated. Barring a miraculous landing attempt this may be my final log entry. For reasons unknown, the ship depleted its fuel supply and the starboard drive has malfunctioned. I'm running on vapor and the port drive is sputtering. I may not make the starport. Hepplewhite employees Eli Watson and Samuel Butler are currently secured at the bridge and computer stations respectively, however Allison Potts' location is unknown as she is not responding. Our small load of foodstuffs destined for Hepplewhite's corporate office is currently secured in the hold. We have made planetfall and losing altitude more rapidly than I am comfortable with. We anticipate a..." <crackling noises, followed by a ping indicating radio activation> "We just lost the port drive! I can't level her out...I am no longer in control, mayday, mayday, mayday!!! Oasis Starport tower, this is scout ship Ferox requesting emergency clearance, mayday, mayday, mayd..." <crackling followed by a loud impact and silence>.

Unless the party utilizes a different approach, this message will drain 10 charges from the laser power pack on the bridge flight recorder and 30 charges on the main computer (assuming the computer isn't used to locate any other info, such as the cargo manifest which simply reads "dried foodstuffs" which will also drain the same 30 charges...any computer access function, such as Potts' retrieval of the encrypted info, will utilize 30 charges). One alternative power-up method that is available --- enough fuel residue can be siphoned from the tanks to fire up the starboard drive and power plant for 30 minutes, which is more than enough time to obtain all the useful information from the computer. Also, if anyone in the group has a laser power pack

it too can be used for further computer access at the same 30 charge per access rate.



## XENOSLUG

Omnivorous hijacking scavenger, 1m in length. Attacks on 10+, flees on 8+, half speed max movement.

The Xenoslug secretes an acid that allows it to "eat" metal, as such any attacks are bites for 1D damage plus secreted acid (+1D/turn until dissolved, d6 turns to dissolve unless treated). If 8 points of damage are accrued the slug is rendered unconscious, 12 to kill.

Leaves trail of slippery mucus as it slithers, which eventually evaporates over a few hours.

Armor as reflc, if shot with ballistic attacks or stabbed/sliced it will burst with acid (roll DEX @ -2 on 2D to avoid if within 2 meters).

Immune to fire, electricity, and smoke.

## LOCATING CAPTAIN

### PARKER

Assuming the group did not have to make a return trip to the starport, Parker will be easy to find as he hasn't traveled far and the footprints in the sand will make for easy tracking. It will take several hours if travelling by ATV but within an hour by using an air/raft. If the group had to make a return trip prior to tracking down Parker then the wind will have covered the footprints.



IMAGE BY RICHARD ROSE

Parker is moving at a rate of three days per 100km hex and has enough survival equipment for the journey. Assuming the party is in the correct hex for the time frame, they will find Parker on a 1 rolled on 1D for every three hours searching by ATV or every hour by air/raft. Otherwise Parker will arrive at the outpost in 14½ days and can be acquired there (the group will be notified by radio as Parker will immediately put a message through to Oasis Starport after arriving at the outpost).

## GRAYSON PARKER

98AA88

**Age:** 34, 4 term Scout (retired)

**Skills:** Air/Raft-1, Jack of Trades-1, Mechanical-1, Navigation-1, Pilot-1, Shotgun-1 Vacc Suit-1

**Equipment:** cloth armor, shotgun, one spare magazine, compass, medium range communicator, 7 days of preserved food & water (minus one day per day of travel to outpost).

Parker also has a 0.5m x 0.5m x 0.5m silver box with a crude life support device attached, inside is the last Xenoslug that was recovered from the fuel tanks after the crash. Parker will not reveal this to anyone save for a Hepplewhite Inc. representative. See AFTERMATH for more information.

Parker has banked 70K to date and is a registered co-owner of the wrecked detached duty scout/courier "Ferox".

## AFTERMATH

Upon returning with the basic information (crash site and rescued crew) the Hepplewhite representative will pay out the agreed upon reward. If the party managed to retrieve the incriminating evidence and present it to the Starport Authorities, they will receive an additional reward of 20,000Cr (total, not per person)...assuming the Hepplewhite reward was collected prior to presenting the evidence (if the party reports to the authorities first then the representative will be arrested and no reward paid). Furthermore, a

small detachment from the Imperial Navy is present and will immediately arrest the Hepplewhite Inc representative. If a live slug was returned an additional bounty of 50,000Cr will be rewarded to the group.

Captain Parker will attempt to rendezvous with the Hepplewhite representative in private. However, if Potts is permitted to offer testimony against the company, then he will make future attempts at contact after the heat has settled. In the meantime, he will offer to join the party with hopes of eventually making it to a system with a Hepplewhite office so that he may complete his secret mission. Meanwhile, he may try to hire a salvage crew at the starport to transport the Ferox wreckage to the port's repair facilities at negotiated rates and repair can eventually be effected to make the ship spaceworthy again. Grayson will remain cordial with the party as long as he feels they can help him complete his mission.

Allison Potts may also be permitted to join the party for future adventures as she has officially resigned from Hepplewhite, Inc. She has no knowledge of Grayson's involvement with Hepplewhite, she simply believes he was contracted to transport the three Hepplewhite employees and the smuggled cargo with no knowledge of the secret mission. She will continue to harbor a grudge against Hepplewhite. Even though she knowingly participated in an illegal scheme, the consequences have certainly changed her outlook. Unless Grayson's scheme is revealed, she will cooperate with him as well should they continue to work together.



IMAGE BY RICHARD ROSE

# TITAN RISING: 2299

## EPIISODE # 20.0: "FETTERED"

v2.0

MOMENTS AFTER ENTERING THE  
HYPERSPACE JUMP, F.T.L. TECH  
NE'SPIR DISCOVERS SOMETHING  
HAS GONE TERRIBLY WRONG...

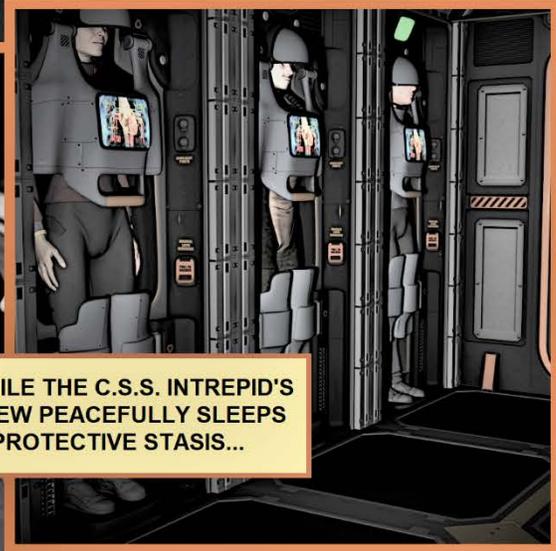
THESE  
INSTRUMENT  
READINGS...



THEY CAN'T  
POSSIBLY BE  
RIGHT.

HOW CAN THE  
SHIP BE STUCK  
IN THE VOID?

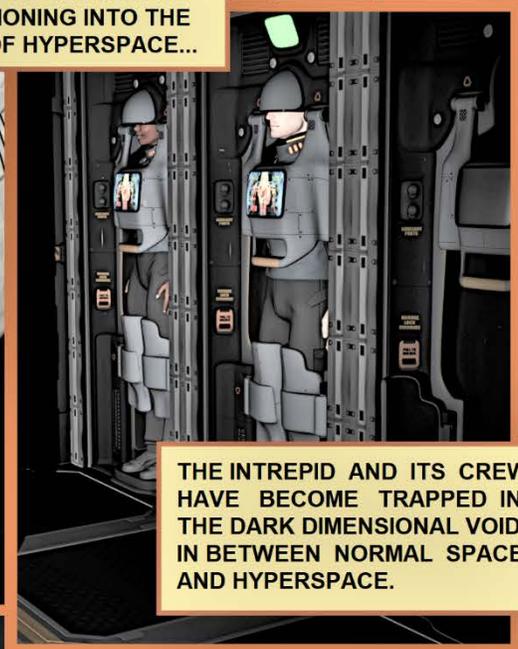
WHILE THE C.S.S. INTREPID'S  
CREW PEACEFULLY SLEEPS  
IN PROTECTIVE STASIS...



NE'SPIR DISCOVERS THAT  
INSTEAD OF SEAMLESSLY  
TRANSITIONING INTO THE  
REALM OF HYPERSPACE...



THE INTREPID AND ITS CREW  
HAVE BECOME TRAPPED IN  
THE DARK DIMENSIONAL VOID  
IN BETWEEN NORMAL SPACE  
AND HYPERSPACE.



MEANWHILE, NEAR THE PLANET ACHILLES ON THE C.S.S. HAMMERFALL...



DENTAK!  
WHERE ARE YOU  
OLD FRIEND?

TIME IS RUNNING  
OUT FOR CAPTAIN  
RACHAEL FLYNN.

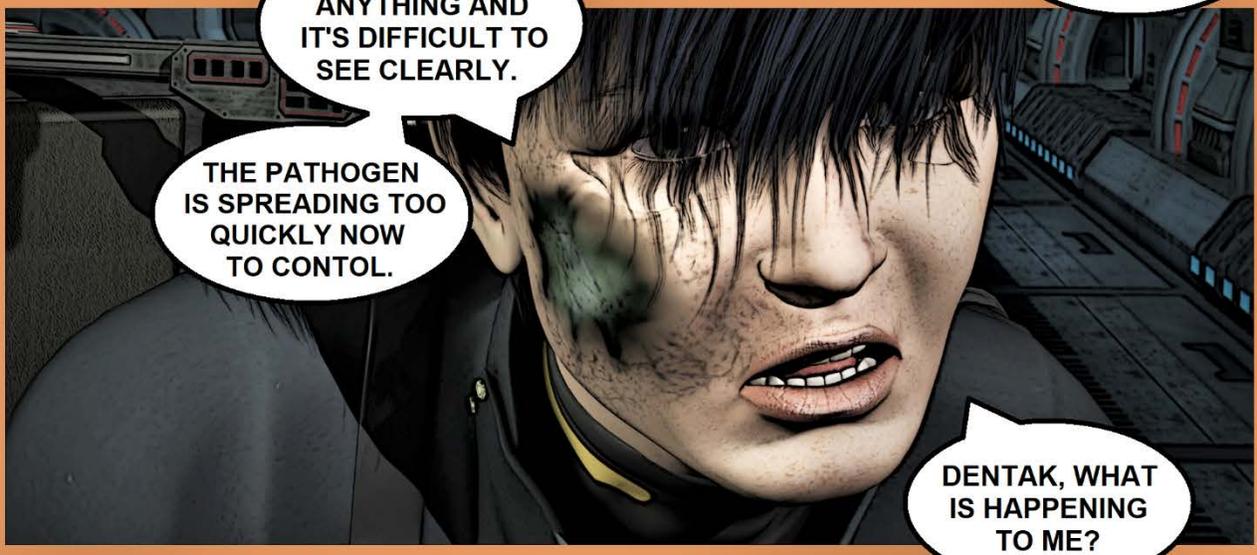


I AM HERE  
CAPTAIN FLYNN...

IT APPEARS  
THAT I'VE ARRIVED  
JUST IN TIME.

I ADMIT YOUR  
AFFLICTION HAS BEEN  
FAR MORE DIFFICULT  
THAN EXPECTED...

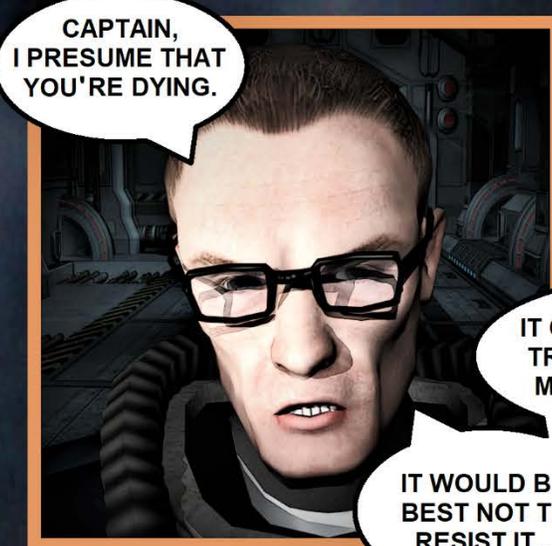
BUT, ENTIRELY  
NECESSARY FOR  
OUR PLAN TO MEET  
WITH SUCCESS.



I CAN'T FEEL  
ANYTHING AND  
IT'S DIFFICULT TO  
SEE CLEARLY.

THE PATHOGEN  
IS SPREADING TOO  
QUICKLY NOW  
TO CONTROL.

DENTAK, WHAT  
IS HAPPENING  
TO ME?



CAPTAIN,  
I PRESUME THAT  
YOU'RE DYING.

IT ONLY MAKES THE  
TRANSFORMATION  
MORE DIFFICULT.

IT WOULD BE  
BEST NOT TO  
RESIST IT...



DAMN IT  
DENTAK!

WE STILL  
NEED MORE  
TIME.

**TO BE CONTINUED...**

# HOW DOES IT WORK?

## COMBAT WITH REMOTE WEAPONS SYSTEMS

BY JOSEPH CABADAS

Remote Weapons Systems (RWS) are weapons platforms that are usually controlled by an onboard computer or can be remote-operated by either a computer using Robot Management programs or a computer operator.

The module “Bugs in the System” offered one such automated weapons turret that the characters needed to overcome. It was equipped with two laser rifles and a grenade launcher and had 120 structure points.

Another example of a remote weapons system is the Sentry Gun, an automated heavy-weapons platform that is often used for perimeter defense.<sup>1</sup> Once the unit is placed into position, it may be specifically set to monitor targets in infrared or optical, depending on the profile of the target. In particular, targets with thermal or visual profiles, respectively.

To prevent the possibility of casualties by means of “friendly fire,” a Sentry Gun’s control unit can be equipped to recognize specific Identification, Friend or Foe (IFF) transponders. When a target enters its sensor range, the RWS will trigger IFF detection, through a coded, radio signal. If the Sentry Gun’s reads are positive, the target will be free to pass; otherwise, the weapon will open fire.

An RWS is limited to levels 2 to 4.

**RWS Chance to-Hit** – An automated remote gun has a basic chance to hit of 30 percent plus 10 times the program’s level (Remote to-Hit = 30% + 10 x Prog Level).

**RWS Initiative Modifier** – A remote weapon system’s IM is its level plus three.

**If Used by an Operator** – A character can also operate a remote weapon system using a computer interface. Generally, the base chance to hit is 30 percent plus 10 times the operator’s skill level (SL) in either Computers: Basic/Access & Operate or Security Systems: Basic/Activate & Operate, or the appropriate weapon skill (Operator to Hit = 30% + 10 x SL).

**Features** – All RWS systems require a power source, a computer link or a control module, and ammunition for its gun.

**Damaging a RWS** – A remote weapons system, such as the sentry gun, has 5 structure points for every kilogram it weighs.

They can be mounted with power screens, one coat of spray armor, or skeinsuit-like armored plates. As with characters, an RWS can only have one energy screen up at any one time.<sup>2</sup>

**Spray Armor on a RWS** – If the RWS is protected by a coat of spray armor, weapons fire must first burn through its 25 points of protection *before* the structure points are damaged.

**Optional: Stunning a RWS** – Whenever an attacker rolls an automatic hit (01-02), the RWS is stunned for 1d10 turns and cannot attack.

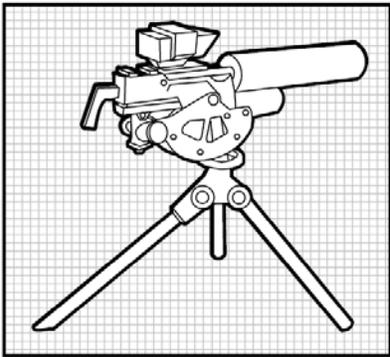


IMAGE BY BILL LOGAN

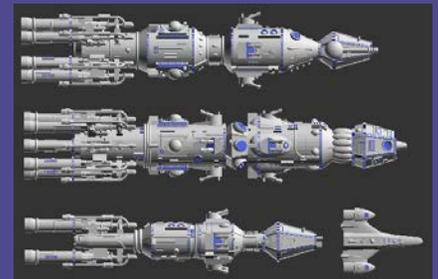
This sentry gun weighs 25 kg and can be assembled in 10 turns. It mounts one heavy weapon, such as a machine gun, heavy laser, sonic devastator or a grenade launcher.

RWS COMBAT TABLE		
RWS LEVEL	TO-HIT	INITIATIVE MODIFIER
2	50%	+5
3	60%	+6
4	70%	+7

<sup>1</sup> Jackson, Madin. “Sentry Guns,” Star Frontiersman Magazine, issue 5, pp. 17-18.

<sup>2</sup> This is a house rule. The Alpha Dawn rules did not provide much information about these weapons.

## STAR FRONTIERS STARSHIP MINIATURES

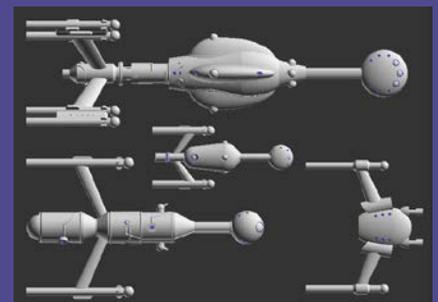


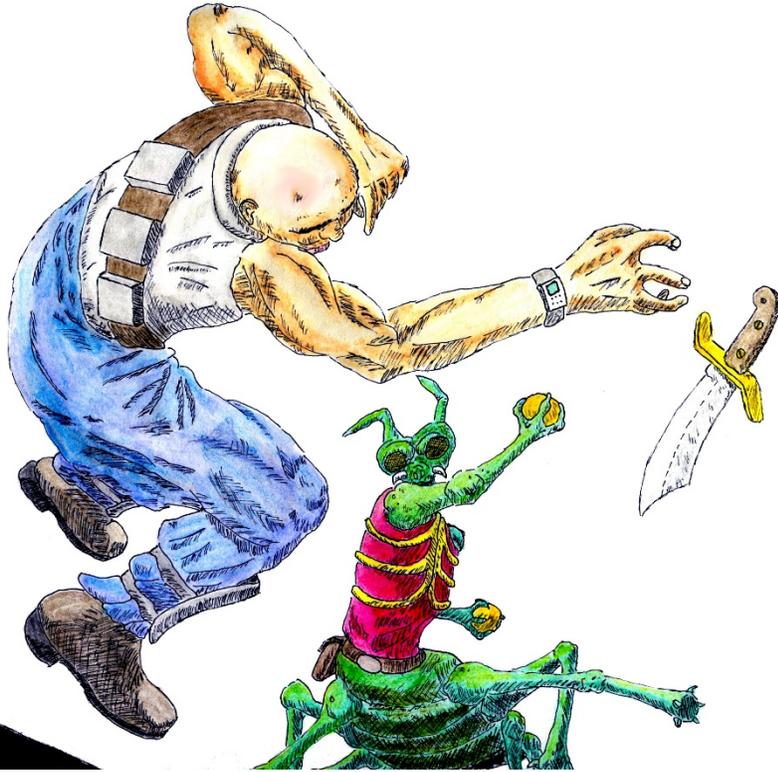
Do you use miniatures in your gaming? Do you like model starships? Do you have the old TSR Star Frontiers ship miniatures but wish TSR had produced miniatures for the rest of the ships in the Sathar and UPF Fleets?

On his [Expanding Frontier blog](#), Tom Stephens has been both reproducing the original TSR miniatures and filling in the gaps by producing models of the ships that didn’t get minis in the original production. He is adding new ships and stations to the line as well.

He is making the model files available for download on [DriveThruRPG](#). The files for the reproduction miniatures are free (or pay-what-you-want) while the new ships and stations have a small cost (typically \$0.99 or \$1.99). These files are great if you just want the model and/or have access to a 3D printer where you can print the miniatures yourself.

If you don’t have access to a 3D printer but would like to have some of the miniatures, old or new, he is also offering a 3D print service through the Expanding Frontier website. You can check out the details of the print service, as well as a price sheet for the individual miniatures, on his [Order Miniatures page](#).





## BRASS BALLS FOR A VRUSK

BY TOM VERREULT

*Zz'n, known as Zen to his shipmates, had been excited to visit the Minzii Marketplace upon his first port of call in the Rim. That excitement had evaporated as his innate comprehension told him that a thuggish looking human was following him with ill intent. On top of that Zen was unarmed.*

*Zen stayed to the main thoroughfares but stopped at a booth hawking vrusk curios. He purchased, without haggling, a pair of brass balls designed to fit a vrusk's hand and turned down a darker path. If there was going to be a confrontation it might as well be on his terms and at least now he was armed with a weapon he knew well from his youth. The city of Triad on Cassidine could be a rough place and this would not be Zen's first street fight. This yahoo was about to get his jaw kissed by a zicker.*

There is a bit of a perception that vrusk are nonviolent pacifists. But this is more of a projected image by the art loving vrusk. Their history is well peppered with periods of violence. One object of violence peculiar to the vrusk is their analog to what humans call brass knuckles but for the vrusk they are called brass balls.

The Zzk'rr, pronounced zicker in Pan Gal, was originally a shaped stone or wood ball and the Terledrom Ancient History

Museum has both wood and stone examples believed to be thousands of years old. They usually have grooves to fit a vrusk's finger digits. The weight added to the vrusk's fist equates to the butt stroke of a rifle stock (use the stats for a rifle butt in combat). Modern examples are made of metal and colloquially referred to as "brass balls" regardless of the metal they are composed of. An idiom of speech, "that vrusk has brass balls", generally means he is aggressive or spoiling for a fight whether he actually possesses a pair of zicker or not.

### METAL ZICKER

Metal balls made of brass or a variety of metal, usually with finger grooves and uses the same combat stats as a rifle butt in combat.

**Cost:** 10 Cr.

**Weight:** N/A

### "CURSED"/ DEFECTIVE ZICKER

This zicker breaks on a critical failure (roll of 96-100) doing 1d10 worth of damage to the vrusk wielder. In addition, all actions with that hand is at the standard pain

penalty whether the vrusk is below half stamina or not.

**Cost:** same as standard zicker

**Weight:** N/A

### "CURSED"/ TRAPPED ZICKER

On any strike doing maximum damage, the zicker cracks open and lets out tangler threads/foam trapped inside sticking the user's hand to the victim's person (roll d10: odd it's the head; even it's the body) it will last the same as a tangler grenade (30 minutes) or until solvaway is applied. This item was invented by a dralasite and that species loves to use this as a practical joke substituting them for ordinary zicker.

**Cost:** 35 Cr.

**Weight:** N/A

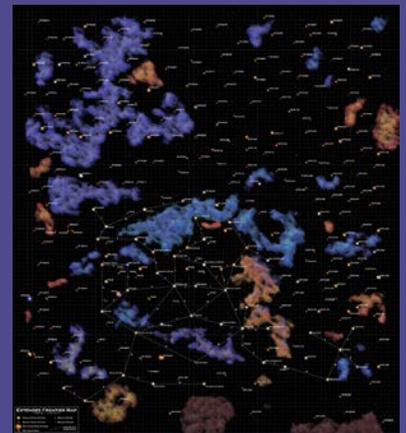
### FINGER LOCKED ZICKER

This is a pair of zicker that comes locked to a belt attachment and is only released by a biometric scan of the vrusk's fingerprints on each hand. This is basically a security and quick draw version – reducing initiative penalties for not having a weapon drawn when combat erupts. The standard penalty for a holstered pistol or slung rifle is 3, but for a finger locked zicker it is just 1. The balls remain firmly attached to the belt attachments until the prime index finger of each hand touches the print sensor embedded in the finger groove of the ball.

**Cost:** 75 Cr.

**Weight:** 1 kg

## EXTENDED FRONTIER MAP



Grab your copy at

<https://expandingfrontier.com/order-an-expanded-frontier-map/>

# THINGS THAT GO BOOM!

## PART 4: MORE EXPLOSIVES IN THE FRONTIER

BY JOSEPH CABADAS

This article continues to look at various demolition explosives that are available in the Frontier.

Please refer back to Part 3: Expanding the Demolition Skill (p 8) for more information - especially concerning how to calculate the blast radius for TNT equivalent explosives and for the discussion about stamina and structure points.

As noted earlier, only someone with a Demolitions skill can buy explosives, which are employed for number of purposes on the Frontier. Explosives are used in mining, oil and gas exploration, demolishing buildings, avalanche control, removal of tree stumps on farmland, along with use in special industrial tools, airbag inflators, and more.

Explosive materials are categorized as either “low explosives” or “high explosives.”

Low explosives, such as black powder, tend to burn (deflagrate) rather than detonate. These materials have little water resistance and are highly flammable. Generally, they do not fragment rock as well as high explosives.

High explosives detonate with a reaction velocity of more than 1,500 meters per second. Real world examples of high explosives include dynamite and TNT. Many have good water resistance, able to withstand exposure to water without deteriorating or losing sensitivity.

Two-compound explosives are products where each separate component is nonexplosive, so they can be easily shipped. But when the components are mixed, it becomes a Class A explosive that must be handled and stored as such, according to the U.S. National Park Service.

### BLAST AREAS

Small explosives such as grenades, small rockets, and recoilless rifle shells have only one blast area, which is about three meters in radius. Characters can make saving

throws to reduce or escape the warhead's effects.

Other munitions including Tornadium D-19 and Type I-III missiles can have a secondary blast radius, which is equal to 1.5 times the radius of the immediate blast area.

Bombs that are larger than 10 kilograms will also have a third blast area, which has a radius equal to 2 times the immediate blast area, and a fourth blast area with a radius that is equal to 4 times the radius of the immediate blast area.

Please see Part 3: Expanding the Demolition Skill (p 8) for more information.

### TNT EQUIVALENCE

Explosives will be rated according to their TNT equivalence. Multiply the number by the weight of the explosive, which will tell you how powerful it is compared to an equal weight of TNT. *This information can be cross-referenced with the “Blast Range to Effects” chart in Part 3 (p ??) to determine the immediate blast radius for large quantities of a specific explosive.*

TNT's energy per gram equals 2,723 joules. By contrast, a bullet traveling at 1,000 feet per second has the equivalent of 40 joules per gram or a 0.015 TNT equivalency (as noted by physics instructor Richard A. Muller in a posting called “*Energy and Power: the physics of explosions.*”)

The mining industry uses a more complicated calculations to determine the TNT equivalent of their explosives when they conduct blasts. These calculations are used to determine safe zones by looking at the heat of the combustion or heat of the explosion as expressed in kilocalories per gram.

### GRUESOME EFFECTS

Most of these rules assume that a character is not holding an explosive or has one strapped to their person, like a suicide terrorist bomber, or is the victim of a criminal

demolitionist who has strapped an explosive collar around a character's neck.

While rolling for damage might produce a low result – say five “1s” on a 5d10 roll for 50 grams of Tornadium D-19 – the referee can rule that the explosion would kill or severely maim a character, up to and including dropping the Stamina score below -30.

Or a referee could decide that a low damage roll meant that the explosive or detonator failed in some way and only injured such a character. (This outcome was suggested by user RKingway on the starfrontiers.us website.)

### WATER RESISTANCE

A Demolition specialist needs to know about the water resistance of the explosive or detonator to be used. A poor water resistance means the product readily degrades when exposed to water. Its primary chemicals may be washed away where it will either not explode or with very little force.

A fair rating means that an explosive or detonator can be used in a wet/humid environment, but will begin to degrade within minutes or hours or days of exposure. A good rating means that the explosive can be used underwater without difficulty.

### FUME CLASS

Many explosives produce fumes. Ideally, this should be water vapor, carbon dioxide, and nitrogen. But a detonation also generates poisonous gases including carbon monoxide and nitrogen oxides. Carbon monoxide damages the brain and central nervous system while nitrogen oxides form nitric acid that damages lung tissue.

In open air work, fumes are not of too much a consequence, but in a confined space, the demolition specialist would need to not only worry about the shockwave produced by any explosion but also

poisonous fumes. In a confined space, the cloud of poison fumes persists for 1d5 turns. Any character who is within the primary or secondary blast radius – or enters the area after the explosion while the toxic cloud persists – will get poisoned.

A character who passes a current Stamina check will not be affected, nor will anyone in a gas mask. A shot of antitox will neutralize the poison so that no further damage is taken.

Explosives are rated from good, to fair, to poor when it comes to its fume class. A fume class of good means the explosive only produces non-toxic vapors.

A fume class of fair means the explosive produces mildly toxic vapors that act as a S2/T4 poison. This type of explosive also produces light smoke that lingers in the blast radius for the duration of the poisonous vapors. Characters who failed their Stamina check will also face a -5 percent modifier on all ability and skill checks for 1d10 turns due to coughing and blurred vision.

A fume class of “poor” would mean that the explosive creates a toxic smoke cloud of vapors that will last 1d10 turns. Any characters breathing in the fumes without the benefits of a filter mask will be poisoned, with the fumes acting as a S3/T6 poison. Additionally, character who failed their skill checks would face a -10 percent modifier on all ability and skill checks for 1d10 turns.

Mining operations often have equipment to ventilate blast areas to disperse or neutralize any toxic clouds.

## SHELF LIFE

The shelf life of various explosives is mentioned in their descriptions. Modern Frontier explosives generally have a recommended shelf life of five Galactic Standard Time (GST) years, though satisfactory performance could be expected for up to four years later.

Obsolete explosives including dynamite would have a recommended shelf life of one year but may be successfully used for two, three, or even four years later. Heat and humidity will greatly degrade an explosive’s capabilities over a fairly short period of time.

## ORIGINS OF BLACK POWDER

Black powder was invented in the 9th century A.D. by Chinese alchemists during the Tang Dynasty. Ironically, they were trying to develop an immortality elixir rather than a substance that would be used to end lives.

One of the few known explosives until the 19th century, black powder is made from sulfur, charcoal, and saltpeter (potassium nitrate). The early ratio of ingredients for black powder was 1 part sulfur, 3 parts charcoal, and 9 parts saltpeter. Later experiments in Europe refined the ratio to 10 percent Sulphur, 15 percent charcoal and 75 percent potassium nitrate.

Knowledge of the formula spread along the Silk Road trade route from China to Europe. Although the Chinese used gunpowder to develop fireworks, due to the scarcity of saltpeter, it was mostly used for military purposes rather than for civil mining or demolition work.

In the early 1400s, black powder may have been used to demolish the walls of a convent in Burgundy, France, to recover stone for construction. This may be one of the first times the explosive was used in a “productive manner,” noted writer Raffaello Vergani in a 2002 research paper called *“The civil uses of gunpowder: demolishing, quarrying, and mining (15th-18th centuries). A reappraisal.”*

Black powder was probably used in mines and even for road work – for military reasons – by the mid-15th century. However, it was still prohibitively expensive for such applications due to the scarcity of saltpeter in Europe.

By the mid-17th century, gunpowder started being used for peaceful reasons. For example, it was used in September 1666 to raze entire neighborhoods of London in order to stop the spread of the “Great Fire.”

As chemists learned how to make potassium nitrate, the use of black powder for mining became more common. It was mostly limited to removing undesirable rocks or for extracting coarse stone and limestone. The blast from black powder fragmented or cracked more desirable materials such as marble.

The development of black powder for shot-holes began in the 1600s. Blasting was used with the much older technique of fire-setting to extract metals such as iron and silver, but it was not customarily used for mining until the first half of the 18th century.

Among the problems with black powder is that it leaves behind a lot of residue, which means that guns need to be cleaned every few shots or so. In the late 1800s, smokeless gunpowders came into use because they burned cleaner and had more power than black powder.

Although black powder became used extensively for railroad construction and tunneling, it was not the best material for this kind of job, noted a New World Encyclopedia entry. As a “low-order explosive,” black powder generates large amount of gases, which is good for shooting projectiles, but it does not generate the shock waves of later explosives such as dynamite and TNT which became the standards for blasting.

In the 19th century a new explosive liquid was discovered – nitroglycerin – and it helped change the world.



## MORE ON GUNPOWDER

The original gunpowder, black powder was used for fireworks and for muzzle-loading weapons. Weapons using black powder also create a cloud of smoke that reduces the shooter's accuracy while also easily revealing the attacker's position.

In the Frontier, black powder is considered to be an antiquated, low-order explosive. It tends to deflagrate (burn violently) rather than detonate. It has little water resistance and is highly flammable. If you are playing a game where the characters find themselves needing to use large quantities of black powder as an explosive, it would be sold in in water-resistant powder horns or flasks for individual shooters. Larger



powder kegs are sold for use with cannons or blasting.

The horns or flasks contain a small amount of powder, which is good for 10 to 15 shots. The flasks could be very utilitarian to very elaborate in design. Mishaps were known where the powder in the flask could explode if exposed to sparks. This mishap could occur when the shooter rolls a "00," which is an automatic miss. An exploding flask would cause 3d10 of fragmentation damage to characters within a 1-meter blast radius.

For cannons, black powder was stored in powder kegs – small casks designed to limit damage from accidental explosions. Some early kegs were 8.75 inches tall and 6.5 inches in diameter, carrying 50 pounds, while larger kegs were 13 inches

tall by 11 inches in diameter, with 100 pounds of powder.

Powder kegs had strappings made of reed or sapling wood instead of metal bands in order to reduce the chance of sparks, which might ignite the powder.

Exposure to fire, electricity, or a misfire explosion (a roll of "00") will cause black powder to explode. A single keg that explodes in this manner deals 5d10 points of fire damage to anyone within a 3-meter primary blast radius. Characters can make a Reaction Speed check for half damage. (This rule is based on a posting on gunpowder kegs on [www.dndbeyond.com](http://www.dndbeyond.com).)

The secondary blast radius is out to five meters, objects and characters take 2d10 points of fire damage; characters can make an RS check to avoid damage all together.

If another powder keg is within the primary blast radius, there is a 40 percent chance that it will ignite in a sympathetic explosion, which may set up a chain reaction of other powder kegs (if they are close by) exploding. For each exploding powder keg, add 25 points of fire damage and 1d5 turns to any fire.

If the keg explodes in an area with other flammable materials – such as on a wooden ship – it may start an uncontrollable blaze.

Blasting powder kegs for use in mining or quarrying were often larger than the kegs for shipping and storing powder for firearms. Black powder was used for early hand grenades (see *A Look at Grenades in Star Frontiers* – issue 26 p.15).

The amount of black powder used by a muzzle-loading cannon depended upon its size and technological level. For example, a British 68 pound naval cannon would use a 16 pound charge, but it could take 25 pounds of powder. A French 12 pound artillery piece would use a 4 pound charge for 1,000 yards of range. A U.S. Civil War 12 pound howitzer used only 1 pound of black powder and had a 600 yard range.

Setting fire to an ounce of gunpowder causes it to flare for 1 round, shedding bright light in a 10-meter radius and dim light for an additional 10-meters.

**TNT Equivalence:** 0.4

**Water Resistance:** Poor

**Fume Class:** Poor

**Shelf Life:** 1 GST years



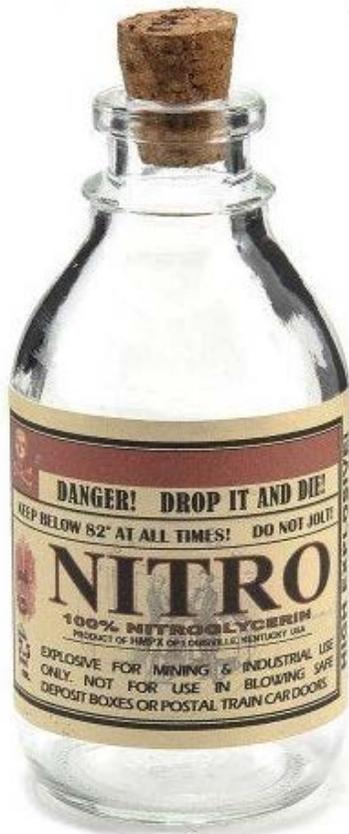
## CREATION OF NITROGLYCERIN

Although used in modern times as a heart medication, nitroglycerin was invented in 1847 in Turin, Italy, by student chemist Ascanio Sobrero who was working under Théophile-Jules Pelouze. Adding glycerol to a mixture of nitric and sulfuric acids.

Sobrero placed a minute quantity of the colorless liquid on his tongue and discovered it had a sweet, burning taste. It also gave him a terrible headache. In another experiment, Sobrero heated a drop of the liquid in a test tube. It exploded, spraying glass fragments everywhere.

Scarred on his face and hands from the explosion, Sobrero called the liquid "pyroglycerine" and warned that it was far too dangerous to be of any practical use (according to an article on the history of nitroglycerin by N. Marsh and A. March that was published in April 2000 by the U.S. National Library of Medicine, National Institutes of Health). By 1851 another student, Alfred Nobel, had begun studying chemistry under Pelouze.

Recognizing the potential of nitroglycerin for demolitions – it has about eight times the explosive power of a similar quantity of black powder – Nobel went on to manufacture it for various uses, including tunneling and mining.



With the molecular formula  $C_3H_5(ONO_2)_3$ , nitroglycerin is composed of 18.5 percent nitrogen and contains enough oxygen to oxidize the carbon and hydrogen atoms during an explosion. The detonation of nitroglycerin generates gases that would occupy more than 1,200 times the its original volume while raising temperature to about 5,000 degrees Celsius (9,000 degrees Fahrenheit), notes the Encyclopedia Britannica.

It is extremely unstable and dangerous. The slightest jolt, shock, or bump can cause it to explode.

“The overall effect is the instantaneous development of a pressure of 20,000 atmospheres; the resulting detonation wave moves at approximately 7,700 meters per second – more than 17,000 miles per hour,” Encyclopedia Britannica continued. “Nitroglycerin is extremely sensitive to shock and to rapid heating; it begins to decompose at 50–60 degrees Celsius (122–140 degrees Fahrenheit) and explodes at 218 degrees Celsius (424 degrees Fahrenheit).”

Nitroglycerin can be frozen at 5-10 degrees Celsius, which “desensitizes” it, making it safer to handle. But if thawed too

rapidly, it becomes extremely sensitive to shocks.

For use in construction, companies employed a chemist on-site to mix up a batch of nitroglycerin because transporting it was dangerous. Lighting a fuse to set the explosive off was also dangerous. To mitigate some of that danger, Nobel created a blasting cap with black powder that would allow miners to trigger it from a safe distance rather than trying to jiggle a bottle with a rope or using open flames from fuses or matches.

The liquid’s instability led to a number of catastrophes, including a September 1864 explosion that killed Nobel’s younger brother, Emil, as he was fulfilling a nitroglycerin order for a railroad company. Several countries banned the use of nitroglycerin, but Alfred Nobel undertook a number of experiments to mix it with various inert materials in order to stabilize it, leading to the creation of dynamite.

## NITROGLYCERIN IN GAME USE

Although glyceryl trinitrate is a medicine that eases cardiac pain, pure nitroglycerin is rapidly absorbed through the skin. It results in a marked fall in blood pressure and a violent throbbing headache. Treat it as a S2/T6 poison. A character would than receive a -10 percent penalty for all skill and ability checks for 10 hours. These effects ordinarily are not dangerous but are exceedingly uncomfortable.

If a character should drink nitroglycerin, a fatal dose is about 2 grams. It would act as a S3T30! poison. It could be neutralized with a dose of antitox. A character who passes a Stamina check would take half damage.

Smaller quantities would still be poisonous (this is not the heart medication after all), though might not be fatal. It is up to the referee to determine what would happen though in Humans it would produce a sudden blinding headache – giving the affected character a -15 modifier for all skill and ability checks for 3d10 minutes.

A 100 milliliter amount of nitroglycerin would cause a 4d10 point explosion (STA or half SP), damaging anything within a 1 meter radius. For each additional 100 milliliters, increase the damage by 10 points,

extend the primary blast radius by 1 meter and add a secondary blast radius.

At 1 liter, a nitroglycerin explosion would have a primary blast ring of 10 meters, a secondary ring at 15 meters, and would do 4d10 + 90 points of damage. For every additional 500 milliliters up to 10 liters (10 kilograms) – add 10 points of damage and extend the primary blast radius by 2 meter, adjusting the secondary blast ring accordingly to a maximum of 4d10 + 400 points of damage and a primary blast radius of 300 meters.

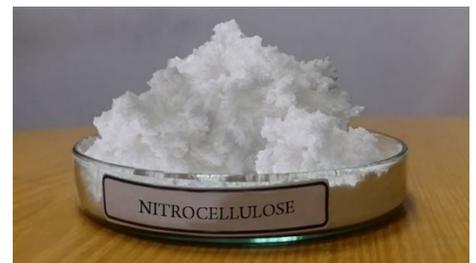
**TNT Equivalence:** 0.8

**Water Resistance:** Poor

**Fume Class:** Poor

**Shelf Life:** 1 GST years

## GUNCOTTON



Discovered by German chemist Christian Schönbein in 1846 during an accident, guncotton or nitrocellulose is a mild explosive that has been used in rockets, propellants but also for printing ink bases, leather finishing and other uses.

An antiquated explosive in the Frontier, guncotton is made with ordinary cotton that is treated with concentrated nitric and sulfuric acids. It ignites easily and was adopted by the military as a replacement for gunpowder. During World War I it was used in torpedo warheads, some grenades, and as a blasting explosive to destroy bridges.

If guncotton ignites, treat it as a 4d10 flaming explosive per 250 grams with a primary blast radius of 3 meters and a secondary blast radius of 5 meters. It causes half-damage to structures and will burn out within a turn. For each additional 250 grams, add 20 points of damage and extend the primary blast radius by 1 meter and adjust the secondary blast radius accordingly.

**TNT Equivalence:** 0.5

**Water Resistance:** Poor

**Fume Class:** Fair  
**Shelf Life:** 1 GST years

## CREATING DYNAMITE

Known as a "high-order explosive" or "high explosive," dynamite is a fairly stable. It requires an additional charge of high-temperature, high-pressure gases with an accompanying shockwave traveling at the speed of sound to before it will detonate.

For example, it can be dropped or even burned in a fire without exploding. Its drawbacks include: obsolete styles of dynamite would freeze at low temperatures and would not detonate. It would have a recommended shelf life of about a year.

The invention of dynamite came about by accident as Nobel's company added different absorbent materials, including sawdust, to nitroglycerin to make it more stable for transport. He found that mixing diatomaceous earth – which mostly contains silica from fossilized plankton – with nitroglycerin created a stable paste that could be shaped and detonated upon command.

Patenting his invention in 1867, Nobel called it dynamite after the Greek word for power, which is *dynamis*. A typical stick of dynamite is about 8 inches long, 1.25 inches in diameter and weighs about three ounces. It is normally set off using a blasting cap, which itself is about as powerful as an M-80 firecracker.

An open air blast of dynamite is not as powerful as a placed charge because the blast force emanates outward in a spherical shockwave. Its power drops off as the cube root of the distance, so at 3 meters the explosion is one-eighth the strength it is at 1 meter.

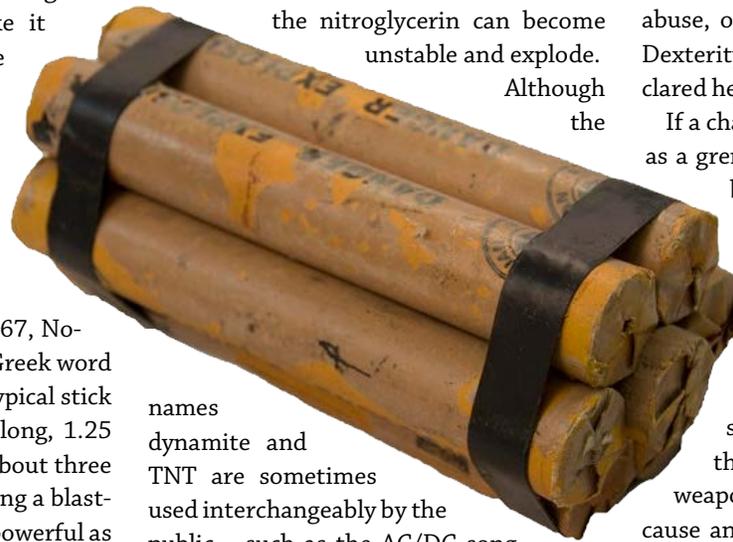


Far safer than nitroglycerin, dynamite can be dropped or when lit on fire it will only burn, because it needs the additional charge to create an intense explosion. As a high-order explosive, dynamite detonates when it is hit with a high-temperature, high-pressure shockwave traveling at about the speed of sound, which breaks down the material, noted author Philippe Dozolme in a 2018 article on "Explosives Used in Mining" that was published on the website The Balance ([www.the-balance.com](http://www.the-balance.com)).

Depending upon how it was made, older types of dynamite could freeze and would not explode unless thawed. As dynamite ages, it begins to weep nitroglycerin, which can crystalize on the outside of the stick or pool at the bottom of a storage container. In this condition, if the material is jarred,

the nitroglycerin can become unstable and explode.

Although the



names dynamite and TNT are sometimes used interchangeably by the public – such as the AC/DC song "T.N.T." – these explosives are not the same.

## GAME USE OF DYNAMITE

Dynamite prefers to be stored in a cool, humidity-controlled environment, while a hot and humid environment would cause it to degrade faster. Older dynamite tends to weep nitroglycerine which can pool at the bottom of a container or even crystalize on the sticks, making them extremely dangerous to use. For this reason, they are banned on a number of Frontier worlds as an obsolete explosive.

In the real world, there are several types of dynamite including ammonium dynamite, gelatin dynamite (which improves water resistance), or

a semi-gelatin dynamite that combines ammonium gelatin and ammonium dynamite for less strength but a good water resistance and fume class.

For ease of conversion, a Frontier stick of dynamite – which might be made on less developed worlds – it would weigh 200 grams. Various detonators can be used to cause it to explode, including lighting a simple fuse. Typical fuses are 12 seconds (two combat turns) long or even up to several minutes.

A character can cut the fuse, requiring a Dexterity check, to shorten it to one combat turn so it would be similar to a grenade. If the skill check fails, when the stick is used, there is a 50 percent chance it is too short, and will blow up "in the user's face, or too long and will explode on the second turn. In order to prevent player abuse, only have the character make the Dexterity check on the turn he has declared he has lit the fuse and is throwing it!

If a character throws a stick of dynamite as a grenade, it will cause 2d10 points of blast damage to characters and structures within a 1 meter blast radius and half damage out to a 2 meter secondary blast radius. If used as a set charge, it causes 25 points of structural damage.

A character could wrap several sticks of dynamite together, up to three, to be used as a thrown weapon. Each additional stick would cause an added 15 points of damage and extend the primary and secondary blast radii by 1 meter.

For larger explosions, it is possible to wire several sticks of dynamite together. Each stick will either extend the primary and secondary blast areas by 1 meter or add 20 points of damage. The effect of each stick depends upon the Demolition specialist's choice, requiring a successful Setting Charges check.

If a character attempts to use old dynamite – where nitroglycerin has clearly begun to weep from the stick – he must pass a Dexterity check to avoid an accidental explosion.

**TNT Equivalence:** 1.0

**Water Resistance:** Poor to Fair

**Fume Class:** Poor to Fair

**Shelf Life:** 1-2 GST years

# THE DYE THAT EXPLODES

Originally produced as a canary yellow dye in 1862 by German chemist Julius Wilbrand, the compound 2,4,6-Trinitrotoluen (TNT) was not recognized as an explosive until the 1890s. Manufacturers realized that it was toxic. The skin of workers exposed to TNT would turn bright yellow-orange. Other health ailments included blood, liver, spleen, and immune system problems.

As an explosive, TNT is more stable than dynamite. It can be melted and then poured into containers, but will not explode without the use of a detonator. The Germans would use this new explosive to great effect at the beginning of World War I, though soon the Allies learned how to make it.

During the Battle of Liège in August 1914, during the opening engagement of the German invasion into Belgium – the first battle of the war – “the world at large became acquainted with a new and powerful military explosive whose cabalistic symbol, T.N.T., acquired a horrifying worldwide significance almost overnight,” noted a 1917 article in the *Engineering and Mining Journal*.

Fairly easy to manufacture, TNT was a relatively safe explosive that could be used for controlled demolitions. Although an equivalent stick of TNT is not quite as powerful as dynamite, it soon became the standard measure for bombs and other explosives.

A large mining and excavation site might use approximately 4,000 pounds (1,823.4 kilograms) of dynamite to complete a single blast for a “two ton explosion.” Later nuclear weapons are measured in megatons – the equivalent to a billion or more sticks of TNT.

## GAME USE OF TNT

A high-order explosive, TNT requiring a blasting cap – or another high explosive event such as other sticks of TNT – before it will detonate. Although the recommended shelf life is about a year, TNT can actually last indefinitely.

TNT has not been used for industrial purposes in the United States since the 1990s due to the toxic by-products of TNT

explosions. A Frontier stick of TNT would weigh 200 grams with five sticks equaling 1 kilogram.

If a character throws a stick of TNT as a grenade, it will cause 2d10 points of blast damage to characters and structures within a 1 meter blast radius and half damage out to a 2 meter secondary blast area. If used as a set charge, it causes 25 points of structural damage.

A character could wrap several sticks of TNT together, up to three, to be used as a thrown weapon. Each additional stick would cause an added 15 points of damage and extend the primary and secondary blast areas by 1 meter.

For larger explosions, it is possible to wire several sticks of TNT together. Each stick will either extend the primary and secondary blast areas by 1 meter or add 20 points of damage. The effect of each stick depends upon the Demolition specialist's choice, requiring a successful Setting Charges check.

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 2-4 GST years

## PLASTIC EXPLOSIVES

Another invention by Nobel was gelignite, which was the first plastic explosive. Invented in 1875, gelignite could be molded into various shapes without detonating.

The military soon put plastic explosives – often abbreviated as PE – to work to destroy doors and bridges. British Special Forces used it extensively during sabotage missions in Nazi-occupied France during World War II.

Also during the war, the chemical RDX (cyclotrimethylene trinitramine) was mixed with TNT to create the bouncing bombs dropped on German hydroelectric dams in Operation Chastise. Later, RDX became the basis for the development of the Composition C family of plastic explosives including C-4 PE.

Molded into any desired shape, C4 can be pressed into gaps, cracks, holes and voids in buildings, bridges, equipment or machinery, noted *Military.com*. A very stable explosive, it cannot be detonated by a gunshot or by dropping it.

C4 will not explode when set on fire or exposed to microwave radiation. “Detonation can only be initiated by a combination of extreme heat and a shockwave, such as when a detonator inserted into it is fired,” *Military.com* reported.

## SHAPED CHARGES

Shaped charges were first created by Max von Förster in 1883 by focusing the blast energy in a single direction by the use of a conical liner.

During a normal explosion, the blast force radiates evenly outward from the detonation point.

“In a shaped charge, the front of the explosive is lined with an inward-facing copper cone that turns into a high-velocity jet stream upon detonation,” according to an April 2015 article by Jacky Chia that was published on British website *DefenceTalk.com*. “This superheated stream of molten copper possesses enough kinetic energy to pierce conventional tank armor as thick as 203mm.”

## USE OF C4/SEMTEX

An early plastic explosive, C4 blocks resemble slabs of wax. Hard and translucent when cold, these explosives warm up when kneaded, and then can be coaxed to take various shapes.

On the Frontier, C4 would be sold in 1 kilogram blocks. An “open air” blast would cause 10d10 + 50 points of damage to characters, animals, robots, etc., but only half-damage to structures. A set charge will do 150 structure points. A block of C4 has a primary blast radius of 2 meters and a secondary blast radius of 3 meters – half-damage to characters and one-fourth damage to structures.

For each block of C4 added, it will do an additional 50 points of damage in an open air blast while a set charge will do an additional 50 SP worth of damage. The primary blast radius increases by 1 meter per block added; adjust the secondary blast radius accordingly.

**TNT Equivalence:** 1.2

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 1-2 years

# AMMONIUM NITRATE/FUEL OIL (ANFO)

Originating in the 1950s, ANFO is one of the most widely used bulk industrial blasting agents in modern-day North America. ANFO explosives come as a dry blasting agent, which has poor water resistance, but also as a slurry, which has good water resistance, or as an emulsion, which has excellent water resistance.

Often used for mining, it is a low-cost explosive that is easy to produce, store, and transport. Consisting of 94 percent ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ) and 6 percent fuel oil, it typically requires a detonator to set it off.

Powdered ANFO has poor water resistance. Water will cause the blasting agent to dissolve. Water exposure results in the explosive agent either having very little energy or preventing a detonation from occurring at all, noted writers Anthony Konya and Calvin J. Konya in an article called “*Blasting mechanics revisited: Characteristics of explosives*,” that was published on March 20, 2019 in the publication Pit & Quarry.

Since ammonium nitrate is a common fertilizer, ANFO products have often been called “fertilizer bombs.” A kilogram of ANFO will cause 10d10 points of damage in an open air blast, or 50 structure points when placed with a primary blast radius of 3 meters and a secondary blast radius of 5 meters. Each additional kilogram will cause another 25 Stamina points or 10 structure points in an open air blast or 20 structure points when placed.

The primary blast radius will extend by 1 meter for every 2 kilograms of ANFO

used; adjust the secondary blast radius accordingly. As with other explosives, this damage and blast range progression does begin to decline with distance.

**TNT Equivalence:** 0.8

**Water Resistance:** Powdered, Poor; Slurry, Good; Emulsion, Excellent

**Fume Class:** Good.

**Shelf Life:** 1-2 years

## DETONATING CORD

Also called “det cord” or primer cord or sun cord, is an explosive in a rope-like form. Technically, det cord doesn’t explode—but it burns so fast – nearly 8,000 meters per second – which means it might as well be exploding.

Normally it used to string multiple explosive charges together for simultaneous detonation while using only a single detonator. Det cord can be looped around a tree or post or other object to cut it neatly in half.

Requiring a detonator to set it off, detonating cord is sold in 10-, 20- and 50-meter lengths. A length of det cord can be spread out. When ignited, it will cause 1d10 points of damage to objects within a 1 meter radius. It can be doubled up and will cause an additional 1d10 points of damage up to a maximum of 4d10 points.

When used as a precision cutting charge, det cord will cause 15 points of STA or SP damage per meter used. It will have a “blast radius” of 1 meter from the cord.

**TNT Equivalence:** N/A

**Water Resistance:** Good

**Fume Class:** Poor to Fair

**Shelf Life:** 1-2 years

## FIRELINE EXPLOSIVE

Fireline is a specially developed version of det cord containing explosive powder. It is used to create a fire line by blowing up small trees and brush. It will create a 6-meter wide break while also throwing a layer of dust over nearby foliage.

When ignited, it will cause 3d10 + 15 points of damage to characters, creatures, and foliage within 3-meters to either side of the cord. It will cause half damage to structures.

Fireline comes in 25-, 50- and 100-meter lengths and can be doubled up, causing an additional 2d10 points of damage per 2-meter length. The line can be wrapped around large trees to cut them in half.

**TNT Equivalence:** N/A

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 1-2 years

## STANDARD FRONTIER DEMOLITIONS

The three most common demolitions available to characters include Tornadium D-19 (TD-19), sometimes called kaboomite, a special shaped charge called Tornadium D-20 (TD-20), and Plastid. But other explosive materials could include black powder – which is the original gunpowder – as well as chemicals such as nitroglycerin or current explosives including dynamite and TNT.

### TORNADIUM D-19

Tornadium D-19 (“kaboomite”) is the standard plastic explosive in the Frontier. It is very stable and it can be shaped into different contours, burned as firewood, dropped repeatedly, or even exposed to high levels of radiation without exploding.

Normally it requires the use of a detonator to set it off, though a character with a Demolitions skill might be able to devise a way to set it off with a high-powered laser or another unusual method. If the expert hits the charge with a laser, it explodes, noted the Alpha Dawn Expanded Game rulebook.

A 50-gram charge of TD-19 will cause 5d10 points of damage (STA or SP) to anyone and anything within 1 meter of the explosion. For each additional 50 grams of TD-19 – up to 500 grams or 10 charges – the damage level increases by 25 points (STA or SP).

Most of the explosive power of TD-19 is focused at the point of detonation. A secondary blast radius begins to expand by 1



meter per every 100 grams used. For example, with a 100-gram TD-19 explosion, there will be a primary blast radius of 1 meter where anyone or anything takes full damage, and a secondary blast radius from 1-2 meters where targets take half damage.

For example, when a character sets a 500-gram charge, it will do 5d10 + 225 points of damage in the immediate blast area – a 1 –meter radius. Its secondary blast area is from 1-6 meters where characters and items will take half damage.

A 1-kilogram charge of kaboomite will do 5d10 + 475 points within the 1-meter radius immediate blast area; the secondary blast area extends out to 10 meters. After that, until the charge reaches the 10-kilogram range, the immediate blast area will extend 1 meter for every 2 kilograms of TD-19 used, but the secondary blast area does not change.

So, when a 2-kilogram charge is used, the immediate blast radius is 2 meters; a 4-kilogram charge will have a 3-meter immediate blast radius; a 6-kilogram charge will have a 4-meter immediate blast radius; and an 8-kilogram charge will have a 5-meter immediate blast radius.

A Demolition specialist can create hand-bombs out of charges of TD-19 and an appropriate detonator. A character can throw up to 250 grams of kaboomite, though at a -5 percent penalty for charges from 100-150 grams and a -10 percent penalty for 200-250 grams. The throwing penalty occurs because the charge will be unbalanced unlike a grenade. A thrown charge does full damage to living creatures, but only one-half damage to structures.

Characters could, of course, heave larger loads of explosives (or rocks, stones, etc.) at a target, though no rules exist in the Alpha Dawn Expanded rules for that possibility. The distance one could heave a larger load is shorter than the throwing distance and would be based on the weight of a charge and the strength of a character.

**TNT Equivalence:** 4.0

**Water Resistance:** Good

**Fume Class:** Good

**Shelf Life:** 5 GST years

## TORNADIUM D-20

TD-20 is a modified version of TD-19. Using federanium strips, it is constructed in pre-made shaped charges.

TD-20 does 3d10 points of STA damage (double that amount for structures) for a 50-gram charge. For every additional 50 grams, it does an additional 15 points of STA damage or 30 structural points to vehicles, buildings and other structures.

The explosive is sold in set shapes – usually to shape the blast in a 15-, 30-, 45- or 90-degree cone – and weights so a Demolition specialist cannot reshape it. At the base of the charges is a thin plastic disc; once this covering is peeled away, its sticky base can be attached to almost anything.

As a shaped charge, TD-20 only explodes in only one direction. Thus, with a small explosion of less than 1 kilogram, the user can remain one meter away from the explosion and suffer no damage whatsoever. A cone of TD-20 is perfect to attach to walls, floors, doors, etc. and blow an entry into another room.

If anyone is foolish enough to try to throw a charge of TD-20 as a weapon, use the Area Effect Weapon Miss Diagram to determine the direction of the blast.

A thrown TD-20 charge inflicts only half its normal damage to bio-forms and structures. *The blast range is identical* to that of TD-19. As the charges get progressively larger, it does take more explosive to increase the damage. It is also recommended that the setter moves much further away than 1 meter with charges that are more than 1 kilogram because the concussive force of the explosion.

TD-19 and TD-20 use the same detonation devices.

Demolition specialists have used TD-20 to create improvised claymore mines. This is done by propping the explosive up. Instead of attaching the sticky base to a wall or structure, it faces outward. A bag, or pouch, or some other container – that holds ball bearings, nails, broken glass or the like – is then attached to the sticky base.

### DAMAGE PROGRESSION OF TORNADIUM D-19

Grams Used	Initial Damage	Damage Additive	1st Blast Area	2nd Blast Area
50	5d10	0	1 meter	N/A
100	5d10	25	1 meter	N/A
150	5d10	50	1 meter	N/A
200	5d10	75	1 meter	2 meters
250	5d10	100	1 meter	2 meters
300	5d10	125	1 meter	3 meters
350	5d10	150	1 meter	3 meters
400	5d10	175	1 meter	4 meters
450	5d10	200	1 meter	4 meters
500	5d10	225	1 meter	5 meters
550	5d10	250	1 meter	5 meters
600	5d10	275	1 meter	6 meters
650	5d10	300	1 meter	6 meters
700	5d10	325	1 meter	7 meters
750	5d10	350	1 meter	7 meters
800	5d10	375	1 meter	8 meters
850	5d10	400	1 meter	8 meters
900	5d10	425	1 meter	9 meters
950	5d10	450	1 meter	9 meters
1000	5d10	475	1 meter	10 meters

An explosion of TD-20 will then fling the shrapnel out to double the blast range. It will cause an additional 8d10 points of damage to targets within the blast cone. The chance to-hit is equal to Demolition setter's skill level and is modified by cover, target size, target speed, etc. Roll separately for each target to see if it is hit and separately for any resulting damage.

**TNT Equivalence:** 4.0

**Water Resistance:** Good

**Fume Class:** Good

**Shelf Life:** 5 GST years

## PLASTID

Stabilized plastic acid is illegal on most planets. Only highly placed Star Lawmen and powerful crooks have access to it. It usually comes in a plastic or ceramic alloy wrap and is shaped like thick spaghetti. One hundred grams of plastid applied to a lock and ignited will melt the lock in one turn (five turns for heavy duty locks).

Plastid must be applied directly to the material it is to melt; it cannot be thrown.

Plastid only affects plastics and metals. Special detonators that use acidic chemical reactions are required to activate a plastid charge. Plastics or metals that have been laminated with glass or ceramics are not affected by plastid.

Determinations of quantities needed for large-scale melting are left to the discretion of the referee.

**TNT Equivalence:** N/A

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 3 GST years

## FUSES AND DETONATORS

A detonator – or blasting cap – is needed to bring about the complete detonation of blasting explosives. They are an explosive themselves, doing 1d10 points of damage if used alone. Blasting caps should be stored separately from explosives and are not inserted into the main explosive charge until it is time to use them. Most detonators are chemically, mechanically, or electronically initiated.

## VARIABLE TIMER/DETONATOR

One of the most common detonators is the variable timer. It can be set for 1 to 60 seconds, 1 to 60 minutes or 1 to 60 hours.

**Water Resistance:** Good

**Fume Class:** Good

**Shelf Life:** 5 years

## ACID DETONATOR CAP

Acid detonator caps are normally used to detonate plastid; however, they can be fitted into detonation devices in place of normal blasting caps.

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 1-2 years

## CHEMICAL DETONATOR

Chemical detonators are used when the Demolition specialist wishes the explosion to coincide with an influx of unusual quantities of liquids or gas. For instance, a chemical detonator can be set to explode if it gets wet, if too much oxygen gets into the air or a room, etc.

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 5 years.

## COUNTER DETONATOR ATTACHMENT

This tiny counter is inserted between the explosive and its detonator. It is preset to cause detonation once it is triggered a set number of times.

For example, a counter attachment is set between 50 grams of TD-19 and its pressure-sensitive whip wire detonator. The bomb is placed behind a door in such a fashion that each time the door opens, the whip wire is triggered.

The counter is set at 10. The first nine times the door opens, the whip wire is triggered and the counter records it. The tenth time the door opens, the bomb explodes.

**Water Resistance:** Good

**Fume Class:** N/A

**Shelf Life:** 5 years

## LIGHT DETONATOR

Light detonators are larger than other types, about the size of a small human fist. These detonators are sensitive to light intensity and they can be set to detonate an explosive when a light is turned on in a

room, when sunrise or dusk occurs, when a flash grenade explodes, when it detect ultraviolet light at a specific wavelength, etc.

**Water Resistance:** Good

**Fume Class:** Good

**Shelf Life:** 5 years.

## PRESSURE DETONATOR

Pressure detonators contain either a small plate, a button, or a whip wire (or trip wire) that is set to key an explosion when a certain pressure is either exerted or released.

For example, a pressure detonator whip wire affixed next to a door will detonate its charge when the door is opened. Or a pressure detonator placed under a dead Sathar body will trigger the explosive when the body is moved, etc.

**Water Resistance:** Good

**Fume Class:** Good

**Shelf Life:** 5 years

## RADIO BEAM DETONATORS

As noted in the Alpha Dawn rules, the chance to explode a charge with a radio beam (RB) detonator is 10 percent less than normal.

### BASIC RB

Instead of using Det Cord, a radio beam detonator can link up to a total of 10 charges within a 100 meter radius of the primary charge. It can receive a radio beam from a signaling device, which comes with the detonator when purchased. The charges can be fired off all at once or sequentially.

**Water Resistance:** Good.

**Fume Class:** Good.

**Shelf Life:** 10 years.

### MID-RANGE RB

Similar to the basic model, the mid-range radio beam detonator can link up to 20 charges within a 500 meter radius. It is sensitive enough to detect the detonation signal from up to 5 kilometers away.

**Water Resistance:** Good.

**Fume Class:** Good.

**Shelf Life:** 15 years.

### ADVANCED RB

The advanced model can link up to 20 charges within a 500 meter radius. On a planet, it can accept a signal from a

EXPLOSIVES AND EQUIPMENT	COST (CR)	WEIGHT (KG)
Tornadium D-19	50	1
Tornadium D-20	100	1
Plastid	500	1
Powder Horn, basic	2*	1
Powder Horn, ornate	20*	1
Powder Keg, 5 pounds	10	5**
Powder Keg, 50 pounds	20	32**
Powder Keg, 100 pounds	40	65**
Nitroglycerin (gallon)		
Guncotton	50	10
Dynamite, per stick	4	0.2
Dynamite, box of 12	40	1.5***
TNT, per stick	5	0.2
TNT, box of 12	50	1.5***
Ammonium Nitrate/Fuel Oil, powdered, sack	50	10
ANFO, Slurry	60	10
ANFO, Emulsion	70	10
C4/Semtex	40	1
Detonating Cord, 10-meters	10	0.5
Det Cord, 20-meters	15	1
Det Cord, 50-meters	30	2.5
Fireline, 25-meters	60	6
Fireline, 50-meters	120	12
Fireline, 100-meters	240	24

\*The price assumes this is a Frontier reproduction. Antique powder horns/flasks may be much more expensive. The price does not include black powder.

\*\*The weight given includes a full load of black powder plus the weight of the storage barrel.

\*\*\*Includes the weight of the storage container.

radiophone, 500 kilometers away. Or, in space, it can receive a signal from a space-ship communication system from 100,000 kilometers away.

**Water Resistance:** Good.

**Fume Class:** Good.

**Shelf Life:** 20 years.

### RADIO BEAM SIGNALING DEVICES

The basic signaling device for a radio beam detonator only has a 100-meter range. Another option is a chronocom-based signaling device has a 5 kilometer range. The advanced signaling device has a 500 kilometer range.

Note, radio beams can be jammed, preventing the proper signal from going to a detonator.

### VOID DETONATOR

Triggered by the transition from normal space into the Void (or vice versa), this is the type of detonator that is often used by Sathar agents, pirates, or terrorists. It can be combined with the counter attachment to initiate an explosion after a set number of transitions into or out of the Void.

The first known use of a void detonator occurred in 9 FY when the PGS Henry Bacon, a Pan Galactic Corporation freighter, suffered an explosion in its lower cargo hold as it was exiting the Void at Dixon's Star. The blast nearly broke the ship in two and left the Bacon drifting through the system at just below jump speed. Fortunately a Spacefleet frigate UPFS Kristna

was transitioning through the system on its way to Truane's Star and happened to be nearby.

The rescue of the Bacon's crew took nearly four weeks of harrowing acceleration and course adjustments by the Kristna. During its time the Bacon was adrift, the crew did manage to recover evidence in the wreckage that Star Law later identified as a Void detonator.

Although highly illegal to possess in the Frontier, pirates and domestic terrorist organizations soon learned to make their own versions of the Sathar device. They might combine them with a Variable Timer/Detonator, setting it to trigger a bomb after a certain number of hours following a ship's exit from the Void.

**Water Resistance:** Good

**Fume Class:** Good

**Shelf Life:** 20 years.

## ANTIQUATED FUSES AND DETONATORS

### MINERS SAFETY FUSE

Invented in 1831 by Alfred Nobel's company, this fuse consists of a rope that includes a strand of yarn infused with black powder. The detonator is a metal shell containing a wooden plug of black powder placed in a charge of liquid nitroglycerin. These may have a fuse time of two minutes or more, depending upon the length of rope.

Assume it has a 15 percent failure rate; so even if the Demolition specialist makes a successful roll to set a charge, the referee will need to determine if the fuse and detonator actually go off as planned. The charge may go off prematurely, very late, or not at all.

**Water Resistance:** Poor

**Fume Class:** Poor

**Shelf Life:** 2-6 months

### MERCURY BLASTING CAP

Invented by Nobel, the mercury blasting cap is highly sensitive to friction and heat. Relatively inexpensive, it is still used in the mining industry in developing countries. Assume it has a failure rate of 2 percent,

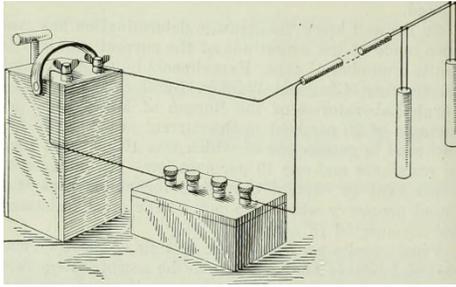
which the referee would need to make a check for separately.

**Water Resistance:** Good

**Fume Class:** Poor

**Shelf Life:** 6 months -1 year

## EARLY BLASTING MACHINES



This is the “plunger-style” detonator often seen in the Looney Tunes cartoons or on the TV show Hogan’s Heroes. It is basically a wooden box containing a high voltage magneto. Pushing down on the plunger spins the magneto, which generates the electricity needed to set off the blasting cap that in turn initiates the detonation of an explosive. The blasting machine needs to be connected to the explosive by a length of wire.

**Water Resistance:** Fair

**Fume Class:** N/A.

**Shelf Life:** indefinite

## SWITCH AND PUSH-BUTTON BLASTING MACHINES

Modern blasting machines are battery powered. The Demolition specialist uses a push button or a key-style switch to activate it. The blasting machine must be connected by wires to the explosive. It would have the equivalent of a 20 SEU battery pack and uses 1 SEU per use.

**Water Resistance:** Good

**Fume Class:** N/A

**Shelf Life:** Indefinite.

## SLOW MATCH FUSE

Using hemp or cotton rope that has been saturated with an oxidizer, the slow match fuse presents only a small glowing tip. It is suitable for black powder weapons because it can be roughly handled without being extinguished.

**Water Resistance:** Poor

**Fume Class:** Fair

**Shelf Life:** 1 year

FUSES AND DETONATORS	COST (CR)	WEIGHT (KG)
Variable Timer/Detonator	5	--
Acid Detonator Cap	10	--
Chemical Detonator	15	--
Counter Detonator Attachment	10	--
Light Detonator	15	--
Pressure Detonator	10	--
Radio Beam Detonator (Basic)	10	--
Radio Beam Detonator (Mid-Range).	20	--
Radio Beam Detonator (Advanced).	30	--
Radio Beam Basic Signaler	10	--
Chronocom Beam Signaler	20	--
Radiophone Beam Signaler	50	1
Void Detonator	500*	0.5
Miners Safety Fuse, set of 20	10	2
Mercury Blasting Cap, set of 20	5	--
Old-Fashioned Blasting Machines	50**	5
Switch and Push-Button Blasting Machines	40	1
Slow Match Fuse, set of 50	10	0.5
Black Match Fuse, set of 50	10	0.5
Quick Match Fuse, set of 10	50	2
Safety Fuse, set of 20	20	0.5

\*This is the approximate black market price for a Void Detonator. The actual cost to make one is about 100 Credits.  
 \*\*This is the price of a reproduction. An actual antique blasting machine would be considerably higher.

## BLACK MATCH FUSE

This fuse has a cotton string that is coated with a dried slurry of black powder and glue. It was used to fire ancient cannons.

**Water Resistance:** Poor

**Fume Class:** Poor

**Shelf Life:** 6 months

## QUICK MATCH FUSE

A type of black powder fuse, the quick match burns at hundreds of meters per second. Professional fireworks displays use this type of fuse to set off widely separated devices almost instantaneously.

**Water Resistance:** Good

**Fume Class:** Fair

**Shelf Life:** 6 months to 1 year

## SAFETY FUSE

Waterproofed, the safety fuse has an inner core of black powder and can burn underwater. With an outer wrapping of textile or

plastic, it will not have an exposed external flame. This will prevent the fuse from igniting methane or other gases that are sometimes found in mines or industrial areas. Each 30-centimeter section will burn for 60 seconds.

**Water Resistance:** Good

**Fume Class:** Fair

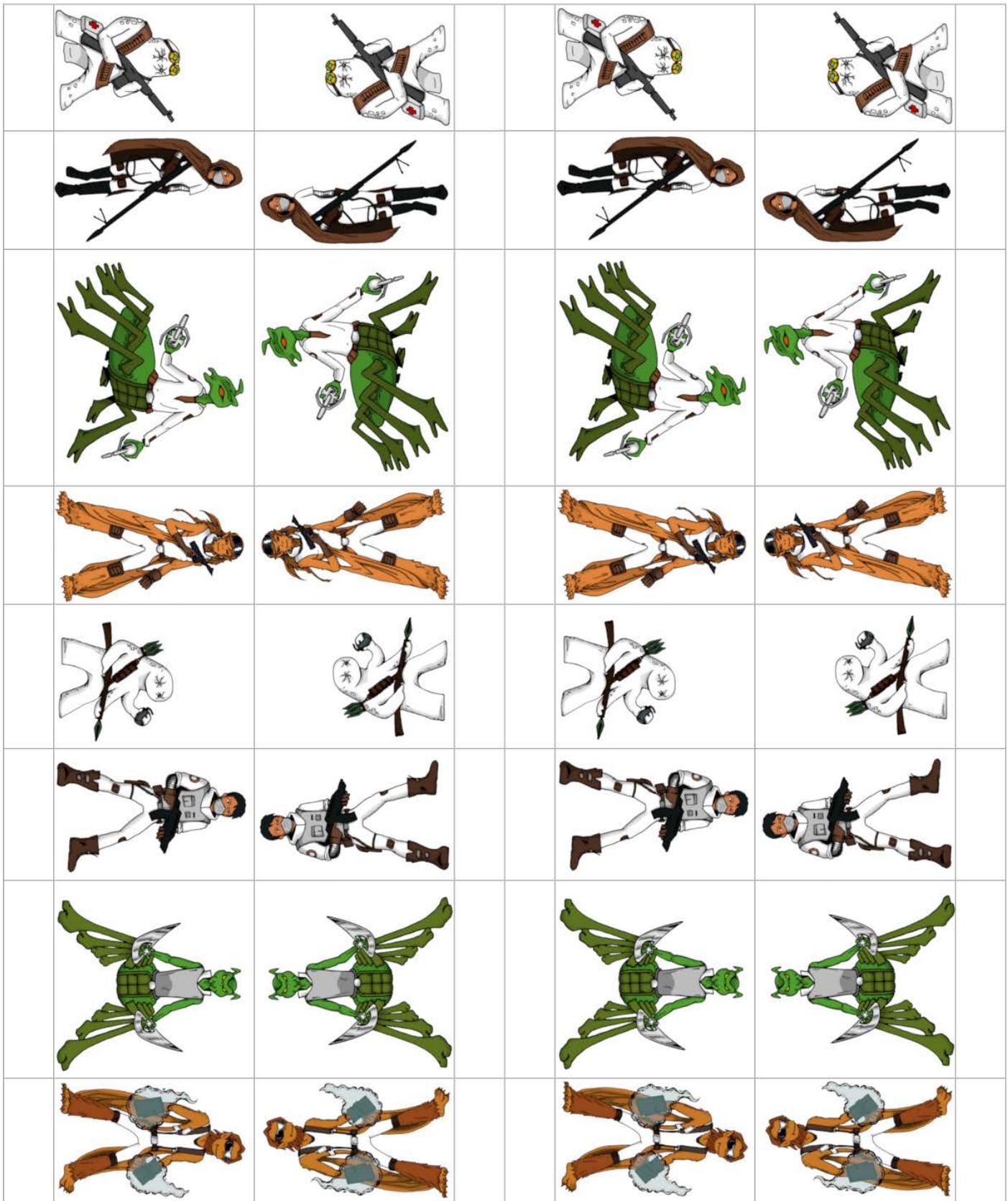
**Shelf Life:** 6 months to 1 year

## CONCLUSION

There are many other types of explosives that have been developed over the years and would be available on the Frontier. This article just provides sampling of what is available even by today’s standards.

# PLAYER CHARACTER COLOR MINIS

BY BRIAN PHONGLUANGTHAM



To use these paper miniatures, just print them on cardstock or heavy paper, cut

them out, fold, and you are ready to use them in your games. They complement

the sathar characters Brian created for issue 25.

**THE**  
**ESCAPE**  
**PLAN**  
EPISODE #8  
... "FRYING PAN"



YOU CAN'T  
BE SERIOUS?



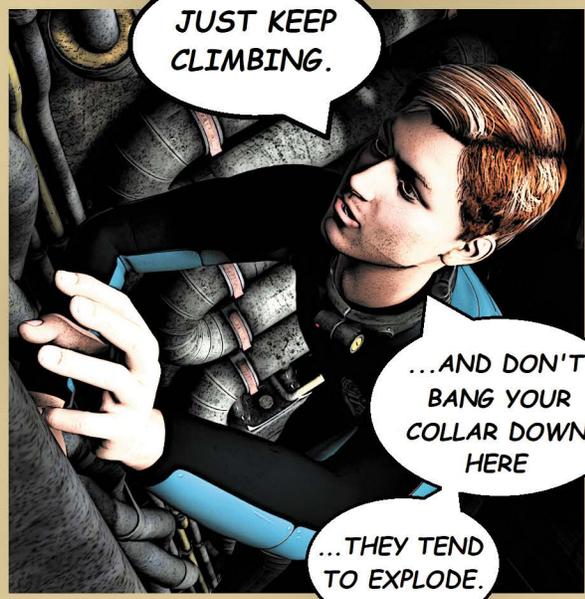
THAT IS  
CORRECT...

YOU WANT ME  
TO CLIMB UP THIS  
DARK MAINTENANCE  
SHAFT WITH YOU?

UNLESS YOU CAN  
MAGICALLY TELEPORT,  
THIS IS THE ONLY  
SAFE WAY TO THE  
HANGAR.



BUDDY,  
YOU REALLY  
HAVE NO IDEA.



JUST KEEP  
CLIMBING.

...AND DON'T  
BANG YOUR  
COLLAR DOWN  
HERE

...THEY TEND  
TO EXPLODE.

