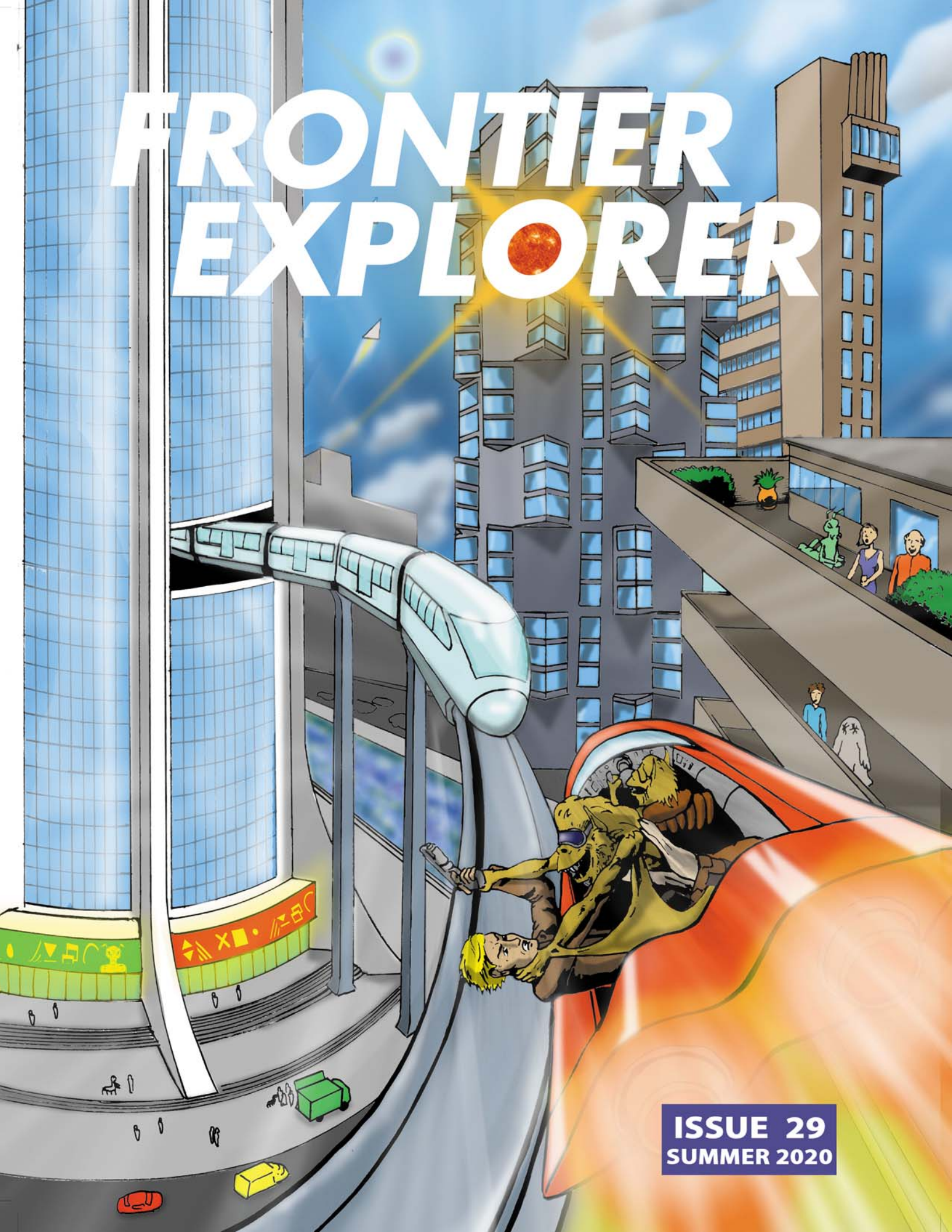
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SUMMER 2020

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SECTION

FEATURES

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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 roleplaying 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.

All the old issues of the fan magazines, as well as print-on-demand versions of the Frontier Explorer can be found at **the Frontier Explorer page**. These products are offered as pay-what-you-want. You can grab them for free, but this provides a way for you to make a donation to help support the magazines if you so desire.

Wizards of the Coast offers the Star Frontiers rules and modules on their **Star Frontiers page**.

FrontierSpace products can be found on the **DWD Studios page**.

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LETTER FROM THE EDITOR

Hello Explorers!

Welcome to issue 29 of the Frontier Explorer.

We kick off the issue with a new ship by a new author, Shawn Starky, detailing a small hull size 4 freighter.

In this issue we are also introducing a new series, "An Alternate Frontier," by another new author, Richard "GreyMyst" Farris. The first article, Electrochemical Slugthrowers, looks basic projectile weapons and provides a variety of new models. Future articles will look at other weapons and develop his version of an alternate Frontier.

We again have two more installments of the "Things that go Boom!" series, which should wrap up with a final article next issue. This time we're looking at dropped ordinance – bombs.

We round out the issue with our usual comics, another article from Jurak Hangna, a look at the Battle of Zebulon, a book review, and a new bit of equipment from the Minzi Marketplace.

I'll have to admit, I really struggled getting this issue out. I don't know if it was a subconscious reaction to the ongoing world events, a bit of burnout, or just general fatigue, but instead of starting the editing in early June, didn't get started until almost the end of the month. Which is why the issue is a bit later than usual. Hopefully things will get better by the next issue.

The RPG industry lost a great artist at the end of June with the passing of Jim Holloway on Jun 28th. More well-known in the wider RPG community for his D&D art as well as the art in Paranoia and BattleTech, Jim also contributed a significant amount of art for Star Frontiers, including art in the original rules, some of the early Voltrunus modues, and the art in the Knight Hawks rules and Warriors of White module. If you look closely at the image of the Osprey, you'll see that it is piloted by one J. Holloway. Thanks Jim for your vision of the Frontier.

Our community continues go grow with our Facbook group adding nearly 200 new members in the last three months. There have also been several Star Frontiers games started that I've seen mentioned on social media as well as the Second Sathar War game that I've started playing in. It's been a good three months for the game.

That's all for now. Sit back, settle in, and enjoy this issue of the Frontier Explorer. And as always, keep exploring.

- Tom Stephens
Senior Editor

IMAGE BY JIM HOLLOWAY

THE PAH'THAS – HULL SIZE 4 FREIGHTER

BY SHAWN STARKY

Editor's Note: We start out this issue with a set of deck plans for the Pah'Thas, a hull size 4 freighter. While Shawn provided the deck-plans and an exterior view of the ship, it is left as an exercise to the reader to determine what game statistics to use based on the system you are using for your game.

DECK DESCRIPTIONS

The contents of the various decks described correspond to the plans on the following pages.

DECK 1 - BRIDGE

1. ASTROGATION
- Astrogation
- Exterior Cameras, Sensors
- Communications

2. PILOT
- Cameras, Sensors
- Communications
- Assault Rockets

3. CO-PILOT
- Exterior Cameras, Sensors
- Communications
- Assault Rockets

4. OPS/TACTICAL
- Exterior Cameras, Sensors
- Communications
- Laser Battery Override

EQUIPMENT A
- VideoCom Hardware
- Bridge Primary Computer
- Astrogation Hardware

EQUIPMENT B
- Subspace Radio
- Intercom and Internal Cameras
- Exterior Cameras

DECK 2 - CREW DECK

1. GALLEY
- Sink
- Cooking Equipment
- Dishwasher
- Cabinets

2. PANTRY
- Dry Goods

3. RESTROOM

4. DINING TABLE

5. EXERCISE AREA

6. LOUNGE/ENTERTAINMENT

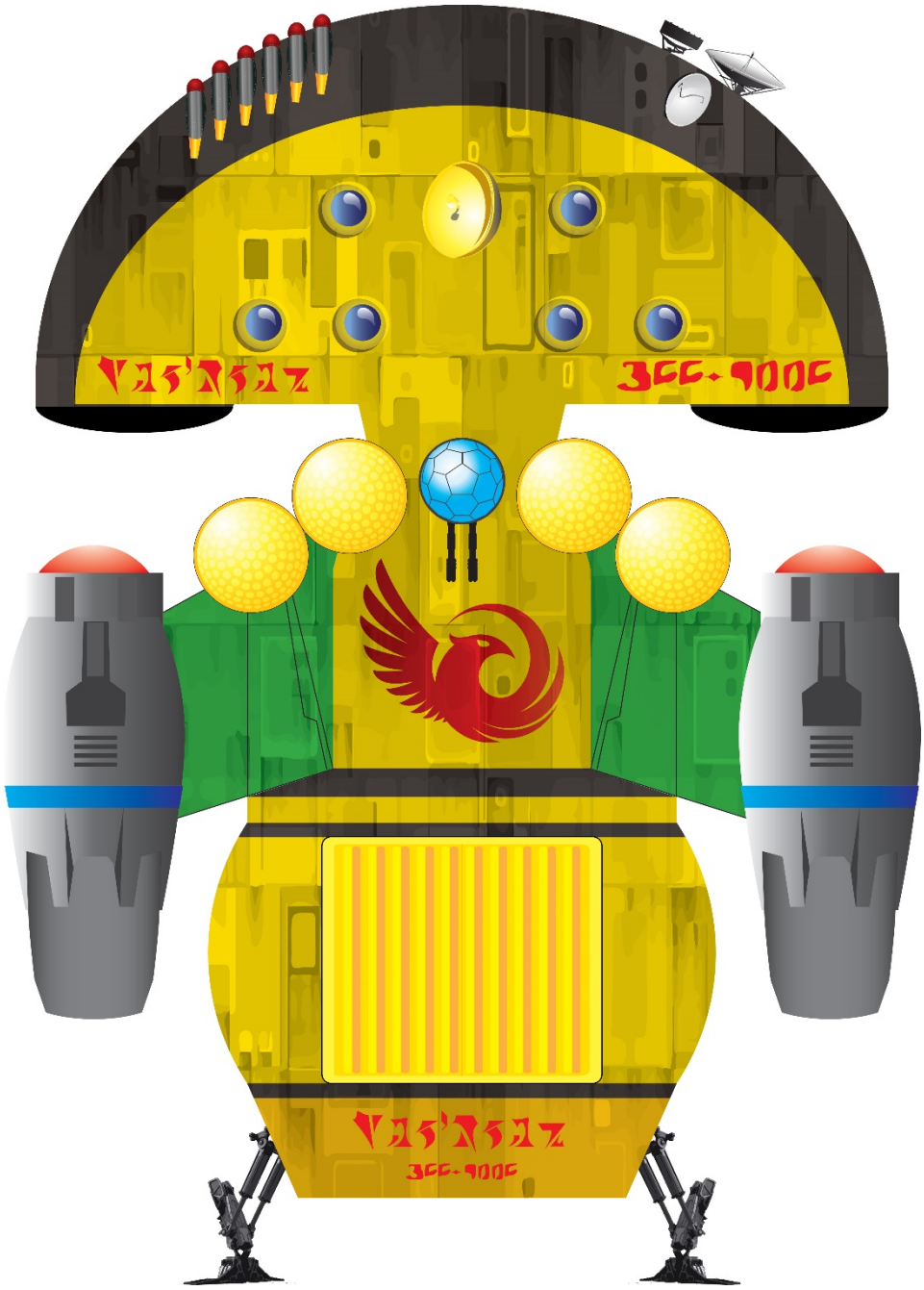
7. AIRLOCK

8. SALLY PORT
- Spacesuit Locker
- Tools/Equipment Locker

9. MEDICAL BAY

Fully equipped medical bay and surgical suite

EQUIPMENT A
- Refrigeration



EQUIPMENT B
Freezer

EQUIPMENT C
Life Support Decks 1, 2

DECK 3 - CREW QUARTERS

1. CAPTAIN'S QUARTERS
Shower with steam

2. 1st OFFICER'S QUARTERS
Shower with steam

3. 1st CLASS GUEST QUARTERS
Shower with steam

4. 2nd CLASS GUEST QUARTERS
Shower with steam

5. CREW QUARTERS
Equipped for double bunk
Shower with steam

6. LOUNGE

ESCAPE PODS
Capacity up to: 1 Vrusk, 1 Osakar, 2 Humans, 2 Yazarians, 2 Hummas, 3 Ifshnits, or 3 Dralasites or combinations thereof.

EQUIPMENT A
Escape pod/decoy ejection equipment

EQUIPMENT B
Life Support Deck 3

DECK 4 - GUNNERY DECK

1. BEAM BATTERY MANUAL CONTROLS
Can act as ejectable capsule in emergency

EQUIPMENT A
Atmosphere tanks

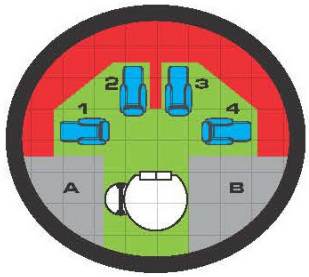
EQUIPMENT B
WNB, Radar, Energy Sensors, Skin Sensors

EQUIPMENT C
Atmosphere & Water Circulation Pumps

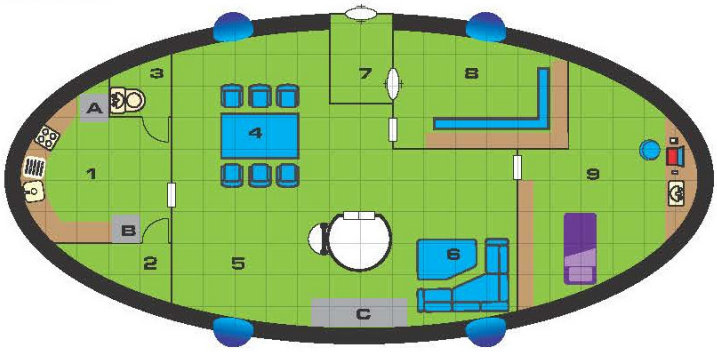
DECK 5 - MAIN ENGINEERING

1. ENGINEERING STATION
Monitor/Control Engine Function
Port/Starboard
Engineering Computer Access

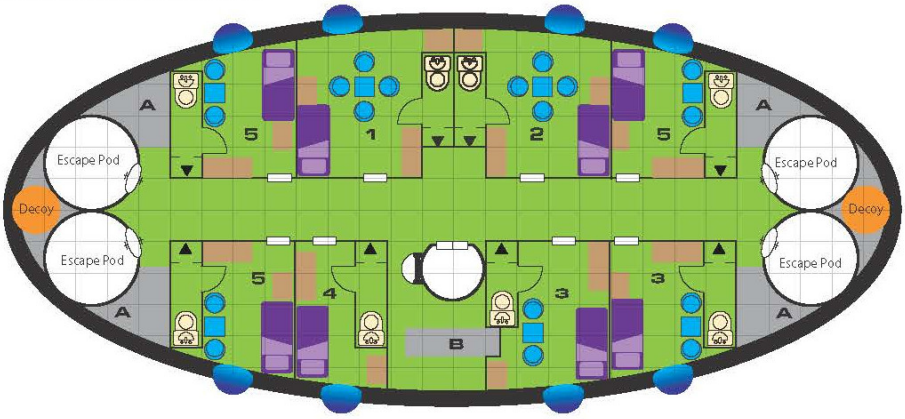
Deck 1 - Bridge



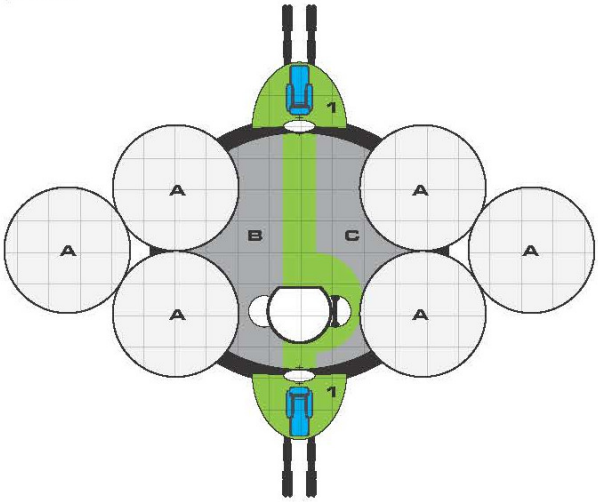
Deck 2 - Crew Deck



Deck 3 - Crew Quarters



Deck 4 - Gunnery Deck



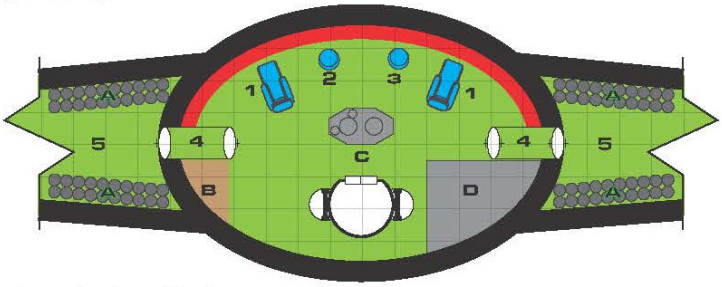
2. AUXILIARY BRIDGE CONTROL
Helm, Tactical

3. AUXILIARY BRIDGE CONTROL
Astrogation, Operations

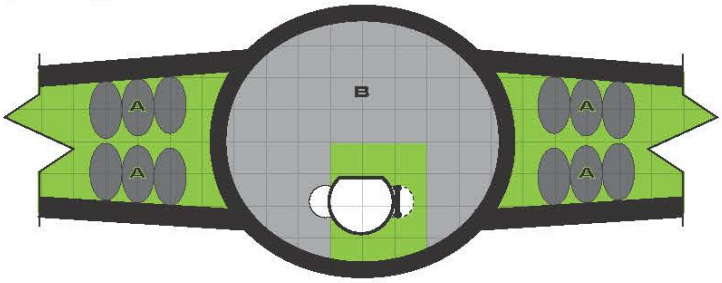
4. AIRLOCK TO ENGINE ACCESS
Port/Starboard

5. ACCESS TUBE TO ENGINES
Port/Starboard

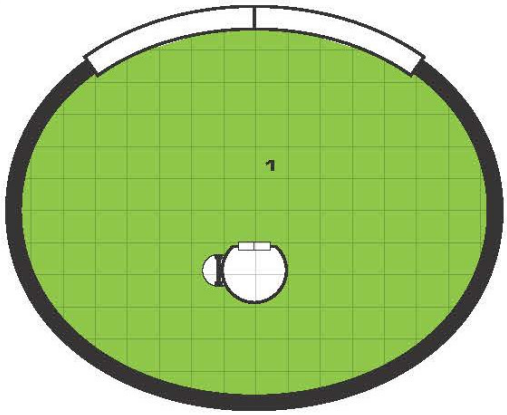
Deck 5 - Engineering



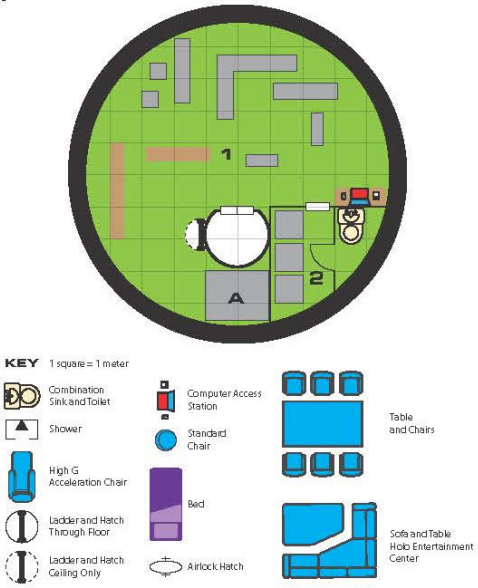
Deck 6 - Engineering Low Deck



Deck 7 - Cargo Hold



Deck 8 - Machine Shop



EQUIPMENT A

Batteries

EQUIPMENT B

Engineering Suit Locker

EQUIPMENT C

Power Converter/Transformer

EQUIPMENT D

Computer Mainframe, Decks 4-8 Life Support

DECK 6 - ENGINEERING LOW BAY

EQUIPMENT A

Deuterium Storage Tanks

EQUIPMENT B

Deuterium Controls
Bussard Controls

DECK 7 - CARGO HOLD

1. CARGO HOLD

SUGGESTED CARGO EQUIPMENT

1 Motorized utility vehicle
1 All terrain quadricycle
4 Bikes
2 Forklift Suits

DECK 8 - MECHANICAL DECK

1. MACHINE SHOP

CNC Lathe
Milling Machine
Grinders
Electrical Discharge Equipment
Electronic Diagnostic Equipment
Welding Equipment
Heat Treatment
Saws
Drill Press
Hand Tools
Parts Storage

2. SHIP'S LAUNDRY

Washer/Dryer
Dry Clean

EQUIPMENT A

Lift Equipment

THINGS THAT GO BOOM!

PART 7: LOOKING AT DROPPED WEAPONS

BY JOSEPH CABADAS

Vehicle weapons including bombs were first introduced in the article "Tanks a Lot!" by Alex Curylo in issue 99 of *Dragon Magazine*.

While Star Frontiers is not a war game, say like BattleTech or Dawn Patrol, there were certainly efforts by the folks at TSR to create some sort of game mechanics for dealing with vehicle combat. The module "Mission to Alcazzar" featured explorers with weapons while the player characters could toy around with an alien hovertank in "Sundown on Starmist."

While Curylo's article dealt with modifying civilian vehicles to carry weapons. This idea was expanded upon in the April 1987 issue of Dragon with an article by Matt Bandy called "Here Comes the Cavalry!" Brandy expanded upon the universe of SF vehicles with hover vehicles including a hovertank, an armored personnel carrier (APC), and a heavily armored vehicle called a "battlewagon." Other vehicles in that article included a ground tank and ground APC, an attack helicopter plus a VTOL fighter-bomber.

This article will not address the ins and outs of vehicle combat. Rather it will look at what kinds of damage explosive bombs will do to vehicles and structures. It also adds a new skill, Dropped Ordnance, for characters who want to successfully use bombs and deliver airborne supplies.

LOOKING AT AERIAL BOMBARDMENT AND SUPPLIES

While the first bomb was not dropped from an airplane until little more than a century ago, balloons were first used to rain down death from the skies.

The first practical hot air balloon was invented by the brothers Joseph-Michel and Jacques- Étienne Montgolfier of France. They took the first non-tethered flight in November 1783. A little more than six decades later after the Mongolfiers' 25 minute flight, a military force attempted to use balloons in an offensive manner.

In 1849, Austrian imperial forces outfitted about 200 paper hot air balloons with bombs that weighed 11-14 kilograms. Their target was the city of Venice, which had revolted against their rule. Previously, the Austrians had conducted a test flight with smaller balloons and bombs to determine the correct timing for the fuzes. But, when the actual attack was launched, the winds shifted.

Most of the Austrian balloon bombs missed the city while a few of the balloons even drifted back over the attacker's forces! Although the assault failed, the Venetians did surrender two days later, though this was probably due to starvation and exhaustion from the long siege.

The Wright Brothers took flight with the first heavier-than-air aircraft on Dec. 17, 1903, at Kitty Hawk, North Carolina. While this was the fulfilment of a human dream to be able to fly like a bird, early aircraft were soon used for military purposes.

During a war between the Ottoman Empire and Italy, an Italian reconnaissance pilot dropped the first bombs from a plane on Nov. 1, 1911. As he flew over a Turkish camp, the pilot took four grenades, each weighing about 2 kilograms, and dropped them one at a time. Although no casualties occurred in this attack, it proved that aircraft could be used in an offensive manner.

By the time of World War I, German Zeppelins were some of the first bombers, dropping explosives on Allied cities. In the Star Frontiers universe, alien races could have figured out the use of aerial bombardment far earlier in their development. With their gliding ability, Yazarians are prime candidates for having done this. And the Kurabanda of Volturnus, with their gliders, were used for air attacks on the invading Sathar forces!

Along with dropping bombs, aircraft have been used to airdrop supplies. The first—and ultimately unsuccessful—use of airplanes to deliver relief to troops on the ground occurred in the Middle East during World War I.

The Ottomans laid siege to the city of Kut in Mesopotamia, which is modern day Iraq. There, some 8,000 British and Indian troops had taken refuge after a failed attempt to conquer Bagdad. The siege lasted for almost five months, from Dec. 7, 1915, until April 29, 1916. Unable to resupply the troops by ground, the British turned to using planes to ferry in provisions to the "beleaguered and starving forces of British soldiers at Kut-el-Amara," noted an article from 1916.

Aircraft loaded with sacks of flour, lentils, and other provisions, such as an 80-pound millstone to grind grains into flour, were flown over the town were the besieged troops were encamped. Turkish gunners kept the planes from being able to fly low, so they released their supplies from 5,000 feet. Unfortunately for the Allies, some of these supplies either fell behind Turkish lines or dropped into the Tigris River.

By the end, only 16,8000 pounds of supplies were successfully delivered—roughly two pounds of food per person for several weeks—which was unable to feed the troops plus the civilian population, wrote Dan Schelnoff, an editor for Scientific American. (Schenoff, Dan. "Aerial Resupply Invented, 1916," Scientific American, 12 August, 2016, **https://blogs.scientificamerican.com/anecdotes-from-the-archive/aerial-resupply-invented-1916/**.) The starving British force ended up surrendering.

By contrast, Schelnoff noted in his article that the Berlin Airlift of 1948-49 "brought in 5 pounds of supplies per person every single day for almost a year (almost all of it carried in by cargo aircraft with a capacity of several tons per flight)."

THE BOMBS OF STAR FRONTIERS

Only two bombs are mentioned in the "Tanks a lot!" article and a follow-up article – "Tanks again!" – that appeared in the November 1985 issue of Dragon. They are the "light bomb" and the "heavy bomb." Both cause fragmentation explosive damage. The small bomb weighs in at 15 kilograms.

Costing 500 Credits, it does 25d10 points of damage. The medium bomb weighs 30 kilograms and costs 1,000 Credits. It does 50d10 points of damage.

The original chart in "Tanks a lot!" listed the light bomb as costing 50 Credits and the heavy bomb was 100 Credits. The follow-up article corrected the prices for these weapons.

No blast radius is provided for either bomb. They both need to be mounted on bomb racks and have the same range brackets: PB 10, S 30, M 60, L 120, E 121+. The light bomb takes up one "space" – called a hard point (HP) here, for purposes of determining how many weapons a vehicle can carry – while the heavy bomb uses up 2 hard points.

It wasn't until the April 1987 issue of Dragon magazine when TSR addressed some of the shortcomings of bombs. Bandy looked at them in his "Here Comes the Cavalry!" article.

"Bombs do damage of varying severity according to the distance an object is from them when they explode," Bandy wrote. "The chance of a bomb hitting its target is equal to one-half of the bomber's dexterity score, modified. In the event of a miss, use the Grenade Bounce Diagrams... The asterisk represents the target and the arrow represents the direction the bomber is travelling. The distance by which the bomb misses its target is dependent upon the altitude of the bomber..."

Bandy further noted that bombs explode "one turn after being dropped, giving the bomber that amount of time to vacate the blast radius. Failure to vacate the blast area results in damage to the bomber."

In the "Cavalry" article, the light bomb has five different blast damage rings – extending out to 300 meters! While the heavy bomb has six blast rings, out to 400 meters.

How do the statistics for these bombs stack up with the effort to explore real-world explosives? This was examined in parts 2 and 3 of the "Things that go boom!" series (Frontier Explorer issues 26 & 27).

The original bomb blast and damage table indicates that the amount of damage decreases the farther away an object is from the center of the explosion, though the decline in damage should be far steeper at the end. Also, doubling the size of the bomb does not necessarily mean that the amount of damage doubles.

Even assuming that the blast power of Frontier explosives is greater than TNT, the "light" and "heavy" bombs are not of the caliber of the blockbuster bombs of World War II, let alone having the destructive capabilities of modern military bombs. So, are the blast areas provided in the "Cavalry" article even reasonable?

Additionally, just like there are a variety of grenades and missile warheads, there would be a variety of bombs available in the Frontier, ranging from sonic to incendiary to even tangler or defoliant ordnance.

ORIGINAL BOMB BLAST RADIUS AND DAMAGE TABLE

DISTANCE FROM BOMB IN METERS	DAMAGE FROM LIGHT BOMB	DAMAGE FROM HEAVY BOMB
0-20	25d10	50d10
21-50	20d10	40d10
51-100	15d10	30d10
101-200	10d10	20d10
201-300	5d10	10d10
301-400	--	5d10
400+	--	--

NEW SKILL: DROPPED ORDNANCE

Instead of relying just on the dexterity score, to successfully use bombs, a character should have a new skill: Dropped Ordinance. This skill, called "Dropped Weapons," is actually mentioned in the "Tanks again!" article from the November 1985 issue of Dragon magazine. It can be added to the traditional Alpha Dawn skill system or a Zebulon-Alpha Dawn style system, such as Star Frontiers 2000. One should also consult the aerial combat rules for more information.

Bombs released from very low altitudes are typically set to explode one turn after being dropped, giving the bomber (such as a jetcopter or aircar) that amount of time to vacate the blast radius. Failure to vacate the blast area results in damage to the bomber.

WEAPONS: DROPPED ORDINANCE

Type: Military PSA/Enforcer

Success Rate: ½ DEX or LOG + 10% per level

PR: None

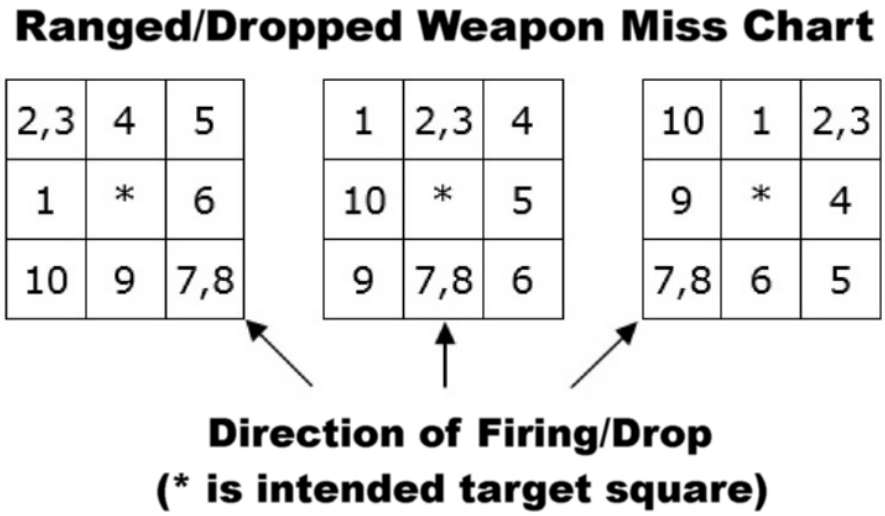
Sometimes called a bombardier or "bomb aimer," characters with this skill are proficient at aiming dropped munitions – or even supplies – from an aerial craft by using bomb sights or advanced targeting systems. It does not help a character throwing grenades or other explosives from an aircraft but it can include dropping munitions/supplies from a low-orbiting space vehicle.

BOMBARDIER RANGES

SKILL LEVEL	POINT BLANK	SHORT	MEDIUM	LONG	EXTREME
1	10	30	60	120	121+
2	20	60	120	240	241+
3	30	90	180	360	361+
4	40	120	240	480	481+
5	50	150	300	600	601+
6	60	180	360	720	721+

BOMB MISS CHART	
ALTITUDE OF BOMBER	MISS DISTANCE
Point Blank	20 m
Short	50 m
Medium	150 m
Long	250 m
Extreme	350 m

For each level of this skill, the bombardier also increases his range brackets. For example, the point blank range for a level 1 bombardier is 10 meters, but it increases to 20 meters for a level 2 bombardier and progressively improves.



FALLING OFF TARGET

The distance by which the bomb misses its target is dependent upon the altitude of the bomber, as shown on Bomb Miss Chart. (Bandy, Matt Bandy. "Here Comes the Cavalry!" *Dragon Magazine,* April 1987, p. 73.)

In the event of a miss, use the Ranged/Dropped Weapon Miss Chart. The asterisk represents the target and the arrow represents the direction the bomber is travelling. The distance by which the bomb misses its target is dependent upon the altitude of the bomber.

DEFENSES FROM BOMBS AND ARTILLERY

Characters caught in the open during an artillery or bomb attack are particularly vulnerable to injury or death. Going prone on the ground should be treated as having hard cover and it will cut the damage/effects of explosive, stun/sonic, and tangler attacks by 75 percent unless the attacker has rolled an automatic hit. Prone characters in the secondary blast radius receive no damage. (Or the referee could opt to roll on the Revised Blast Area Resolution Table.)

Going prone does not protect against gas attacks, but it will mitigate the effects of foam bombs, electrical discharge, field crusher and incendiary warheads.

IN VEHICLES

Characters in unarmored vehicles are subject to damage from artillery, bomb, and missile attacks. Those in armored vehicles, such as tanks, may have partial or even full protection from damage until any defenses are breached. Energy screens can protect or reduce the damage done to characters, vehicles and structures.

TAKING COVER

Taking cover in trenches, underground bunkers, caves, etc. may completely protect characters from damage. But, if a character is in a low-lying shelter, they are potentially even more vulnerable to gas attack weapons.

EFFECT OF DEFENSES

Defense screens and suits, such as the skeinsuit, may reduce the amount of damage a character takes. (See below.)

LOOKING AT EXPLOSIVES

A military bomb is a high order explosive that generates shrapnel along with a very hot, dense, high-pressure, gas shockwave. The shockwave expands out at supersonic speed and is the primary damage mechanism at a distance from impact. This shockwave keeps expanding but the air pressure decreases rapidly with the cube of the distance. The duration of the explosive force is very short. It is measured even milliseconds.

TNT is the standard for judging the effects of other explosives. An explosion of one stick of TNT releases about 1 mega joule (MJ) of energy, which will move and split one cubic meter of rock. Assume that the explosives used in the Frontier are roughly four times as powerful, kilogram-to-kilogram, versus TNT.

Explosives weighing less than 1 kilogram –such as grenades – will only have an immediate blast area. For quantities of explosives weighing 1 kilogram or more, it will have a secondary blast area. This secondary blast area is equal to 1.5 times the radius of the immediate blast area; round any fractions up to the nearest whole number.

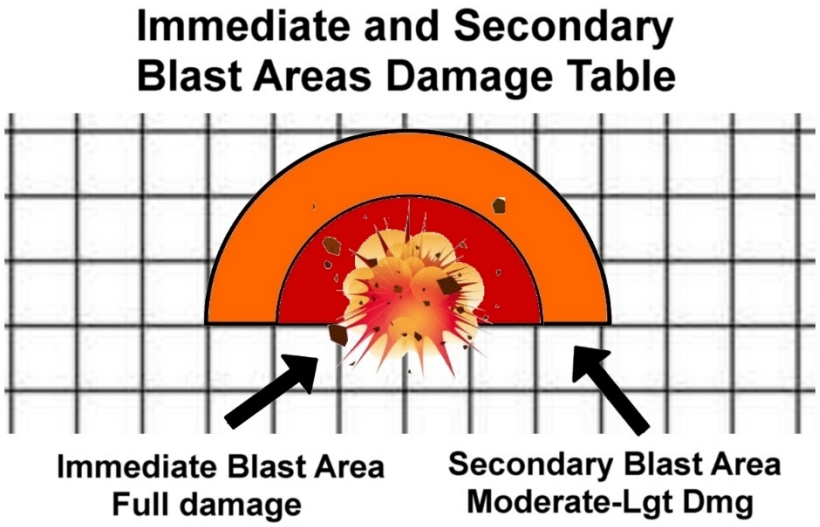
For example, if the immediate blast area of a bomb has a radius of 10 meters, the secondary blast radius extends out another 5 meters to 15 meters from the blast point.

IMMEDIATE BLAST AREA

Characters within the primary burst 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.

DEALING WITH LARGE BOMBS

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 the "Large Bomb Blast Area Resolution Table."

Large Bomb, 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!

Large Bomb, 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.

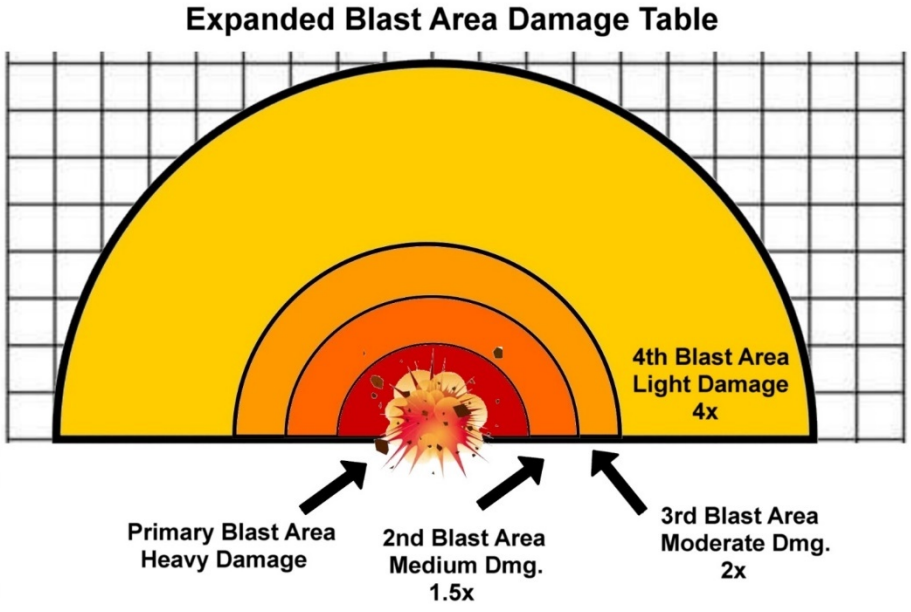
Large Bomb, Fourth Blast Area. The fourth blast radius extends out 4 times the immediate blast area. Targets will take light damage, 1d5 to 1d10 points, and may be stunned from 1d5 to 1d10 turns.

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.

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

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



LARGE BOMB BLAST AREA RESOLUTION TABLE

ROLL	IMMEDIATE	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

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.

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.

10%, 25%, 50% or 75% Damage. Reduce the damage a character receives appropriately. For example, if the damage caused by a bomb is 100 points and the character takes 75 percent of it, they receive 75 points of damage.

ANATOMY OF EXPLOSIVE BOMBS

One of the earliest dropped bombs was the 25-pound British Cooper bomb, which was used during World War I. The bomb actually weighed 24 pounds (10.8 kilograms), out of which 20 pounds was the cast iron casing while it only had 4 pounds of explosive. The after body of the Cooper bomb was made out of wood while the fins were constructed out of steel.

Those early bombs had an estimated failure rate of 25-30 percent.

Today, most modern air-dropped bombs are aerodynamic, created to reduce drag when mounted on external racks. The general purpose (GP) bombs of the United States have explosive filler that is about 30-40 percent of the weapon's total weight.

Some of America's bombs are the Mark 80 series which include:

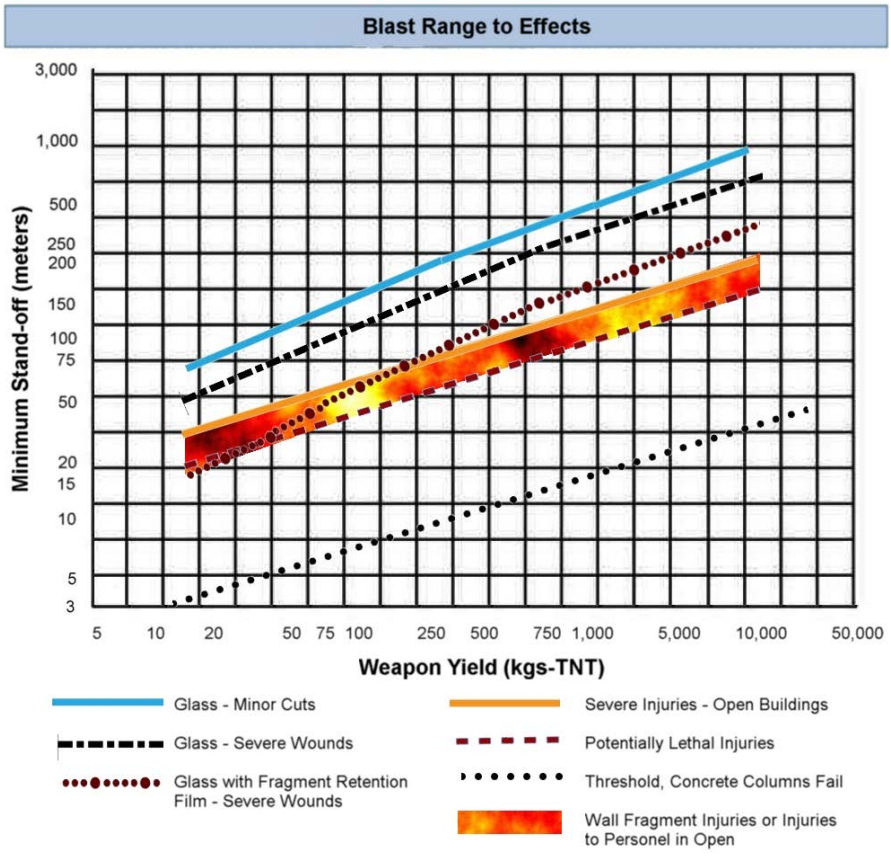
- **Mark 81** – nominal weight 250 pounds (113 kg)
- **Mark 82** – nominal weight 500 pounds (227 kg)
- **Mark 83** – nominal weight 1,000 pounds (454 kg)
- **Mark 84** – nominal weight 2,000 pounds (907 kg)

A nominal weight is provided because the actual weight can vary, noted Wikipedia, "depending upon its retardation, fusing, carriage and guidance systems. For example, the actual weight of a U.S. M117 bomb, nominally 750 lb. (340 kg), is typically around 820 lb. (372 kg)."

Retardation refers to the small parachutes or pop-out fins that are often outfitted to bombs. Called "retarders," these devices slow the bomb's descent to permit the bombing aircraft to escape the blast area.

BLAST RANGE TO EFFECTS

Introduced in Part 4 of this series (Frontier Explorer issue 27), which looked at the Demolitions Skill, the "Blast Range to Effects" chart is based upon one created by the U.S. Defense Threat Reduction Agency. At a glance it shows the severity of



STRUCTURAL DAMAGE CAPACITY 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

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 "Threshold, Concrete Columns Fail" is well within the primary blast area while the "Potentially Lethal Injuries" dashed line could be the outer limit of the secondary 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" line is in the third blast area. And anything under the "Glass – Minor Cuts" line would be in the fourth blast area.

Let's assume that 15 kilogram light bomb from "Tanks a lot!" has an 8 kilogram warhead and has a TNT equivalent of 32 kilograms. It would have a primary blast radius of 5-15 meters according to the chart above. This is a bit less than the radius given in "Here Comes the Cavalry!"

Since the 3 kg Type III missile warhead has a primary blast radius of 9 meters, the one for the 15 kg bomb needs to be larger. So we will go with a 15 meter radius.

With that decision, the secondary blast area would be from about 16-23 meters, where a target could take up to 50 percent damage. The third blast area would be between 34-30 meters where targets would take up to 25 percent damage. The fourth blast area extends out to 31-60 meters where targets would take 10 percent damage.

In any case, even if we kept the primary blast area for the "light bomb" the same as was given in Dragon magazine, the farther one gets from the center of the explosion, the amount of damage it inflicts significantly falls as one gets farther away from the center of the explosion.

DAMAGE TO CHARACTERS AND STRUCTURES

Stamina (STA) points are used to record wounds to characters and animals plus damage to robots and other small equipment. Structure points (SP) represent the damage sustained to various walls, doors, computers, and vehicles.

The Structural Damage Capacity Table is based on the chart originally provided on pages 24 and 25 of the Alpha Dawn Expanded Game rules. It has been altered to cover a wider selection of structures.

Game referees need to use their judgment as to the exact effects listed with the structural damage capacity table. For example, a bomb might blow a hole in a wall, but will it cause the whole wall to collapse? Will blowing up a single bridge support or a major structural support column could cause a bridge or building to collapse? Maybe, but perhaps it might not fall right away. But destroying several supports/columns could cause an immediate collapse.

The Weapons Damage to Structure Points Table is based on the charts found in the Alpha Dawn Expanded Game rules book along with the "Weapons vs. Armor" chart in Knight Hawks regarding how space suit armor can protect against certain weapons. For example, a fragmentation grenade will do 15 points of structure damage if used against a building or a computer. When it comes to bombs, missile warheads, artillery shells and the like, they will do normal damage to structure points.

For example, if a bomb does 25d10 points of damage to characters' Stamina, it will do 25d10 points of damage to a structure. Please see Part 3 of this series (issue 27) for a fuller list of how weapons will damage – or won't damage – structure points.

WEAPONS DAMAGE TO STRUCTURE POINTS TABLE

WEAPON TYPE	STRUCTURAL DAMAGE
Fragmentation grenade If placed instead of thrown:	15 points 30 points
Explosives (TD-19, TD-20, TNT, dynamite, etc.)	See description
Micromissile	1d10+4/shot
High Explosive Warhead	Use Standard Explosive Damage
High Explosive Anti-Tank (HEAT) Warhead	Normal damage
Standard Explosive Warhead	Normal damage
Bombs/Artillery Shells	Normal damage

Note: These are examples of the types of damage that these weapons can cause against normal structures. 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.

REVISED 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.

VEHICLES AND STRUCTURE POINTS

As noted in previous articles, including an article about sathar vehicles in issue 25 of Frontier Explorer Magazine, structure points for vehicles have been part of the Star Frontiers game from the beginning. The Alpha Dawn Expanded Game rules provide such information on pages 24 and 25. The module, "Starspawn of Volturnus," notes that a sathar transport vehicle had 120 structure points (SPs) while an automatic cannon had 60 SPs.

Normally, the game does not seem to keep track of structure points in vehicle combat. Rather, when a vehicle is damaged, one rolls a 2d10 on the Vehicle Damage Table (for ground vehicles) or on a second damage table for jetcopters and aircars. The number of dice of damage caused by an attack is added to this result.

An optional rule is to also mark off structure point damage whenever a hit occurs. Or the referee could decide that the structure takes damage when the "No Result" is rolled on the damage tables.

After a vehicle reaches zero structure points, it is so badly damaged that it is unfit for service.

If a referee would rather just treat vehicle damage like Stamina point damage for robots and the like, there is a simple conversion. One structure point generally equals two stamina points.

The amount of SPs that a vehicle has depends on its size, which is presented in the "Revised Vehicle Size, Structure/Stamina Point Table." This table is based on the one created by Moore. His rule was: "As a baseline a vehicle has a number of SP equal to its size x 200. From there you can adjust up or down."

AVERAGE VEHICLE STRUCTURE POINTS

- Size 0: bicycle, 5; go-kart, 10, moped, 15; transport pod, 20
- Size 1: golf/utility carts, 30-40; ground and hover cycles, 50-60; ATV, 50-70
- Size 2: 2-person ground car, 75-100; 2-person hover car, 50-80; 4-person ground car, 60-120; 4-person hover car, 50-100
- Size 3: 6-person ground and hover cars, 150
- Size 4: Cargo trucks and vans, 200
- Size 5: Large cargo haulers, tractor trailers, 400
- Size 6: Varies

Moore's calculation, however, greatly exceeds the amounts provided for vehicles in the Alpha Dawn game and the "Starspawn" module. The revised table provided here is an effort to be closer to the canon material. Instead of just a single structure point number for a certain size vehicle, the revised table provides a range with the idea that lighter, faster vehicles in a certain size class will have fewer structure points, while sturdier vehicles will have more SPs.

ATTACKING GROUNDED SPACESHIPS

The official TSR rules regarding spaceships does not exactly cover how the referee is supposed to treat starship hull point damage outside of the Knight Hawks rules. Sure you can look at the "Structural Damage Capacity" table in the Expanded Game rules and note that an armored wall has 200 + 2d100 structure points. You could surmise that to breach a starship hull, that would probably be the damage needed, but how much damage would a group of characters need to do to knock off one hull point?

This is useful to know, especially if a bomber wants to attack an assault shuttle that is sitting on the ground somewhere, or a small freighter or space shuttle. One fan discussion I had once read opined that a hull point would be equal to 1,000+ Stamina points, so the damage caused by space weapons vs. a character's handheld laser pistol would similarly be scaled up. That seems like a bit of overkill, especially if we consider (what I think is) the last Star Frontiers module ever published, "The War Machine," by Ken Rolston.

In one encounter, a sathar attack craft called a Ravager, will circle the character's landing site and fires on their assault scout with its heavy laser. If the ravager is to serve as any kind of real threat, except to any characters standing outside, it should be able to do more than scorch the paint on the starship. So, based on a more recent discussion on the starfrontiers.us website, 1 hull point will equal 250 structure points or 500 STA for handling situations like this – including an attack by bombers.

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.

STAMINA VS. STRUCTURE VS. HULL POINTS TABLE

2 Stamina Points = 1 Structure Point
500 Stamina Points = 250 Structure Points = 1 Hull Point

SAMPLE BUILDING TYPES	APPROX. SIZE (IN METERS)	OVERALL AVG. STRUCTURE PTS.
Wooden hut	3x4 (12 m^2)	20
Small wooden/vinyl home	45 m^2	100
Small brick/stone building	45 m^2	150
Sm. reinforced concrete bldg	45 m^2	200
Small armored building	45 m^2	300
Medium wood/vinyl home	150 m^2	120
Medium brick/stone bldg	150 m^2	175
Med. reinforced concrete bldg.	150 m^2	250
Medium armored building	150 m^2	350
Large wooden building	250 m^2	150
Large brick/stone building	250 m^2	200
Lg. reinforced concrete bldg.	250 m^2	300
Large armored building	250 m^2	500

DAMAGING BUILDINGS

A large amount of Tornadium D-19, a dropped bomb, missile warhead, or an artillery shell can cause considerable damage to structures, which cannot make saving throws. Buildings caught in the blast radius of a bomb may simply be overwhelmed by an explosion and could partially or completely collapse.

The Sample Building Types chart provides a guide for how to handle an overall structure, as opposed to characters trying to blast open a hole in a wall or a floor. Larger buildings would have different sections and how resilient they are to certain types of damage will depend on how they are constructed and their purpose.

For example, a skyscraper that is designed to withstand a magnitude 4 earthquake and/or a category 5 hurricane may still be fragile to bomb/missile attacks. The building's outer shell could be breached by a bomb, exposing occupants to damage. Assume that large buildings have one or more major structural support columns. When one of these columns fail, a section of that building collapses.

LEVELS OF PROTECTION

Just like characters and vehicles can be armored, buildings and structures can be reinforced to reduce damage from bombs.

"The extent and severity of damage and injuries in an explosive event cannot be predicted with perfect certainty," noted a U.S. Federal Emergency Management Administration document about the effects of an explosive blast. "The air blast shock wave is the primary damage mechanism in an explosion. The pressures it exerts on building surfaces may be several orders of magnitude greater than the loads for which the building is designed."

While the FEMA document is geared toward guarding against terrorist car and truck bombs, it can be used to infer what would happen when an aerially delivered bomb or artillery shell or missile lands near a building. The U.S. Department of Defense lists several levels of protection for buildings against the effects of explosions. We will adapt these levels for the Star Frontiers game.

Note: the following chart can be used for determining what will happen to a structure from most conventional attacks –

BUILDING LEVELS OF PROTECTION	POTENTIAL STRUCTURAL DAMAGE	POTENTIAL DOOR AND GLAZING HAZARDS	POTENTIAL INJURIES INSIDE
Below Standards	Double the damage to the structure, causing massive destruction. If the explosion is massive enough, little is left standing.	Doors and windows fail and result in lethal hazards	Majority of personnel may suffer fatalities.
Low	Apply normal damage. Major deformation of primary and secondary structural members, but progressive collapse is unlikely. Collapse of non-structural elements.	Glazing will break and is likely to be propelled into the building, resulting in serious glazing fragmentation injuries, but fragments will be reduced. Doors may be propelled into rooms, presenting serious hazards.	Majority of personnel suffer serious injuries. There are likely to be a limited number – 10 to 25 percent – of fatalities.
Average	Apply Damage as normal. This is a typical civilian structure. Depending upon the amount of damage, it may be repairable. There will be deformities of non-structural elements and secondary structural members. Minor deformation of structural members, but progressive collapse is unlikely.	Glazing will break, but fall within 1 meter of the wall or otherwise do not present a significant fragment hazard. Doors may fail, but they will rebound out of their frames, presenting minimal hazards.	Majority of personnel suffer significant injuries. There may be a few fatalities – less than 10 percent.
Medium	Reduce damage to structure by 50 percent. Building may be repairable with minor deformations of non-structural elements and secondary structural members. No permanent deformation in primary members.	Glazing will break, but will remain in the window frame. Doors will stay in frames, but will not be reusable.	Some minor injuries, but fatalities are unlikely.
High	Reduce damage by 90 percent. Superficially damaged. No permanent deformation of primary and secondary structural members or non-structural elements.	Glazing will not break. Doors will be reusable.	Only superficial injuries are likely.
Based on information from the U.S. Department of Defense.			

bombs, lasers, missiles, artillery, demolitions, etc. But it does not necessarily offer a guide of what a weapon of mass destructions, such as the use of a nuclear warhead, will do to a building or to those inside.

Beyond the high level of protection, there are military structures that are virtually impenetrable, such as a bunker built into a mountain with blast doors that can absorb a nuclear explosion. Even with such a fortress, there are probably ways to get inside of it through emergency – and probably secret – exits where hatches can be blown up, allowing intruders to enter.

EXPLOSIONS AND CRATERS

Craters are formed in the ground when an explosion occurs either at the surface or immediately above or below the surface. Many craters are bowl-shaped, but there are several exceptions. This shape is caused by high-pressure gases and the resulting blast shockwave.

Writer Peter Hibbs of the United Kingdom has a blog at pillbox.org.uk, for a research paper called "The Defence of East Sussex Project." He noted that during the war, the British Home Office's Research and Experiments Department offered some information on the effectiveness of German bombs and the types of craters they left. Please see the chart below.

GERMAN BOMB WEIGHT	CRATER DIAMETER	CRATER DEPTH
50 kg	8-12 ft (2.4 - 3.6m)	2-5 ft (0.6 - 1.5m)
100 kg	20-30 ft (6-9.1m)	7-10 ft (2.1-3m)
250 kg	24-36 ft (7.3-11m)	10-12 ft (3-3.7m)
500 kg	30-40 ft (9.1-12.2m)	10-16ft (3-4.9m)

This information could be useful to a referee when determining what happens when a bomb or shell hits. Keep in mind, the chart about crater sizes is for a World War II era bomb, rather than more powerful explosives that would be used in a Frontier bomb.

Hibbs also references a 1942 UK manual called *Bomb Reconnaissance and Protection Against Unexploded Bombs*. That document notes that the size and shape of a crater and how far a bomb penetrates into the ground depends several factors, including:

- The composition of the ground. Bombs, for example, would have a hard time denting granite.
- Heavier bombs tend to be able to penetrate soils easier.
- How high up a bomb was dropped – up to about 15,000 feet (approx. 4,500 meters), after which there is no added penetration. For game terms, figure that this is for planets with approximately 1 G gravity that has any more than a thin atmosphere.

The bowl-shaped crater in figure 1 was

Figure 1.

made from a bomb that exploded on or shortly after impact. The actual size may be much larger, but material ejected upward (ejecta) may fall back in and erosion and landslides from the walls will partially fill the crater back in.

Figure 2.

Figure 2 shows a surface hole and camouflet (an artificial cavern) was formed by an unexploded bomb that deviated from its original trajectory.

Figure 3 shows a surface crater and camouflet from a bomb that deviated from its original trajectory but exploded.

Figure 3.

Figure 4.

Figure 4 shows a surface crater and camouflet from a bomb that exploded underground, but only a small surface area was affected.

Figure 5.

Figure 5 is when a bomb explodes too deeply in the ground to form a crater on the surface, but soil may be heaped over the camouflet. This soil covering may collapse when a character or vehicle travels over the area.

Craters and camouflets are potentially dangerous. Along with the possibility of encountering an unexploded bomb, the pit may have poisonous carbon dioxide or other gases lingering inside!

ANOTHER LOOK AT BOMBS

Instead of describing bombs as "light" or "heavy," they will be listed based on their nominal weight. These weapons are typically mounted on bomb racks and attached to pylons for modified jetcopters or aircars. Air transports (from Zebulon's Guide), Cloud Flyers (a vehicle by David "Zeb" Cook from the August 1986 issue of Dragon), and even special bombers would probably have internal bays too. Since most Frontier planets only have a single

colonial government, special bombers are probably unusual.

Space fighters could also carry bombs. In fact, this is mentioned in a November 1986 article in Dragon called "An Interstellar Armory: new defenses and weaponry for Star Frontiers Knight Hawks gaming" by Gus Montier. In that case, it only listed a fusion bomb, which is not being covered by these rules.

Space fighters would need an internal bomb bay, especially if they want the weapons to survive the fiery entry into an atmosphere. Of course, if the fighters are going against a target in the vacuum of space, they could be mounted on the craft's exterior.

DAMAGE ADDITIVES FOR PRIMARY BLAST AREA

The damage calculation for the 15 kg and 30 kg bombs has been changed. For example, the 15 kg "light" bomb with a standard explosive warhead was altered from 25d10 as presented in Dragon Magazine's "Tanks a lot!" article to 10d10 + 50. The "+ 50" is a damage additive. So the maximum amount of damage from such a bomb in the primary blast area is 150 stamina or structure points and the minimum is 60 points.

The damage additive **is not used** for the second, third or fourth blast areas.

PYLONS

Pylons are basically adaptors mounted onto a jetcopter or aircar so they can carry weapons. Aerodynamic, they are designed to reduce drag (wind resistance). There are different styles and sizes of pylons and some can be jettisoned after use to reduce an aircraft's radar signature.

BOMB RACKS

External bomb racks are mounted onto pylons and are used to carry and release the stored ordnance. Coming in different designs, some bomb racks may only hold one bomb, but others can store two, three, or more bombs. In the equipment list, the Roman numeral following the bomb rack type indicates how many bombs it can carry.

In the case of the 15 kg Mount III, it can carry up to three 15 kilogram bombs. For racks such as the "Mount III" that carry more than one bomb, the weapons specialist can release any combination of bombs on the rack, from one, two to all at once.

A referee can certainly create bomb racks that hold more bombs. Keep in mind that certain aircraft, such as modified jetcopters and aircars, might not be able to handle them!

BOMB RACKS

TYPES	AMMO CAPACITY	ROF	COST (CR)	MOUNTING COST (CR)	WEIGHT (KG)	HP
15 kg Mount I	1	1	50	50	1	1
15 kg Mount II	2	1-2	100	50	1.5	1
15 kg Mount III	3	1-3	200	50	2	1
15 kg Mount IV	4	1-4	300	50	3	1
30 kg Mount I	1	1	50	50	3	2
30 kg Mount II	2	1-2	100	50	5	2
30 kg Mount III	3	1-3	200	50	7	2
30 kg Mount IV	4	1-4	300	50	9	2

RANGES AND DROPPING SPEED

Bomb range categories are provided under the Dropped Ordinance skill. Most assume that the bomb will hit the same turn that it is dropped, but this is not the case when they are released at a good deal of altitude.

A forum discussion on a World War II aircraft enthusiast website (**ww2aircraft.net**), offers some information on how long it takes a bomb to fall from a given distance. One poster, Greyman, offered some statistics from "Air Publication 1243 Armament Training for the RAF – Part II – Bombs, Pyrotechnics, Bombsites, etc."

The exact timing depends on the speed of the aircraft, the bomb type, wind, and weather conditions. For a 250 pound general purpose bomb, the British Royal Air Force gave these statistics: 17.9 seconds to fall from 5,000 feet (1,534 meters), 25.5 seconds from 10,000 feet (3,048 meters), 31.5 seconds from 15,000 feet (4,572 meters), and 36.6 seconds from 20,000 feet (6,096 meters). This will be of course for planets with a 1 G gravity and a standard atmosphere.

BOMB DETONATORS/FUZES

The bombs provided in "Tanks a lot!" seem to just have contact detonators, but just like demolitions and mines, a variety of detonators are available. These detonators must be purchased separately and installed before the bomb can be successfully used! They will add weight to the device. (And, yes, it is fuze with a "Z".)

The cost of the detonators is 20-40 percent of the cost of the standard explosive bomb and the weight is 10-30 percent of the bomb's nominal weight class. For example, the 15 kg standard explosive bomb costs 250 Credits. A contact detonator is 20 percent of that cost or 50 Credits. Its weight would be 1.5 kilograms or 10 percent of the weight of the bomb.

15 KILOGRAM BOMBS

This is the class of weapons was called the light bomb in "Tanks a lot!" Instead of just having a fragmentation explosive, a variety of warheads are available for bombs including electrical discharge, field crusher, foam, gas, incendiary, sonic and even tangler types. They need a detonator, sold and installed separately, to explode.

30 KILOGRAM BOMBS

This is the class of weapons was called the heavy bomb. A variety of warheads are available here as well.

TYPES OF WARHEADS

Although they act similar to their smaller grenade counterparts, because of the larger size of missiles, bombs, large

BOMB DETONATORS/FUZES

TYPE	DEFINITION	WGT (KG)	COST (CR)
Contact	The explosive detonates when the warhead makes a physical contact with the target. Sometimes this detonator is combined with a delay so the bomb explodes a specific amount of time after contact.	10% bomb	20% bomb
Altitude	The bomb explodes when it reaches a specific altitude (see proximity).	15% bomb	25% bomb
Proximity	Using in combination with scanners including radar, a magnetic sensor, infrared, laser, etc., the bomb explodes when it reaches a specified distance from the target. These are usually used on bombs with a shaped warhead – such as a H.E.A.T. – to send fragmentation (or its effects) primarily toward the target.	20% bomb	30% bomb
Remote	A bomb can be equipped so it can be remotely detonated by the operator. Usually this is an added self-destruct mechanism.	10% bomb	25% bomb
Timed	The bomb explodes after a certain amount of time.	10% bomb	20% bomb
Combined	This is a combination of any or all the types of detonators above into one package. Add the costs of the individual detonators together and add 20 percent. The weight stays at 2 kilograms.	30% bomb	40% bomb

mines, and artillery shells they have a secondary blast area. Typically, the effects of these weapons are reduced by half or are greatly diminished.

STANDARD EXPLOSIVE

Also called a general purpose (GP) bomb, the standard explosive warheads will cause normal damage to people, structures, robots, vehicles, and other objects within their primary, second, third and fourth blast areas.

HIGH EXPLOSIVE

High explosive warheads are more designed to inflict maximum damage to "soft targets" – i.e. people, animals, light structure buildings. But, when used against robots, vehicles, buildings, spaceships, characters in powered armor, etc. the amount of damage they inflict is similar to a standard explosive bomb.

HIGH EXPLOSIVE ANTI-TANK (HEAT)

This round is a shaped charge designed to inflict maximum damage to armored units and bunkers. It uses a proximity detonator to explode just before reaching its target; this creates a high-velocity shockwave and a jet of metal particles in a 15-degree cone that will penetrate most conventional armors.

Skeinsuit material is useless against a HEAT bomb. Spray-on armor will only absorb one-tenth of the damage inflicted as will any normal vehicle armor. Inertia screens, however, will act as normal against this type of weapon.

ELECTRICAL DISCHARGE

Releasing a high charge of electrical energy when it strikes, the electrical discharge bomb short-circuits every device in the blast radius including computers, chronocoms, and other normal electronics. It can stop an unshielded vehicle, warbot, etc., dead in its tracks, requiring extensive repairs. The ED warhead acts as an electrostunner set to damage for every bioform in the primary blast area.

This subject is based on the description of the Electronic Countermeasures (ECM) Rifle that was provided in the January 1988 issue of Dragon Magazine in an article on powered armors.

The chance of disabling an electronic device is based on the amount of energy that is used. When it comes to bombs, their effects are spread over a wide area rather than a specific target like the ECM Rifle. So, even if one assumed that a 15 kg ED bomb packed the equivalent of 300 SEUs, its base chance of success will not be 100 percent. The same logic applies to the 30 kg bomb.

Computers, robots, mines and other electronic equipment have a resistance level to avoid shorting out. This resistance level is the robot or computer's level – for landmines, it is the sensor level minus 1. Multiply the resistance level by four, then subtract this number from the ED bomb's base chance of success. Please see the Electronic Discharge Bomb Chance of Success Table.

If the attacker rolls at or below the resistance number, the result will yield a malfunction. When a malfunction occurs, roll on the malfunctions table for the results. A failure of 99-00 always means that the target resisted the attack regardless of what the success rate was. These bombs will cause 5d10 points of electrical damage

ELECTRONIC DISCHARGE BOMB CHANCE OF SUCCESS TABLE

		----------RESISTANCE LEVELS----------					
BOMB TYPE	BASE CHANCE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6
15 kg	70	66	62	58	54	50	46
30 kg	75	71	67	63	59	55	51

- The resistance levels of robots and computers are based on their level.
- The resistance levels of mines are based on their sensor level minus one.
- An automatic failure roll of 99-00 means that the target has resisted the attack.

to living targets within the primary blast area no matter what the size is. Beings in the secondary blast area receive half damage.

Regarding vehicles, Dragon magazine did not provide resistance levels, so we will use some information from Issue 15 of Star Frontiersman magazine. In an article on vehicle combat by Larry Moore – which is basically an update of "Tanks a lot!" – he offers several vehicle "duty" types – including corporate, security, para-military, and military – which are beyond the mere civilian types found in the Alpha Dawn rule book.

Assume that most civilian vehicles will only have a resistance level of 1. An exception is the Explorer; these vehicles will have a resistance level of 3. Corporate-Duty vehicles will have a resistance level of 2; while security-duty and paramilitary-duty vehicles will be level 3; and average military-duty vehicles will have a resistance level of 4.

If the target is specially insulated, the damage can be negated!

A gauss screen will offer complete protection, but its power pack is drained by 1 SEU per SEU used by the ED bomb. An anti-shock implant will reduce damage by half to living beings. If the target robot or computer has an anti-shock implant, subtract an additional 20 percent from the modified chance of success for causing a malfunction. In other words, a 30 kg bomb normally has a 98 percent chance of success to disable unshielded robots of any level. But, with A-S implant, it only has a 78 percent chance of success.

A character can also choose to purchase electromagnetic pulse (EMP) insulation for his devices. This insulation is not a power screen, but rather an extensive hardening of a device's/robot's/vehicle's internal circuitry that is much more comprehensive than installing an anti-shock shock implant. Note: this information comes from the article "Robots Rules of Order Revised," from issue 17 of Frontier Explorer Magazine.

If EMP shielding is included as part of the robot's (or vehicle's, computer's or device's) initial construction, the cost is an additional 50 percent of its body style while weight only increases 10 percent. If this shielding is installed later, the modification is an added 90 percent of the robot's body style cost while weight increases 20 percent.

Effects: If a target has EMP shielding, subtract an additional 70 percent from the modified base chance of success. This effect is cumulative with A-S implant and a gauss screen. Of course, an automatic hit by an EMP weapon will overcome any protection.

Most unshielded robots, vehicles, computers, and devices will need extensive repairs if they suffer an electronic discharge attack. However, those that have EMP shielding have a cumulative 5 percent chance per turn of "rebooting" and being able to resume operations.

Within the secondary blast radius, the ED bomb will "stun" an unshielded robot, vehicle and other electronic systems for 1d10 turns/warhead size; to determine the chance of success, use the warhead chance of success table. Unshielded bioforms need to conduct a Stamina check with a + 20 percent modifier or likewise will be stunned for 1d10 turns. For example, a robot within the secondary blast radius of a type III missile ED warhead will be stunned for 3d10 turns.

Any bioform, robot, vehicle, computer, or device shielded by a gauss screen or A-S implant will be fully protected from an ED bomb if they are within the secondary blast area.

15KG BOMB TYPES

WARHEAD TYPE	DAMAGE	BLAST AREAS	DEFENSE	COST (CR)
Standard Explosive	10d10+50	15/23/30/60	Inertia	250
High Explosive	15d10+50/ 10d10+50*	15/23/30/60	Inertia	300
H.E.A.T.	15d10+50	15 degree cone 10/15/20/40	Inertia	300
Electrical Discharge	Elect. Short	15/23/--/--	Insulation	300
Field Crusher	10d10+50 vs fields	15/23/--/--	--	300
Foam: Acid	10d10/turn	15/23/--/--	Basegel	250
Foam: Chemical Defoliant	Defoliates	15/23/--/--	--	250
Foam: Extinguish	Smother Flame	15/23/--/--	--	250
Foam: Irritant	1d5/turn	15/23/--/--	Special	250
Foam: Rad-Blast	Blocks Radiation	15/23/--/--	--	250
Foam: Slick	Slick Surface	15/23/--/--	Slow move.	250
Foam: Solid	Entrapment	15/23/--/--	RS check	250
Gas: Doze	Sleep	20**	STA check	250
Gas: Dusk	Dim Light	20**	IR, scanners	250
Gas: Nightfall	Darkness	20**	IR, scanners	250
Gas: Poison	S10/T10	20**	STA check	250
Gas: Smoke	-15% to hit	20**	IR, scanners	250
Incendiary	10d10 + (1d10x6 turns)	15/23/--/--	Asbestos	300
Sonic	10d10+50/5d10+25/ 2d10/1d10	15/23/30/60	Sonic, STA	300
Sonic Stunner	Stun	15/23/30/60	Sonic, STA	250
Tangler	Entanglement	15/23/--/--	RS check	250

*High Explosive bombs only do maximum damage to light structures and to people and animals. The second number is the damage it does to structures, vehicles and robots.

**The chemical cloud produced extends downwind 4 times its primary radius.

FIELD CRUSHER

This warhead only damages force fields and other energy screens such as inertia, albedo, gauss, light shift, simp, sonic, shimmer, etc. Refer to the Weapons Charts for the amount of damage it will cause within the immediate blast area to these types of fields.

Field crushers will cause holographic screens to collapse, draining an equivalent amount of energy from their power sources as it would by damaging other screens. It only inflicts half-damage on protective screens in the secondary blast area. Otherwise, these bombs have no other effect on bioforms or electronics.

FOAM TYPES

Foam bombs are much larger versions of the foam grenades of the same type (see "Things that go boom! Part 1", issue 26), but there is more foam so it is more persistent. They only have an immediate and secondary blast area.

The bomb will fill the immediate blast radius with opaque, dense foam that cannot be visually penetrated without the aid of radar or other scanners. Most foams will dissipate after 15 turns for the 15 kg bomb or 30 turns for the 30 kg bomb. The solid foam bomb will last for 20 hours before it begins to break down.

Within the secondary blast radius, cut the foam warhead's effects in half. For example, if a chemical defoliant bomb is used, not all vegetable matter within the secondary blast radius will be hit (a 50 percent chance of not being hit); an extinguish foam will only put flames out half the time in the secondary blast radius; etc.

Irritant foam bombs only cause temporary, non-fatal damage—unless a being drops below 0 STA, at which point it stops causing the character damage but then the character loses 1 STA point per turn until they are beyond the point of revival. The temporary damage heals at the rate of 2 STA points per 30 minutes of rest. Characters can defend against this foam by wearing goggles and filter masks. This foam can be flushed off with water.

Because warheads are much larger than grenades, they will affect larger creatures easier.

GAS TYPES

These bombs behave similar to a gas grenade of the same type; however, the gas clouds they produce are much more persistent. Assume that the resulting cloud – barring a fierce wind – will last for 1 turn times the weight of the warhead. Thus, the doze gas cloud from a 15 kg bomb will last for 15 turns but the cloud from the 30 kg bomb will last for 30 turns.

A breeze will also cause such a cloud to drift from its original location, following the direction of the wind. The length of the chemical cloud would be four times its width. For example, if a doze bomb has a burst radius of 22 meters, the resulting cloud would extend 88 meters downwind.

Any gases will sink into lower lying areas. So, if a character is taking cover in a ditch, the gas cloud from a poison bomb may drift to where he is at. Since the sizes of bombs are much larger than grenades, the gas will affect larger creatures as if multiple grenades had been successfully thrown at it.

If characters do not escape a gas cloud or do not have any kind of gas mask, they will need to keep rolling each turn they remain in the area of effect to avoid falling victim to its effects.

30KG BOMB TYPES

WARHEAD TYPE	DAMAGE	BLAST AREAS	DEFENSE	COST (CR)
Standard Explosive	15d10 + 50	18/27/36/72	Inertia	500
High Explosive	20d10 + 50/ 15d10+50*	18/27/36/72	Inertia	750
H.E.A.T.	20d10 + 50	15 degree cone 12/18/24/48	Inertia Screen	750
Electrical Discharge	Elect. Short	18/27/--/--	Insulation	750
Field Crusher	15d10 + 50 vs. fields	18/27/--/--	--	750
Foam: Acid	10d10/turn	18/27/--/--	Basegel	500
Foam: Chemical Defoliant	Defoliates	18/27/--/--	--	500
Foam: Extinguish	Smother Flame	18/27/--/--	--	500
Foam: Irritant	1d5/turn	18/27/--/--	Special	500
Foam: Rad-Blast	Blocks Radiation	18/27/--/--	--	500
Foam: Slick	Slick Surface	18/27/--/--	Slow move.	500
Foam: Solid	Entrapment	18/27/--/--	RS check	500
Gas: Doze	Sleep	22**	STA check	500
Gas: Dusk	Dim Light	22**	IR, scanners	500
Gas: Nightfall	Darkness	22**-	IR, scanners	500
Gas: Poison	S10/T10	22**	STA check	500
Gas: Smoke	-15% to hit	22**	IR, scanners	500
Incendiary	15d10 + (1d10x10urns)	18/27/--/--	Asbestos	750
Sonic	15d10+50/10d10+25/ 5d10/1d10	18/27/36/72	Sonic, STA	750
Sonic Stunner	Stun	18/27/36/72	Sonic, STA	500
Tangler	Entanglement	18/27/--/--	RS check	500

*High Explosive bombs only do maximum damage to light structures and to people and animals. The second number is the damage it does to structures, vehicles and robots.

**The chemical cloud produced extends downwind 4 times its primary radius.

INCENDIARY

This warhead causes fire damage, with the flames continuing to burn long after the initial explosion, which causes more damage. Keep in mind, if an incendiary warhead is used in a highly combustible location, such as a building, forest, etc., it will probably start a conflagration that will spread and grow even after the effects of the incendiary device have passed.

It only has a primary blast area and a secondary radius. As with explosive rounds, characters can make a RS check to try to reduce or avoid damage. But, if the characters remain in an area that is on fire, they will start taking fire damage.

SONIC

This bomb generates damage through the use of high frequency sound waves. The damage is halved if someone is using a sonic screen or sonic headphones.

SONIC STUNNER

This type of sonic bomb only causes non-permanent stunning damage. Anyone failing a Stamina check within the immediate blast area will be stunned for 1d100 turns. In the secondary blast radius, a character receives a +10 percent bonus to avoid falling victim to the stunning effect, which would only last 1-50 turns.

In the third blast area, the character receives a +20 percent bonus while the effect lasts for 1-25 turns. And in the fourth area, the character receives a +30 percent bonus while the stunning effect lasts for 1-10 turns. Since bombs are much larger than grenades, they will affect large creatures as if multiple grenades had been used.

TANGLER

These warheads throw out hundreds of strong, sticky polymer threads. Threads stick to everything within the immediate blast radius. Characters can try to avoid this effect with a RS check. An entangled individual cannot move until the threads decay (in 30 minutes) or until solvaway is spread over the threads. Any creature with more than 100 stamina points can break out of tangler threads in one turn.

Note, because warheads cast far more tangler threads than a grenade, even if a character avoids being entrapped in the polymer threads, they may be trapped in the "safe" area that they sought shelter until the threads decay.

Characters, robots and creatures within the secondary blast radius also need to make a RS check to avoid entrapment; otherwise they are snared for 15 minutes. Any creature with more than 50 stamina points can break out of the threads in one turn. These bombs do not have a third or fourth blast area.

CONCLUDING NOTES

For the sake of brevity, this concludes Part 7 of "Things that go boom!" The next article (page 40) will look at targeting equipment, more dropped ordnance, including larger bombs, aerial deployed minefields, aerial resupply containers, and bomb disposal equipment.

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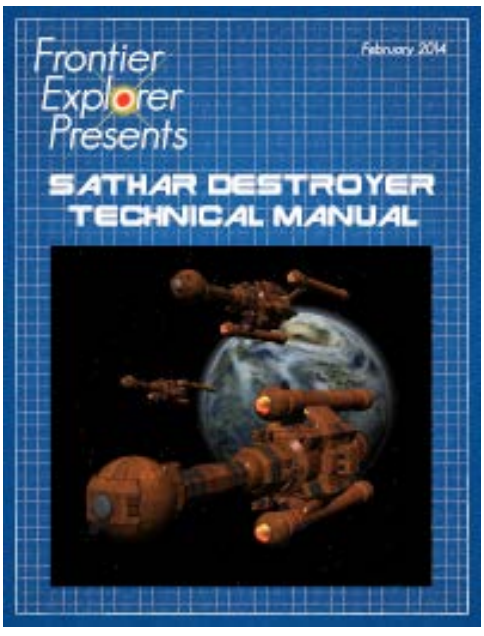
THE BATTLE OF ZEBULON

A KNIGHT HAWKS ENCOUNTER

BY TOM STEPHENS

Author's Note: This article originally appeared on my blog, the Expanding Frontier (**https://expandingfrontier.com/2019/04/battle-of-zebulon/**), on April 23,2019, right as we were restarting the magazine's publication. It was recom-mended I reprint it here in the magazine.

While working on a series of blog posts on a complete campaign using the published modules (**https://expandingfrontier.com/?s=%22A+Module+based+campaign%22**), I talked about the space battle around Volturnus at the end of the first 3 modules. The modules hand wave it away as, at the time, the spaceship rules had not yet been published so there was no way to run it. In this article, we will look at my concept for that battle: what sathar ships are there, and what the UPF sends to the fight. If you read my Detailed Frontier Timeline posts on my blog, you know the answers as this has already been covered there, but I thought I'd lay out some of the rationale behind the decisions and set the game up for an epic Knight Hawks board game battle. And I'll tell you how it played out when I ran through the scenario to generate the timeline posts.



SATHAR SHIP DESIGN

In my universe, all the sathar ships of destroyer size or larger are also troop transports. While the UPF tend to have small crews and lots of allocated space, the sathar pack in lots of ground troops on to each ship.

You can see an example (and more detailed explanation) of this in my **Sathar Destroyer Technical Manual** (link goes to product page on DriveThruRPG – it's a free product) that details the interior of a sathar destroyer. That ship carries over 500 ground troops packed into its bowels.

Based on the ship sizes, I've extrapolated that the light cruisers carry about 4,500 troops, the heavy cruisers carry over 15,000 and the assault carriers transport around 10,000 troops in addition to up to 12 fighters. While I haven't completely fleshed out those larger vessels, this is a close enough estimate for this article.

HOW MANY SATHAR SHIPS ARE INVOLVED

Now that we know how many troops each ship transports, we can come up with a reasonable composition for the invasion fleet that is attacking Volturnus.

The boxed text from the adventure gives us the following clues:

"All that can be done has been done to prepare the planet for defense against the hideous worms. The initial reports arriving at the Eorna complex beneath the ruins of Volkos are good; the Eorna planetary defense batteries have kept the Sathar fleet at bay, and many of the Sathar shuttles have been destroyed attempting to land ground troops on the planet

The successful landing of a large Sathar army has been detected. After scanning the planet, the Sathar advanced in the direction of Volkos. They should arrive in full battle array sometime tomorrow morning. They number at least 30,000 plus robots and other weapons!"

This tells us that there are at least 30,000 troops on the ground and that there were more to begin with as many were destroyed in the landing attempt.

So, we want a mix of ships that can transport something over 30,000 troops. Based on the mix of ships given in the Knight Hawks campaign book, I settled on the following mix of ships for the fleet:

- 2 frigates
- 6 Destroyers
- 2 Light Cruisers
- 2 Heavy Cruisers
- 1 Assault Carrier with 8 fighters

This gives me a total troop compliment of about 52,000 troops plus robots, attack creatures, and heavy weapons. We can assume that about 40% of the troops were killed by the planetary defense system leaving about 30,000 for the assault on Volkos.

THE UPF CONTINGENT

We have to remember that this is not a planned engagement in an on-going war. Rather it is a sudden call to arms that needs to be filled at short notice with no idea of what the opposing force will be. In fact, given the overwhelming number of ships that were seen at Pale 50-60 years earlier (in my history), the UPF might be loathe to commit any ships fearing that they are sending them into a death-trap. Regardless, the ships are sent, but they are assembled on short notice.

The most obviously available ships are the Pale militia ships, consisting of a frigate and three assault scouts. They would almost certainly be pressed into service by Spacefleet as they are only one jump away. If Laco (in Dixon's Star) had a militia, they too would probably have been involved but Laco is only an outpost.

IMAGE BY SCOTT MULDER

Streel is headquartered on Pale, and it is almost certain that they have a number of military or paramilitary vessels at their disposal. They might be conscripted by Spacefleet or possibly even volunteered as Streel has a definite interest in opening (and exploiting) Volturnus. Keeping the sathar out of the system and off the planet is just good business practice. So Streel will probably send some ships along.

That leaves Spacefleet. Strike Force Nova might be around. It patrols around the Frontier constantly so there is a chance it is nearby. The nearest large group of ships with a known location is Task Force Prenglar, stationed in its namesake system. The problem is that it is three systems away from Zebulon. Which means it is going to take some time to get there and may not arrive in time.

If you just use the distances between the stars as travel time, it's only 15 days. That's the way the Alpha Dawn rules described interstellar travel. However, the Knight Hawks rules say you have to accelerate up to 1% the speed of light to make the jump and then slow down at your destination. That acceleration, at 1g takes a little over 83 hours or just over 4 days. And then 4 days to slow down. Assuming some maneuvering at the beginning and ending of the trip and checking vectors and such just before Void entry, a single interstellar hop really takes about 9 days, regardless of distance. Maybe a bit longer on long jumps due to extra astrogation calculation time.

Now we can speed this up a bit by accelerating faster but for a long transit, that has detrimental effects on crew. If you expect to be coming out of the Void into a firefight, you don't want to have spent the last two weeks strapped into an acceleration chair at 2-3 gees.

We can also speed up the transit by not slowing down in the intermediate systems. Then we only have the astrogation time to worry about. That might work for the Dixon's Star system, but they will have to slow down in Truane's Star to rendezvous with the ships from that system and coordinate their jump. So assuming ships from Prenglar blow through Dixon's Star without stopping it will take them 4.5 days to get to Void speed in Prenglar, 2.5 days in Dixon's Star to do the astrogation calculations (assuming 2+ astrogators working in shifts around the clock), 4.5 days to slow down at Pale in the Truane's Star system. Then they need to accelerate and jump to Zebulon which will take another 9 days. All told, that's 20.5 days of travel. Add to that any time it takes to assemble the Task Force and get the ships ready to leave.

What other options are there? In the description of Spacefleet, it describes the two Task Forces and Strike Force Nova and then says that there are other smaller units as well. I decided to take advantage of this.

At the same time as the events are unfolding on Volturnus, Streel and Pan Galactic are locked into what will be known as Laco's War, the first corporate war. In my games, this war is just starting to heat up. Because of that, Spacefleet had recently dispatched a medium sized Patrol Group to the system to attempt put a damper on the rising hostilities. Patrol Group Virgo, consisting of 2 light cruisers, 2 destroyers, 2 assault scouts, and an assault carrier with 8 fighters, has just recently arrived in Dixon's Star. That puts them marginally closer only requiring 18 days to get to Volturnus with the advantage that since they are already out on patrol, they can depart immediately.

So once the call comes in from the PCs, Spacefleet takes a day or two to make the decision and then dispatches Patrol Group Virgo from Dixon's Star. In Truane's Star they pick up the Pale militia as well as a frigate, 4 corvettes, and 3 assault scouts that Streel sends along on the expedition. With that, the ships arriving at Volturnus from the UPF are:

- 8 Assault Scouts
- 4 Corvettes
- 2 Frigates
- 2 Destroyers
- 2 Light cruisers
- 1 Assault Carrier with 8 fighters

From a campaign perspective, I have the UPF fleet arrive just as the battle on the ground is ending, driving off the sathar ships.

THE KNIGHT HAWKS SCENARIO

We now have the order of battle. The sides are fairly evenly matched. The UPF fleet has more ships, but the sathar have

IMAGE BY SCOTT MULDER

slightly more hull points. The UPF's forces are concentrated into its smaller vessels, lots of little assault scouts and corvettes that can potentially be picked off fairly easily.

This scenario can be played by any number of people. Simply divide into teams and each team takes a side. The UPF forces divide fairly easily into three groups, one playing the UPF ships, one the Pale militia, and one the Streel ships. Although the number of ships and their strength isn't evenly distributed between those groups. The sathar ships can be divided up any way that team sees fit.

SETUP

A planet counter representing Volturnus is placed in the center of the map.

The sathar are the defenders in this scenario. Sathar ships, with the exception of the frigates, are all placed in orbit around Volturnus with a speed of zero. They have just recently finished dropping off all their troops. Since the frigates are not troop carriers, they can start in any hex within 5 hexes of the planet with a speed of up to 5 hexes/turn.

The UPF are the attackers. They all start along one of the short sides of the map. The individual ships can be anywhere on that side, but all the ships have to be on the same side. They must start within 3 hexes of the map edge and be moving at any speed up to 15 hexes/turn. All the UPF ships have to start at the same speed.

SPECIAL RULES

ESCAPING THE BATTLE

A ship is considered to have escaped from battle if it moves off any edge of the map with a) no ships in pursuit, or b) is out of weapon range and has a higher ADF of any pursuing ships.

PRESERVE THE FLEET

Heavy cruisers and assault carriers are important vessels in the sathar navy. If the tide of battle seems to be going against the sathar, they will try to pull back to preserve these larger vessels, sacrificing the smaller ones if necessary (even if it means ramming) to delay the UPF ships and allow the larger vessels to escape.

VICTORY CONDITIONS

SATHAR VICTORY

The sathar claim victory if they can destroy all the UPF vessels.

UPF VICTORY

The UPF claim a complete victory if all the sathar vessels are destroyed. If any of the sathar vessels escape, it is only a partial victory.

WHEN I PLAYED

I played this out once using the full Advanced Combat rules of the Knight Hawks boardgame. I wanted to test the plausibility of this mix of ships in the scenario. Basically, I was playing to make sure it was possible for the UPF to win. I definitely thought the sathar would have the advantage. It turned into quite the slugfest. However, the UPF got in some lucky early blows with the assault scouts living up to their hype and taking out nearly half of the sathar fleet by round 3 of the game after losing only a single assault scout.

In the end, the sathar fleet was routed, escaping with only 1 frigate, 2 destroyers, and a heavy cruiser. The other heavy cruiser and assault carrier were lost on that fateful round 3. The UPF only lost a Pale militia assault scout, and a light cruiser and assault scout from the Spacefleet contingent, but almost no ship escaped unscathed. The die rolls favored the UPF and it ended up being a very lopsided game. I suspect if played through several more times, it could go either way.

LAST THOUGHTS

Do you like these Knight Hawks game scenarios? In the early days of the magazine I did a regular "Knight Hawks Encounters" feature with one or two scenarios outlined, often including stats or based on other articles in the issue. Would you like to see those features return? Let us know at **editors@frontierexplorer.org**.

And if you play this scenario out, let me know which rule set you used (Basic or Advanced) and how it turned out.

IMAGE BY JERRY BOUCHER

PERCIVAL'S LEGACY!

BY ERIC WISOR

Master Ranger Theodore Percival spent a month with us at the Jurak Hangna Foundation (JHF) enjoying the addition to our museum of the Morgainean Swamp Lurker. We got the slurker transferred to a permanent display freeze field the first week we were back. Percival recorded an exciting account of his hunt on holovid for presentation at the display. He was very anxious to share his adventures with the young hangers and kids that came to see the display on the opening week. Then Percival just spent extra time roaming about the habitats and reminiscing to anyone who would listen to him. Dwain pulled me away one evening at the end of the third week and explained that he felt that Percival was stalling. We found out why at the end of the fourth week. Percival marched stoutly into my office with a package in tow and a ticket off world in hand. He bellowed, "My parting gift has arrived!", gave us each a big slap on the back, much to the pain of Tik, bade us farewell, and strode off to his waiting air car with the delivery bot blocking my door.

PERCIVAL'S EGG

A note was attached to the package written in human script upon paper. Dwain read it to me.

Dear Friends,

I bagged one of these beasts many, many years ago as a young man. This thing will rip the entrails out of a man in seconds and crush his bones in its jaws all while running at full speed for its next victim. These creatures are extremely dangerous and feared by the sapient beings of New Pale. They will become endangered as a result.

I believe you are destined to be the premier wildlife refuge in the Frontier. You are well prepared to take on this challenge and responsibility. No other wildlife refuge in the Frontier has the vast space, the bioforming, genetic & zoological staff, and the world ecology tolerant enough to accept the biodiversity that must be housed here. Each world has the responsibility to preserve the habitats of its creatures and will do so to the best of its capability. Only Hakosoar is suitable to back them all up by providing off world habitats for the future endangered creatures of the Frontier.

Inside this crate you will find an incubator and a live egg for a New Pale Rip Roar, proper name, Giant Scandere Lacerant Lacertos Paleosaur. My colleague at the New Pale Wildlife Conservation Office will be in contact with you to answer your every need. We have been discussing the JHF for some time among the inner circles of many world conservation offices and we feel you are up to the test.

Sincerely Yours,

The Honorable Theodore Percival, COL UPFLR, KG CWL, KT COL MT, KT COL MWP, COL TS, COL TR, CAP MS, CAP LD, CAP RH.

Attached to the letter was a memory chip with Percival's Rip Roar hunt.

ECOLOGY OF THE RIP ROAR

Percival went to New Pale as a young officer in the Clarion Royal Marines in a cooperative military exchange with the Truane's Star Rangers. Their mission was to protect the developing outposts from the many Paleosaurs. Percival joined a team of Truane's Star Rangers tasked with protecting the science teams studying an area of Paleosaurs which included the Rip Roar. He became enamored by the Rip Roar and took up the study of this creature as his personal hobby. He also took up the hobby of big game hunting common to officers of the military and elites of society of the time.

Game was plentiful (and still is) on New Pale. Scientists were eager to catalog and dissect every creature. A hungry population was seeking safe local meat sources. Government was desperate to establish their control over the resources of the planet. Establishing big game hunting as a government sponsored sport encouraged all these things and more. Gaining a tag to hunt a Rip Roar was thus easy to do. Percival set his sights on gaining the hunting skills and knowledge necessary to be the first to bag a rip roar. Everyone was after a hunting first. Gentleman's agreements and friendly competition made big game hunting the sport of notoriety. It also helped that the game of New Pale could also hunt the hunters, controlling the number of participants in this elite game.

The Rip Roar gained its name from its most prominent instinctual behaviors. The rip roar has four legs and an extra pair of arms forward of the legs. These arms support a sharp and powerful curved claw well designed to slash and tear at its victims. The rip roar uses these claws to slash at prey it pursues. Prey smaller than the rip roar are typically ripped down in a single stroke and bleed out quickly. A rip roar may attack a pack of creatures and take down half a dozen before beginning to feast. And as Percival noted in his letter, rip roars are known to eat on the run, munching on one victim while chasing the next.

Each forearm also sports a small pair of opposable claws on either side of the main claw. These are used to grab prey to hold on when the prey is large and biting is needed to attack or to tear victims apart.

The rip roar is also noted for its unusual roar. These creatures will announce their territory by arching their heads upwards and producing a growling low whistle out of their throats. The sound is rather disconcerting to most humans and yazirians. When one rip roar announces their territory at night others respond causing the jungle to become a chorus of eerie whistle roars that frighten everyone. Outpost settlements typically employ very large caliber weapons to announce their territory in response and drive away any rip roars not obliterated by them. Expeditions into the jungle typically employ armored personnel carriers with large caliber weapons for protection from Rip Roars and their larger native New Pale Paleosaur cousins.

The rip roar is carnivorous. They hunt at all hours of the day and night. They wait in ambush and sprint at their prey to slash at them and knock them down. They are not averse to attacking larger prey. Teaming up with a mate is common when seeking larger prey. When not mating the rip roar returns to a solitary territorial life.

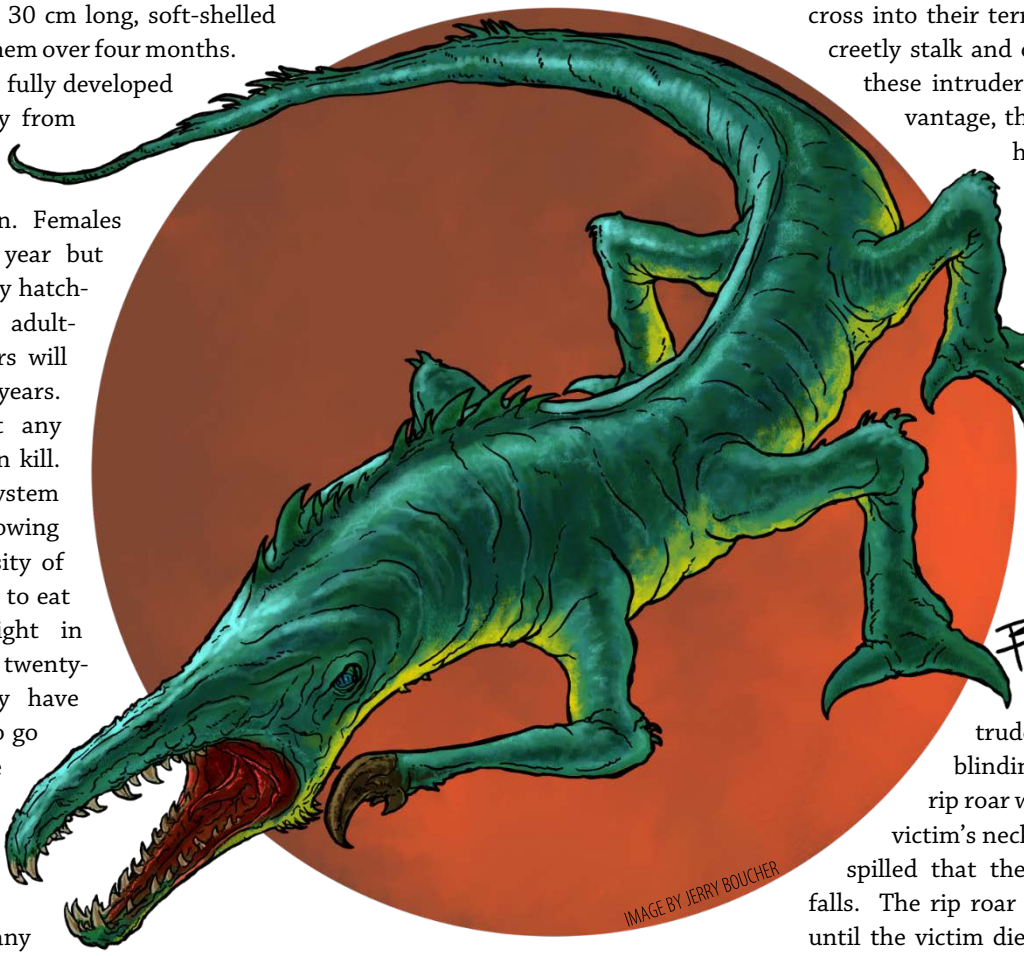
The rip roar confines its territory to the jungles of New Pale with the largest trees. The rip roar will use the largest trees to climb into for safety from the larger Paleosaurs. They make their nest on the ground. After mating a female rip roar will lay half a dozen, 30 cm long, soft-shelled eggs and guard them over four months. The young hatch fully developed and scatter away from the mother quickly to mature on their own. Females will mate each year but only one in thirty hatchlings survive to adulthood. Rips roars will mate for twenty years.

Rip roars eat any creature they can kill. Their digestive system is robust allowing them this diversity of prey. They need to eat their body weight in prey once every twenty-six days. They have been observed to go as long as twelve days without food when prey is scarce and also to bag large prey or many prey and guard the food consuming it over many days. Fights over food are common but not deadly. A rip roar that enters an other's territory to take its kill will be driven off if possible. If the intruder succeeds to drive off the owner of the kill, then its territory is shifted to include the territory containing the kill and the looser must seek another kill and adjust its territory.

The rip roar thrives in the warm jungle climates of New Pale. It fails and dies in the cold.

PERCIVAL'S FIRST BIG KILL

The old video recordings of Percival's hunt to bag the first rip roar start with many smaller hunts showing Percival honing his skills. Then there are hours of video of tracking rip roars. Percival learns how to identify rip roar nests from other paleosaur nests. A rip roar likes to nest around higher ground or even a tall tree that it can climb when seeking defense or the opportunity to attack from the highest advantage.



Percival observes the hunting habits of rip roars to learn what prey make the best bait for attracting a big rip roar. Dobers, a small herbivore a meter tall when mature, are the preferred food source of rip roars. They congregate in groups of four to six and provide an exciting chase that the rip roars seem to encourage. Many times in the videos a single rip roar will sneak onto the edge of a group of feeding dobers and pounce into their midst with a startling whistling hiss slashing one victim down and scattering the group. Then the chase begins to catch as many dobers as possible. The dober has the advantage in these chases as it can leap and duck through obstacles that the rip roar cannot pass through. Dobers will seek safety in thick brush and fallen debris. They can also out last a rip roar in a long-distance chase.

Then there is a long and extensive collection of videos where Percival follows large rip roars with drones and observes their hunting of other predator paleosaurs. Rip roars will lay in concealment observing the hunts of other paleosaurs that cross into their territory. They then discreetly stalk and observe the actions of these intruders. When there is advantage, the hunters become the hunted. The preferred method of attack on these intruders is to discreetly climb a tree and leap upon the intruder from above striking at the neck and head. The forearms are used to gain the initial grapple on the intruder while the legs secure a tight hold. Then the rip roar will claw at the eyes of the intruder with its forearms, blinding it. Once blinded the rip roar will claw and bite at the victim's neck until enough blood is spilled that the victim weakens and falls. The rip roar will maintain its hold until the victim dies. Once the victim is dead the rip roar will commence in a protracted display of whistling roars. However, when an intruding predator spoils a rip roar's attack either by avoiding the leap attack or throwing it free, the rip roar will flee to fight another day.

Percival used these many expeditions tracking and observing active rip roars to select and hunt his big rip roar. Percival mentions to a companion that the honors of first rip roar kill will be forgotten if he does not also kill a large rip roar which will hold the record for largest kill for a long

time. Risking losing the first kill to competing hunters, Percival took weeks tracking into the jungle to find a full grown male larger than any recorded, five point five meters in length. The creature was battle scared and cunning. Three video segments show this rip roar talking down other larger predators that had wandered into its territory while hunting. Crazy Eight, as Percival named this beast, claimed territory near a jungle river with thick trees sheltering the river. Many creatures would venture to the river seeking water. Crazy Eight would pick his prey from among them. They would also draw other predators with them from time to time which Crazy Eight dutifully dispatched to protect his territory. Percival dubbed this rip roar Crazy Eight because it repeatably demonstrated its ability to leap upon and ride the largest paleosaurs for the longest times he had ever observed among rip roars. Dwain explained this name to me by showing ancient human videos of a sport call bull riding where the goal of the rider is to stay on the angry bull's back for eight seconds to score points.

Percival developed a plan to bait another large predator into Crazy Eight's territory and follow it in. Percival and his companions would then scale another tree sufficiently distant from Crazy Eight's favored ambush sight that they would have a clear shot when the hunting predator followed their bait into the ambush zone. The trick would be to not kill Crazy Eight before the opposing predator was killed by Crazy Eight. Not doing so would mean the loss of Crazy Eight as he would likely be torn to shreds or devoured by the predator out of spite. However, if they waited too long then Crazy Eight may be taken out of their kill zone as the wild ride of predator upon predator rampaged into the jungle. They needed enough time for Crazy Eight to become the victor before becoming the slain and to keep the ride in a known place.

Percival would only get one shot and his companions could not help him by taking out the intruding predator or the kill would not be counted as a lone hunter's victory. His companions were present to capture video documentation of the successful kill and to protect Percival if anything went wrong. If Percival was lucky, he could get two shots off, one to kill Crazy Eight and a second to assure that the intruding predator did not get back up and rip Crazy Eight's dead body to pieces.

Percival put his plan into motion and set a dozen long-leg paleots fleeing past a giant blade back. The beast set in pursuit of the herd. Blade backs are not too worried about stealth in their pursuits. They enjoy the privilege of just crashing through things. This the beast did to great display as it smashed through the jungle bludgeoning vegetation aside. The resulting commotion did exactly as Percival desired. Crazy Eight took immediate notice and raced to pursue the giant blade back. Percival controlled the fleeing long-leg paleots by remote detonating small flash charges spread about the jungle to change their course. Laboriously, Percival detoured the paleots and the pursuing giant blade back towards Crazy Eight's favorite ambush site. Crazy Eight, following the pursuit, correctly perceived the impending passage into his favorite ambush site and scurried up his ambush tree.

The giant blade back entered the clearing below the ambush tree just as the long leg paleots leapt into the river risking unknown submerged predators in exchange to rampaging death by blade back. Crazy Eight made his pounce from above. Percival's rifle went on site to his neck. Percival, lashed to his high tree perch, twisted about keeping a bead on the obstinate Crazy Eight. Foreclaws dug deeply into the blade back's neck as the four legs struggled to gain a grasp around the considerable girth of the giant blade back. Percival twisted to stay on sight. The blade back bucked and slashed its tail about ripping bushes from the ground. Crazy Eight gained foot holds between the blades on the giant blade back. Foreclaws began raking and stabbing for the eyes of the blade back. The blade back smashed its body against a large tree in response and Crazy Eight's body flew up from its grapple. Instantly his fore claws stabbed back down into the blade back's neck preventing Crazy Eight from being thrown free from the big beast. Bucks and twists followed amid wild roars of pain and anger from the giant and hisses of determination from Crazy Eight.

NEW PALE (RIP ROAR), GIANT SCANDERE LACERANT LACERTOS PALEOSAUR	
TYPE:	Carnivore
SIZE:	Large: 5.0m / 225kg
NUMBER:	1 – 2, Jungles
MOVE:	Medium, 75 m/turn
IM/RS:	6/55
STAMINA:	80
ATTACK:	45
DAMAGE:	2d10+5
SPECIAL ATTACK:	Slash and Tear, leap from above
SPECIAL DEFENSE:	Climbing
Native World:	New Pale, Truane's Star

Percival strained to stay on sight as the giant blade back was now between him and his target. Crazy Eight regained his grapple, straddling the girth of the beast and grasping tightly among the blades. Clawing and raking resumed with fury. The left eye was successfully excised. The blade back began wheeling to the left bringing Crazy Eight back into view and Percival's sights. Now only seconds remained before a kill shot could be made. Crazy Eight needed to make his kill. His perch was secure, blood needed to be spilled and quickly to weaken the giant blade back.

Crazy Eight began stabbing relentlessly at the right eye while hacking at the open gore of the left. The wheeling, thrashing, bucking blade back smashed up against a pair of trees that it could no longer see impeding its movements and giving Crazy Eight the advantage it needed to score killing wounds. Percival wedged his body against his tree perch and a branch to strain for a clear shot. Crazy Eight finished blinding the beast invading his territory and pushed his body forward to claw and bite at the now vulnerable neck. Blood poured and the giant blade back's feet began to lose their footing. Crazy Eight was winning and the beast was weakening. The beast bucked thrusting Crazy Eight into the air again. Claws once more arrested the flight bringing Crazy Eight down again onto the blade back's shoulders. Something ruptured in response to the exertions of the frantic bucking. Blood spurt from the open neck wounds and the

giant blade back went down. Crazy Eight clinched its grasp tight. Percival fired! Crazy Eight tensed still for a long moment then slumped onto the wiggling blade back. Percival fought to reload fearing the blade back would rally one last time. The round was chambered. The blade back heaved its body futilely. Percival took his second shot through the skull of the blade back before unlimbering himself from the tree.

Percival and his companions approached the kills rearmed and alert for last minute strikes or the attack of opportunistic predators. Upon reaching the dead blade back Percival tossed a small charge to the back of the open mouth. The explosion assured the giant blade back was dead. He lanced Crazy Eight and electrified the blade to paralyze the corpse as a precaution. Limbs were tied and Crazy Eight was hoisted up into the trees for protection from scavengers and to bleed out while the air transport arrived to haul out the kills. Percival had bagged the trophy kill that held the record on New Pale for fifteen more years. His career as a Frontier wide big game hunter had just launched.

GM NOTES

Theodore Percival's Titles: Colonel United Planetary Federation Landfleet Reserve COL UPFLR, Knight of the Guard Colonel Clarion White Light KG CWL, Knight Colonel Minotaur Theseus KT COL MT, Knight Colonel Morgaine's World Prenglar KT COL MWP, Colonel Truane's Star COL TS, Colonel Triad COL TR, Captain Madderly's Star CAP MS, Captain Laco Dixon's Star CAP LD, Captain Rupert's Hole CAP RH.

Rips roars have been recorded stalking sapient beings in the jungles much the same way they stalk and pounce dobers. They seem to neglect vrusk prey in preference for human, yazirian, ifshnit, osakar, and humma prey. A dralasite who remains still may go unnoticed by a rip roar. Vrusk and dralasites have been killed by rip roars but have never been recorded being devoured.

JURAK HANGNA'S FRONTIER TRAVELS

Jurak Hangna, Dwain, and Tik have been adventuring across the Frontier and across the pages of the Frontier Explorer looking for new and exciting creatures for the Jurak Hangna Foundation on Hakosoar since issue 2. And we look forward to many more adventures.

For those who haven't been along on the entire journey, we thought we'd recap all the adventures and organize the creatures studied by homeworld with references to where you can find them in the various magazine issues.

As always, readers wishing our intrepid adventurers to investigate a creature of the Frontier need only submit a picture and any details of the creature via FrontierExplorer.org. Submitters must have rights and permission to submit all artwork.

CREATURE	HOMEWORLD	ARTICLE	MAGAZINE ISSUE
Ice Cave Wolves	Alcazzar (Rhianna)	Ice Cave Wolves of Alcazaar	5 (p. 4)
Mubobp	Dralasite homeworld	The Dralasite Mubobp	19 (p. 21)
Carnivorous Wom	Gorilia (unknown)	Gorilian Carnivorous Wom	3 (p. 7)
Nugkta	Hakosoar (Scree Fron)	Nugkta Cultivation	16 (p. 15)
Infita	Homeworld (Capella)	The Infita	4 (p. 29)
Sabertooth Eel	Hum (Fochrik)	The Sabertooth Eel of Hum	22 (p. 12)
Blue Biters	Kdikit (Madderly's Star)	Kdikit Blue Biters	24 (p. 30)
Buckerbeisser	Kdikit (Madderly's Star)	The Buckerbeisser	15 (p. 1)
Grazelle	Lossend (Timeion)	Jurak's Timeon Safari Grazelle Hunt	27 (p. 19)
Miniature Lossodragon	Lossend (Timeon)	The Miniature Lossodragon	18 (p. 41)
Whitefooted Storch	Lossend (Timeon) & Clarion (White Light)	Running with the Whitefooted Storch	13 (p. 13)
Ublax Allagi	Mahg Mar (Waller Nexus)	The Ublax Allagi	23 (p. 39)
Rip Snake	Minotaur (Theseus)	Minotaur Rip Snake	20 (p. 21)
Sealion	Minotaur (Theseus)	The Minotaur Sealion	9 (p. 37)
Whiteheaded Treebouncer	Minotaur (Theseus)	Whiteheaded Treebouncer	25 (p. 39)
Great Aquatic Sandworm	Moonworld (Lynchpin)	Great Aquatic Sandworm of Moonworld	2 (p. 42)
Skads	Moonworld (Lynchpin)	Scads and Scads of Skads!	8 (p. 20)
Swamp Lurker (Slurker)	Morgaine's World (Prenglar)	Two Seconds with a Slurker	28 (p. 30)
Cybernuk	New Pale (Truane's Star)	Cybernuk of New Pale	6 (p. 33)
Rip Roar	New Pale (Truane's Star)	Percival's Legacy!	29 (p. 23)
Sea Dragon	New Pale (Truane's Star)	My Friend Jurak and Fat Max	14 (p. 3)
Mangsailings (Flinthoppers)	Osaka (Osak)	Finding the Flinthopper	17 (p. 43)
Sac-Laang	Osaka (Osak)	The Sac-Laang, Ash-laa, and Osakar Legend	7 (p. 23)
Ravenous Cave Creature	Terledrom (Fromeltar)	No Passport for Giggles	10 (p. 5)
Sathar Parasite	Unknown	An SP on Hakosoar	12 (p. 17)
Tok'Vzz	Vrusk homeworld	A little Tok'Vzz	11 (p. 1)
Bowler	Volturnus (Zebulon)	The Voltrunian Bowler	26 (p. 10)

TITAN RISING: 2253

EPISODE #22.0: "EMERGING"

V2.0

CAPTAIN RACHEL FLYNN ABOARD THE CENTAURAN SEPARATIST'S FLAGSHIP HAMMERFALL FIGHTS TO SURVIVE AGAINST THE ALIEN AFFLICTION CONSUMING HER.

HER TRUSTED ADVISOR AND LONG TIME FRIEND, CHARLES DENTAK HOLDS VIGIL OVER HER LAST MOMENTS.

CAPTAIN FLYNN, CAN YOU STILL HEAR ME?

JUST LET GO RACHEL. DON'T TRY TO RESIST WHAT IS EMERGING IN YOU.

GASP...

YOUR LIFE IS NOT ENDING HERE, IT IS ONLY YOUR HUMANITY DYING.

THIS IS JUST THE NANOGEN'S PROCESS...

REWRITING YOUR CELLS' GENETIC CODE.

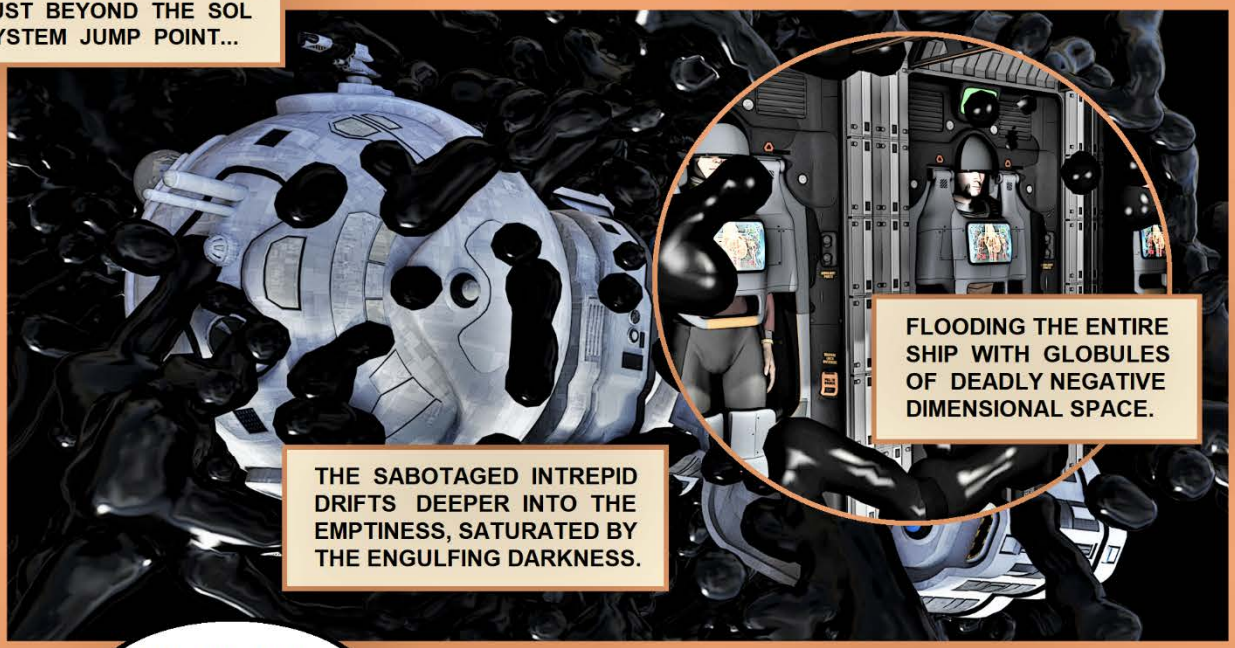
'CHOKE, GASP...

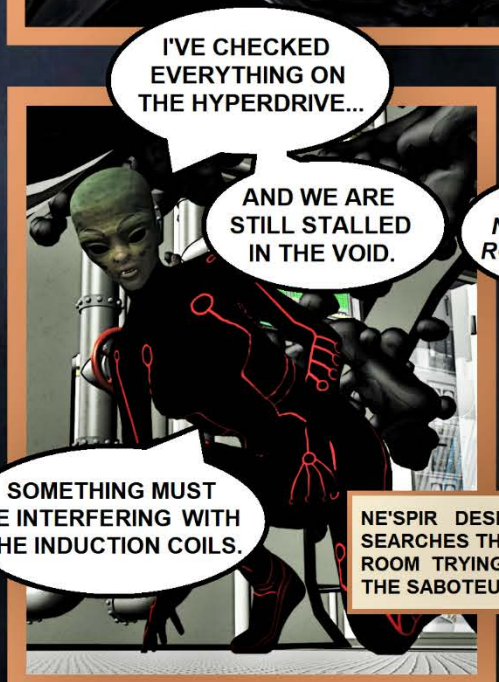
THE NANOGEN WILL GRADUALLY REPLACE YOUR FRAIL TISSUE STRUCTURES WITH ITS OWN.

IT IS AN AMAZING METAMORPHOSIS, I ONLY WISH YOU COULD SEE IT FOR YOURSELF.

VERY SOON, ALL OF HUMANITY WILL UNDERSTAND WHAT THE XIN REALLY ARE WHEN YOU BECOME ONE.

MEANWHILE, IN THE VOID JUST BEYOND THE SOL SYSTEM JUMP POINT...





INERTIA UMBRELLA

IN THE MINZII MARKETPLACE

BY TOM VERREAULT

Grollo had been ignoring the "in-flight" digital magazine playing on the display in the seatback facing him. These things were part infomercial, part advertising, and 100% annoying. You were, in effect, a captive audience on shuttle flights which meant he was usually well practiced at tuning out the noise. However, something about the item being offered caught his eyespot. It was an inertial umbrella. Not anything really revolutionary in technology, just in application.

Inertia screen technology had been in military and mercenary use for a long time since it could lessen the physical force of many things from bullets to batons. It had been adapted as safety technology for vehicles to reduce injury to occupants during vehicle crashes and collisions. What was unique here was that the tech had been engineered to deflect precipitation and that is what had caught Grollo's eyespot, he hated being wet. This was unusual for his species but true. He would never set foot in a hot tub which was popular among dralasites for the absorption of intoxicants and most of all he hated when his work took him to the planet Clarion with its constant rain. Too bad the umbrella was phased to just deflect rain, snow, and hail as it would be nice if it could be used as an inertia shield in a pinch.

He was about to tune out the diminutive ifshnit pitchman when the classic phrase, "but wait there's more," came from his slightly annoying high-pitched voice. The umbrella could indeed be used as an inertia shield same as the inertia screen. There were caveats like you could not have another defensive screen of any type in operation but that was standard and any rookie enforcer new that. There was a downside though, using it as a defensive shield burned it out. But hey if it saved your life Grollo could live with that.

Just as he was thinking it was an interesting product but was also ready to tune out the infomercial, the ifshnit pitchman said, "But wait, there is more!" It seemed this was the deluxe model and providing it had not been burned out as an inertia screen, it also doubled as an electric sword. In the ancient tradition of concealing a sword inside a cane they had disguised the rod that was the inertia umbrella as an electric sword. Now that might just be handy. The government of Clarion was not very friendly toward beings walking around armed, so a concealed weapon that might also save his third butt cheek in a hostile situation would be something of interest indeed.

Drawing out his ID folio he made the purchase for the deluxe model and had it sent to the Stellar Arms Hotel planet-side where he had a reservation when the shuttle landed.

INERTIA UMBRELLA (BASIC MODEL)

This specially engineered item runs on a mini power clip (Zebs Guide- 10 SEU) using 1 SEU per month to deflect precipitation. If used as an inertia shield it must have 2 SEU left in the clip. One use as an inertia shield does burn out the umbrella but will halve inertia damage in the same way as an inertia screen. All rules that apply to an inertia screen apply. Once the umbrella is burned out, it is useless until repaired (-10 penalty) and the power clip is replaced.

IMAGE BY JERRY BOUCHER

To use the inertia shield feature the player must be holding the umbrella in one hand and state whether he is defending against a direction or making a RS check. If the player has stated a direction then the inertia shield feature will function against the first inertia attack from that direction. If the player invokes with the RS check rule then he must make a successful RS check when an inertia-based attack is made and then the inertia umbrella can be used against that attack.

Cost: 100 Cr. **Weight**: 1 kg

INERTIA UMBRELLA (DELUXE MODULE)

This item looks and functions like the basic inertia umbrella but with a few distinctions. If it has not been burned out by using the inertia shield feature then the item can be switched to and used as an electric sword. It functions exactly like an electric sword while the mini power clip's energy holds out (10 SEU). It may be plugged into a power belt or power back pack but this may alert an opponent to the concealed nature of this defensive/offensive device. If it runs out of power or is burned out, the item is rugged enough to be used as a baton or nightstick type weapon without damaging it against future repair or recharge. If this model is plugged into a power beltpack or backpack when it is used as an inertia shield, there is a 40% that it will short out the power source.

Cost: 200 Cr **Weight**: 1.5 kg

INERTIA WALKING STICK

This item is crafted to look like a walking stick or cane. It has an internal rechargeable battery (2 SEU) that cannot be changed like a SEU clip but can be recharged at a standard recharging station. The cane cannot be connected to a power belt or power backpack. It is designed to be a concealed single use inertia shield. All rules for the use of the inertia umbrella as an inertia shield apply. It will function once and a special circuit breaker may prevent it from

burning out and requiring repair: 50% chance. It is rugged enough to be used as a baton or nightstick type weapon without damaging the electronics.

Cost: 100 Cr. **Weight**: 1 kg

APPENDIX - INERTIA SCREENS AS VEHICLE SAFETY DEVICES

A model of inertia screen is manufactured to be used in vehicles to halve damage to one occupant from a crash or collision. It has the same weight and cost as the wearable inertia screen but must be installed in a vehicle. These devices will be installed in a vehicle as part of the seat and activate only during a crash or collision. Integral to their circuitry is a scanner that prevents it from activating if the occupant of the seat already has a defensive screen in operation.

A similar model is used on military and militia vessels to protect the crew from the effects of high G maneuvers while at their duty stations. Again, the crew cannot have a worn defensive screen in operation. These inertia screens can also increase crew survivability during catastrophic damage to the ship during combat.

In a "Mutiny on the Eleanor Mores" type situation, a player character might salvage a vehicle inertia safety screen and cobble together a non-wearable inertia shield. In this case the referee should require multiple successful skill checks for the PC to get it to operate. The referee should also enforce limits making the device unwieldly to use and prone to burn out.

Another application of this field technology is in a structure where it is used to deflect precipitation from an open courtyard. A character jumping from a height and passing through such a field would reduce any computation of falling damage by 10 meters. He cannot have any active worn defensive screens or both screens will short out with a 50% chance of them burning out and requiring repair.

ELECTROCHEMICAL SLUGTHROWERS - "SLUGGERS"

AN ALTERNATE FRONTIER

BY RICHARD "GREYMYST" FARRIS

This article gives a look at the expanded weapons in "An Alternate Frontier". An Alternate Frontier will look at the people, places, and things in a different, but very similar setting of the Star Frontier Universe. This is the first in a series of articles on the weapons of an alternate Frontier.

The first section will detail the history of the weapon class. This delves into where the technology came from. A description of the weapon class follows, detailing briefly how the class works. The next two sections go into some reasons why a person might want to carry this kind of weapon, or why they may want to avoid the class. Next comes specific rules that apply to this class of weapon. Then comes a list of generic representations within the class. Finally, in the simple rules comes specific ammunition types that can be used in the weapon class that may alter the statistics in some way. These will allow the weapon some versatility in dealing with specific threats.

If you wish to stop there, the generic list is perfectly playable as is. Use them and have fun. The next sections expand upon the weapon class and explain how the statistics and features came into being. The "Nuts and Bolts" section explains how the base weapons (generic pistol and rifle) can be modified by applying templates to create new weapons. The accessories section allows further customization to a shooter granting bonuses or penalties when applied to a weapon. The specific weapons section takes just a few generic versions of a fully modified weapon and gives it context with the campaign world. This is where a weapon can "come to life", with a manufacturer, history, and possible uses within the campaign.

Finally, there is the Optional Rules section that expanded upon the standard statistics of weapons to add more flavor and granulation between weapons, or even weapon classes. If a particular rule is unwanted, disliked, or seems too complicated, feel free to ignore that rule and its corresponding column in the stat blocks. Removing any optional rule will not break the other weapon stats or make them unplayable.

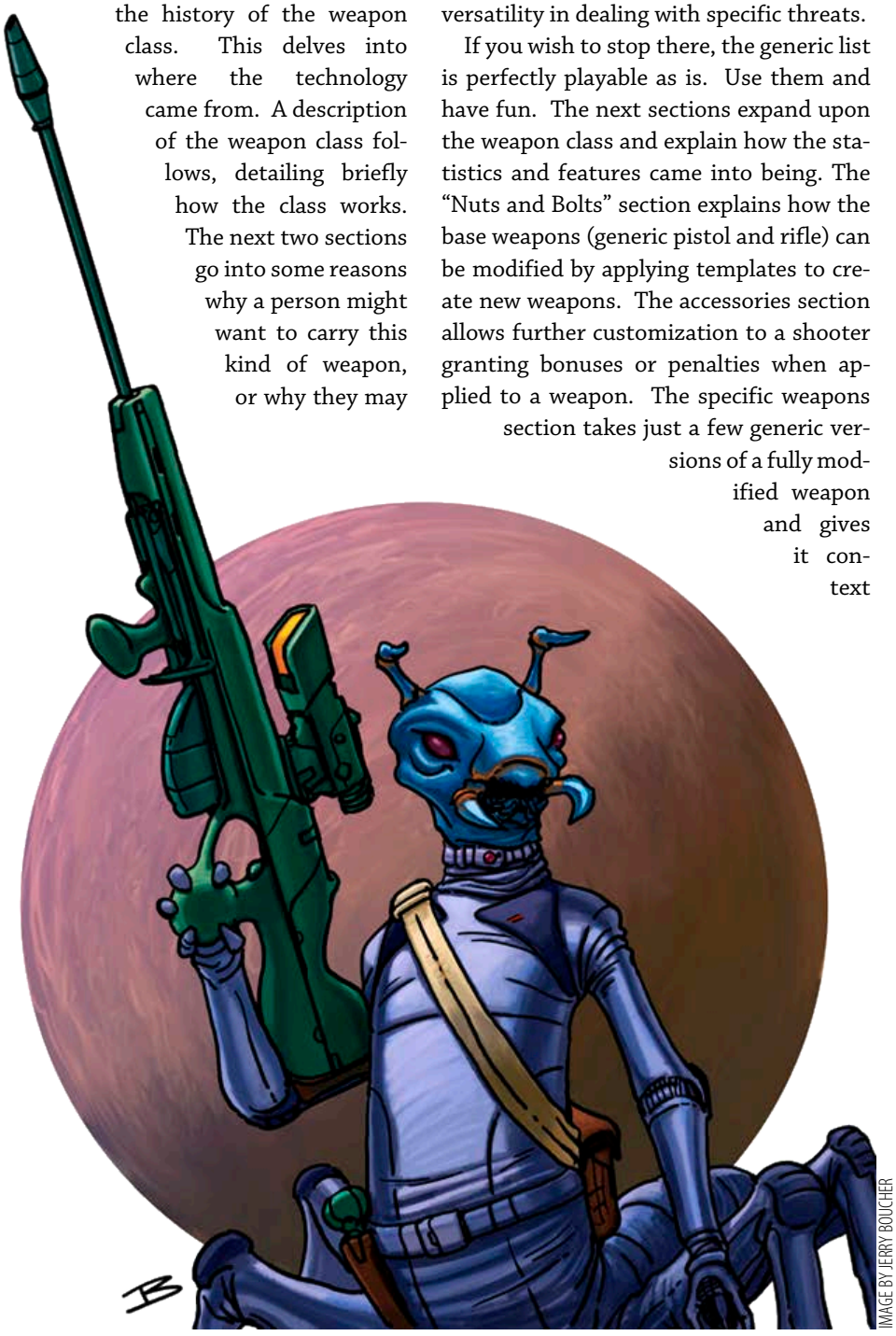


IMAGE BY JERRY BOUCHER

HISTORY

Humans have always had a penchant for things that go boom. Most early technologies rely on fire and chemicals with violent tempers. From generators and vehicles that burn fuel to create propulsion or electricity, to shooting people with things that use chemical reactions to propel projectiles; human technology revolves around blowing something up in one form or another. There is no reason to believe this trend will diminish going into the future. As humans reach for the stars, they invent new fuels that make the reactions more efficient. Just as gasoline produces much more energy than burning wood to get steam, so will new fuels provide the energy needs of the future.

DESCRIPTION

ElectroChemical Weapons fire a slug by delivering an electrical charge to a chemical propellant block. This vaporizes the block into expanding gases that accelerates the round. The result is a "softer" launch that reaches a very high velocity without significant increase in recoil. Most electro-Chemical slugthrowers use caseless ammunition: a solid block of propellant replaces the traditional cartridge containing the loose propellant. Losing the cartridge reduces ammunition weight

and bulk, eliminating the need for ejection ports (which can allow dirt into the weapon), making the weapon's action more reliable.

Skeinsuits and Inertia screen protect again Electrochemical weapons.

WHY SLUGGERS RULE (ADVANTAGES)

Why would people still be using Electro-Chemical weapons when other energy weapons are available? Several reasons. ElectroChemical weapons are simple, sturdy, and reliable. If a round should fail, it can be removed, and the weapon is pretty much good as new. There are very few electronics to damage or fail. They are unaffected by environmental conditions, such as vacuum, smoke, rain, or anti-laser aerosols. Lastly, the weapon itself is easily produced in any descent machine shop.

WHY SLUGGERS SUCK (DISADVANTAGES)

Ammunition is non-reusable, easier to regulate or deprive, and much easier to detect. Energy clips are used in almost every piece of normal equipment and would be hard for security personnel to detect a weapon from normal devices, but Electro-Chemical ammunition is easy to detect and has no use other than weaponry. Also, elimination of ammunition supplies (found by the same methods above) would seriously hurt any terrorist and revolutionary activities. They have significant recoil to overcome in zero-G. Electro-Chemical weapons have limited endurance (shots), and they can't be plugged into vehicle or emplacement power sources to recharge.

SPECIFIC RULES

STAR FRONTIERS

Burst Fire: a weapon capable of burst fire, fires 3 rounds per pull of the trigger. Firing a burst counts as a normal attack and a weapon can fire a number of bursts equal to the ROF. Each attack has a +10 bonus to the attack, causes one extra dice amount (1d5) of damage, and increases the recoil for this attack by +5.

Automatic Fire: weapons capable of automatic fire can fire 1 full auto group per turn instead of the normal rate. A group uses 10 bullets but receives no bonus to the attack (the recoil negates the bonus). Full Auto fire can target up to 5 adjacent targets and does damage equal to 3 normal shots, plus 1d5 per target after the first. Damage is divided between all targets.

FRONTIER SPACE

Burst Fire: a weapon capable of burst fire, fires 5 rounds per pull of the trigger. Firing a burst counts as a normal attack and a weapon can fire a number of bursts equal to the ROF. Each attack has a +20 bonus to the attack, causes damage as per being hit by 2 bullets, and increases the recoil for this attack by +5.

STAR FRONTIER AND FRONTIER SPACE

Optional Rule: A shotgun's blast, when not using slugs, spreads slightly as it travels, both making it easier to hit with and giving it the possibility of hitting adjacent targets to the original. Stats are kept consistent for ease of play. If desired, use the following modifiers in addition to the standard range modifiers:

- Close range has no additional modifiers
- Short range has +5 to attack, but cannot hit adjacent targets
- Medium range has +10 to attack and can hit targets withing 2m of the original target. Roll separate attacks on valid targets with damage being 2d5
- Long range has +15 to attack and can hit targets within 5m of the original target. Roll separate attacks on valid targets with damage being 1d5

COMMON WEAPON DESCRIPTIONS

EC PISTOL

This weapon is the most common EC handgun and is a commonly carried by those who want protection for typical situations. It uses standard pistol ammunition.

HEAVY EC PISTOL

This big, semi-automatic pistol fires a powerful round, trading higher power for fewer rounds and a larger frame. Its size makes it harder to conceal, and it requires a strong person to shoot accurately. This weapon is a common military or police sidearm for forces wanting a little more punch than the weapon above. It uses heavy pistol ammunition. This weapon used the Heavy template (see the Nuts and Bolts section below).

HEAVY POCKET EC PISTOL

For individuals wishing stopping power and concealability, there is this small weapon. It carries one round in each of its two barrels. It uses heavy pistol ammunition. This weapon used the Heavy and Hold-out templates.

EC SMG

Submachine guns are fully automatic weapons that fire pistol-caliber ammunition. This model features a pistol grip and extra foregrip for better control. Due to their combination of firepower and maneuverability, SMGs find favor with anybody fighting aboard a spaceship or confined area. It uses standard pistol ammunition. This weapon used the SMG template.

EC ASSAULT RIFLE

The assault rifle is a simple bullpup-style weapon. It is standard human military weapon, often loaded with AP bullets. It uses standard rifle ammunition. This weapon used the Military template.

HEAVY EC BATTLE RIFLE

Sometimes you need more punch than an assault carbine. This caseless battle rifle fires a more powerful (if slightly lower velocity) 7.7mm caseless rifle round, making it popular with troops who expect to face armored opponents. Its drawbacks include heavier ammunition and noticeably higher recoil. It uses heavy rifle ammunition. This weapon used the Heavy and Military template.

HEAVY SNIPER RIFLE

This is a big "anti-materiel rifle" - a large-caliber sniper weapon powerful enough to damage or cripple light vehicles more than

STAR FRONTIERS STATISTICS	DAMAGE	RANGE					AMMO	CONCEAL	SNAP SHOT	RECOIL	RELIABILITY	ROF	DEFENSE	WEIGHT	COST
		CLOSE	SHORT	MEDIUM	LONG	EXTREME									
EC Pistol	4d5	5	15	30	60	120	15	-15	-5	-10	100	3	Inertia	1kg	200
EC Hvy Pistol	5d5	5	15	30	60	120	10	-10	-5	-15	100	3	Inertia	1.5kg	250
EC Hvy Hold-out Pistol	5d5	2	5	10	25	50	2	-30	-5	-20	100	3	Inertia	0.5kg	150
EC SMG	4d5	7	20	40	80	150	30	-5	-5	-10	100	3B, FA	Inertia	1kg	300
EC Rifle	5d5	20	50	120	250	500	10	+20	-15	-10	100	3	Inertia	3kg	300
EC Assault Rifle	5d5	20	50	120	250	500	30	+20	-15	-10	100	3B	Inertia	3kg	400
EC Hvy Battle Rifle	6d5	20	50	120	250	500	20	N/A	-15	-15	100	2B	Inertia	4kg	500
EC Hvy Sniper Rifle	6d5	40	125	250	500	1000	10	N/A	-20	-20	100	1	Inertia	4kg	500
EC Lt MG	5d5	10	25	50	200	300	50	N/A	-10	-10	100	FA	Inertia	8kg	1000
EC Hvy MG	6d5	20	50	100	500	1000	100	N/A	-20	-20	100	FA	Inertia	20kg	2000
EC Shotgun	6d5/5d5/ 3d5/2d5	5	15	30	60	--	5	+15	-10	-20	100	2	Inertia	3kg	250

a kilometer away. These weapons typically equip Special Forces and recon units and are used to pin down or neutralize high-value targets such as command posts, vehicles, and combat robots. It uses very heavy rifle ammunition. This weapon used the Very Heavy and Long template.

HUNTING RIFLE

This semi-automatic rifle fires the same ammunition as the assault rifle above. It retains popularity as a sporting or colonial weapon even at higher tech levels. Some armed forces upgrade these weapons to improve accuracy and issue them as a lower weight alternative to the heavy sniper rifle. It uses standard rifle ammunition.

MACHINE GUNS

These full-automatic weapons are designed to be fired in long bursts from a bipod (or in some cases, tripod) mount, using an ammunition belt (sometimes contained within a cassette or box). For firing on the move, machine guns often are carried using either an articulated weapon harness or the gyro-stabilized weapon harness. These weapons use the Projectile weapons skill.

LIGHT EC MACHINE GUN

A light belt-fed machine gun, it comes equipped with a folding bipod or can use a tripod. It fires the same round as the assault rifle. It fills the same role as the Squad Automatic Weapon in today's military. Its extremely reliable action makes it excel in suppressive fire.

HEAVY EC MACHINE GUN

This belt-fed, single-barrel machine gun fires the same round as the heavy sniper rifle from a tripod mount. It usually serves in perimeter defense or as a vehicular weapon. Normal humans can't handle its weight while firing removed from the

FRONTIERSPACE STATISTICS	DAMAGE	RANGE INC.	AMMO	CONCEAL	SNAP SHOT	RECOIL	RELIABILITY	ROF	DEFENSE	WEIGHT	COST
EC Pistol	4d5	20	15	-15	-5	-10	100	3	Ballistic	1kg	200
EC Hvy Pistol	5d5	20	10	-10	-5	-15	100	3	Ballistic	1.5kg	250
EC Hvy Hold-out Pistol	5d5	10	2	-30	-5	-20	100	3	Ballistic	0.5kg	150
EC SMG	4d5	25	30	-5	-5	-10	100	3B, FA	Ballistic	1kg	300
EC Rifle	5d5	40	10	+20	-15	-10	100	3	Ballistic	3kg	300
EC Assault Rifle	5d5	40	30	+20	-10	-10	100	3B	Ballistic	3kg	400
EC Hvy Battle Rifle	6d5	40	20	N/A	-15	-15	100	2B	Ballistic	4kg	500
EC Hvy Sniper Rifle	6d5	125	10	N/A	-20	-20	100	1	Ballistic	4kg	500
EC Lt MG	5d5	40	50	N/A	-10	-10	100	FA	Ballistic	8kg	1000
EC Hvy MG	6d5	125	100	N/A	-20	-20	100	FA	Ballistic	20kg	2000
EC Shotgun	6d5/5d5/ 3d5/2d5	15	5	+15	-10	-20	100	2	Ballistic	3kg	250

tripod mount, but cyborgs and powered infantry sometimes use it as a hand-held weapon.

SHOTGUNS

Shotguns are a special category of slugthrower: they are smoothbore weapons firing large rounds. The usual shotgun ammunition is shot, a cartridge containing multiple small pellets, but rifled slug can be used. Damage for shot is variable by range; damage reduces for each range cat

egory. Unless otherwise noted, Projectile Weapons skill is used when firing them.

SHOTGUN

The shotgun is a typical semi-automatic shotgun commonly used as a hunting and defense weapon.

SLUGGER AMMUNITION TYPES

For simplicity's sake, all calibers should be considered the same for recording purposes. It will reduce the amount of tracking that is necessary. Assume any bullets a character has will fit whatever weapon (pistol, rifle, or shotgun) they have.

If a little more granularity is desired, use the following categories:

- Pistol ammunition comes in light, standard, and heavy.
- Rifles come in light, standard, and heavy.
- Shotgun ammunition is standardized.

STANDARD AMMUNITION

Use the stats listed for the weapon. Standard bullet cost 1cr per 10 rounds (assume magazines to be included in the cost).

HOLLOWPOINT AMMUNITION

Hollowpoint bullets have a deep dimple in the nose, a hollowed-out area on the front surface. When the hollowpoint bullet strikes a semi-solid object (such as a body), the dimple allows the bullet to expand, opening up almost like an umbrella or a parachute does. Some hollowpoint bullets are also designed to fragment as they expand. This increases the damage by 1 point per die, but armor and screens count double toward them. Therefore, if the target has a skeinsuit or an inertial screen, it only does ¼ damage. If the target has

both, damage is 1/8. Hollowpoint bullets cost 5cr per 10 rounds (assume magazines to be included in the cost).

ARMOR-PIERCING AMMUNITION

The armor piercing bullets are strengthened with a harder jacket, much like the jacket that surrounds lead in a conventional projectile, a jacket which is destroyed upon impact to allow the penetrating charge to continue its movement through the targeted substance. Since the bullet does not expand like a normal round, the damage is reduced 2 points per die, but armor is half effective. Therefore, if the target has a skeinsuit, it only reduces the damage by ¼ (i.e. the round still does 75% damage). As an inertia screen only reduces the speed (inertia), AP ammo has no benefit versus them. If both are used the damage is ½. AP bullets cost 10cr per 10 rounds (assume magazines to be included in the cost).

NUTS AND BOLTS

This section will delve into the way I created the statistics above and how to use templates to create new weapons. All EC weapons were created from the first two weapons: the EC pistol and rifle. By placing templates on those weapons, new weapons can be created for your universe. If this is not your style, feel free to disregard and use only the weapons provided. Not all templates will make sense with all weapons. Finally, this document is only to provide some flavor for an individual's campaign. Remember fun is always the goal, not to make the game complicated or feel like a wargame. Templates are summarized on a table on the following page.

CALIBERS

Calibers detail how large of a projectile is shot out of the weapon.

Light – A small caliber used for those who don't need the power or are uncomfortable with the recoil of the standard caliber.

Standard (Medium) – The standard caliber in use.

Heavy – A more powerful round for use with those that want a little more stopping power than the standard. It trades ammo capacity for damage.

PISTOL TEMPLATES

Hold-out – A small sized weapon designed for concealment. It trades ammo capacity and range for concealment.

Compact – In between the hold-out and a standard pistol is the compact pistol. Its penalties aren't as extreme as the hold-out, but it isn't as concealable. Sometimes carried by those who want a lighter weapon and are not expecting trouble.

Target – A longer weapon made for better accuracy at longer ranges. It trades concealability for range.

Machine – adds a burst mode to a weapon. Typically used by the military or criminals.

SMG – A larger weapon, it adds points for holding with a second hand and a folding stock to support both burst and full automatic fire.

RIFLE TEMPLATES

Short – This template shortens the length of the barrel to make the weapon more maneuverable. It trades range for reducing the snapshot penalty.

Long – Opposite of above, this template lengthens the barrel to gain extra range. It makes the weapon more unwieldy, though.

Military – Adds a burst and full automatic mode. As per the name, it is generally used by the military.

GENERIC

Cheap – Made from inferior materials or craftmanship, these weapons cost less at the expense of reliability.

Very Cheap – Made of absolute junk or hastily thrown together with shoddy craftsmanship. Generally, these weapons are made for individuals who can't otherwise acquire better weapons (such as criminals or subjects in authoritarian regimes) or are used weapons that were not maintained well.

WEAPON ACCESSORIES

The following are options that can be added to a weapon for various bonuses.

TEMPLATES	DAMAGE	RANGE					AMMO	CONCEAL	SNAP SHOT	RECOIL	RELIABILITY	ROF	WEIGHT	COST
		CLOSE	SHORT	MEDIUM	LONG	EXTREME								
CALIBER														
Light (Lt)	-1 dice						--	-5		+5			-0.5kg	--
Medium (No prefix)	--						--	--		--			--	--
Heavy (Hvy)	+1 dice						-33%	+5		-5			+0.5kg	+50
PISTOLS														
Hold-out		-50%	Close X 3	Short X 2	Med X 2	Long X 2	-66%	-20	+5	-10			-0.5kg	--
Compact		-25%	Close X 3	Short X 2	Med X 2	Long X 2	-33%	-5	--	-5			-0.25kg	-50
Target		+25%	Close X 3	Short X 2	Med X 2	Long X 2	--	+10	-5	+5			+0.5kg	+50
Machine		--	--	--	--	--	--	--	--	--		B	--	+100
Sub Machine Gun (SMG)		+50%	Close X 3	Short X 2	Med X 2	Long X 2	--	+20	-5	+5		B,FA	+2kgs	+150
RIFLES														
Short		-25%	Close X 2.5	Short X 2	Med X 4	Long X 2.5		-5	+5	-5			-0.5kg	--
Medium		--	--	--	--	--		--	--	--			--	--
Long		+100%	Close X 2.5	Short X 2	Med X 4	Long X 2.5		N/A	-5	+5			+1kg	+100
Military		--	--	--	--	--	+200%	--	--	--		B	--	+100
Cheap		-5 to Attack									-2			-50
Very Cheap		-10 to Attack									-4			-100

ACCESSORIES	DAMAGE	RANGE					AMMO	CONCEAL	SNAP SHOT	RECOIL	RELIABILITY	ROF	WEIGHT	COST
		CLOSE	SHORT	MEDIUM	LONG	EXTREME								
Laser / Red dot Sight									+5				--	50
Scope		Halves range penalty						+10					+0.25kg	100
Recoil Compensation								+5		+5			+0.25kg	50
Customization		+5 to Attack											--	100
Personalization		+5 to Attack											--	200
Bipod		+5 to Attack when aiming						+10		+10			+0.5kg	25
Tripod		+5 to Attack when aiming						N/A		+15			+20kg	100
Extended Magazine							+100%	+10					+0.25kg	25
Sound Suppressor								+10	-5				+0.5kg	300
Gyrostabilization Harness										-10			10kg	500
Security														100

Laser Sight / Red Dot Sight – Two devices that can be installed on a weapon to aid in aiming. Either reduces the Snapshot penalty. The is no benefit to installing both on a single weapon.

Scope – An optical sight that reduces the penalties for range.

Recoil Compensation – A modification attached to the front of the weapon that redirects some of the escaping propellant to reduce recoil.

Customization – A series of modifications that improve the function of the weapon. These modifications may include: better grip, performance internal parts, and/or accurized barrels.

Personalization – A series of modifications that tune a weapon to a specific person like custom grips and/or customized sights.

Bipod – A device that extends 2 prongs that can be rested on a surface to aid in aiming and recoil.

Tripod – A device that is a larger version of a bipod. Usually used for larger weapons. Cannot be combined with the bipod.

Extended Magazine – An extension of the magazine that allows the weapon to hold more rounds.

Sound Suppressor – A device that attaches to the front of the weapon that uses sound bafflers and electronic acoustic dampeners to muffle the sound of the weapon. It will not remove all the sound but will make it much less noticeable. To notice the report of the weapon takes an INT check, -20 per range category (same as for attacking)

Gyrostabilization Harness – A large harness that can be strapped to the wielder of the weapon to absorb the recoil.

Security – A modification that ties a specific weapon to be used only a specific person. This may be accomplished by DNA sniffers, implants, or electronic bracelets.

SPECIFIC WEAPONS

This section uses the above statistics to create specific named weapons to use in an individual's campaign. The generic weapon above can be used with no problems, so use of named weapons is purely an option depending on the personal tastes of the GM. These specific weapons are statted out for Star Frontiers.

WARTECH M434 PISTOL

Designed for garrison duty, this trusty, yet economical sidearm should be in every guard's holster.

This weapon is a specific example of the generic Heavy pistol shown in the generic stats. It is included to show how the templates can be applied to the generic stat block.

Templates: Heavy Caliber
Accessories: None
Attack modifier: None (There are no templates that modify attack rolls)
Damage: 5d5 (the base weapon has a damage of 4d5. Adding the heavy templete adds one dice to the damage resulting in 5d5 damage)
Range: 5/15/30/60/120 (There are no templates that modify range)
Ammo: 10 (The base weapon holds 15 shots, but the Heavy template reduces that by -33% or 5 shots)
Conceal: -10 (The base weapon has a conceal of -15. The Heavy template adds +5, making it easier to detect)
Snapshot: -5 (There are no templates that modify Snapshot)
Recoil: -15 (The base weapon has a recoil of -10. The Heavy template modifies it by -5, making the recoil heavier)
Reliability: 100 (There are no templates that modify reliability)
ROF: 3 (There are no templates that modify rate of fire)
Defense: Inertia
Weight: 1.5kg (The base weapon is 1Kg. Adding the Heavy template adds 0.5kg)
Cost: 250Cr (The base weapons cost is 200Cr. Adding the Heavy template added 50Cr)

DAESHA T-16 LIGHT RODENT RIFLE

When little Duke wants to bullseye womprats (which aren't much bigger than 2 meters long, although most of it is tail), he relies on his trusty Daesha T-16 rifle. Its light caliber grants that smaller beings can reliably handle it and its long barrel guarantee accuracy for those far shots.

The Daesha T-16 Light Rifle is a small-caliber, long-range rifle perfect for plinking or small animal hunting.

Templates: Light Caliber, Long
Accessories: Scope
Attack Modifier: None
Damage: 3d5
Range: 10/25/50/200/500 (Range penalties halved)
Ammo: 10
Conceal: N/A
Snapshot: -20
Recoil: -5
Reliability: 100
ROF: 3
Defense: Inertia
Weight: 3.5kg
Cost: 400Cr

SWD LW10C

For those of means that want discreet, powerful protection, Streel Weapons Division offers the SWD LW10c. Using premium hardware and quality craftsmanship, it is unparalleled in performance. With its state-of-the-art security features, it will never be used against the owner.

Templates: Compact, Heavy caliber
Accessories: Customization, Security
Attack Modifier: +5
Damage: 5d5
Range: 4/12/25/50/100
Ammo: 10
Conceal: -10
Snapshot: -5
Recoil: -15
Reliability: 100
ROF: 3
Defense: Inertia
Weight: 1.5kg
Cost: 400Cr

BALLISTIC TECHNOLOGIES "WOLF"

When Wolfe, the Yazarian bounty hunter, is chasing prey, he brings his custom pistol along. Made specially for him by Ballistic Technologies, it is a very intimidating weapon. Built on a very heavy target pistol frame, it adds recoil compensation to help with the enormous kick, high quality parts, personalization just for Wolfe, and a laser sight mainly for intimidation. Face it, who isn't intimidated by a red dot centered on your chest. Finally, in case the tables get turned, security is added to only work with a subdermal implant in Wolfe's hand.

Templates: Heavy Caliber, Target
Accessories: Customization, Personalization, Laser Sight, Recoil Compensation, Security
Attack Modifier: +10
Damage: 5d5
Range: 6/20/40/75/150
Ammo: 5
Conceal: -5
Snapshot: +0
Recoil: -10
Reliability: 100
ROF: 3
Defense: Inertia
Weight: 1.75kg
Cost: 800Cr

WARTECH MPS790 ASSAULT SHOTGUN

Wartech, the premier maker of firearms, introduces the MPS (Military Projectile Shotgun) 790 Assault Shotgun. When your unit demands heavy firepower, the MPS790 delivers. With it burst feature, the MPS790 is guaranteed to put more lead downrange than our competitors.

Templates: Military
Accessories: Recoil compensation
Attack Modifier: None
Damage: 6d5/5d5/3d5/2d5
Range: 5/15/30/60/--
Ammo: 15
Conceal: +20
Snapshot: -15
Recoil: -15
Reliability: 100
ROF: 2B
Defense: Inertia
Weight: 3.25kg
Cost: 400Cr

MUSTUTANGU ARMS THUNDERCAT

Mustutangu Arms has come up with a pistol perfect for the customer on a budget. Small, affordable, and ready for your personal protection needs. [derisively called the noisy kitten by street gangs and criminals]

Templates: Light Caliber, Compact, Cheap
Accessories: None
Attack Modifier: -5
Damage: 3d5
Range: 4/12/25/50/100
Ammo: 10
Conceal: -25
Snapshot: +0
Recoil: -5
Reliability: 99
ROF: 3
Defense: Inertia
Weight: 0.25kg
Cost: 150Cr

PGCA M17A3 ADVANCED COMBAT RIFLE

The M17 was developed by PGCA (Pan-Galactic Corp Arms) for use as a military rifle to equip planetary militias and corporate security forces. Its efficient and economic design make it very popular with those forces. The lighter caliber allows troops to carry more ammunition while reducing recoil and the underslung barrel-mount gyrojet attachment give the soldier versatility when engaging unusual targets.

The under-barrel gyrojet is a teaser from an upcoming article

Templates: Light Caliber, Military
Accessories: Recoil compensation, Underbarrel gyrojet
Attack Modifier: None
Damage: 4d5 | by ammo type (gyrojet)
Range: 20/50/120/250/500 | by ammunition type (gyrojet)
Ammo: 40 / 4
Conceal: +20
Snapshot: -15
Recoil: +0
Reliability: 100
ROF: 3B / 1
Defense: Inertia
Weight: 4.25kg
Cost: 600Cr

OPTIONAL RULES

This section explains the new columns in the weapon stats and how they are used. Again, if any rule is unwanted or too complicated, just ignore the column in the stats.

CONCEALMENT

This represents the size and bulk of the weapon which affects how hard it is to conceal. If the weapon has a CONCEAL of N/A, then that weapon is too big to be concealed on person.

Generally, unless an individual is trying to hide a weapon, it is readily visible. Checks should only be made if there are adverse conditions like darkness or distance or the individual is trying to hide the weapon. Checks are an INT check with penalties determined by the GM, the CONCEAL bonus or penalty applies to the INT check.

Example: a light, compact EC Pistol has a -20 modifier. An observer would need to make an INT – 20 check to spot that pistol hidden on a person.

OTHER CONCEAL MODIFIERS:

Dim Light..... -10
Very Dim Light..... -20
Per 5m..... -10
Bulky or heavy clothing ..... -5
Clothing or holsters designed to hide weapons..... -10 to -20

SNAPSHOT

This represents the bulk of the weapon and how hard it is to aim at a target. Typically, the smaller a weapon is, the faster it is to bring to bear on a target. This is why shooters prefer a smaller weapon (SMG) than a longer weapon (assault rifle) in a situation where they have to maneuver in tight spaces or targets appear unexpectedly.

This modifier applies to the first shot at a target. All subsequent shots at that same target do not get this penalty. Any aim action will also negate this penalty for that target. Certain weapon modifications will lower or negate this penalty, but it can never go below zero (i.e. give a bonus).

A shooter could aim at a specific area, like a door or edge of a wall, and would not get this penalty if a target appeared in the area they are aiming at.

Example #1: a shooter armed with a Laser rifle sees a target and wants to shoot immediately. He would take a -10 attack penalty on the first shot. After the first shot, he no longer gets a penalty unless he switches targets. Let's say he fires 3 times to take down the first target; he gets -10 on his first shot and has no snap shot penalty to shots 2 and 3. After that target is down he switches to a new target. He then has the -10 penalty again on his first shot at this target.

Example #2: an operative is armed with an EC Pistol. He is entering a room with 3 enemy guards. He tells the GM he wants to fire one shot at each of the three guards. Each shot gets a -5 penalty because each shot has a new target. Penalties, even in the same turn, do not stack; so it does not go -5, then -10, and then -15.

INCREASED PUNCHING SCORE OPTION

This rule from AD is added here in reference to its use in the recoil rules below.

(Alpha Dawn book page 149, modified)

As it stands, having a punching score of +2 isn't that different from having a score of +4. Opponents have an average of 45 Stamina, and that makes strength have very little effect on melee combat. This rule increases the impact of Strength on melee damage.

PS: Punching score is calculated in a different manner. Divide your character's Strength score by ten, rounding up, then subtract four (modified from five due to 45 being average). This results in a number between -1 and +3, with rare occurrences of -4 or +6.

Application. Instead of adding to the damage roll, it adds to each die of the damage roll. Thus, if you get to roll 5d10 for melee damage, and your punching score is +3, you get to roll 5d10+15 (that is, +3 per die, then simplified to 7d10+3). This allows Strength to play a more significant role on melee damage, and weapons designed to amplify Strength do so in a more pronounced manner.

RECOIL

This penalty represents how much a weapon kicks and the measure of control it has. It applies to any shot after the first during a turn and is cumulative. Certain weapon modifications will lower or negate this penalty, but it can never go below zero (i.e. give a bonus). This modifier does stack with the Snap Shot penalty. Recoil penalties reset at the beginning of every turn.

Continuing Example #2 above: The operative fired 3 shots in one turn, so the first shot does not have a recoil modifier. The second shot has a -10 penalty to the attack roll, in addition to the -5 for a new target. The third shot gets a -20 recoil modifier, again in addition to the -5 for a new target.

STRENGTH REDUCING RECOIL (OPTIONAL)

This optional addition allows for persons of great strength to overcome some if not all recoil penalties. Take the punching score from above (use PS minus 3, if using the standard PS from Alpha Dawn), take the modifier times five and add to the recoil penalty.

Example: if a character had a strength score of 61, their Punching score would be +2 (+4 using standard rules). This would reduce recoil penalties by 10 (-5 if using standard rules, because it is PS minus three). Simply add this to the recoil modifier. So, the character with a 61 STR firing a Heavy slugger pistol would have a recoil modifier of -5 (-10 using standard rules) instead of -15.

RELIABILITY

This statistic represents how "fragile" a weapon is. If an attack roll is this number or higher, the weapon does not fire and is disabled. Repairing the weapon will take 10 minutes, a toolkit, and a successful attack roll to repair the weapon. If critical success/failures are being used, a critical success would take less time and a critical failure would render the weapon broken and unusable.

Continuing Example #2 above: The operative above fires at a guard and rolls 100 on the attack roll. His pistol is now disabled and will not function. Assuming he makes it out of the situation, while back at his base, he can disassemble the weapon with an appropriate toolkit, and spend 10 minutes to get the pistol back into a usable condition.

BOOK REVIEW: THE ULTIMATE RPG CHARACTER BACKSTORY GUIDE

BY TOM VERREAULT

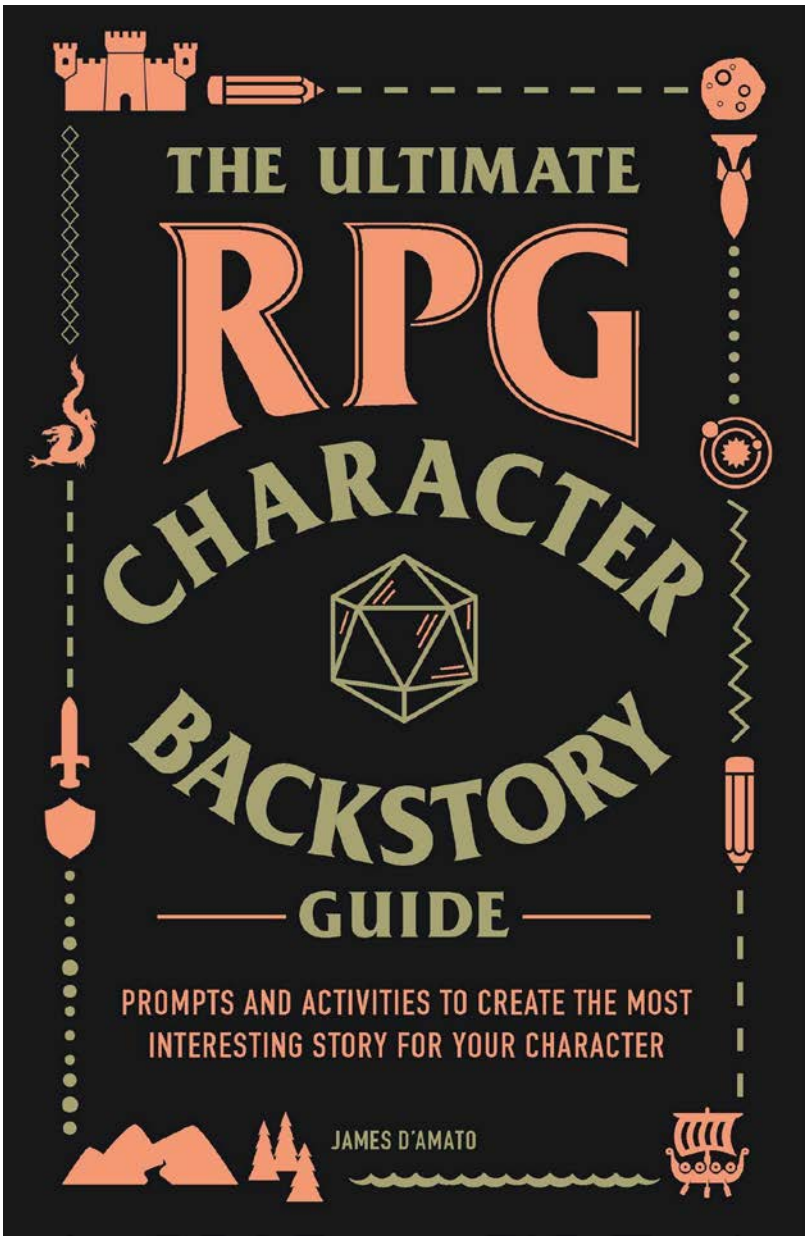
I was browsing my local "buy and sell used movies, music and games" store which also sells new Reaper & Wiz Kids miniature as well as D&D 5e materials and came across this guide by James D'Amato. It normally retails for $14.99 US although I paid $11 for a new copy.

The title is fairly self-explanatory. The cover art would lead one to believe its usable for fantasy, sci-fi, and historical RPG gaming but this is deceptive. Its written front to back with Dungeon and Dragons in mind. Chapters are arranged according to the classic D&D adventure tiers: levels 1-7 for the first chapter, levels 8-14 for the second chapter and levels 15-20 for the third. For a d20 retro clone like Stars Without Number this isn't a problem but for a skills-based RPG like Star Frontiers, Traveller, or FrontierSpace it can be.

The "tiers" in Star Frontiers have been described in terms of equipment: the PCs walk around doing things, the PCs drive around doing things, and the PCs fly spaceships around doing things. This was predicated on the original rule system requiring level 6 skill prerequisites before the PCs could learn spaceship skills but that requirement is breaking down in fan created material as few players want to endure the equivalent of adventuring to level 15 before they get to fly a spaceship. Everyone wants to fly the Millennium Falcon right away or at least bullseye womp rats while flying a T16 in Beggar's Canyon. The bottom line is you will have to use your own judgement and adapt the exercises to your needs and the needs of your sci-fi campaign.

Secondly, it is geared straight up for a fantasy genre. Random tables and writing prompts mention fantasy element throughout. For example, the first exercise involves rolling dice on tables to produce an idiom that your character likes to say but one result is "with a dwarf". That is not a huge problem and anyone playing a sci-fi RPG can easily substitute any of the alien races for "dwarf" or in the case of Star Frontiers substitute that game's space dwarf species, the Ifshnit. The use of dwarf in the very first exercise is emblematic of the guide's failure to be system or genre neutral.

The "writing exercises" are a mix bag of random tables and simple writing prompts. The random tables are not meant to be followed slavishly; you will need to think and decide if the result works for you. The writing prompts should be seen as a springboard. The book is actually a great aid to fuel creativity and add depth to your RPG character.



While my biggest hang up with the guide is its innate prejudice in favor of a fantasy genre and D20 rules, I still value the book. Most books like this are geared for fiction writers (I've tried using some of those) or actors. This may be the first book of its kind specifically geared for RPG players. I just expected a product that billed itself as "the ultimate" and whose cover art suggested it was for fantasy, sci-fi, and historical gaming would be more genre and system neutral. I recommend it with the caveat that sci-fi gamers will have to treat it like a menu and pick and choose a little of column A, a little of column B, and some from column C. Some of the exercises can be used as is but others will need to be adapted. It gets three dralasite thumbs up out of five.

THINGS THAT GO BOOM!

PART 8: MORE BOMBS, TARGETING, AND AERIAL DROP SYSTEMS

BY JOSEPH CABADAS

Outside of surface actions against Sathar raiding parties or a planetary civil war, there are probably few – if any – classical heavy bombers in the Frontier.

With the advent of space fighters or assault scouts, planetary bombing missions would probably be handled by such craft. Yet, in corporate wars and other minor conflicts, some aircraft and shuttlecraft would be modified or even purposely built to handle minor bombing roles.

This article builds upon "Part 7: Looking at Dropped Weapons" (p. 6) as well as earlier installments in this series. What follows is an examination of some more, heavier bombs that planetary militias or the UPF might use along with aerial deployed minefields. Some other items that will be looked at are the bombers available in the Frontier, targeting equipment, and even bomb disposal equipment.

MORE WARHEADS

ELECTROMAGNETIC BOMB (E-BOMB)

Much larger than an electronic discharge warhead, the e-bomb generates an intense electromagnetic field that is designed to knock out unshielded electronics, including vehicles and robots. A non-nuclear e-bomb would consist of having an explosive material, a metal cylinder known as an armature, a coil of wire, and a bank of capacitors, noted writer Tom Harris on the website Science.HowStuffWorks.com.

When the fuze detonates the high explosive material, the blast energy travels through the armature, causing it to come into contact with the surrounding coil of wire (the stator winding). This results in a short circuit that cuts off the stator off from its power supply.

"The moving short circuit compresses the magnetic field, generating an intense electromagnetic burst," wrote Harris. "Most likely, this type of weapon would affect a relatively small area – nothing on the order of a nuclear EMP attack – but it could do some serious damage."

E-bomb warheads can only be installed on bombs that are 100 kilograms or larger. They typically will generate enough power to blanket their primary blast area with a microwave pulse. Otherwise, they behave very similarly to electronic discharge bombs.

These bombs are large enough to impact the power grid of a facility to several city blocks. The resistance level of power grids would range from level 1 for common, unshielded civilian utilities to level 6 for military facilities. A success roll indicates that a blackout has occurred. See Part 7 for more information.

RECAPPING BOMB NOTES

The warheads for modern, larger bombs can vary, though typically they will be explosive fragmentation (general purpose), high explosive, high explosive anti-tank (HEAT), electromagnetic pulse (EMP), gas: doze, gas: poison, incendiary, and sonic. Many of these weapons are only found in the arsenals of planetary militias or the Landfleet.

E-BOMB CHANCE OF SUCCESS TABLE

		----------RESISTANCE LEVELS----------					
BOMB SIZE	BASE CHANCE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6
100 kg+	85	80	76	72	68	64	60

The resistance levels of robots and computers are based on their level.

The resistance levels of mines are based on their sensor level minus one.

An automatic failure roll of 99-00 means that the target has resisted the attack.

RANGES

The ranges for all dropped weapons are the same and are given in Part 7. Without any skill levels taken into account, they are: Point Blank 0-10 meters, Short 11-30 meters, Medium 31-60 meters, Long 61-120 meters, and Extreme 121+ meters.

GAS WARHEADS

As noted in Part 7, the chemical cloud produced by a gas bomb is much more persistent than a gas grenade. Assume that the resulting cloud will last for 1 turn times the weight of the bomb. So, a 100 kg poison gas bomb will produce a cloud that lasts for 100 turns. A breeze will also cause such a cloud to drift from its original location, following the direction of the wind. The length of the chemical cloud would be **four times** its width. Any gases will sink into lower lying areas.

INCENDIARY WARHEADS

The larger fire bombs cover a wider area than the 15 kg and 30 kg bombs, which greatly increases the chance of sparking a major, nearly uncontrollable blaze.

BOMB RACKS NEEDED

As with the 15 kg and 30 kg bombs, the other bombs presented here need some sort of bomb mount or rack that is designed to hold them on the aircraft and then release them at the intended time.

In the case of the hot air balloon bombs – which is a nod to the weapons used by the Austrian army against Venice in the year 1849 (see Part 7), the "rack" is a hot air balloon that is made out of fabric and paper. Two aerial pioneers, the Montgolfier brothers of France, made a 9-meter diameter balloon out of taffeta and coated it with alum to fireproof it, according to a article by Tim Sharp on Space.com. (Sharp, Tim. "The First Hot-Air Balloon Flight," Space.com, 9 April 2019, **https://www.space.com/16595-montgolfiers-first-balloon-flight.html**)

BOMB RACKS

TYPES	AMMO CAPACITY	ROF	COST (CR)	MOUNTING COST (CR)	WGT (KG)	HP
Hot Air Balloon	1	1	50	N/A	45	1
Cooper Bomb Mount	1	1	50	20	5	1
100 kg Mount I	1	1	150	50	7	2
100 kg Mount III	2	1-2	250	50	14	2
200 kg Mount I	1	1	300	50	14	2
200 kg Mount II	2	1-2	400	50	28	2
500 kg Mount I	1	1	500	50	35	3
500 kg Mount II	1-2	1-3	600	60	75	3
1,000 kg Mount I	1	1	1,000	100	70	4
1,000 kg Mount II	2	1-2	1,500	100	140	4
5,400 kg Mount I	1	1	5,000	500	378	5
10,000 kg Mount I	1	1	5,000	500	700	10
MOAB Pallet	1	1	200	200	250	10

Some of these balloons could rise up between 1,600 and 2,000 meters and stay aloft for 10-25 minutes.

DETONATORS NEEDED

The bombs and even FASCAM weapons presented in this article still need to have some sort of fuze/detonator installed in them to work. See part 7 for these items.

FIN KITS AND RETARDERS

This topic is covered further down in the article, but all the following classes of bombs can be equipped with these devices for different missions.

MORE BOMB TYPES

HOT-AIR BALLOON BOMBS

This is an antique bomb with black powder explosive that can be delivered by a paper, hot air balloon. While they weighing between 10-14 kilograms, the iron covering comprises most of its weight. It has a primitive, lit fuse "detonator" that is good for 10-30 minutes. This would only cost about 1 Credit and the weight is negligible.

These weapons are highly dependent upon the direction of the wind, which could suddenly change after the balloons are launched. They also have a failure rate of about 40% percent, meaning the bombs

BOMB TYPES - SMALL

WARHEAD TYPE	VDM	DAMAGE	BLAST AREAS	DEFENSE	COST (CR)
Hot Air Balloon Bomb	5	5d10	5/8	Inertia	100
25 Pound Cooper Bomb	10	10d10	5/8	Inertia	200
100 Kg Stnd. Expl.	15	8d10 x 5	30/45/60/120	Inertia	1,000
100 Kg Hi. Expl.	15	10d10 x 5/8d10 x 5*	30/45/60/120	Inertia	1,100
100 Kg HEAT	20	10d10 x 5	15-degree cone 20/30/40/80	Inertia	1,100
100 Kg E-Bomb	N/A	Elect. Short	30/45/--/--	Insulation	1,250
100 Kg Gas: Doze	N/A	Sleep	40**	STA check	1,000
100 Kg Gas: Poison	N/A	S10/T10	40**	STA check	1,000
100 Kg Gas: Smoke	N/A	-15% to hit	40**	IR, scan.	900
100 Kg Incendiary	10	15d10 + (3d10x10 turns)	30/45/--/--	Asbestos	1,000
200 Kg Stnd. Expl.	20	12d10 x 5	80/120/160/320	Inertia	1,500
200 Kg Hi. Expl.	20	15d10 x 5/12d10 x 5*	80/120/160/320	Inertia	1,600
200 Kg HEAT	25	15d10 x 5	15-degree cone 30/45/60/120	Inertia	1,600
200 Kg E-Bomb	N/A	Elect. Short	80/120/--/--	Insulation	1,850
200 Kg Gas: Doze	N/A	Sleep	120**	STA check	1,500
200 Kg Gas: Poison	N/A	S10/T10	120**	STA check	1,500
200 Kg Gas: Smoke	N/A	-15% to hit	120**	IR, scan.	1,400
200 Kg Incendiary	15	15d10 + (3d10x10 turns)	80/120/--/--	Asbestos	1,500

Damage Additive: Some bombs have an additional damage number such as "+ 50." This added damage only applies to targets within the primary blast area!

*High Explosive bombs only do maximum damage to light structures and to people and animals. The second number is the damage it does to structures, vehicles and robots.

**The chemical cloud produced by gas bombs extends four times its burst radius downwind.

BOMB TYPES - LARGE

WARHEAD TYPE	VDM	DAMAGE	BLAST AREAS	DEFENSE	COST (CR)
500 Kg Stnd. Expl.	25	(18d10 x 5) + 100	90/135/180/360	Inertia	2,000
500 Kg Hi. Expl.	25	(20d10 x 5) + 150/ (18d10 x 5) + 100*	90/135/180/360	Inertia	2,200
500 Kg HEAT	30	(20d10 x 5) + 150	15-degree cone 50/75/100/200	Inertia	2,200
500 Kg E-Bomb	N/A	Elect. Short	90/135/--/--	Insulation	2,500
500 Kg Gas: Doze	N/A	Sleep	150**	STA check	2,000
500 Kg Gas: Poison	N/A	S10/T10	150**	STA check	2,000
500 Kg Gas: Smoke	N/A	-15% to hit	150**	IR, scan.	1,900
500 Kg Incendiary	25	15d10 + (4d10x10 turns)	90/150/--/--	Asbestos	2,000
1000 Kg Stnd. Expl.	35	(18d10 x 5) + 150	120/180/240/480	Inertia	2,500
1,000 Kg Hi. Expl.	40	(20d10 x 5) + 175/ (18d10 x 5) + 150*	120/180/240/480	Inertia	2,750
1,000 Kg HEAT	40	(20d10 x 5) + 175	15-degree cone 100/150/200/400	Inertia	2,750
1,000 Kg E-Bomb	N/A	Elect. Short	120/180/--/--	Insulation	3,000
5,400 Kg Tallboy	40	(20d10 x 5) + 250	Underground: 50/75/100/200 Above: 150/225/300/600	Inertia	6,000
6,800 Kg Daisy Cutter	40	12d10 x 3d5	150/225/300/--	Inertia	8,000
10,000 Kg Grand Slam	40	(20d10 x 4d5) + 500	Underground: 250/375/500/1000 Above Ground: 2250/3375/4500/9km	Inertia	15,000
10,000 Kg MOAB	40	(20d10 x 4d5) + 250	500/750/1000/2000	Inertia	12,000

Damage Additive: This added damage only applies to targets within the primary blast area!

*High Explosive bombs only do maximum damage to light structures and to people and animals. The second number is the damage it does to structures, vehicles, and robots.

**The chemical cloud produced by gas bombs extends four times its burst radius downwind.

will not detonate. If the balloon bomb actually makes it over the target area, they have about a 10 percent chance to hit anything, doing 5d10 points of fragmentation damage.

Blast Areas: 1 **Blast Radius**: 5m

25 POUND BRITISH COOPER BOMB

One of the earliest dropped bombs was the 25 pound British Cooper bomb, used during World War I. The bomb actually weighed 24 pounds (10.8 kilograms), out of which 20 pounds was the cast iron casing. It only had 4 pounds of explosive. The after body of the Cooper bomb was made out of wood while the fins were constructed out of steel. The bomb had an estimated failure rate of 25-30 percent.

100 KG BOMB

Much larger than the 15 or 30 Kg bombs, this is one of the smallest aerial dropped bombs in a military's arsenal. It consists of a composite steel case with a 40 kilogram warhead. It would have a 40 kilogram warhead of the most common types.

200 KG BOMB

This class of bombs has a 90 kilogram warhead. This bomb is capable of forming a crater that is 15 meters wide and 11 meters deep. It can penetrate up to 38 centimeters of metal or 3.4 meters of concrete, depending on the height from which it is dropped. It can cause lethal fragmentation out to a radius of 370 meters.

500 KG BOMB

One of the most common bombs, it has 200 kilograms of explosive. The actual weight varies depending on the fuse options and fin configuration. The standard explosive bomb is capable of forming a crater that is 20 meters wide and 12 meters deep. Depending upon the height from which it is dropped, the bomb can penetrate up to 40 centimeters of metal or 4 meters of concrete. Despite being larger than the 200 kg bomb, its blast area, where it causes lethal fragmentation damage, is very similar.

1,000 KG BOMB

This is one of the largest bombs in the Landfleet's arsenal. It has a 450 kilogram warhead, typically high explosive, HEAT, or an e-bomb.

5,400 KG "TALLBOY" BOMB

This weapon was developed on the human's home planet during a conflict called World War II. It had 2,400 kilograms of explosive filling. Known as an "earthquake" or "bunker buster" bomb, it was used against massive and hardened structures that conventional bombs had proven ineffective at destroying.

At 6.4 meters in length, the Vickers Tallboy was designed to be dropped from an altitude of 5,500 meters while the aircraft was traveling at 270 kilometers per hour. It struck after reaching speeds of approximately 1,200 kph and could penetrate about 5 meters of concrete. The bomb made a crater that was 24 meters deep and 30 meters across. The earthquake damage caused by these bombs often made it uneconomical to repair any buried bunkers.

If one of these bombs exploded near the surface, it could displace 29,000 cubic meters of earth, producing a crater that needed 5,000 tons of earth to fill it in. This was an expensive bomb to manufacture and was used against high value targets. A Frontier version would have similar design parameters and would probably have a smart bomb conversion.

Because of the bomb's expense, the Tallboy had three fuze detonators – two were backups. When used against underground targets, it used a delayed fuze set from 30 seconds to 30 minutes, to help ensure the bomb penetrated the earth as far as possible.

6,800 KG "DAISY CUTTER" BOMB

This bomb earned its nickname during the Vietnam war for being able to clear jungle areas, turning them into helicopter landing zones. It uses an altitude/proximity fuze to detonate a few meters above the ground. During the Afghanistan War, it was used as an anti-personnel weapon. Some 2.6 meters in length and 1.4 meters in diameter, it was filled with 5,700 kilograms of GSX Slurry (ammonium nitrate, aluminum powder and polystyrene). Its blast radius has been reported to be between 100-300 meters.

10,000 KG "GRAND SLAM" BOMB

This is another ancient weapon that was used during World War II on Earth by the British RAF. Also nicknamed the "Ten Ton Tess," about half of its weight from the cast iron casing. It was designed to penetrate up to 40 meters in the ground or into 20 meters of concrete before exploding.

Produced between 1944-45, some 99 Grand Slams were built and 42 were used against hardened targets such as submarine pens, railway bridges, costal batteries, and viaducts that had survived previous attacks by Tallboy bombs. With 6.5 tons TNT equivalent, it caused mini earthquakes. The explosion could form a camouflet (cavern) while shifting ground that undermined a target's foundation.

The underground explosion could shake and weaken concrete structures up to 50 meters away. One of the unused Grand Slams was put on display at the RAF Scrampton until 1958 when it was discovered to contain live explosive. It was taken elsewhere to be detonated safely,

"Some safety distance calculations were done, however, about the effect of a Grand Slam detonating at ground level in the open. Apart from the entire RAF Station, most of the northern part of the City of Lincoln (nearly 9 kilometers away), including Lincoln Cathedral, which dates back to 1250, would have been flattened," noted an article from a World War II website called PeoplesMosquito.org.

Like the Tallboy bombs, this weapon was only used against high value targets. It has multiple fuzes to ensure detonation.

MASSIVE ORDNANCE AIR BLAST (MOAB) BOMB

One of the largest conventional bombs ever made, the GBU-43 weighs about 10 metric tons and contains 8,164 kilograms of explosives. This bomb does not penetrate into the ground. When used, its explosive air blast is the equivalent of 11 tons of TNT. It has a blast radius of a mile wide. So massive – it is 9 meters long and 103 centimeters in diameter – it had to be pushed out of the back of a C-130 cargo plane rather than delivered by a bomber. The reported cost of the weapon in the mid-2000s was $170,000.

HANDLING DAMAGE FROM LARGE BOMBS

Much like the 15 kg and 30 kg bombs, the large bombs presented above have just four blast areas. An effort was made to try to create more blast areas – a fifth zone and all the way out to an eighth blast area – but that quickly became untenable. Researching the term "blast injuries" confirmed that there are just four primary zones where injuries occur.

BLAST AREAS

Except where noted, use the method laid out in Part 7 to calculate the four blast areas – the secondary area is generally 1.5 times the primary area; the third area is twice the primary area; and the fourth zone is usually four times the primary zone. In some cases, a referee may need to rule that nothing could survive if it was at the exact center where an explosion occurred.

DAMAGE ADDITIVES

In Part 7, the damage for the standard explosive warhead in the 15 kg "light" bomb was changed from 25d10 as presented in Dragon Magazine's "Tanks a lot!" article to 10d10 + 50. The "+ 50" is a damage additive. So the maximum amount of damage from such a bomb is 150 stamina or structure points and the minimum is 60 points.

The damage additive is ***only*** applied to targets within the primary blast area.

DAMAGE MULTIPLIERS

Some weapons will also have a damage multiplier. For example, a 100 kg general purpose bomb – which has a standard explosive warhead – will do 8d10 x 5 points of damage. Roll the 8d10 and multiply the result by 5. The minimum amount of damage would be 40 points and the maximum amount would be 400 points. Some bombs will then add an additional amount of damage after that.

Some bombs have a variable multiplier, which declines the farther you get from the center of the blast. For example, the "Daisy Cutter" will do 12d10 x 3d5 points of damage in the primary blast area; but in the secondary area, the multiplier falls to 2d5; in the third area, it is 1d5; and is a zero in the fourth area, meaning characters and objects there take no damage.

VEHICLE DAMAGE MODIFIER (VDM)

In Star Frontiers vehicle combat, whenever a vehicle is struck by gunfire, an exploding grenade and the like, the character rolls a 2d10 and checks the "Vehicle Damage Table." The number of dice of damaged caused is added to the result as a modifier. Since they player is not necessarily rolling large numbers of dice, a vehicle damage

CLUSTER BOMB TYPES

WARHEAD TYPE	DAMAGE	BLAST AREAS	DEFENSE	COST (CR)
100 Kg "Ruction" with eight 15 kg bomblets	10d10+50/ bomblet	15/23/30/60 per bomblet	Inertia	1,500
100 Kg "Williwaw" w/ 200 frag gren.	8d10/bomblet	3-meter radius per grenade	Inertia	4,500
100 Kg "Vile" with 200 poison gren.	S10/T10	3-meter radius per grenade	STA check	6,600
100 Kg "Sea of Fire" w/ 200 incendiary grenades	4d10 + (1d10x3turns)/ grenade	3-meter radius per grenade	Asbestos	4,500

Cluster bombs have dozens to hundreds of sub-munitions that scatter across several hundred meters.

modifier has been added to the descriptions of the bombs.

CLUSTER BOMBS

This class of bombs releases dozens or hundreds of sub-munitions that scatter across several hundred square meters. This type of weapon has long been controversial in human society, though other races, such as the Sathar, apparently have no hesitation in using them. They are mainly designed to cause as much damage as possible, generally to "soft targets" – i.e. characters.

Cluster bombs target an area around a "center square" with the sub-munitions scattering around it.

REGARDING DETONATORS

As noted earlier, cluster bombs still need a fuze/detonator unit to work, but you can assume that the sub-munitions will be equipped with a combination contact and time-delay detonator. The default setting for the sub-munitions is the contact setting. The bombardier (to use that old-fashioned term) can remotely set the sub-munitions to the time delay mode at least one turn **before** the bomb is dropped. All of the sub-munitions within a particular bomb will be affected by this decision.

ON A SUCCESSFUL HIT WITH A CLUSTER BOMB

If the cluster bomb scores a successful hit on its central target square, roll a 1d5. That is how many sub-munitions actually hit that square.

REGARDING CLUSTER BOMB MISSES

Just because a cluster bomb misses the central targeting square, it does not mean the characters are out of danger. Use the dropped weapons miss chart to determine where the center square is. They may still be within the dispersal area and may take damage from bomblets.

TYPES OF CLUSTER BOMBS

100 KG "RUCTION" CLUSTER BOMB

This weapon disperses the equivalent of eight 15 kg standard fragmentation bombs which scatter around the main point of impact. Use the dropped weapon miss chart from Part 7 to determine where these land.

100 KG "WILLIWAW" CLUSTER BOMB

About the size of a Frontier 100 kg general purpose bomb, Sathar aircraft have dropped Williwaw's from a minimum distance of 100 meters from the ground. These weapons release some 200 bomblets that have the size and power of a standard fragmentation grenade (8d10).

They scatter across a roughly circular area (if the bomber was relatively stationary), or an elongated oval (in the direction of a moving aircraft) and cover some 200 5-by-5 meter squares! About 10 percent of the bomblets are known to fail to explode on impact but may still be very dangerous if they are disturbed. Generally, a referee doesn't need to keep track of every single bomblet, but if characters are in the area of effect of one of these, they will probably get hit by at least one of the explosives.

100 KG "VILE" CLUSTER BOMB

Similar to the Williwaw, this bomb releases 200 poison gas bomblets that are the size of a standard poison gas grenade.

100 KG "SEA OF FIRE" CLUSTER BOMB

This weapon releases 200 incendiary grenade-size bomblets, which disperse similarly to the bomblets from the Williwaw.

DROPPED FAMILY OF SCATTERABLE MINES (FASCAM)

FASCAM is the term for a range of systems to rapidly deploy mines. These can be used to directly attack enemy formations or to place them down ahead of time to serve as an obstacle to adversaries. Some systems can also be delivered by artillery or rocket launchers.

DROPPED FAMILY OF SCATTERABLE MINES (FASCAM)

TYPES	MINES	SCATTER AREA	DEFENSE	COST (CR)
30 Kg Gorgon	125 small frag.	25-by-25 meters	Inertia	8,500
30 Kg Medusa	125 solid foam	25-by-25 meters	RS check	8,500
100 Kg Orthus	300 small frag. + 125 anti-vehicle	Sixty 5-by-5 meter squares	Inertia	42,000
100 Kg Shedu	16 grasshopper (frag)	Sixteen 5-by-5 meter squares	Inertia	2,500
500 Kg Daksha	150 frag mines + 16 grasshopper + 16 leapfrog	Fifty 5-by-5 meter squares	Inertia	17,000

Dropped FASCAM are minefields packaged into the size of a bomb. These mines scatter over wide areas and become active within a turn after touching the ground.

Some FASCAM minefields – at least those produced for the Landfleet and most Frontier planetary militias – are meant to be temporary. They are set to self-destruct after 1-20 days, depending on how they are set. Typically the mines can be equipped with radio receivers so they can be remotely deactivated so they can be collected and reused.

ALTITUDE DETONATOR NEEDED

All of the FASCAMs presented below will need an altitude detonator installed; otherwise, they will not function when dropped. The altitude detonator tells the unit when to disperse its mines. As noted in the descriptions, the mines are already equipped with certain types of detonators.

TYPES OF FASCAMS

Below are a few examples of the aerial-deployed FASCAMs, though referees can design other types.

30 KG "GORGON" FASCAM

About the size of a 30 kg bomb, this is a set of small, anti-personnel fragmentation mines (4d10 damage, 2 meter radius), with type 2 pressure sensors (50% chance to-hit). The gorgon can be dropped from low altitudes – at least 20 meters from the ground. It deploys 125 mines over a 25-by-25 meter area, with an average of 5 mines per 5-meter square. These mines will lay opening on the surface.

30 KG "MEDUSA" FASCAM

Similar to the Gorgon, this system replaces the fragmentation warheads with mini-solid foam grenades that have a two meter blast radius and a type 2 pressure sensor. It is designed to be a non-lethal obstacle.

100 KG "ORTHRUS" FASCAM

This system is about the size of a 100 kg bomb. It scatters a set of 300 small anti-personnel fragmentation mines (see above), and 120 small anti-vehicle mines with type 3 contact sensors (60% to-hit) that do 5d10 points of damage. It will scatter these mines across sixty 5-by-5 meter squares in a roughly circular pattern from the center. It will have an average of 5 anti-personnel and 2 anti-vehicle mines per square. Most of these will be lying openly on the ground.

100 KG "SHEDU" FASCAM

This is the size of a 100 kg bomb. It will scatter 16 Grasshopper mines with fragmentation warheads (8d10) and level 4 proximity sensors (70% chance to-hit). These mines will spread over sixteen 5-by-5 meter squares in a roughly circular pattern from the center.

500 KG "DAKSHA" FASCAM

The size of a 500 kg bomb, the Daksha FASCAM will scatter 150 normal fragmentation mines with type 2 pressure sensors (8d10 damage, 50% to-hit). It will also disperse 16 grasshopper and 16 leapfrog mines with level 4 proximity sensors (70% to-hit) and fragmentation warheads. The fragmentation mines will go across fifty 5-by-5 meter squares, with an average of mines per square. The grasshoppers and leapfrog mines will be spread over this area too.

AIRDROP AND SPACEDROP PODS

Along with bombs, aircraft can carry specially-designed, aerodynamic airdrop pods. Or, vehicles such as the air transport can offload pallets of supplies, which are equipped with parachutes, for either high-speed, low altitude up to high-speed, high-altitude deliveries.

These pods have the same ranges and thus the same chance for the dropper "to hit" the intended resupply point. If the pod misses, consult the Ranged/Dropped Weapon Miss Chart in Part 7.

The Frontier and even Sathar have special resupply pods that can be dropped from low orbit. These are equipped with heat shields, along with retrorockets and/or parachutes. Technically, these systems can be recovered, refurbished and reused, though many are abandoned. The cost to refurbish is 20 percent of the unit's original price unless it was heavily damaged during the delivery. Then its scrap value is 10 percent the original cost.

Some examples are:

15 KG AND 30 KG AIRDROP PODS

These are small resupply container that takes the place of either a 15 kg or 30 kg bomb on a bomb rack. The smaller pod can be packed with 10 kg of supplies while the larger pod can hold 25 kg worth of supplies. They rely on a one-use parawing system to guide the pod into place. A "smart drop" system can be added to the pod,

AIRDROP AND SPACEDROP PODS AND EQUIPMENT

TYPES	DETAILS	COST (CR)
15 Kg Airdrop Pod	Can deliver 10 kg of supplies.	100
30 Kg Airdrop Pod	Can deliver 25 kg of supplies.	150
Hi-Speed ADS	An adjustable, cargo pallet delivery system. Its total weight is equal to 10% of the cargo.	2 Credits per kg of weight.
Smart Drop System	Provided a 20 percent bonus to make a successful airdrop.	+50
250 Kg Spacedrop Pod	Can deliver up to 250 kilograms of cargo from orbit. This can include 1 fully-equipped standard-size robot.	1,500
500 Kg Spacedrop Pod	Can deliver up to 500 kilograms of cargo including three standard-size robots. It is too small for a heavy-duty robot.	2,500
500 Kg Heavy Spacedrop Pod	This model is designed to deliver fully equipped, heavy-duty size robot to the surface.	3,500
Vehicle Size 3 Spacedrop Pod	This can deliver a ground car or hovercar size vehicle and/or the equivalent in cargo to the surface.	5,000
Vehicle Size 5 Spacedrop Pod	This can deliver a tractor-trailer size vehicle (16,500 kg) with 20.5 metric tons of cargo.	10,000
Pressurized Spacedrop Pods	These are special-made pods, though conversion kits are available for an additional 10 percent cost, which can deliver especially fragile cargo (including lifeforms) from space.	Three times the cost of a normal spcedrop pod.

which provided the aircraft dropping the pod a +20 percent bonus for successfully delivering the supplies.

HIGH-SPEED, LOW-LEVEL AERIAL DELIVERY SYSTEM (HI-SPEED ADS)

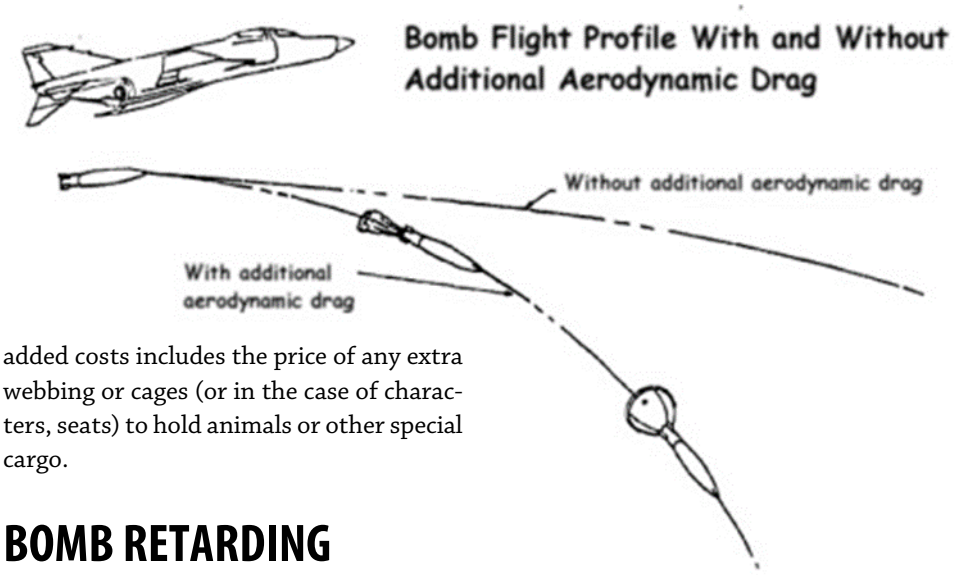
An adjustable container that is wrapped by a nylon cargo cover and mounted on a pallet. The dimensions and weight capacity of the Hi-Speed container is determined by the load being airdropped. All items are rigidly secured to ensure they will survive the shock of a parachute opening when released at high speeds. It can also be equipped with a "smart drop" system.

SPACEDROP PODS

These can range in size ones that can deliver a mere 250 kg from orbit-to-ground up to pods that can transport Explorer-size vehicles. In this case, the weight rating indicates the amount of cargo that these pods can contain. These pods actually weigh *double* the indicated cargo amount. They can only be dropped from low orbit and only have a thruster system capable of handling one atmospheric entry. This operation would take two Knight Hawks turns (20 minutes).

PRESSURIZED SPACEDROP PODS

A pressurized pod, with a limited life support system (10 hours) costs triple the normal cost. These can deliver precious cargo, including animals. They are not rated for people, though some intelligence agencies, cadres, and pirate organizations have been known to use them to drop people from space to a planet's surface. The added costs includes the price of any extra webbing or cages (or in the case of characters, seats) to hold animals or other special cargo.



BOMB RETARDING DEVICES

The bombs presented in "Tanks a lot!" of Dragon Magazine and even Larry Moore's article on vehicle combat in issue 15 of Star Frontiersman Magazine appear to be unguided weapons. Also known as dumb bombs – or free-fall, or gravity, or even iron bombs – these weapons simply follow a ballistic trajectory from the aircraft to the ground. They do not have any kind of guidance system other than the fin assembly on the back.

Some bombs will be equipped with some sort of retarding device such as a drogue chute or a fin-retarder. These devices slow the forward momentum of a bomb after its release. This is especially important when an aircraft is dropping it from a low altitude. Retarding devices are also used to prevent the possibility of a bomb skipping after it impacts the ground before it explodes.

DROGUE AND EXTRACTION PARACHUTES

Drogue chutes are small parachutes that are deployed by a rapidly moving object in order to slow them down, thus providing improved stability and better control. They are used in conjunction with normal parachutes, for drag racing ground vehicles, aircraft, and in this case, for bombs.

The drogue chute often deploys for only a few moments on a bomb to slow its descent by at least one turn. This will permit the dropping aircraft to escape the blast radius.

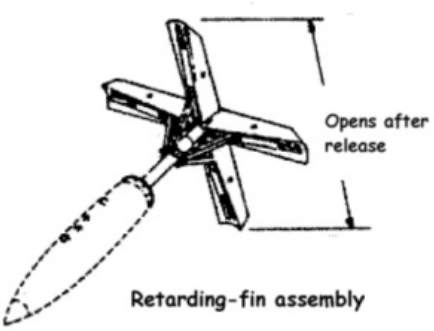
Drogue chutes are also used to help deploy larger extraction parachutes, which in turn pull a cargo pallet out from the back of military-like cargo aircraft when they are making aerial drops.

FIN RETARDERS

Assume that the fin retarding systems of the Frontier's era offer the bomb

BOMB RETARDERS AND SMART BOMB CONVERSIONS

TYPES	EFFECTS	WGT (KG)	COST (CR)
Drogue/Extraction Chutes	With bombs, the drogue chute slows the bomb's descent by at least one turn so the aircraft can escape the blast area. A combination drogue chute/extraction parachute package is used by air transports to deliver airdropped packages/pods.	5% of the weight of the bomb or supply pod	5% of the bomb/supply pod
Fin Retarders	This slows a bomb's descent by 1-2 turns. It also eliminates any movement modifiers for the attacking aircraft and provides a +10 percent bonus to hit.	10% of the bomb's weight	10% of the bomb's cost
Ballute	It is used by aircraft flying at high altitudes and supersonic speeds to decelerate and even stabilize a bomb during its decent. It any movement modifiers for the attacking aircraft and trims the range level by one bracket except for the short and point-blank ranges that are left unchanged	10% of the bomb's weight	10% of the bomb's cost
Smart Bomb Conversion	Eliminates all movement modifiers for attackers and defenders. Reduces extreme and long ranges to medium range; medium range becomes short range; short range becomes point blank range.	20% of the bomb's weight	double of the bomb's cost



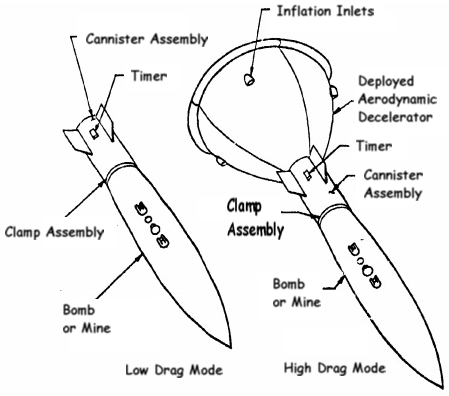
Retarding-fin assembly

additional stability and some smart bomb characteristics. It will slow a bomb's descent by 1-2 turns (the bombing character choses). The fin retarder also eliminates any movement modifiers for the attacking aircraft and provides a +10 percent bonus to hit.

BALLUTE

Some other retarding devices include the ballute. Invented by Goodyear in 1958, this is a parachute-like system. It is used by aircraft flying at high altitudes and supersonic speeds to decelerate and even stabilize a bomb during its decent.

The ballutes of the Frontier's era eliminate any movement modifiers for the attacking aircraft and trims the range level by one bracket, though the short and point-blank ranges are left unchanged. For example, extreme range becomes long range; long range becomes medium range, while medium range becomes short range.



Ballute Retarding System

SMART BOMB CONVERSION

Dumb bombs can be converted into smart bombs with a few, though major, alterations. These include adding a built-in computer controller, an electronic control sensor, an adjustable fin assembly, and a battery to power it all.

This equipment is required to use any of the advanced targeting equipment that was provided for in either the "Tanks" or Moore articles or the vehicle computer-based gear in Zebulon's Guide and *is* compatible with fin retarding systems. The smart bomb conversion package is compatible with all of the bomb retarding devices listed above.

"When a plane drops a smart bomb, the bomb becomes a particularly heavy glider," noted an article about smart bombs on Science.HowStuffWorks.com. "It doesn't have any propulsion system of its own, like a missile does, but it does have forward velocity (by virtue of being dropped from a speeding plane). It also has flight fins that generate lift and stabilize its flight path."

As the bomb drops, the computer control system activates actuators that adjust the flight fins. Acting like flaps on a plane, the fins can turn the bomb in different directions.

"This adjustment process continues until the smart bomb reaches its target, and the fuze mechanism sets off the explosive." Science.HowStuffWorks.com continued. "Smart bombs generally have proximity fuzes, which set off the explosive just before the bomb reaches the target, or impact fuzes, which set off the explosive when the bomb actually hits something."

A smart bomb conversion increases the weight of the bomb by 20 percent while doubling the cost. It requires the bomber to have a vehicle computer with the following progits: Dis-Vis (Type A); Diz-Map Navigation (Type B); Smart Bomb Targeting and Tactical Analysis (both Type D); and a sensor package, typically radar with at least a 500 meter range. Many of these items will be explained in a possible future article, "Vehicles that drop things that go boom! Looking at Bombers."

A smart bomb eliminates all movement modifiers for attackers and defenders. It reduces extreme and long ranges to medium range; medium range becomes short range; and short range becomes point blank range.

CONCLUDING THOUGHTS

This series of articles came about from an effort I had to try to consolidate all the various Star Frontiers combat rules into one booklet for myself. This included an idea from Matt Bandy's "Here Comes the Cavalry!" article that expanded the bumping maneuver because under the current rules it might include scenarios where a hovercycle has as much chance of running an Explorer off the road as any other vehicle.

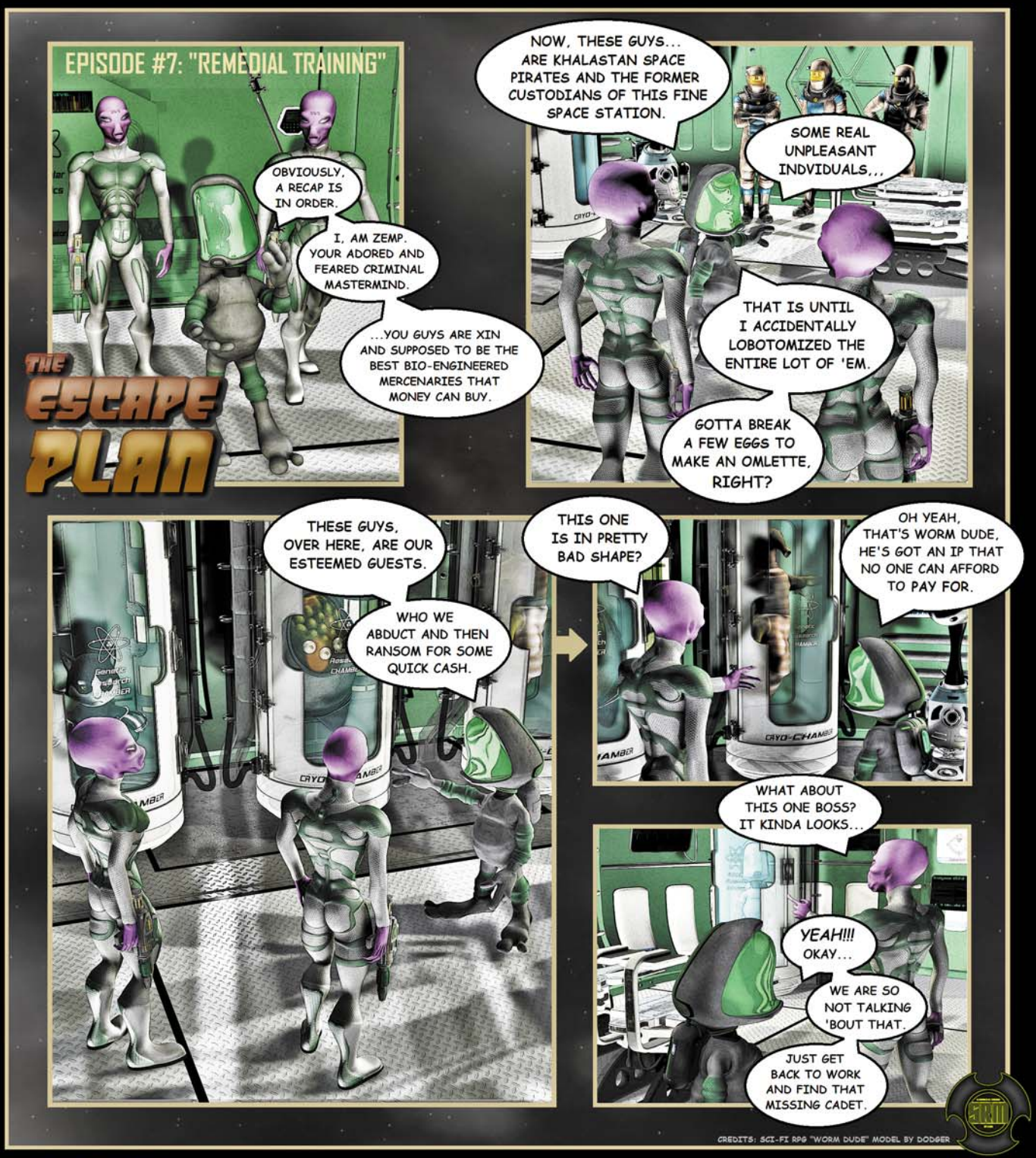
Instead of submitting one humongous, overblown combat article, I broke it up into parts on specific topics, especially in a section I called "Area Effect Weapons," that covered the rules of grenades, rocket launchers, recoilless rifles, grenade mortars, and then the Zebulon's Guide missiles and the vehicle weapons from "Tanks a lot," etc. Researching and writing these stories far in advance of any possible publication time allowed me to go back and revise earlier parts. Hopefully, the finished products that you have seen have provided consistent information and game rules that are close to simulating what happens in real world explosions.

A few last-minute changes included changing the blast area resolution tables and the amount of damage caused by large bombs. The idea of using a damage multiplier to help determine the damage caused by large bombs is an idea that I borrowed from Twilight 2000 (Tw2K), the post-nuclear RPG published by Game Designers Workshop (GDW) in the 1980s. Tw2K was also helpful in deciding how to handle the chemical clouds created by the various gas bombs.

I would also like to thank Dan Harlan who responded to an inquiry I made on the "Star Frontiers: Alive & Well" Facebook page along with Tom Stephens and Tom Verreault for their feedback.

CALL FOR SUBMISSIONS

Do you have material you've created for your sci-fi game that you'd like to share with the wider community? We are always looking for new submissions. If you have something to share, just head on over to the **Frontier Explorer website** and hit the gold "Submit New Content" button.



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