A Guide to Space Combat

Author: Derran Tyler
Contact: disgruntlednegro@hotmail.com

Part One Introduction

That's right ladies and gentlemen; the man is back with the second installment on his warship series. The first article covered how to actually build an interstellar warship by laying out the various types, classes, and systems of a fighting ship. This article assumes that you already have a working warship design. Now, it's time to understand how all the systems of a warship come together and work in an actual combat environment.

Given that warships are considered naval vessels, a lot of the nomenclature between a sea water navy and a space faring navy are the same. The commander of a Nimitz-class aircraft carrier is called a Captain just the same as the commander of an Imperial-class star destroyer of Star Wars fame. However, the similarities end right there. In space, planets are big and ships are small.

In space, ships are unlikely to be able to physically block their opponents from approaching a planet. What this means is that the traditional naval blockade isn't nearly as effective as it is in a terrestrial environment. In space, you're dealing with a fully three-dimensional plane. Not only can you go forward, backwards, and side to side, but you can go up, down, and in diagonals. In space, distances are huge, speeds are near relativistic velocities, and weapons have extremely long ranges.

So while ships may not be able to physically block each other, they will be able to force opponents to enter their engagement envelope on the way to their target. This holds true only if all ships are forced to concentrate near a specific point like a planet. You want to conquer a world, kid? You got to go there. If you're defending a world, the enemy has to come to. Space may be vast, but that doesn't mean that ships won't concentrate sometimes. A fight in deep space is completely different because each fleet could fragment and scatter if necessary without degrading is ability to fight as one cohesive unit.

Part Two: Information and Logistics

In war, information is the most important commodity. The most powerful army is useless if it can't be where it needs to be at the right time. In order to be where it needs to be, it needs information. To destroy the enemy, you have to know where the enemy is. The problem with space is that it is huge and effectively without limits. As far as we know, space stretches on and on infinitely. Because these distances are so huge, radar and radio communications have very limited usage.

You see, radio waves travel at the speed of light, which we all know to be extremely fast. However, it takes the light from the Sun eight minutes to reach Earth from a 'miniscule' distance of 93 million miles away (1 astronomical unit [AU]). Quite simply, in terms of space, the speed of light still means that it could take literally hours for two friendly ships to update each other on their status. This makes giving orders a hard task because by the time an order is received it might no longer be relevant to its

recipients.

In the end, what this comes down to is that space combat becomes fundamentally de-centralized unlike warfare as we have come to know it in the early 21st century. A general simply won't have enough information to make informed decisions, while an individual ship commander lacks overview, but knows what is going on in his immediate area. This means that warfare in space shifts from organized fleet maneuvers and network-centric warfare to a state of chaotic, ship-to-ship battles that focus on individual ship tactics.

Playing off this fact, one must realize that space is the ultimate stealth battlefield. The size and dimensions of space makes it possible to hide effectively using distance. If the enemy doesn't know your direction and you do not emit any telltale radiation, the search volumes can grow so large that contact is virtually impossible. Even with powerful sensors that can detect ships at a range of a million kilometers and the ship is within a 1 cube AU volume, the chance of finding it is little more than one in a million. In space, distances are so incredibly large that it is practically impossible to find anything hiding, something which is easily exploitable.

The size of interstellar space makes it possible to send entire fleets through enemy lines with little chance of being discovered before reaching their target. Borders have no meaning, blockades are nearly impossible unless tightly surrounding a planet or habitat.

To make matters even harder, space is truly four-dimensional. Everything is moving, and it is not just distances that matter but also their relative speeds and timing.

Part Three: Ship-to-Ship Combat

In space, maneuvers mean little. Nval warfare is based on attrition. Whoever attacks first and effectively will win. Naval forces are never broken by encirclement or superior maneuvers; they are broken by destruction.

Space combat is actually in phase space, the six dimensional spaces of position and velocity. The leader that can exploit the peculiarities of the local phase space will have a great advantage. Gravity acts by bending trajectories, different velocity vectors enable different kinds of attack and the asymmetries induced by stars and planets in visibility provide great creative material.

While space is the easiest environment to simply disappear in, if you can be seen, you can be hit. In space, there is nowhere to really hide because most of it is empty. However, in order to be seen, you have to be giving off some form of telltale radiation. This could come from many places, including but not limited to: engines, communications masts, and weapons.

The engines are often a primary culprit because they are the lifeblood of the vessel. They provide the power to run the ship's devices as well as move the ship around. Communications masts can also give you away because they emit RF or microwaves that can be picked up by other vessels. Communicating with another vessel is like lighting up a signal flare – you've just told everyone your location. Weapons and their reactors can give off tremendous amounts of energy when being powered up, which can tip off your enemy that you are in fact there.

Thus ship-to-ship combat is a constant game of cat-and-mouse. More than 2/3rds of the battle will be spent trying to just find the enemy while the rest is watching your weapons streak towards their targets, hoping you can score a hit. Also, combat rarely lasts past the first or second salvo, simply because a lot of times, you have caught an enemy off-guard.

A. The Weapons

Weapons include beam weapons, which often will strike a target instantly since they travel at light speed. The most common weapons of this type are lasers and particle beam weaponry. Pound for pound, these weapons are your primary armament because their payload is effectively unlimited (as opposed to missiles).

Beam weapons have moderate ranges in excess of 250,000 miles, but that number could be deceiving. Why? Because beams dissipate as they travel further and further. That means the farther off the target, the less damage the beam will do. This is why you have a maximum range and an effective range for beam weapon. The maximum range is the absolute farthest amount a beam will travel before breaking up completely. Thus, the effective range is the absolute farthest a beam will travel and deal damage to a target.

Beam weapons require a substantial amount of power to operate in combat, and if you power up your beam weapons then it is too like a signal flare to everyone around that you are a threat. This also plays into the stealth factor of combat.

Ballistic weapons come in two varieties: mass drivers and missiles. Mass drivers use powerful electromagnetic fields to hurl slugs at targets at tremendous speeds. While compared to a beam weapon, a large bullet doesn't seem like it would do a lot of damage, a 100 kg object traveling at speeds in excess of Mach 20+ has a tremendous force behind it. And more often than not, mass drivers operating in space can hurl objects at far greater speeds. So a matter of damage isn't the detractor of a mass driver, but rather the simple effective range. The maximum range of a mass driver is indefinite simply because of the law of inertia. You shoot a 100 kg slug and it'll keep on going forever unless it gets acted on by a greater force. Unfortunately, because mass drivers do not travel at relativistic speeds (but pretty close), they are inaccurate to the extreme. This means that such weapons are limited to point-blank ranges in terms of space combat.

Missiles on the other hand are the real heavy hitters in space combat. Why? Missiles are considered 'smart' weapons because they have their own sensors from which to guide them to their targets. Missiles can use the law of inertia to maximum effect by using their engines to accelerate to a desired velocity, disengaging them, and then coasting to their targets, periodically reengaging their engines to maintain the correct vector of attack. Also, missiles can carry heavy warheads from large multi-megaton thermonuclear devices to exotic warheads like anti-matter. The main disadvantage of missiles is that they can be defeated by point-defense systems in their terminal guidance phase.

Another weapons system is the long romanticized starfighter. I could write a whole guide on these units alone, but I'll just give a short overview. In space, starfighters have one glaring problem: speed. Starfighters are comparatively slow compared to their parent ships as they don't have the powerful engines driving them. Also, there is always an issue of fuel and range. Starfighters can't go far away from their parent ships or risk becoming stranded out in deep space. So what does this mean? This means that

starfighters are just like your mass driver: You have to use them close. Like missiles, starfighters are prone to fall victim to point-defense guns which they can seldom avoid due to their speed.

Conclusion

Well, that's all I have for now. It's a long and informative read, but those are some things that you need to have in mind when trying to engage in space combat. I might hit you up again, I might not. I'm out.