

# NaGa DeMon 2012

*Starships, Solar Systems, and Space Trade – Oh my.*

## Introduction

Hi there.

This document contains the results of my participation in NaGa DeMon 2012 – the National Game Design Month. I decided that I really need starship and solarsystem creation rules for my SF setting... and NaGa DeMon is a good excuse to set these up.

These documents will contain various “Designer's Notes” sections, in which I explain and discuss the decisions behind the systems; obviously, this file is not intended as a finished “product”.

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## Ship Design

### Concept

Before you start designing your space ship, you should pause and give some thought to what it is you are designing. Is it a planetary defense craft? An interceptor? A battleship? A tramp freighter? What is the length of a mission it will embark on, and what tech level will it be constructed at?

These simple decisions will help you decide what components to pick, later.

There are three key measurements you will track over the course of your ship design: Volume, Mass, and Price.

- Volume is measured in cubic meters.
- Mass is measured in metric tons
- Price is measured in Imperial Credits.

It makes sense to set yourself a volume and price budget, but unless you have a specific design need, you usually do not worry about mass during construction. Mass determines ship performance, however, so if you have specific performance parameters in mind you will probably also make informed choices about the mass of components you pick for your ship.

### Tech Level

*Designer's Note:* So the first “sub-system” to design is our tech level chart. I have been working on that on and off for a while; it's a lot of research. Tech Levels are a staple, and I guess every designer has their own philosophy on how to set the levels. I am assuming that 0=no technology or stone age technology and major breakthroughs that revolutionize the world come every 2-3 tech levels. That way, we can have an “early” and a “mature” level of technology for each.

TL	Description	Examples of Technologies
0	None/Early Stone Age	Cudgel, club, handaxe, spear, harpoon

<b>TL</b>	<b>Description</b>	<b>Examples of Technologies</b>
		Needle Hunting and gathering Huts, caves – mobile lifestyle Clothing made from furs and leathers
1	Late Stone Age	Bow and arrows, baskets, boats, plough, yoke, chisel, hoe, loom, earthenware Domestication of plants and animals – agriculture Organized warfare, permanent settlements
2	Bronze Age	Potter's wheel, metal working: copper and bronze tools and weapons Craft, trade, City-state and empire Fortifications, carts, chariots
3	Iron Age	Iron tools and weapons, national economy cities connected by roads, countries and empires, hill forts matches, paper, bridges and suspension bridge water mill, gear, screw Lighthouse, catapult, concrete, aqueduct, irrigation, drainage
4	Medieval	Mechanical clock, spectacles, windmill Horseshoe, trebuchet, modern sailing ship, plate armor crossbow, pointed arch, gunpowder and cannons castles, sawmills, crop rotation, paper, printing press
5	Renaissance	Blast furnace, arquebus, musket parachute, astrolabe, drydock and floating dock newspaper, paddle-wheel boat
6	Industrial Revolution (until circa 1900)	Cotton spinning, steam power, railroads, steam ship machine tools, gas lighting, sheet glass, canals, factories light bulb, hot air balloon, photography
7	WW1 (ca 1900-1930)	Petroleum refining, hydroelectric power, automobile Electrification, telegraph, telephone, tabulating machine Germ theory, tanks, airplane, dirigible, radio Sound recording, chemical weapon, motion picture
8	WW2 (ca 1930-1960)	Radar, jet engine, rocket Nuclear power, nuclear weapons, primitive satellite Analog computers
9	Information Age (ca 1960-2000)	Digital computer, large passenger jets, mass tourism Satellites, spaceships capable of moon landing, industrial robots
10	Interplanetary Age (ca 2000-2050)	Manned spaceships capable of landing on other planets Primitive terraforming
11	Fusion Age (ca 2050-2150)	Fusion power Terraforming
12	Early Interstellar (ca 2150+)	Hyperdrive
13	Interstellar	
14	Early Gravitic	
15	Gravitic Age	
16	Antimatter	Cheap anti-matter generation; antimatter weapons; antimatter power
17	Planetary Engineering	Complete re-engineering of planets Total elimination of aging
18		Megastructure construction: Banks Orbitals Body rejuvenation

TL	Description	Examples of Technologies
19		Jumpgates, force-fields Moving worlds
20		Matter conversion, matter transportation Full-sized ringworlds Personal force-fields
21		Dyson swarms
22		Vacuum energy Dyson spheres
23		Galactic engineering
24		
25		Artificial big bang
26		Custom universes

Ships will almost always be built at a specific tech level. You can reasonably deviate by one TL in either direction; if the ship-building society already has access to the higher tech level these could represent “cutting edge” or experimental systems and should at least cost multiple times list price. A ship that has many or only lower tech level components could be an outdated model.

*Designer's Note:* Okay, the chart has a lot of gaps in it; but I think it's one I can use as a basis. The science fiction universe uses TL12 for all early interstellar colonization. The FN was TL13-15. The Terran Federation and Empire are TL14-15.

## **Design Process**

After you have decided on a concept and set a budget (if any) and tech level, it's time to start picking systems for your spaceship. There is no mandatory order – I recommend beginning with the primary system that is required for your ship's mission: A passenger liner will need staterooms, a freighter will need cargo space, and so on. Not every ship will need all systems, of course – for example a civilian ship could well be unarmed.

## **Weapons Systems**

### **Fire Control**

Combat between space ships involves high velocities and long distances. Human gunners can't “eyeball” targets, unless they are very close and very slow-for example if one ship attempts to board another. For all other situations, gunners need the assistance of special sensors and computers.

A fire control station can control any number of weapons, but can only engage one target at the same time.

Fire Control Station: TL9; 5t; 5m<sup>3</sup>. Requires 1 workstation.

Larger ships with multiple FC stations – and especially military vessels – will have additional workstations on the bridge for weapons officers who assign targets and weapons to fire control stations.

## **Control Systems**

### **Bridge**

Contains a number of workstations.

Captain: If a dedicated commanding officer is on board, he will have his own workstation from which to command the ship. On smaller ships, the commanding officer doubles as some other function and will use that workstation instead.

Fire Control: Weapons officers assign targets and weapons to fire control stations.

### **Ship's Computer**

Every spaceship – except very primitive capsules – needs a computer of some sort.

The predecessors of computers are invented at TL6 and become slightly more general-purpose at TL7 – at this point they are still largely mechanical and use punch cards to operate. At TL8, computers become usable on spaceships. First in the form of custom-built special-purpose ballistic computers, later, as computers became more commonplace and more powerful, in the form of computers built from off-the-shelf parts.

*Designer's Note:* NASA started using on-board computers with Gemini. The space shuttle went through several generations of its on-board computers, which gives us a nice comparison on improvements in the technology.

TL8 Space Capsule Ballistic Computer: 0.1m<sup>3</sup>; 30kg; 95W.

TL9 Space Shuttle General Purpose Computer Mk 1: 0.3m<sup>3</sup>; 300kg; 650W.

TL9 Space Shuttle General Purpose Computer Mk 2: 0.2m<sup>3</sup>; 150kg; 550W.

## **Other Systems**

### **Living Space**

Consumables:

*Designer's Note:* Models for actual missions to Mars seem to assume just under 5kg/day/person for consumables. We can assume that this includes recycling as much as possible, but no hydroponics or anything like that.

### **Facilities**

**Cargo Hold**

***Engineering***

**Tanks/Fuel**

**Power Plant**

**STL Drives**

**Hyperdrive**