Accounting for Next Generation Ship Weights

This paper extends the concept as originally posted at the group to take account of the suggestions made by George Recker Jr and Terry Shannon, I'd like to thank them for their useful ideas, as well as the others who have contributed to this interesting debate so far.

This shows my overall suggestions for who to deal with the mass of Next Generation ships. My basic desire is to provide suggestions that allow to make use of the canon displacement figures.

The paper details my suggestions, and shows the effect that each has in absorbing some of the mass of the Galaxy Class Design. I'm describing the construction rule concepts I'm suggesting, and demonstrating them by constructing a Galaxy class ship using those concepts.

In simple terms these ideas add additional non combat related mass to the original FASA displacement, as a result we end up with three distinct classifications of displacement:

- **STANDARD** - Traditional FASA weight (including new systems for SIF and Docking)
- **UNLADEN** - STANDARD mass with the addition of non combat equipment (i.e. Crew facilities and Science/Sensors facilties)
- **LADEN** - UNLADEN mass with the addition of cargo and fuel

Standard would correspond to the idea of a fighting mass as suggested at the group. This approach will also allow existing FASA vessels to be easily adapted, as will be shown later.

Basic Assumptions used in construction of Galaxy Class Ship

Ship Weight Classes

I've fudged a quick system that puts the GCS in Class 33, that has been used in all displacement calculations

Class	Minimum (mt)	Maximum (mt)
xxi	700,000	800,000
xxii	800,000	900,000
xxiii	900,000	1,000,000
xxiv	1,000,000	1,200,000
xxv	1,200,000	1,400,000
xxvi	1,400,000	1,600,000
xxvii	1,600,000	1,800,000
xxviii	1,800,000	2,000,000
xxix	2,000,000	2,500,000
xxx	2,500,000	3,000,000
xxxi	3,000,000	3,500,000
xxxii	3,500,000	4,000,000
xxxii	4,000,000	4,500,000
xxxiii	4,500,000	5,000,000

New Equipment

Structural Integrity Field/Emergency Forcefields

The SIF/EF concept is one solution for such a system could work in the game, and more importantly, what it could cost in terms of SS and mass.

The cost is 1 SS per size class, but also 500mt per SS, so it basically adds a 33% to SS weight.

I've also extended the idea to include emergency shielding for hull breaches, as that would otherwise require a separate system.

SIF/EF	Classes	Standard Power Used	Full Power Used	Mass	SS
SIFA	1-3	2	4	500 per SS	1 per class
SIFB	4-8	4	8	500 per SS	1 per class
SIFC	9-14	6	12	500 per SS	1 per class
SIFD	15-20	8	16	500 per SS	1 per class
SIFE	21-25	10	20	500 per SS	1 per class
SIFF	26-30	12	24	500 per SS	1 per class
SIFG	31-35	14	28	500 per SS	1 per class

I'm assuming that the SIF/EF system would give the following benefits when used in different power modes:

- **When Unpowered** – No effect all damage applies as per standard rules
- **Standard Power** – Reduces damage caused by stress, and reduces crew casualties from combat by 50%
- **Full Power** – As Standard Power, but also reduces SS damage from combat.

There may also be scope to add a further modifier to the Ships PE and D as a result of this system being fitted.

Hull Separation Mechanism

The hull separation mechanism would be fitted to all vessels with a hull that can be separated, but crucially is capable of being reconnected without dockyard support.

Older vessels such as the Consitution class or D7 would not require this mechanism as they are not capable of having their command hulls reattached without dockyard assistance, ships such as the Galaxy class are capable of routine reattachment without external support.

Ships such as the Prometheus class would be fitted with multiple sets of this equipment connecting each pair of sections.

The mass cost for a ship with two hull sections would be:

Mass	SS Cost	Power required to separate/reconnect
2% of maximum class mass (split evenly between the two sections)	2 (1 point allocated to each section)	2 (1 point for each section involved)

A ship with three hull sections would have double this cost, and would require 4 points of power to separate or reconnect as two pairs of docking mechanisms are required

Standard Ship Equipment

Much of the equipment on the Galaxy Class has had to be created specially for this example, but WER, IER, DPC, SER and WDF figures are correct, to ensure D and WDF are both correct.

The mass of the warp drive may seem high at 600,000mt, but this is only 13% of the LADEN displacement of the Galaxy class, while the 100,000mt FWG-1 represents some 55% of the FASA Enterprise class LADEN displacement.

Basic Ship Construction

The basic construction of the Combined Galaxy class ship in this example is as follows:

- Ship weight class 32 (maximum 4,500,000mt)
- Control Computers
  - 3 x M10 Totalling 66,000mt and 18 SS
- Warp Drive
  - 2 x FWX-2 Totalling 600,000mt and 60 SS. Power Output = 80 each, Movement ratio 12/1, WER 19.1
- Impulse Drive
  - 2 x FIX-4 Totalling 50,000mt and 0.2 SS. Power Output = 60 each, BUT only one engine can be used while ship is in combined flight mode. Movement ratio 12/1 IER 7.2 (IER only allows for use of one engine)
- Shields
  - 2 x SFX Totalling 10,000mt and 10 SS. BUT only one shield system can be used while ship is in combined flight mode. Shield efficiency rating 4, DPC 11, Maximum power = 30. (SER and DPC only allows for use of one shield system)
- PE
  - PE = (19.1+7.2+11) x 4 = 149.2
- Structural Integrity field
  - SIF-G, 32 SS (1 per mass class SS). Mass is not counted here, but when SS mass is calculated you need to multiply the SS score by 2000 not 1500. Power requirement is 14 standard, 28 full.
- Saucer Separation Mechanism
  - Requires 2 SS (1 per hull section involved) and 90,000 mt (2% of maximum class weight of 4,500,000mt)
- Primary Hull Phasers

    - The main phaser array consists of 4 FMH-15, in total weighing 3,800mt and requiring 18.8 SS. WDF is 156.
- Secondary Hull Phasers
    - The secondary hull phaser arrays consist of 12 FH-20s, in total weighing 8,100mt and requiring 58.8 SS. WDF is 175.2.
- Photon torpedoes
    - The ship carries 3 FP-X photon torpedo systems weighing 1,440mt in total and requiring 12 SS. Total WDF is 75, but as one launcher cannot be used in combined flight mode we only count two of the launchers towards the WDF score.
- Total WDF
    - 33.1
- Component Mass
    - 829,340mt
- SS
    - Required SS 212.8
    - Additional SS 94.2
    - Total SS 307
- SS Mass
    - 307 x 2000 (as SIF/EF is fitted) = 614,000mt
- **STANDARD DISPLACEMENT 1,443,340mt**
- **D**
    - (307x1.43) + 149.2 = **588.2**
- **CE**
    - **1948.2**

Moving to UNLADEN DISPLACEMENT

To move to UNLADEN displacement from STANDARD displacement we need to add the mass of the non-combat facilities. As stated earlier UNLADEN displacement represents the mass of all ships systems (both combat and non combat), but excludes cargo and fuel.

Crew/Science Facilities

Instead of creating lots of tables for Crew facilties, sensors and science equipment (ie all non combat stuff) I've gone for a simpler approach. The crew facilities and science/sensors are basically percentage modifiers to the maximum class weight of the ship.

Modifiers range from 0% to +30% depending on the ship and era. I see the baseline being the TOS era ships at 0%, the Enterprise D is 25% for both.

This serves to represent the tremendous advancements made to sensors, science equipment (for example Stellar Cartography on the Enterprise – D), crew quarters (staterooms for all crew on the Enterprise D compared to bunk rooms on the Enterprise A) and crew amenities (holodecks on the Enterprise-D).

This does not mean that TOS era ships did not have crew or science facilities, but rather the facilities aboard those early ships are the baseline which later ones are measured by

Crew Facilities

	Tonnage Modifier	Example Use	Sample Facilities
A	0	Enterprise A, Defiant	Crew Bunk rooms, Rec Deck, Bowling Alley, Gym
B	5%	Enterprise B	Shared Crew Quarters, Enhanced Rec Deck, Basic non interactive Holosuites
C	10%	Prometheus	Individual Crew quarters, EMH, Holosuite
D	15%	Most TNG Ships	Family Quarters or enhanced Crew Quarters, Holosuites
E	20%	Enterprise E	Full Family Facilities or enhanced Crew Quarters, Holodeck
F	25%	Enterprise D	Full Family Facilities or enhanced Crew Quarters, Multiple Holodecks
G	30%	Luxury Liner	

Science/Sensor Facilities

	Tonnage Modifier	Sample Use	Details
A	0	Enterprise	Basic TOS Science Package
B	5%	Enterprise - A	Sensors for logging gaseous anomalies
C	10%	Defiant	Basic TNG science package
D	15%	Enterprise - E	TNG era military role ship science package/small science ship
E	20%	Intrepid	Specialist Small Explorer Science Package
F	25%	Enterprise - D	Specialist Large Explorer Science Package
G	30%	TNG Oberth	Science ship package

Adding Crew Facilities and Science/Sensor Facilities to the Galaxy Class

- The Galaxy Class is class 32, or a maximum of 4,500,000mt, we have chosen package F for both Crew Facilities and Science/Sensor Facilties.
  - Crew Package F equates to 25% of maximum class weight, or 1,125,000mt.
  - Science Package F equates to 25% of maximum class weight, or 1,125,000mt.
- In total these two packages come in at 2,250,000mt or half the total mass.
- **STANDARD DISPLACEMENT WAS 1,443,340mt**
- **UNLADEN DISPLACEMENT IS 3,693,340mt**

Moving to LADEN displacement

To move to LADEN displacement from UNLADEN displacement we need to add the total mass of cargo and fuel that is usually carried.

Cargo

The cargo weights we have previously used were based on TOS levels of crew luxury and personal space. The more voluminous quarters aboard TNG era ships will allow more personal possessions, and we also need to allow for raw material carried for replicators for crew members.

Additionally a new category of passenger has been added, Evacuation, we need to allow for emergency supplies carried for when a ship is used in an emergency evacuation. Such supplies would be carried as in an evacuation situation replicator power may not be available.

	Cargo required (mt) per year
Crew	11
Passengers	9
Troops	13
Evacuation	5

Previous FASA publications suggested the carriage of 5,000mt of spares aboard military ships, and 10,000mt aboard science ships. The dual role of the Explorer suggests that all ships in that category should carry 15,000mt of spares.

The description of the mission of the explorer in the TNG technical manual also suggests that Explorers carry off loadable fuel and cargo to support remote stations, such cargo will also be need to allowed for.

Fuel

Figures provided by George Recker Jr suggest that the following amount of fuel is required for the ships own use:

Ship Fuel	Cargo (mt) Per weight Class per year
Deuterium	262.821
Anti Matter	68.248

Adding Cargo to the Galaxy Class

- Standard Duration is stated as 7 years (Starship Spotter)
- Crew 1,012
  - 77,924mt of cargo (1012 x 7 x 11)
- Passengers 200
  - 12,600mt of cargo (200 x 7 x 9)
- Troops 0
- Evacuation Limit 15,000 additional personnel
  - 525,000mt of cargo (15000 x 7 x 5)
- Subtotal of cargo from personnel
  - **615,524mt or 12,310 SCU**
- Spare Parts
  - 15,000 mt
- Off loadable cargo/fuel
  - 100,000 mt
- Ship's own fuel
  - Deuterium 58,872mt (262.821 x 32 x 7)

    - Anti Matter 15,288mt (68.248 x 32 x 7)
- Subtotal of cargo from spares, off loadable cargo/fuel and ship's fuel
    - **189,159mt or 3,783 SCU**
- **GRAND TOTAL OF CARGO**
    - **804,683mt or 16,094 SCU**
- **UNLADEN DISPLACEMENT WAS 3,693,340mt**
- **LADEN DISPLACEMENT IS 4,498,023mt**

Summary

By using these methods the end result is a Galaxy Class ship with a LADEN displacement that is accurate to canon, that includes non combat systems and cargo. This additional displacement is added simply to the STANDARD (FASA) displacement by the addition of Non combat systems as a percentage relative to maximum class weight to find the UNLADEN displacement, and by including cargo to find the LADEN displacement.

The suggested hull separation mechanism is a simple solution to the issue, and can also be applied to vessels such as Prometheus with its multi vector assault mode, and Ptolemy as the way the cargo pods are attached.

The SIF/EF concept needs refinement, but does again give a simple way to add this aspect to the game without over complicating construction or gameplay.

This is only one solution to the issue, but it does serve to address the main concerns raised:

- How can we build TNG era ships that are not excessive in terms of SS and CE
- How can we modify the system to allow for systems that FASA excluded

TOS era ships

TOS era ships are unaffected by these changes, and can be played as normal. Players may wish to add a laden displacement figure which includes the cargo. For the majority of FASA ships this will not affect the class they are in, as most FASA ships are at the low end of their mass range for their class. For ships such as the FASA Enterprise and Constitution classes, adoption of a laden displacement goes some way to addressing the disparity between the FASA displacements and more commonly quoted figures

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Thanks to George Recker and Terry Shannon for ideas that have added to the original concept.