



# Missiles 101

<http://eveuni.org/missiles101>

*"Doesn't anybody have any missiles left?"*

12 March 2015

# Missiles 101



- Missiles launchers – types & sizes
- Missiles – types & sizes
- Range: velocity & flight time
- Explosion Radius
- Explosion Velocity
- Missile damage equation
- Missile skills
- Missile modules & rigs

# Why use missiles?



- + Missiles cannot miss, so long as your target is within range
  - + Can switch damage between all four damage types equally\*
  - + Missile launchers do not use capacitor
  - + Missile can have a long range with consistent damage
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- Missiles can take a long time to reach their target
- Some fast ships can actually outrun missiles!
- Big missiles do awful damage to smaller targets

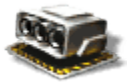
*\* some ships may have bonuses to certain damage types*

# Frigate Launchers



**Rocket Launcher:** short-range / higher damage

- fast rate of fire
- Range: 10km
- DPS: 16
- low CPU/PG fitting requirements
- ammo: Rockets



**Light Missile Launcher:** long-range / lower damage

- slow rate of fire
- Range: 42km
- DPS: 14
- higher CPU/PG fitting requirements
- ammo: Light Missiles



*Range & DPS are approximate and assumes all Vs skills, T2 turrets, basic T1 missiles and no ship bonuses. DPS is highly theoretical; faster and smaller targets can reduce this value significantly.*

# Cruiser Launchers



**Heavy Assault Launcher (HAM):** short-range / higher damage

- fast rate of fire
- Range: 20km
- DPS: 31
- more PG but less CPU required
- ammo: Heavy Assault Missiles



**Heavy Missile Launcher (HML):** long-range / lower damage

- slow rate of fire
- Range: 62km
- DPS: 22
- less PG but more CPU required
- ammo: Heavy Missiles

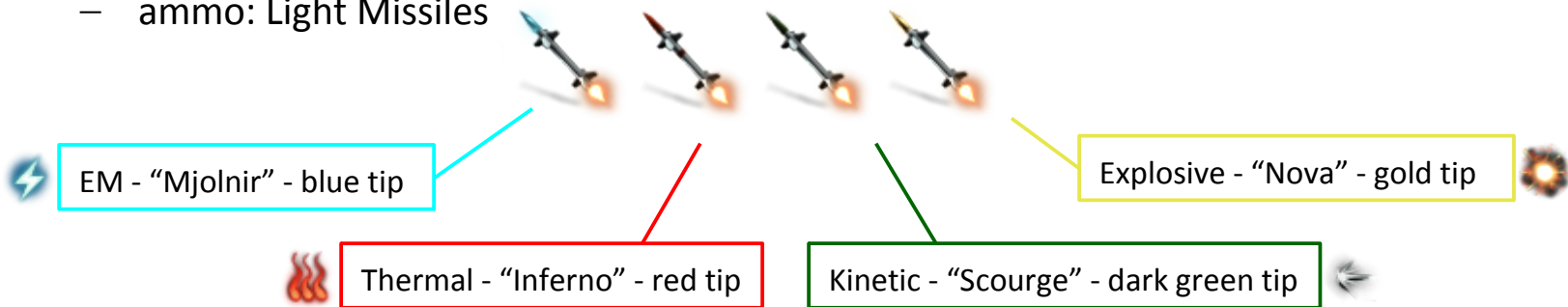


# Rapid Light Launcher







**Rapid Light Missile Launcher:** mid-range launcher, designed for cruisers, for use against fast cruisers or frigates, with high damage but long reload time

- fast rate of fire, but a 40 second reload time
- Range: 42km
- DPS: 27
- very low CPU/PG fitting requirements
- ammo: Light Missiles



Missiles come in specific colours and specific names for each damage type, e.g.:

-  Inferno Cruise Missile
-  Scourge Torpedo
-  Caldari Navy Nova Rocket
-  Mjolnir Rage Heavy Assault Missile

# Battleship Launchers



**Torpedo Launcher:** short-range / higher damage

- fast rate of fire
- Range: 20km
- DPS: 62
- higher CPU/PG requirements
- ammo: Torpedoes



**Cruise Missile Launcher:** long-range / lower damage

- slow rate of fire
- Range: 150km
- DPS: 45
- lower CPU/PG requirements
- ammo: Cruise Missiles



# Rapid Heavy Launcher



**Rapid Heavy Missile Launcher:** mid-range launcher, designed for battleships, for use against cruisers or battlecruisers, with high damage but long reload time

- fast rate of fire, but a 40 second reload time
- Range: 62km
- DPS: 52
- very low CPU/PG fitting requirements
- ammo: Heavy Missiles





# Other Missile Types



## T2 Missiles: Rage & Fury

- very similar in purpose to each other
- much higher damage missiles, but with a larger explosion radius and lower explosion velocity (penalties!)
- used for greater damage versus larger & slower targets
- slightly shorter range



## T2 Missiles: Precision

- *for longer-range launchers only (light, HML, cruise)*
- lower damage missiles, but with a smaller explosion radius and higher explosion velocity (bonuses!)
- used for shooting smaller & faster targets, e.g. drones, frigates



## T2 Missiles: Javelin

- *for shorter-range launchers only (rocket, HAM, torpedo)*
- lower damage missiles, but with a much longer range
- used for shooting targets further away (obviously)

# Other Missile Types



## T1 Missiles: Defender

- *comes in Light and Heavy varieties, for use in Light Missile Launchers and Heavy Missile Launchers only*
- used without a target selected, Defenders will shoot down incoming missiles targeted at you
- not very popular due to simply not being very effective
- can be occasionally useful for defending yourself
- explosive damage only



## Auto-Targeting Missiles



## T1 Missiles: Auto-targeting (aka F.o.F.)

- *for longer-range launchers only (Light, Heavy, Cruise)*
- missiles that don't need a locked target – when activated fires on the nearest hostile (ship or drone that has aggressed you)
- lower damage than normal missiles, otherwise identical
- not very popular due to low damage and inability to select exact target
- comes in all four damage types

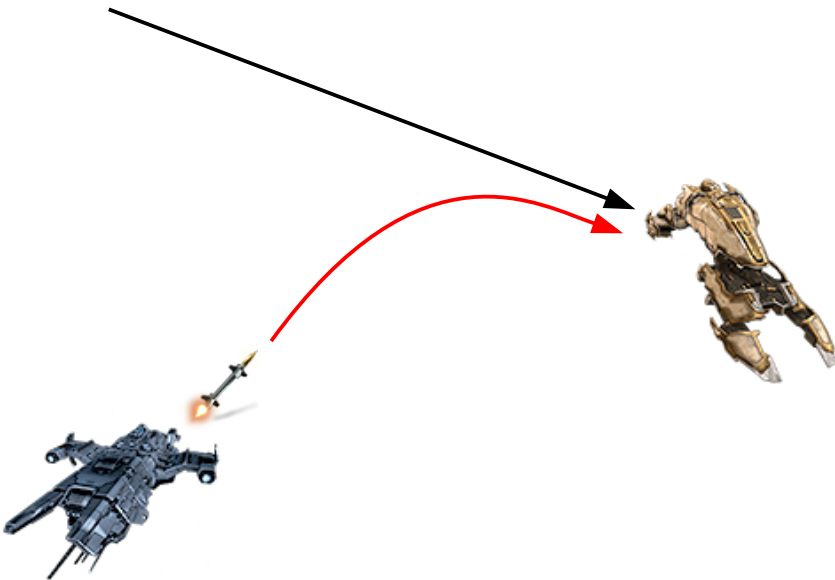


## Defender Missiles

# Missile Range

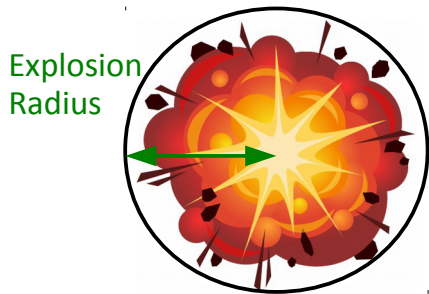


- You can find the range of your missiles from the mouseover tooltip on your launchers.
- Alternatively by multiplying together flight time and velocity on any missile.



- The actual range is usually slightly less than this, especially versus moving targets, as missiles will fly in an arc towards a moving target
- It's possible to outrun missiles if you are fast enough.

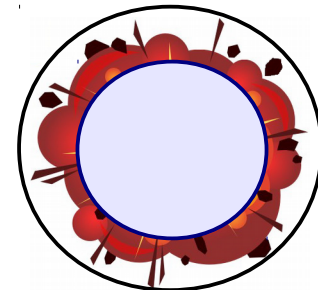
# Explosion Radius



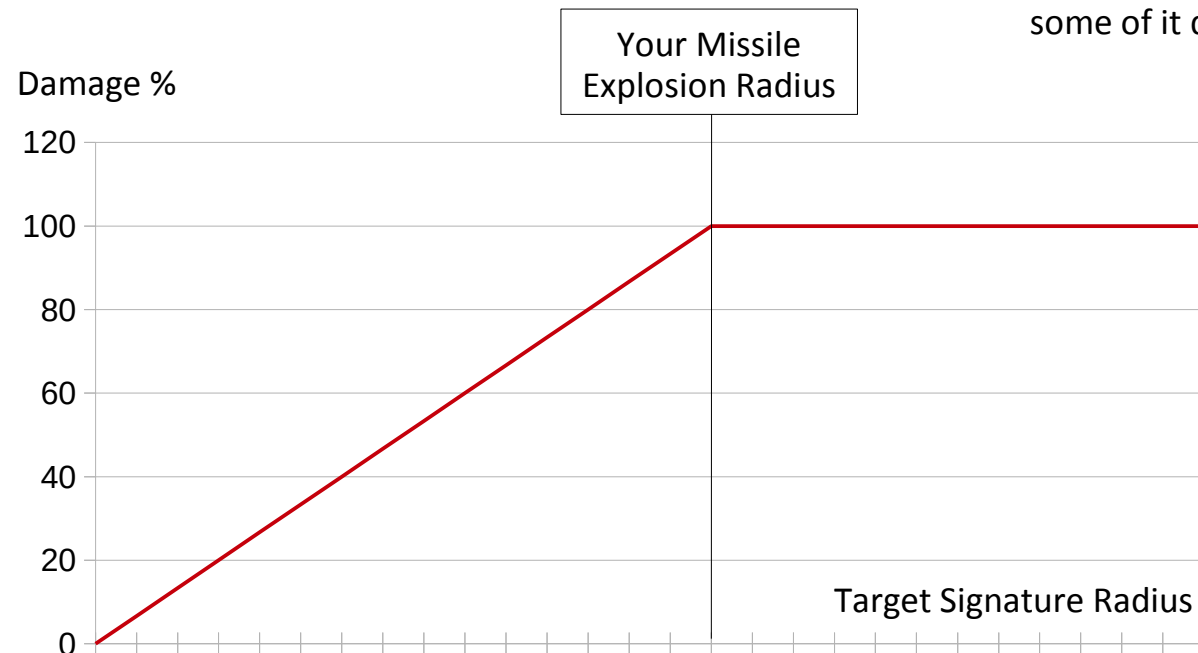
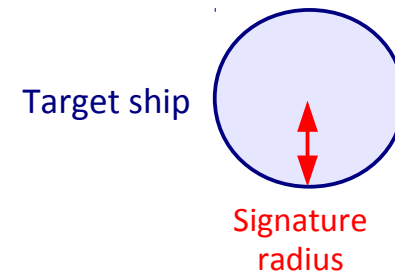
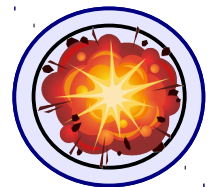
**Explosion Radius** is a property of a missile (in metres), that tells you how wide its explosion spreads – a smaller radius concentrates the damage into a smaller area.

*A smaller explosion radius means your missiles will do more damage versus smaller targets.*

In this case the damage from a large missile is spread out and only some of it damages a smaller ship.



The same target takes all of the damage from a smaller missile.



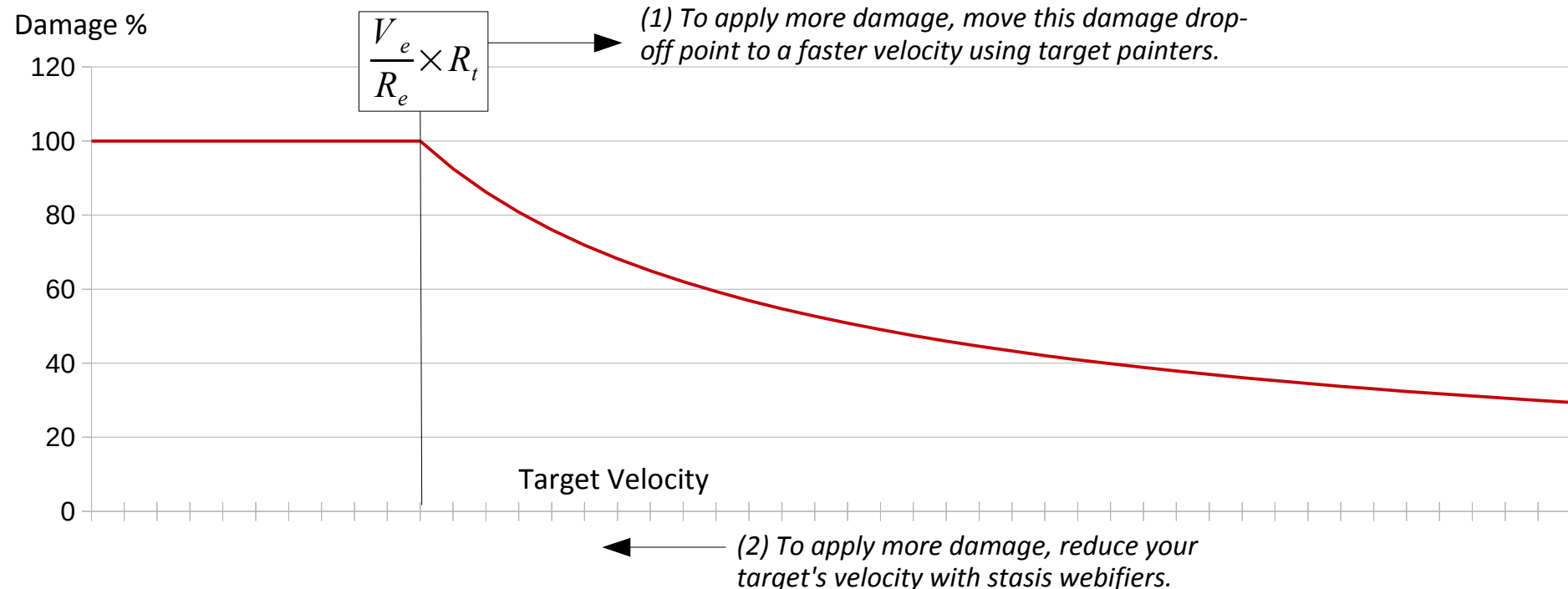
# Explosion Velocity



**Explosion Velocity** is a property of a missile (in metres per second), that kind of tells you how fast its explosion spreads – a smaller velocity means the explosion happens slower, and faster ships might be able to outrun much of the damage.

*A smaller explosion velocity means your missiles will do less damage versus faster-moving targets.*

Unfortunately the velocity at which your damage starts to reduce is *not* when missile velocity ( $V_e$ ) equals target velocity ( $V_t$ ), and is actually affected by both the missile explosion radius ( $R_e$ ) *and* velocity, and also the target's signature radius ( $R_t$ ). Note that this means reducing your missile explosion radius (using rigs & skills) has a double effect against small *and* fast targets.



# Explosion Velocity

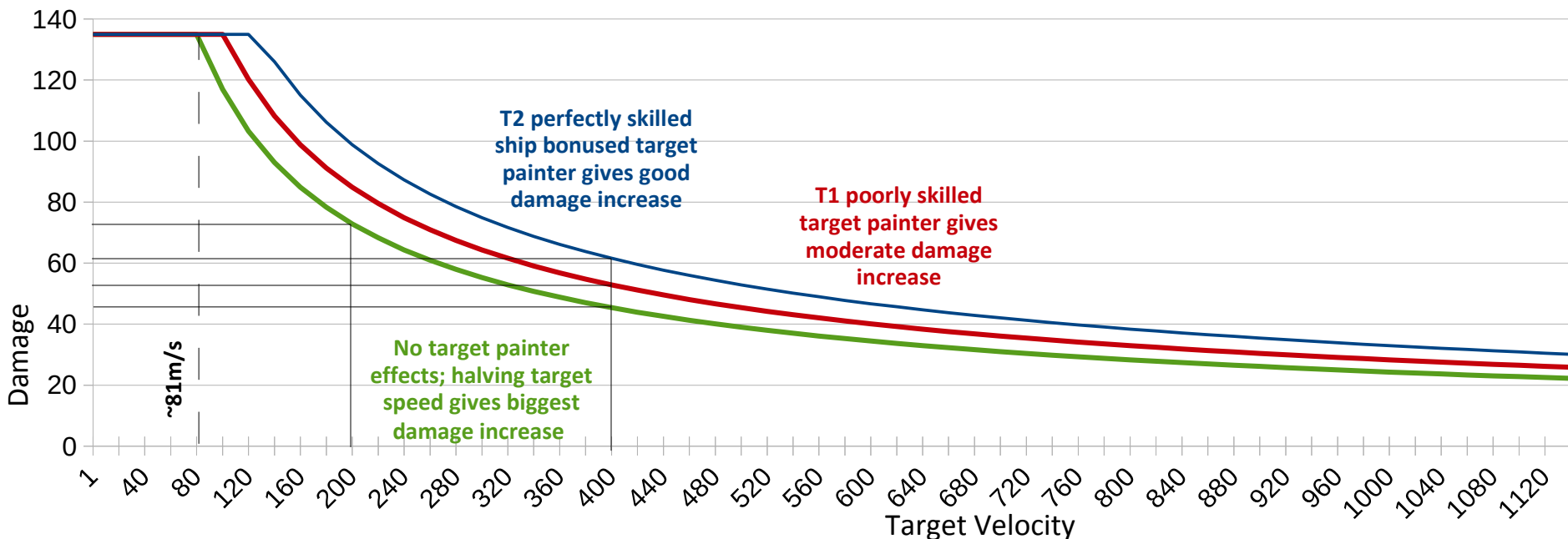


On the previous slide we noted that the velocity at which damage starts to drop off is a factor of Explosion Velocity ( $V_e$ ), Explosion Radius ( $R_e$ ) and Target Signature Radius ( $R_t$ ).

$$\frac{V_e}{R_e} \times R_t$$

Note that in the case where the explosion radius equals the target's signature radius, these factors cancel out, and the target velocity at which damage starts to drop off is equal to explosion velocity.

Example below: shooting Heavy Missiles ( $V_t=140\text{m}$ ) at a Vexor ( $R_t=145\text{m}$ ) target. Heavy Missile  $V_e=81\text{m/s}$ .



# Missile Damage equation



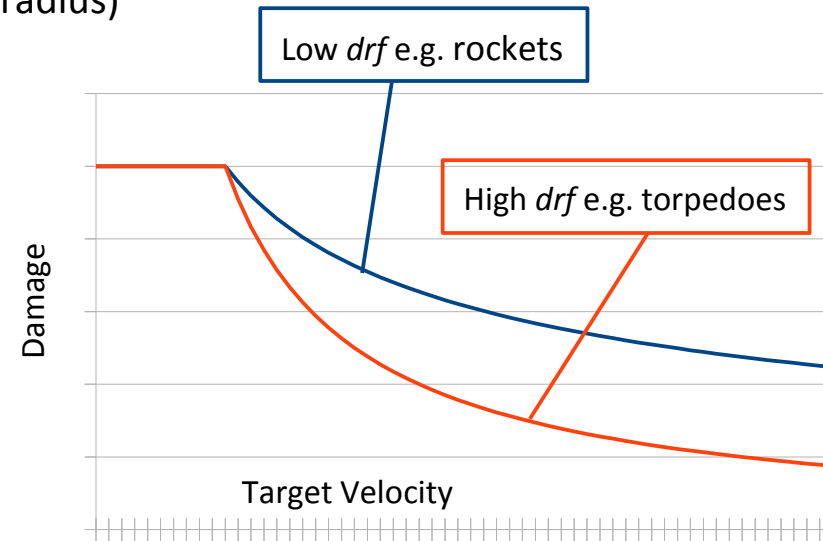
$$\text{Total Damage} = D \times \min \left( 1, \frac{R_t}{R_e}, \left( \frac{R_t}{R_e} \times \frac{V_e}{V_t} \right)^{\frac{\ln(drf)}{\ln(5.5)}} \right)$$

Where:

- $D$  : base missile damage
- $R_t$  : Target Signature Radius
- $R_e$  : Missile Explosion Radius
- $V_t$  : Target Velocity
- $V_e$  : Missile Explosion Velocity
- $drf$  : Damage Reduction Factor

When a missile strikes a target, the damage done by the missile is multiplied by the smallest of three calculated values:

- a signature/missile radius term
  - a target/missile velocity term (that also includes radius)
  - 1
- The Damage Reduction Factor is not visible in game, but can be seen in applications like EVEMon or EFT.
  - It affects how quickly the missile damage drops off as the target moves increasingly faster than the explosion velocity.
  - Lower is better; smaller missiles like rockets have a low value whilst torpedoes and cruise missiles have a larger value (damage drops off quickly).



# Missile skills

These are all Perception/Willpower skills



**Missile Launcher Operation (x1)** – increases all launcher rate of fire by 2% per level



**Rockets / Light Missiles (x1/x2)**

**Heavy Assault Missiles/ Heavy Missiles (x3)**

**Torpedoes / Cruise Missiles (x4/x5)**

Increases damage of relevant missile type by 5% per level



**Rocket / Light Missile Specialization (x3)**

**Heavy Assault Missile / Heavy Missile Specialization (x5)**

**Torpedo / Cruise Missile Specialization (x8)**

Increases rate of fire of relevant launcher (T2 only) by 2% per level



**Rapid Launch (x2)** – increases all launcher rate of fire by 3% per level



**Missile Bombardment (x2)** – increases all missile flight time by 10% per level



**Missile Projection (x4)** – increases all missile velocity by 10% per level



**Target Navigation Prediction (x2)** – increases your missile explosion velocity by 10% per level



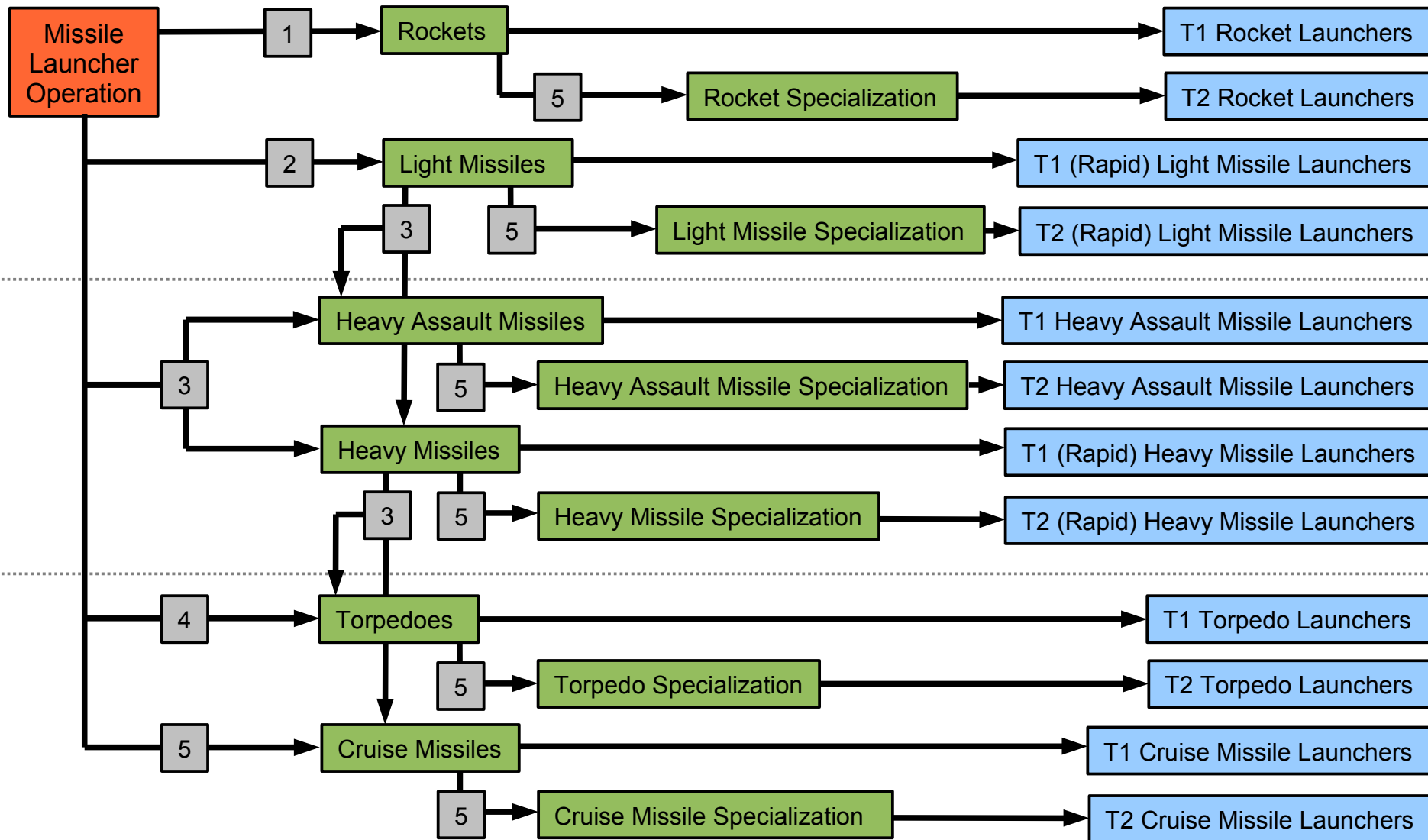
**Guided Missile Precision (x5)** – decreases your missile explosion radius by 5% per level



**Warhead Upgrades (x5)** – increases all missile damage by 2% per level



# Missile skills



# Weapon Upgrade Modules



**Ballistic Control System** (passive, low slot): increases missile damage by 7% and launcher rate of fire by 7.5% (+10% and +10.5% for Tech 2)

- basic damage-increasing upgrade module, stacking penalized if you fit 2+
- works on all types of missile launcher
- High CPU requirement



**Stasis Webifiers** to slow down your targets and **Target Painters** to make them bigger, although not technically weapon upgrade modules, will both significantly increase applied DPS, up to a certain point.

# Launcher Rigs



**Warhead Calefaction Catalyst** : +10% damage

**Bay Loading Accelerator** : +10% rate of fire (slightly more effective than Calefaction Catalyst)

**Flare Catalyst** : +15% missile explosion velocity

**Rigor Catalyst** : -15% missile explosion radius

Not stacking-penalized

**Hydraulic Bay Thrusters** : +15% missile velocity

**Rocket Fuel Cache Partition** : +15% flight time

*Drawback for all missile rigs: 10% increased CPU requirement for launchers (effect reducible by training Launcher Rigging skill)*