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On Hiatus

The Theory and Practice of Speed Tanking (WIP)

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Tanking is the act of fitting a ship with modules in order to improve its defensive capabilities to resist, absorb, or mitigate incoming damage, thus preventing or delaying your ship's destruction. **Speed tanking** is a defensive doctrine that emphasizes maximizing speed and agility and minimizing signature radius to protect a ship from damage. Speed tanking exploits the precision component of turret and missile damage mechanics: missiles do very little damage to small and/or fast ships, and turrets will hardly ever hit ships that are small, maintain fast and tight orbits, and/or are able to quickly outrange them. The distance to the attacker, and, in the case of attackers using turrets, transversal velocity/angle of approach/departure also matter, and are additional considerations when it comes to speed tanking.

The purpose of this guide is to explain how to speed tank. It does not go into the precision and damage computation mechanics that make it possible – for that I defer you to the appropriate articles on EVE Uni.

Signature Radius

Ships with a large signature radius are hit more easily by turrets and receive more damage from missiles. Signature radius is dictated by the hull used and is generally a constant value with three exceptions:

- Your signature radius is increased (ie. suffers "sig bloom") while Microwarpdrives (MWD) are active, and while Micro Jump Drives (MJD) and Micro Jump Field Generators (MJFG) are spooling up, thereby making your ship liable to suffer substantially increased damage for the duration.
- If your ship is receiving an Evasive Maneuvers command burst (ie. from a command ship in your fleet), then its signature radius is reduced for the duration of the command burst, thereby reducing incoming damage.
- If your ship is being target painted, your signature radius will be increased for the duration of the target painting.

Notable Exceptions:

- Interceptors and the Talwar have a substantial reduction to the signature penalty of MWDs such that, with L5 skills, the increase in speed results in a greater damage reduction than the increase in damage from sig bloom. In other words, Interceptors and the Talwar have a net damage reduction when using the MWD and moving at full speed in contrast to other ships.
- Assault Frigates and Heavy Assault Cruisers also have sig bloom penalty reduction and therefore reduce incoming damage; however, the penalty reduction is not as strong, so these ships still suffer more damage when an MWD is running than when it is off.

In addition to suffering sig bloom and rapidly draining your capacitor when in use, fitting MWDs cause a permanent decrease in your maximum capacitor capacity (even when inactive), and they drain a lot of capacitor when in use. Furthermore, they can be disabled when a warp scrambler in used on your ship. For these reasons, **most speed tanks fit an AB in addition to an MWD: the AB is constantly engaged to maintain speed without suffering sig bloom or excessive capacitor consumption with infrequent exceptions in which the MWD is used in short bursts to quickly open or close distances before switching back to the AB.**

Because the increase in speed is substantially greater than the increase in sig, a MWD usually decreases incoming damage from turrets and will never increase it – not even if (traversal) velocity less than maximum (eg. such as when heavily webbed), near zero, or zero per chance-to-hit computations. However, MWDs will increase incoming damage from oversized missiles while reducing damage from "at-size" missiles (with a sufficiently high velocity).

Speed Tanking Against Turrets

Hit Quality

If a turret hits you, the quality of the hit is entirely randomized and not affected by any variable. Therefore, in relation to enemy gunboats, **the objective of a speed tank is to make the ship as hard to hit in the first place.** It is not difficult to speed tank certain targets such that turrets virtually never hit (ie. you'd be more likely to be struck by lightning).

Chance to Hit

There are two components to the hit chance formula: one is based on tracking, and the other based on range:

- Any target that exceeds optimum range is harder to hit. The extent to which it is harder to hit is determined by turret falloff. There is no penalty for being well within optimum range. **One way to speed tank is to outrun and outrange the enemy so you can attack them from beyond their optimal range while still being within your own.** This is called kiting.
- Smaller targets (lower signature radius) and targets with higher angular velocities are harder to track and therefore harder to hit. **The other way to speed tank is to move as quickly and closely to the target as possible ("tight orbit") to maximize your angular velocity, thereby making it as hard as possible for them to track and hit you.**

Note that if you outrange the target, you will still want to maximize your angular velocity to decrease incoming damage. This will be discussed in detail later.

Tracking speed refers to how quickly the target's turrets can turn in order to maintain a line of sight to you at all times. If they cannot turn quickly enough, they will rarely if ever hit you. Larger turrets and long range turrets have lower tracking speeds than smaller and short range turrets respectively.

Conceptually, angular velocity refers to how quickly the target's guns need to turn in order to maintain a line of sight with you at all times based on your distance and velocity. The closer you are to your target, the faster the target's turrets needs to turn in order to maintain a line of sight to you (higher angular velocity), and the further away you are, the slower the target's turrets need to turn in order to maintain a line of sight to you (lower angular velocity).

The objective of speed tank against turrets is to maximize your angular velocity in order to minimize the chance the target's turrets will hit you.

Your angular velocity is computed from your transversal velocity (the portion of your velocity that is perpendicular to the line of sight to the target) and your distance to your target. In more practical

terms, your transversal velocity itself is determined by your velocity (ie. speed) and angle of approach to (or departure from) the target relative to the line of sight between you and your target.

If your transversal velocity is zero, your angular velocity is zero and it will be extremely easy for the enemy to hit you. This happens whenever you are stationary or moving directly toward or away from the enemy. **In order to maintain a reasonable angular velocity to make it harder for the enemy to hit you, always stay in motion, and always move at an angle relative to your line of sight.**

In addition to determining your transversal velocity, your angle of approach also determines your radial velocity, which is how quickly you move toward or away from the target (ignoring motions 'sideways'). While this is not used in damage calculations, it is an important consideration in navigating the battlefield effectively, especially in relation to properly positioning yourself relative to multiple targets. **It is important to balance maintaining a reasonable transversal velocity (to make it harder for the enemy to hit you) with a reasonable radial velocity (to ensure you close/open distances to/from your target in quickly), and this is done by using a sensible angle of approach.**

The following table illustrates how much of your velocity (100%) gets translated onto your transversal velocity and radial velocity given the specified angle of approach:

Angle of Approach	Transversal Velocity	Radial Velocity
15º	25.88%	96.59%
30º	50%	86.60%
45º	70.71%	70.71%
60º	68.60%	50%
75º	96.59%	25.88%

For example: If your ship is traveling at a velocity of 1000m/s at a 30 degree angle of approach to your target, then the transversal velocity would be 500m/s and the radial velocity would be 866m/s

Note that the velocity vectors of players, rats, and drones/fights are shown overlaid on top of them. Notably, the velocity vector of the selected item (not necessarily targeted) is overlaid on your ship as well as a soft, flashing flashing arrow.

As stated earlier, both ABs and, to a lesser extent, MWDs can decrease incoming damage from turrets in addition to increasing speed; however, these can decrease maneuverability (ie. agility, often measured as "align time") and thus make it harder to form close-and-tight-and-fast orbits around targets at the increased speeds.

Speed Tanking Against Missiles

Minimizing damage from incoming missiles involves maximizing speed (in any direction – radial and transversal velocity does not matter) and minimizing signature radius (ie. favoring ABs over MWDs/MJDs/MWFGs whenever possible).

There is a soft and hard damage cap on the maximum damage missiles can inflict on you based on your size and speed in relation to the missile's explosion radius and velocity (the two 'precision' attributes of missiles).

If the missile's explosion radius is larger than your signature radius, then the maximum damage a missile can inflict is at most proportional to the ratio of your signature radius to the explosion radius; this is the hard damage cap. For example, if your ship's signature radius is 40m and the missile's explosion radius is 80m, then the sig-to-explosion radius ratio is 50%, and this percentage is the maximum amount of damage the missile can inflict on your ship. On the other hand, if your ship's signature radius was 400m and the missile's explosion radius was 80m, the sig-to-explosion radius ratio is greater than or equal to 100%, so there is no cap on the amount of damage the missile can inflict on your ship. **The smaller the explosion radius, the greater the damage that a missile is able to inflict on your ship (up to 100%).** While the missile explosion radius can be lowered through command bursts, **in practice, the only way the enemy can overcome the hard damage cap is to use target painters to increase your signature radius and have it become greater than or equal to the explosion radius of the missiles used.**

If the missile's explosion radius is less than or equal to your signature radius, then maximizing your speed and minimizing your signature will minimize the damage inflicted on you up to but not exceeding 100% of the missile damage – this is the soft damage cap. (While turret damage may exceed 100% 'normal' damage up to 300% through random randomized hit quality, missile damage is strictly less than or equal to 100% normal damage at all times.) Note that even though the explosion radius is already less than your signature radius, if the explosion radius is reduced further (eg. via command burst) and/or if your signature radius is increased further (eg. via target painting) so that the signature radius to explosion radius ratio increases, then will you be liable to suffer

increased damage. **In practice, the only way the enemy can overcome the hard damage cap is to use webs and target painters.**

In the absence of sufficient webs and paints (and command bursts) on the battlefield, there is no mechanism by which a missileboat can improve missile precision relative to their targets and therefore improve its damage application further; this is in contrast to gunboats, which are able to improve precision by matching the velocity vector of the target to the best of the ship's and pilot's ability. **In relation to precision mechanics, missiles have an advantage over turrets in that, provided the target does not outpace missiles (almost never), missiles never miss, whereas turrets can miss and will miss frequently against speed tanks.** In some cases, it is better to apply low damage consistently than any amount of damage very infrequently.

Speed Tanking Strategies

Flying Perpendicular to Enemy (Orbiting) to Minimize Enemy Tracking

If the enemy is using turrets, you can mitigate tracking ability by maximizing the enemy's transversal velocity; this can done by trying to fly perpendicular to their line of sight. In practice, this typically amounts to orbiting the enemy, though some manual flying (discussed later) may provide for better ways of flying perpendicular to the enemy while also maintaining desirable positions and flight paths in the battlefield.

Note that enemy's transversal velocity is the same as your transversal velocity with respect to the enemy: this means that when you maximize their transversal velocity, you also maximize yours and make it harder for your turrets to hit them.

Tight Orbits

If the enemy is using turrets that are too large, long range, or do not have enough precision enhancement (to improve their tracking speed), then orbiting them as closely as possible as quickly as possible will maximize your angular velocity while making it difficult for them to hit you. In effect, you are safer being closer rather than further from the enemy in relation to incurring damage.

Spiraling Inward and Outward

A good way to close or open distances to/from your target is to manually fly your ship in a spiral pattern. This is similar to an orbit, except that you are incrementally reducing or increasing your distance as you orbit.

Q-Clicking < http://wwwnew.archerentilavine.org/the-theory-and-practice-of-speed-tanking-wip/#Q-Clicks> makes spiraling easy.

Zig Zagging Through Pockets

One way of maintaining a high angular velocity with multiple targets in close proximity with each other at the same time is to simply zig zag between the targets. (Spiraling a specific target within the pocket often achieves a similar effect).

Piranha Tactics (WIP)

A relatively large gunboat (whose turrets have poorer tracking than those used by smaller gunboats), gunboats that are not adequately bonused for precision (from hull and/or fittings), gunboats using long range turrets, and gunboats not utilizing webs (for use against enemy craft operating in web range) will perform poorly against smaller, faster craft.

The larger the size discrepancy, the greater the advantage the smaller craft have against the larger craft in terms of being able to inflict damage without receiving any. Smaller craft are also generally cheaper than larger craft, so they are able maintain this advantage while also having a lower cost liability than their targets if they are destroyed. As such, gunboats are generally weak against smaller/faster craft, which can quickly destroy them like a cow in a tank full of piranhas.

Taking all this into consideration, Piranha Tactics can be employed in which a force of comprised primarily of smaller, faster, cheaper craft are fielded to easily and cheaply destroy all larger craft who can neither ward off the assault nor compensate for all of the incoming damage through self repair. Piranha fleets are usually comprised of frigates and destroyers, which are collectively able to assume all major battle roles (dps, tank, logi, EWAR, command bursts, interdiction). Very few ships are able to effectively encounter piranha fleets.

Manual Flight

Double-Click (Manual Piloting)

Double-clicking in space instructs your ship to navigate your ship in the direction you clicked. If you angle your camera in the direction you want to go and double-click near your ship, your ship will move in the direction the camera is facing.

Q-Clicks

Q-Clicks are a mechanism by which you can quickly and precisely specify a direction and distance of travel without changing your camera angle. There are two types of Q-clicks, and in order to

understand and properly utilize either of them, it is important to enable the Tactical Overlay (which, in general, should always be enabled anyway.)

By default, the 'Q' button is the hotkey for "approach". Pressing and holding Q and dragging outward away from your ship draws a line from your ship to the mouse cursor. A number on the line indicates the distance from your ship to the point on the XZ plane indicated by your mouse cursor as seen in the tactical overlay. A circle is also formed centered around your ship whose radius is the distance indicated on the line.

After holding Q and dragging outward, double-clicking (*without moving the cursor in-between clicks*) will remove the circle but leave the line and create a small circle in the area you clicked. Your ship will now fly toward that circle and stop moving once it arrives. As your ship moves, the line between your ship and the destination circle indicates the direction and remaining distance of travel. This flight mechanism is called a Q-Double-Click.

Instead of double clicking, if you click once and then drag outward a second time, you can specify an angle upward or downward such that your ship will horizontally travel in the direction specified by the first click in the XZ plane and vertically travel as specified by the second click. The distance traveled is the distance specified by the first click, and you will stop traveling once you reach the specified point as was the case with Q-Double-Clicks. This mechanism in which you first specify a horizontal direction and distance followed by a vertical angle is called a Q-Click-Angle-Click.

Q-Clicks are particularly useful when speed tanking, but they are useful even for general navigation (combat, mining ops, hacking sites, etc). Most of the time Q-Double-Clicks are used, but on occasion Q-Click-Angle-Clicks are helpful (especially when enemies or other targets of interest have different vertical displacements, as is often the case in PVE but even sometimes in PVP).

It is important to remember that your ship will come to a halt when it reaches the destination circle. If you want your ship to keep on going for a sufficiently long enough period of time, you can either:

1. Make the travel distance very long (eg. 300km) so your ship won't stop anytime soon
2. Set a Q-Click destination in the desired direction, have your ship fly toward it for a bit, then quickly stop your ship (Ctrl+Space) and set it to full throttle again (Ctrl+Alt+Space) so that your ship will continue to fly in that direction but never stop.

Weapon Disruption

Technically, use of Weapon Disruptors (Amarr primary EWAR) is not a form of or part of speed tanking, but they are similar in how they expoit precision mechanics to mitigate incoming damage, and that is worth mentioning. Weapon Disruptors severely cripple the range and/or precision of turrets and missiles. Weapon disruption will cause enemy gunboats to miss significantly more often, and enemy missileboats will either experience a significant damage reduction, or they won't be able to hit you at all if you exceed their optimal range. (By contrast, a turret can still hit you outside of their optimal range, they just have an decreasing probability that they will do so successfully.)

In effect, weapon disruption offers the benefits of speed tanking – damage mitigation – from the use of a module that affects the same mechanics that speed tanking exploits. That weapon disruption can be combined with speed tanking only increases the net effect.

Use of weapon disruptors should generally be reserved for ships with weapon disruption bonuses. Weapon disruption is generally only employed in fleet settings because a solo EWAR ship generally doesn't offer the offensive or defensive capabilities to be useful for anything else.

Weapon disruption can be used on drones and fighters since they use the same turret and missile mechanics as players. It is generally not worth using weapon disruption on drones, however, since individually they deal little damage, though drones fielded by Gurista ships are a notable exception since they have massive damage bonuses, are hard to kill, and are few in number (only two fielded at a time). Against a player using a Gurista ship, a weapon disruption ship with two turret disruptors

and one missile disruptor would apply one turret disruptor on each drone and the missile disruptor on the ship itself (since it uses missiles).

ECM and Sensor Dampening are also used to mitigate damage inflicted by enemies, but these forms of EWAR employ different mechanics and have fewer use cases in which they are appropriate or beneficial. By contrast, weapon disruption is always appropriate for use in any fleet for mitigating damage from turrets and missiles. (Weapon disruptors cannot mitigate damage from bombs or smartbombs.)

Countering Speed Tanking

Webbing and Target Painting

Slower and larger targets are easier to hit by turrets and suffer more damage from missiles. Webs can be used to slow down targets, and target painting can be used to magnify the signature radius of a target to "make them larger" for the purposes of precision mechanics and damage computations. Webs have greater magnitude than paints on non-bonused ships, but paints have far superior range. Webs also keep a target in place, which makes it easier for a short-range gunboats and for non-sentry drones to maintain range. As such, webs are generally favored by short-range gunboats and non-sentry droneboats, but paints are favored by long-range gunboats, sentry droneboats, and missileboats. All else being equal, a greater webbing magnitude is always desirable over a weaker painting magnitude for improving damage from turrets, but this is not always true of missiles: missiles that have reached the hard damage cap against craft smaller than their missiles were intended to handle will not improve their damage by webbing the craft, but will improve their damage by magnifying their signature radius using paints.

Paints are typically not used by ships that don't have paint bonuses on them (these bonuses are typically viewed as necessary to make them worth using in favor of other modules), while webs may be used to great effect on most short-range combat ships with or without bonuses. Stasis Webifiers ("regular webs") are often used in in pairs, or in conjunction with extremely powerful but extremely short-range web modules called Stasis Grapplers (usable by battleships and capitals). Unlike regular webs, the strength of grappler dissipates the further away the target gets. The use of a web and grappler would permit, for example, a battleship to deal devastating damage to a frigate attempting to speed tank by forming close and tight orbits: the closer the frigate gets, the stronger the grappler become and the slower the frigate gets.

In general, webs are the greatest threat to a speed tank. Speed tanks may also have difficulty engaging short-range battleships and capitals due to their heavy use of web+grapples, especially if they cannot handle the full incoming damage potential.

Precision Ships, Modules, Rigs, and Ammo

Actual Damage = Raw Damage Potential × Precision. If precision is too low, then it doesn't matter how high the raw damage potential is: the actual damage is going to be low with turrets missing all the time or the hard damage cap of missiles being reached at a low threshold. In general, it is both unreasonable to expect and impractical to design a ship to in inflict high damage (relative to HP) against craft of all kinds of sizes, speeds, and operational ranges: small ships will have high precision against large ships but low potential damage, and large shills will have high damage potential against smaller ships, but low precision. Combat ships should be designed with certain targets in mind in order to balance raw damage potential and precision in relation to intended targets.

As a rule of thumb, hulls lacking precision bonuses or additional precision enhancement modules/rigs cannot inflict max or near-max damage against same-sized ships or smaller, but can against larger and slower craft. Ships with precision bonuses usually require additional precision enhancement in order to deal max/near-max damage against same-sized and smaller craft, but the damage increase will be notable compared to ships lacking precision bonuses even without additional precision enhancement.

Tracking Computers, Missile Guidance Computers, and Omnidirectional Tracking Links are optionally-scripted modules that can be used to enhance the precision or range of turrets, missiles, and drone weapons (turrets and/or missiles). When unscripted, the modules provide bonuses to both range and precision; when scripted, one set of bonuses is disabled while the other set is doubled. For the respective modules, the precision script improves turret tracking for Tracking Links, increases missile explosion velocity and reduces missile explosion radius for Missile Guidance Computers, and the Omnidirectional Tracking Links improve both turret and missile precision of drones/fighters. The range script of the Tracking Computers and Omnidirectional Tracking Links also affects the Falloff Distance of ship and drone turrets respectively, which affects precision against targets exceeding optimal distance. The passive counterparts to the aforementioned modules are Tracking Enhancers, Missile Guidance Enhancers, and Omnidirectional Tracking Enhancers, which improve range and precision of turrets and missiles, and those used by drones/fighters accordingly.

Rigs also exist to enhance the range and precision of turrets, missiles, and drones: optimal range, falloff distance, turret tracking, missile explosion velocity, and missile explosion radius. The explosion radius reduction rig (Rigor) requires more calibration than the explosion velocity (Flare) rig; however, given the ability to fit it, the Rigor rig is strictly superior to the Flare rig. In most cases, it is better to accept the double-stack penalty of using two Rigor rigs than using a Flare rig in place of a Rigor rig because the Rigor rigs allows you to overcome the hard damage cap of smaller craft,

whereas Flare rigs would not. Given calibration constraints, however, using Flare rigs alongside or instead of Rig rigs is perfectly acceptable – some precision improvement is better than none. It is also worth noting that precision enhancement usually raises actual damage against most, but not all, craft to a larger extent than use of damage rigs.

Matching (Traversal) Velocity Vectors

If you are using turrets, you can improve your tracking and maintain range by minimizing the enemy's transversal velocity; this can be done by trying to match their velocity vector (direction and magnitude) as much as possible. In particular, if your vector matches theirs exactly, then their transversal velocity is zero and you can hit them with near perfect accuracy. If range is not an issue, you only need to match their traversal velocity – the "sideways" movement relative to your line of sight – to maximize turret tracking while increasing or decreasing distance to the enemy. Matching velocity vectors to an enemy employing speed tanking is a great way to diminish the effectiveness of their speed tanking; however, their flight path may vary over time, so manual flight may be required to keep up with these changes.

Note that enemy's transversal velocity is the same as your transversal velocity with respect to the enemy: this means that when you minimize their transversal velocity, you also minimize yours and make it easier for their turrets to hit you.

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