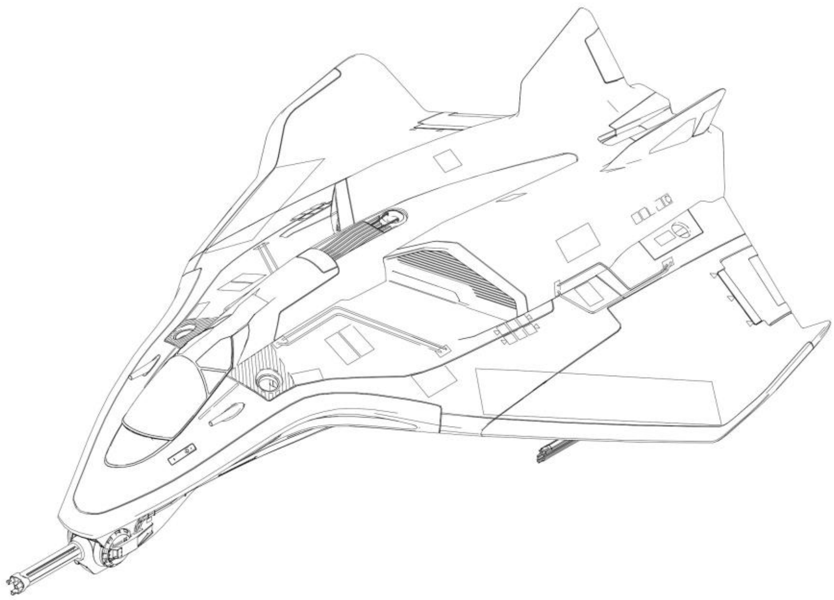
S1-N6G-UFM-000

FLIGHT MANUAL

UEE NAVY MODEL
AEGIS DYNAMICS AVENGER



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STAR CITIZEN

LIST OF CONTENTS

NOTES TO READERS

This manual contains information on spacecraft systems, performance data, operating procedures and tactical information to aid pilots in the operation of the spacecraft when aboard a carrier or disembarked. It is not, however designed to be a rigid set of procedures but is designed to stimulate ideas to be effective during space operations and combat. Always exercise sound judgement when conducting operations.

Modifications and software changes to the spacecraft systems may affect the subject matter of this publication. When orders or instructions are released from the technical spaceworthiness regulator for the spacecraft (**CIG**) that contradict any part of this publication they are to be taken as the overriding authorities.

This publication utilises change bars in the left hand margin to signify changes that have been made to the publication content since the last release. An example of a change bar is shown to the left.

All airspeeds in this manual are in metres per second (M/S) unless stated in other terms.

Recommendations for amendments to, or feedback on this publication can be made via the standard UEE Electronic message absolute immediate letter (Email) system. Send to amendments.ufm@gmail.com.

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N6G AVENGER

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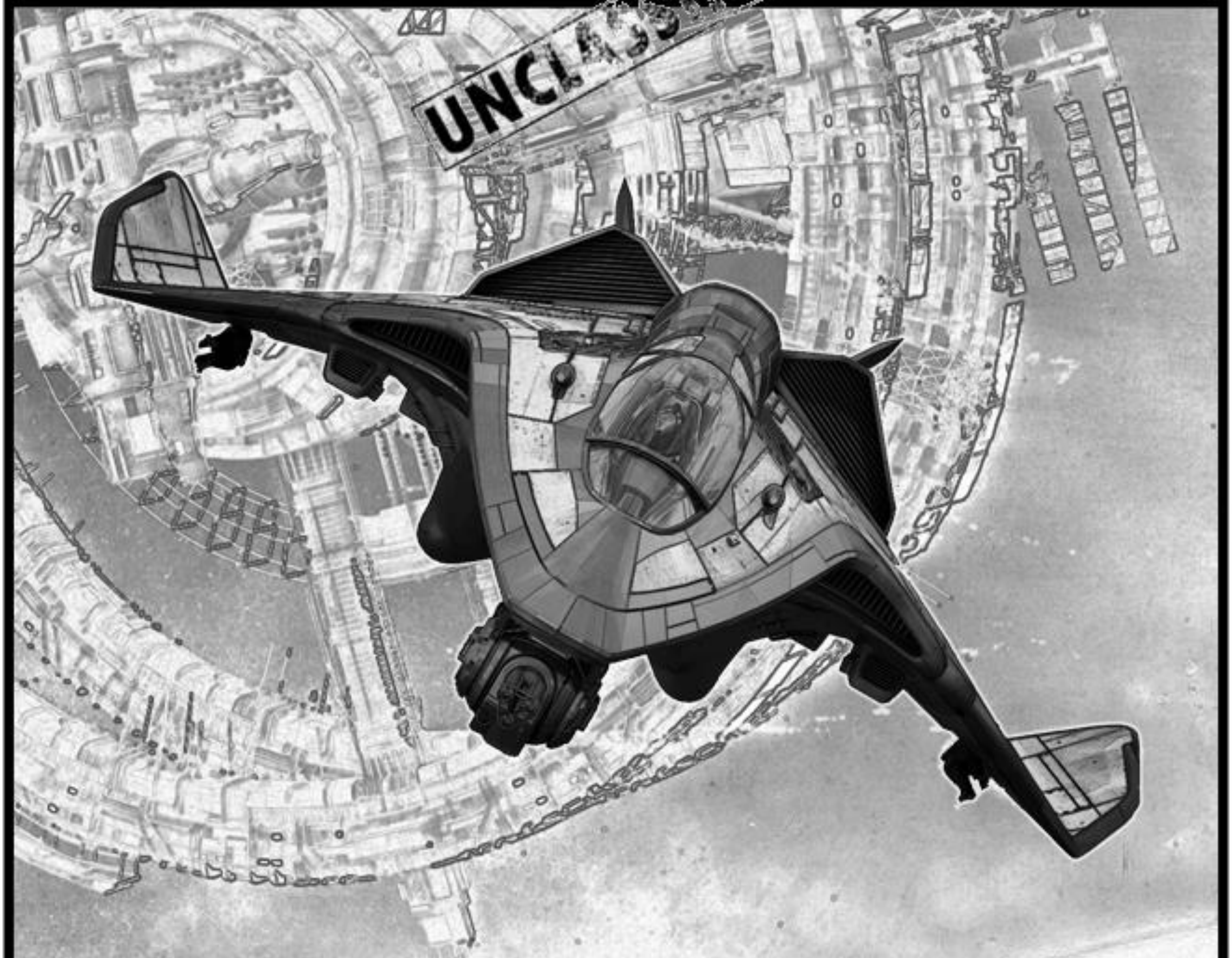

Chapter 1

The Spacecraft

1.1 SPACECRAFT DESCRIPTION

1.2 Meet the Avenger. The Avenger is a multi-role interceptor/utility spacecraft built by Aegis Dynamics (AG) Corporation. The spacecraft has two size 2 weapon hardpoints on the outerwings, one size 2 missile pylon on each wing and a single size 3 weapon mount is located on the nose. Effective protection is afforded to the spacecraft by way of a size 3 Sterne Katzen AG Hornisse-36 shield (size 3 max).

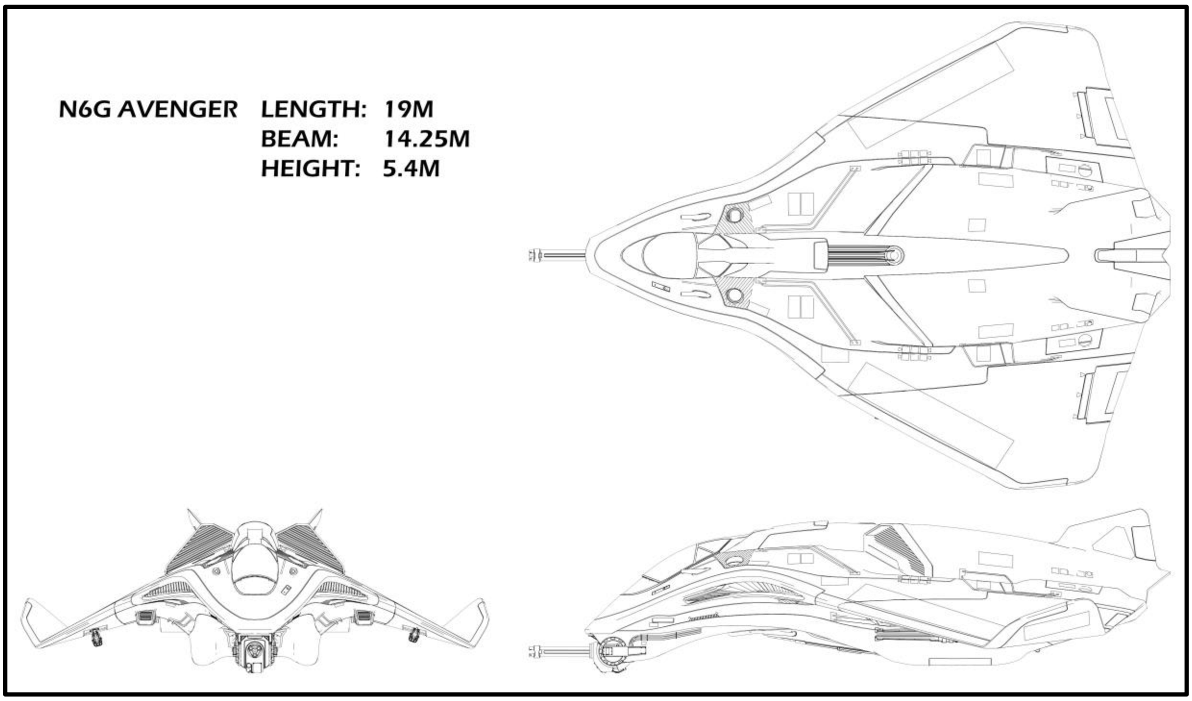

Figure 1-1 N6G General Arrangement

The spacecraft is powered by two Hammer HL 2.4 engines, eight Hydra propulsion M1-16 manoeuvring thrusters and a size 2 Maxnet Powerfountain 2+ fusion power plant for subsystem electrical power. The spacecraft wings have 25^{o} of anhedral angle. The spacecraft has a small cargo bay for utility and personnel carrying capabilities. The spacecraft has a tricycle landing gear arrangement.

1.2.1 Accommodations.

1. 4 cryogenic holding cells for prisoner transport (optional fit).
2. Crew rest sleeping pod located in the cockpit access crawl space
3. Cargo compartment.

1.2.2 Spacecraft gross weight. The spacecraft basic weight is approximately 18,000 kgs. Refer to on-board systems for accurate weight.

1.2.3 Spacecraft top speed. The spacecraft has a top speed of 225 metres per second (M/S).

1.2.4 Cockpit General Arrangement. The spacecraft's cockpit general arrangement is shown in figure 1-2.

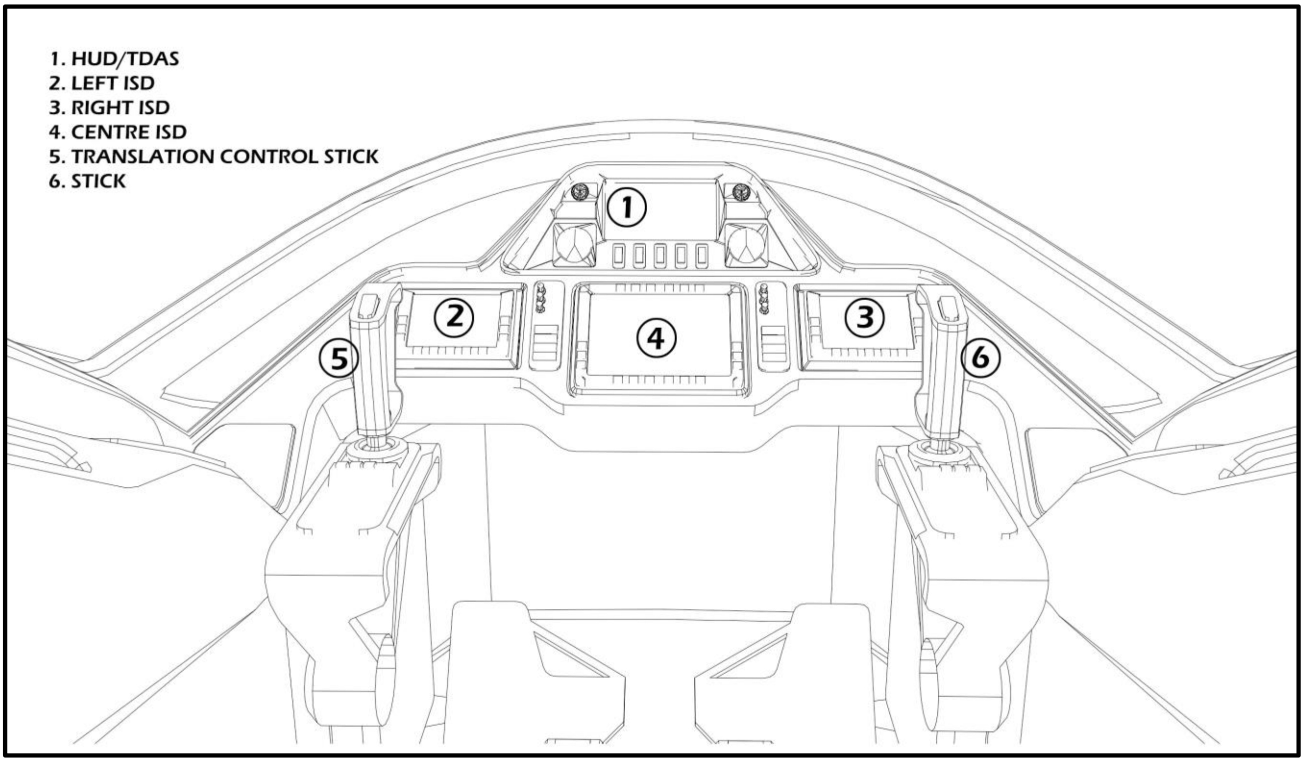

Figure 1-2 Cockpit Arrangement

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Chapter 2

Systems

2.1 ENGINE/THRUSTER SYSTEMS

2.1.1. Engines. The Spacecraft is powered by two Hammer HL 2.4 engines. The engines provide power for the manoeuvring thrusters as well as main propulsion thrust.

2.1.2. Manoeuvring Thrusters. The Spacecraft utilises eight (8) Hydra propulsion M1-16 Omni ball style manoeuvring thrusters mounted on the spacecraft fuselage. The manoeuvring thrusters are a reaction control system that utilises thrusters to provide spacecraft attitude and translation control. Thruster output is displayed on the thrust output page on the cockpit Interchangeable Status Displays.

2.1.3. Throttles. The spacecraft engine is controlled by the longitudinal movement of the translation control located on the LH cockpit console. Translation control longitudinal movement is transmitted to the main engines for thrust modulation.

2.1.4. Engine/Thruster Boost. Thrusters and main engine performance can be periodically increased through the use of boost. When in boost the output of the manoeuvring thrusters increases to allow faster changes in direction or to recover speed lost through manoeuvring. Boost utilises and is limited by the onboard spacecraft fuel. Boost does not affect spacecraft top speed but will increase acceleration. Activation of boost is controlled via the Boost button and is independent of engine throttle or translation control setting.

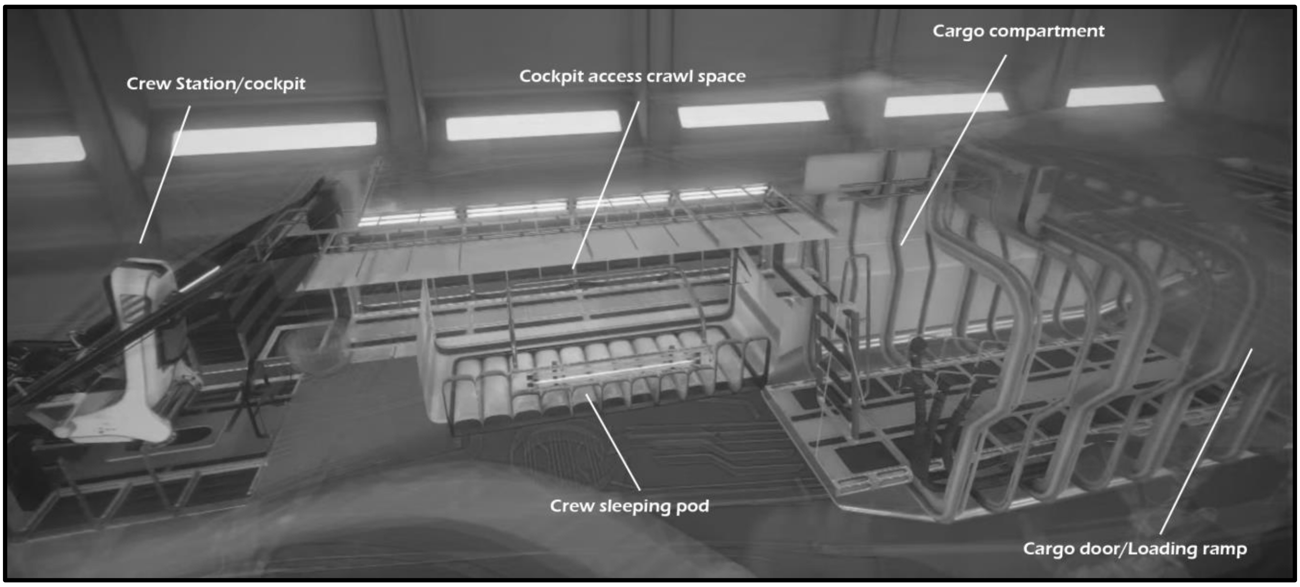


Figure 2-1 Spacecraft internal arrangement

2.2 FUEL SYSTEM

The spacecraft fuel system provides fuel for Engine/Thruster system for boost operation. Boosting allows for periodic increases in thruster and main engine performance.

2.2.1. Refuelling system. The Spacecraft can be refuelled on deck via a single point refuelling receptacle or inflight through a hydraulically actuated inflight refuelling receptacle.

2.2.2. Fuel Quantity Indicating system. The fuel quantity indicating system measures the individual fuel quantities in the spacecraft's fuel tanks and provides cockpit readouts either on the HUD or cockpit screens.

2.2.3. Fuel consumption. Fuel is consumed by the manoeuvring thrusters and main engines during boost operation. The combined fuel consumption is 7.1%/sec (14 sec boost time total).

2.2.4. Hydrogen Intakes. The Hydrogen intakes are capable of recovering hydrogen molecules to be stored as fuel in the fuel tanks at a rate of 25%/min (total refuel in 4min).

Figure 2-3 Fuel QTY displays (CVI)

2.3 ELECTRICAL SYSTEM.

2.3.1. Power Plant. The spacecraft sub-systems are powered by a Maxnet Powerfountain 2+ fusion reactor. All spacecraft sub-systems are connected to the power plant by the main power pipe.

2.3.2. Battery. The battery is connected the main power pipe and battery power pipe. The battery provides redundancy for the power plant for essential systems in the event of electrical power loss.

2.3.3. Power Throttle. The power plant power output can be adjusted utilising the power throttle in the power management display. This gives a linear total power output request from 0 – 100%.

2.3.4. Power Management Display. The power management display allows the pilot to prioritize power distribution among all of the spacecraft's various components and subsystems powered by the spacecraft's power plant. Power is distributed among three generic groups using the power allocation triangle. Components are not strictly bound to a particular group however, and can be rearranged into other groups if desired, providing an extra layer of flexibility in the pilot's preferences for power distribution among the spacecraft's components. By default, ship components are grouped in the following manner:

G1 (Group 1): Weapon Components
G2 (Group 2): Shields & Avionics
G3 (Group 3): Engines & Manoeuvring Thrusters

Individual components can also be powered on/off via power toggles for system components. A row of boxes below each component indicates how much power is directed to it.

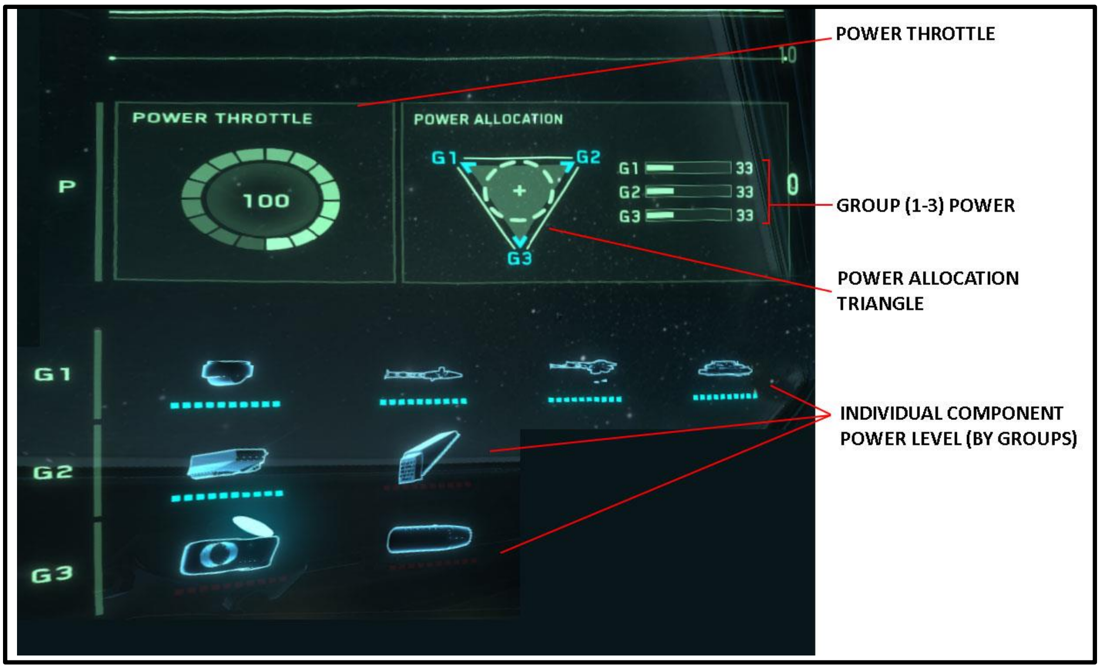


Figure 2-4 Power management display

2.4 THERMAL MANAGEMENT SYSTEM

The spacecraft sub-systems are cooled by a Classic C001 cooling unit. The cooling unit efficiently dissipates heat created by sub-system operation. Heat is transmitted to the cooler unit via the heat pipe which connects all the spacecraft sub-systems to the coolers.

2.5 AVIONICS SYSTEM

2.5.1. Transdirectional Awareness System (TDAS). The TDAS is multifunctional radar which is capable of processing information on surrounding signals and displaying distance and relative position of external contacts in 3D space. The TDAS is able to interface with the ship's targeting computer in order to overlay additional targeting-specific markers and indicators within the TDAS Holosphere. The TDAS is also designed to switch between various modes of scanning such as omnidirectional and focused, depending on the desired fidelity and range of signal detection. The TDAS can be zoomed to focus in a particular area of space. The TDAS displays the galactic plane and a 3D image of the spacecraft as standard references for your ship's orientation in space (shown as a disc within the TDAS sphere). Objects in the TDAS display a relative distance indicator (line and stalk) that indicate distance to target both horizontally and vertically. A selected target is represented as a 3D holo-image of the target object. The colour of the relative distance indicator and 3D hologram changes to indicate friend or foe. Un-scanned or unknown targets appear as blue spheres. Scanned, unselected targets will appear as triangles pointing either up or down depending on the targets vertical direction to the spacecraft.

2.5.1.1. TDAS Landing mode. When landing mode is selected the TDAS display changes to display the landing zone in 2D beneath the spacecraft, along with the attitude and altitude of the spacecraft in a 3D.

2.5.1.2. Identification friend-or-foe (IFF). IFF is a function of the TDAS system. IFF automatically scans and interrogates any new TDAS contact and displays the corresponding symbology (friendly or threat) on the TDAS holo-sphere for pilot situational awareness.

2.5.1.3. Inflight Missile bracketing. The TDAS will display detected inflight missiles as a red contact on the TDAS holosphere. TDAS will also bracket detected inflight missiles via the CVI via a red triangle bracketed around it.

2.5.2. Combat Visor Interface (CVI). The CVI is a helmet-mounted display that is operated by receiving brain impulses as input instructions sent to the visor software. These in turn are the inputs necessary to facilitate general interaction and context window navigation, as well as systems and target management. The CVI interfaces with the spacecraft HUD. The CVI has four distinct display options for ship management, Overview display, weapons group management display, power management display and shield management display. The CVI also displays the targeting pane.

2.5.2.1. Overview Display. The overview display shows all priority spacecraft information consisting of hull condition, shield condition and power priority, weapon loadout and grouping, weapon ammo remaining and heat levels, and basic power plant power allocation. Individual weapons can be deactivated from the overview display without entering the weapons display.

2.5.2.2. Weapons Group Management display. The weapons group management display is described in Para 2.9.9.

2.5.2.3. Power Management Display. The power management display is described in Para 2.4.4.

2.5.2.4. Shield Management Display. The shield management display is described in Para 2.8.1.

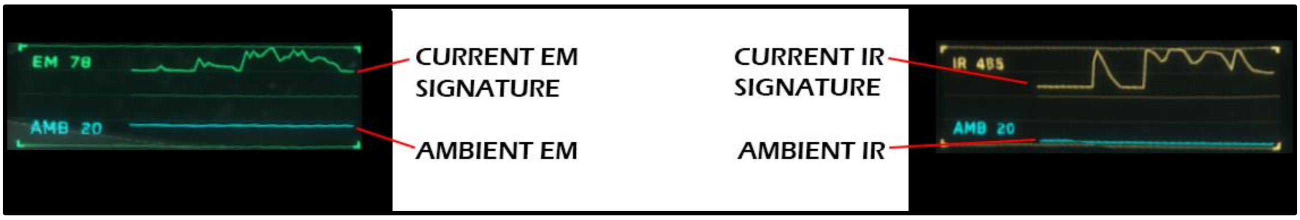


Figure 2-5 Signature displays

2.5.2.5. Signature displays. The spacecraft's Electromagnetic (EM) and Infrared (IR) signatures are displayed on the CVI. These indicate the level of the current emissions in both spectrums to the pilot in a constantly refreshed line style graph. Selected target Electromagnetic (EM) and Infrared (IR) signatures are also displayed on the HUD. These indicate the level of the current emissions in both spectrums of the spacecraft to the pilot in a constantly refreshed line style graph. The signature of the spacecraft directly relates to detectability and trackability by weapon systems and TDAS.

2.5.2.6. Rear-view camera. The spacecraft is fitted with a rear facing camera to aid in pilot situational awareness. The rear view when selected is displayed on the CVI.

2.5.2.7. Targeting pane. The targeting pane displays information regarding your current target including range, hull condition, shield condition and pilot information (if available). Targets can be "pinned" to the lower part of the targeting pane. Pinned targets will remain in view regardless of the currently locked target. A target direction arrow is displayed for locked and pinned targets.

2.5.2.8. Total Velocity/Anti-total velocity Indicator. The total velocity indicator (TVI) provides an outside world reference to actual spacecraft flight path. The anti-total velocity indicator (ATVI) represents the point to which the spacecraft is actually flying away from. The TVI/ATVI is displayed on the CVI.

2.5.2.9. CVI enhanced optical zoom. The CVI enhanced optical zoom function gives the pilot the ability to magnify the area of space that they are looking at.

2.5.2.10. CVI Weapon cueing. Gimbal mounted weapons can be aimed using head tracking via the CVI. Sensors within the cockpit and helmet provide input signals to the spacecraft's targeting computer for weapon positioning and missile cueing.

2.5.2.11. Line of sight (LOS) marker. The CVI helmet interface displays the pilot's point of focus with the line of sight (LOS) marker. The LOS marker indicates the point at which the pilot is looking, and where gimballed weapons will attempt to align on. The LOS marker is hidden when the pilot is looking directly ahead through the HUD.

2.5.3. Heads Up Display (HUD). The HUD is holographically displayed above the instrument panel. The HUD is used as the primary flight instrument, weapon status, and weapon delivery display for the spacecraft under all conditions. The HUD displays critical information and warnings to the pilot including ship status, weapons status, selected target status, boost fuel level, commanded throttle setting (in %), velocity, weapons targeting information, etc.

2.5.3.1. Velocity Ladder. The velocity ladder displays your current velocity in metres per second (M/S) at one M/S intervals. The velocity ladder can show forward speed or reverse speed in negative M/S.

2.5.3.2. Longitudinal Velocity. The current spacecraft velocity, displayed in metres per second (M/S) is indicated in the lower LH corner of the HUD. The velocity display indicates velocity in the longitudinal axis only.

2.5.3.3. Thrust. Thrust, displayed in kilo-newtons represents the force being applied to the forward axis of the ship.

2.5.3.4. Commanded Throttle setting. The main engine throttle's current ″requested″ throttle setting for the main engine is displayed on the HUD in % (forward and aft strafing are not taken into account in throttle angle).

2.5.3.5. Gun Boresight Cross. The gun boresight cross indicates the fixed weapon direction. The boresight cross also indicates the position of your ship's longitudinal axis.

2.5.3.6. Landing gear indication. When the landing gear is being deployed the HUD will display "LANDING GEAR DEPLOYING" during landing gear transit. When the Landing gear is down and locked the HUD will display "LANDING GEAR DEPLOYED".

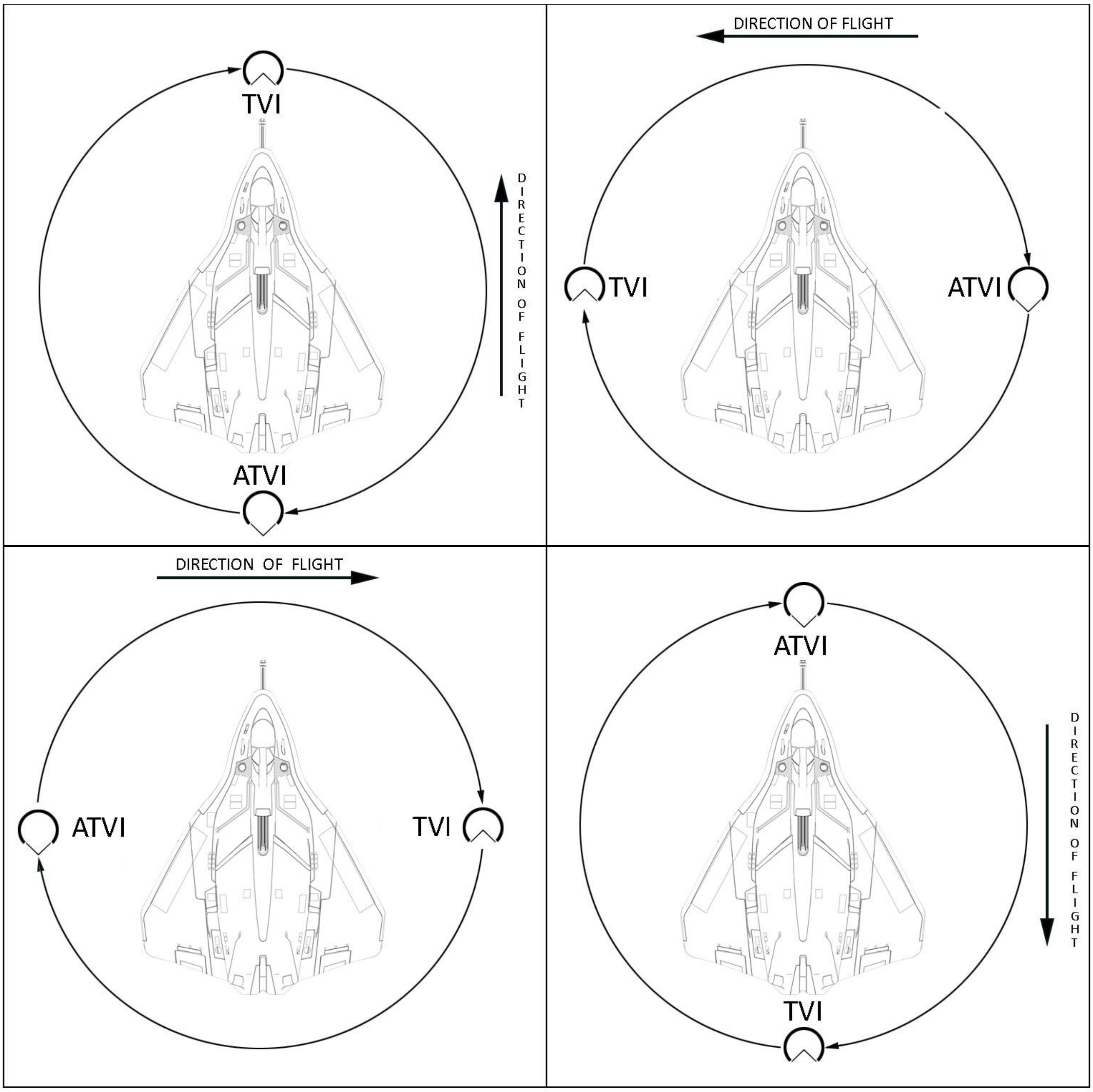


Figure 2-7 Total Velocity/Anti- Total Velocity Indicator function

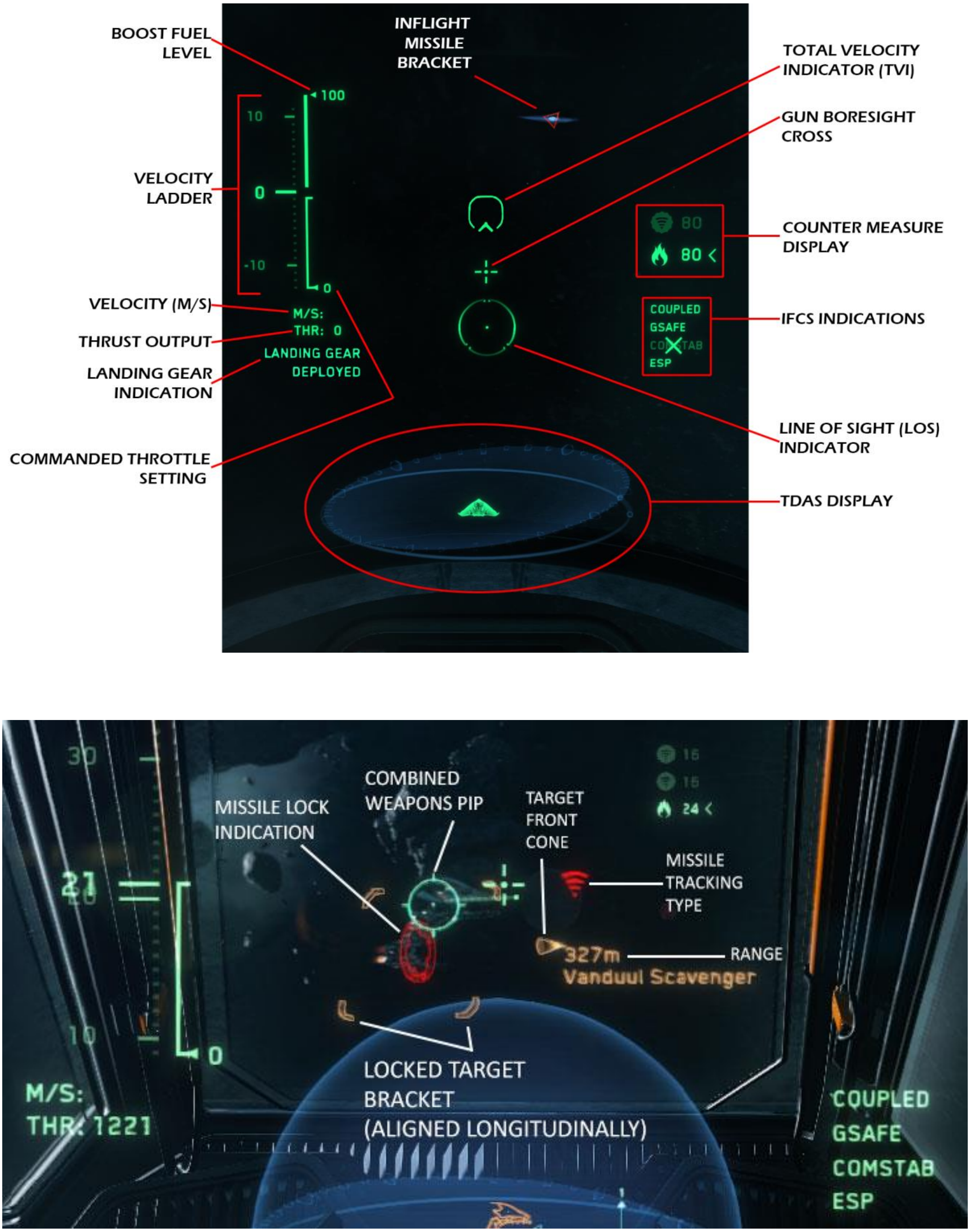


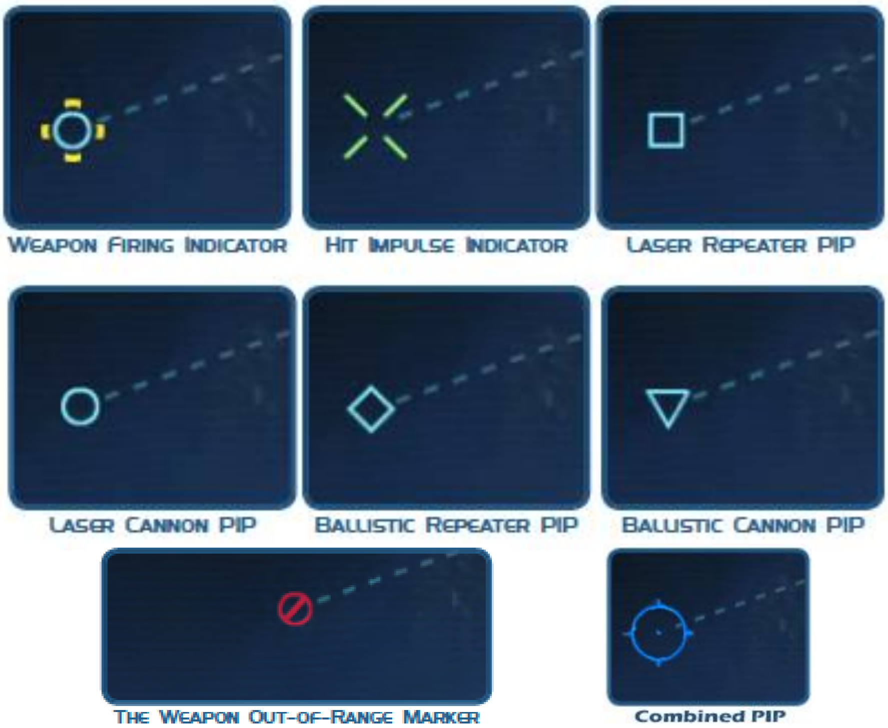
Figure 2-9 HUD Symbology

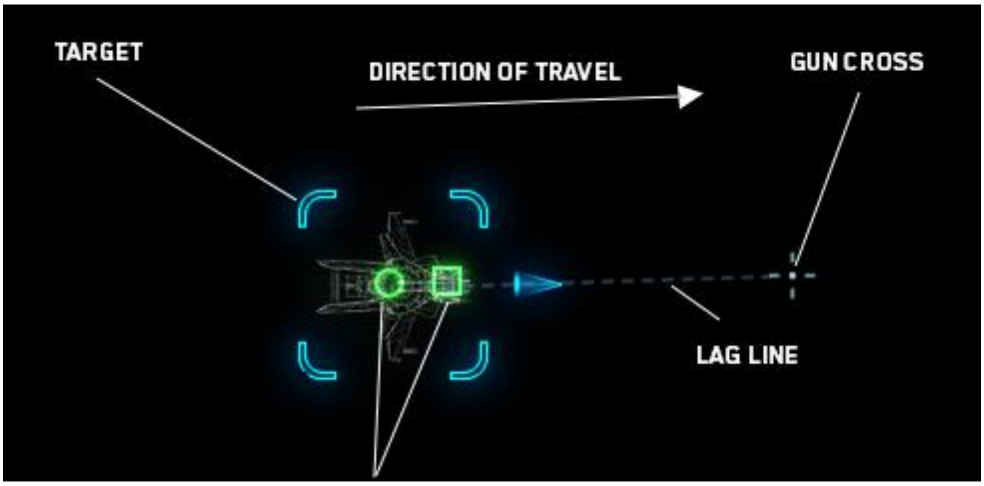
2.5.4. Intelligent Target Tracking System (ITTS). ITTS computes and displays Predicted-Impact-Point (PIP) markers corresponding to each type of weapon equipped on the ship. When the fitted weapons groups targeting solution converge due to closure, the separate weapon PIP's will combine into a combined weapons PIP. The PIPs display the predicted impact point of the projectile of each weapon will intercept the target based on the calculated distance, vector, and speed of the target as well as the projectile speed of each weapon. The PIPs project from the gun boresight cross or line-of-sight (LOS) reticule depending if the weapon has fixed or gimballed convergence (the ITTS can also be configured to display the PIPs as a lead indicator projecting from the targeted ship. This is pilot selectable). Out of range target is indicated by the PIP being displayed in RED with a line through it. Weapon firing is indicated by flashing yellow indicators appearing around the PIP. Projectile hits are indicated by green markers appear outside the PIP, once for each hit detected. Different weapon types are indicated by different PIP symbology. These different PIP symbology is shown in figure 2-10.

2.5.5. Interchangeable Status Displays (ISDs). The ISDs are integrated into the cockpit vertical console. The ISDs convey second priority information. The ISDs can display current TDAS configuration, thruster output & monitoring and current power configuration. Each ISD is able to cycle between the various display modes available. Display modes can also be duplicated across multiple screens if desired.

2.5.6. Communications system. The spacecraft utilises short and long range communication systems. The communications systems are controlled by the HUD, CVI and ISD's.

Figure 2-10 HUD Landing symbology





Weapon PIP's

Figure 2-11 ITTS Symbology

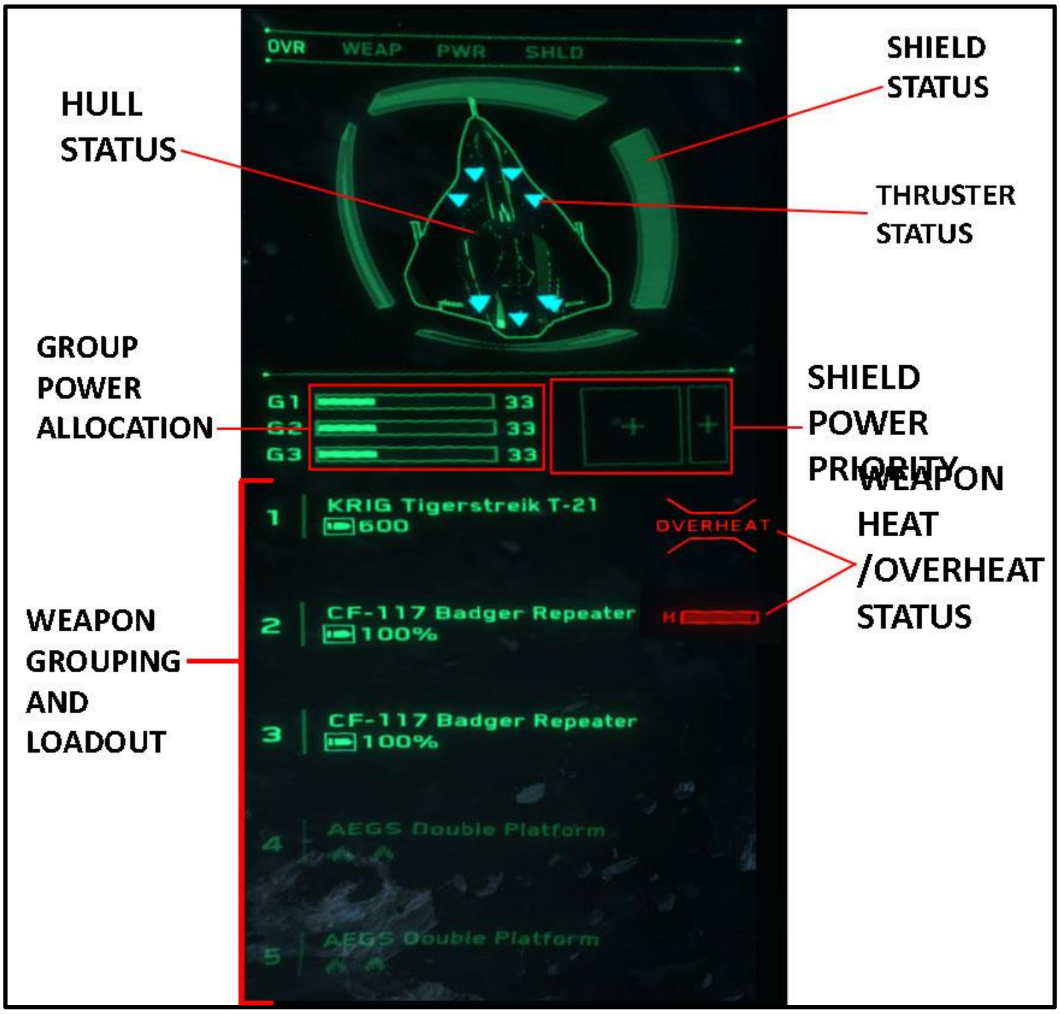


Figure 2-12 Overview CVI display

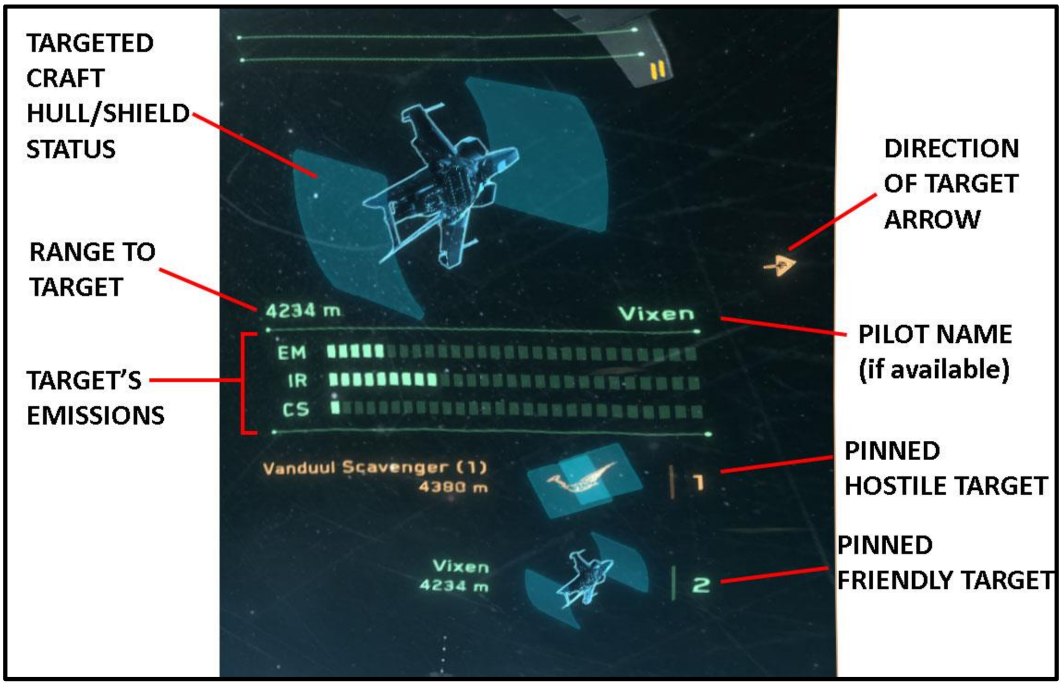


Figure 2-13 Targeting Pane

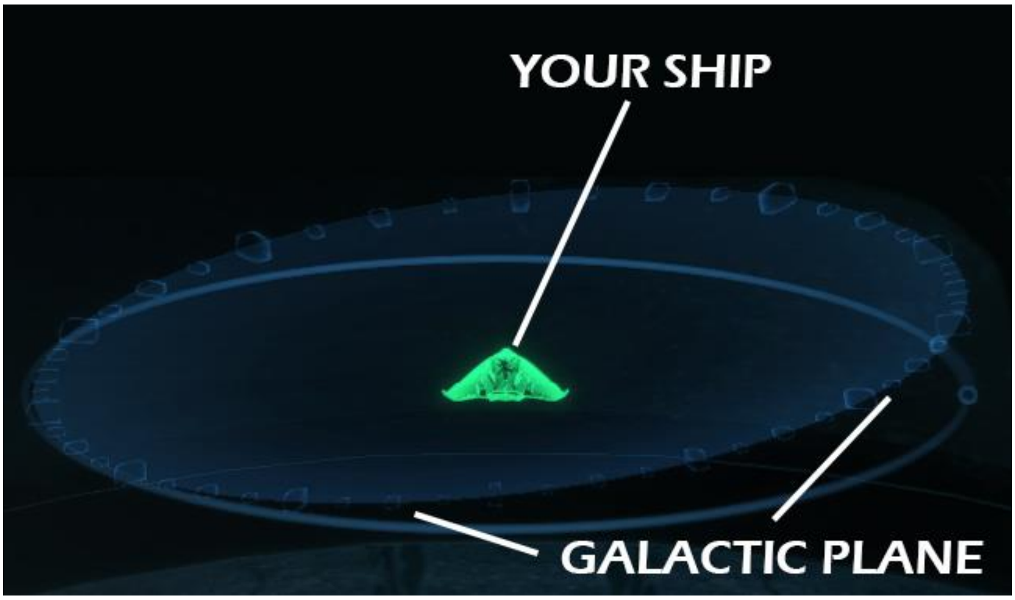


Figure 2-14 TDAS Display

Figure 2-15 TDAS Landing Display

2.6 FLIGHT CONTROLS

2.6.1. Stick. A side mounted control stick (RH Console) is used to provide pitch and yaw (or roll dependant on software configuration) inputs to the IFCS.

2.6.2. Directional Pedals. Two directional pedals (left and right) are used to provide directional inputs to the IFCS for roll (or yaw dependant on software configuration) control.

2.6.3. Translation (Strafe) control. Translation control allows movement of the spacecraft via the manoeuvring thrusters in 3 dimensions without changing the orientation of the spacecraft. Translation inputs are summed, and are in addition to the spacecraft's forward or aft motion however the total speed of the spacecraft is limited by the IFCS to the spacecraft's max rated speed. Translation of the spacecraft is controlled via the Translation control stick mounted on the LH console (dependant on software configuration and pilot preference).

2.6.4. Intelligent Flight Control System (IFCS). IFCS is a fly-by-wire, full authority control augmentation system (CAS). The FCS provides four basic functions: spacecraft directional stability, spacecraft control, crew safety and structural loads management. The IFCS functional modes are:

a) **Coupled mode.** In coupled mode IFCS commands the spacecraft's manoeuvring thrusters to maintain similar flight characteristics to atmospheric flight (i.e. Attitude linked to direction of flight). The IFCS also allows strafing in the lateral, longitudinal, and vertical directions when commanded in coupled mode. This mode is indicated through the "COUPLED" indicator on the HUD.

b) **Decoupled mode.** In decoupled mode the spacecraft's forward facing direction is not linked to the spacecraft's direction of travel. This allows the spacecraft's attitude to be changed without affecting the spacecraft's vector. The IFCS also allows strafing in the lateral, longitudinal, and vertical directions when commanded in decoupled mode. This mode is indicated by the text dulling and an "X" being displayed through the "COUPLED" indicator on the HUD.

c) **G-Safe.** G-force safety mode limits excessive positive or negative G-force on the pilot by limiting the spacecraft's rotational turn rate, or rate of directional change during strafe. This limits the physiological effects of excessive G and prevents the onset of G-LOC. G-Safety mode is indicated by the "G-SAFE" lit for ON, or by the text dulling and an "X" being displayed through the "G-SAFE" indicator on the HUD when OFF. **Note: G-Safe is disabled when utilising main Engine/Manoeuvring Thruster Boost.**

d) **Command-Level Stability (COMSTAB).** COMSTAB mode limits spacecraft slip during directional changes during turns at high velocity by slowing the spacecraft's velocity during high rate directional change. COMSTAB mode is indicated by the "COMSTAB" lit for ON, or by the text dulling and an "X" being displayed through the "COMSTAB" indicator on the HUD when OFF.

e) **Enhanced stick precision (ESP).** Enhanced stick precision enhances pilot aim by reducing control sensitivity via reducing manoeuvring thruster output when the targeting computer (in conjunction with TDAS) senses that the PIP's are close to the desired target. When ESP is engaged, the IFCS reduces thruster output directly proportionate to the proximity of the aiming PIPs to the target. This aids in precision aiming and reduces overshoots. ESP can be toggled on or off according to pilot preference.

2.6.5. Auto-pilot. The autopilot provides two basic functions: navigation waypoint steering, and auto-landing. When in navigation waypoint steering mode the spacecraft will fly to the designated waypoint on the HUD/TDAS without further pilot input. In auto-landing mode, when the spacecraft is within the required landing zone the spacecraft will land without further pilot input. This mode is indicated on the HUD by "AUTOMATED" cue appearing in the HUD and TDAS changing to landing mode.

2.6.6. Space Brake. Space brake is a function of the IFCS and utilises the manoeuvring thrusters and/or main engines to arrest spacecraft movement by applying thrust in the opposite direction of travel. ITTS will modulate the thruster output directly with spacecraft speed.

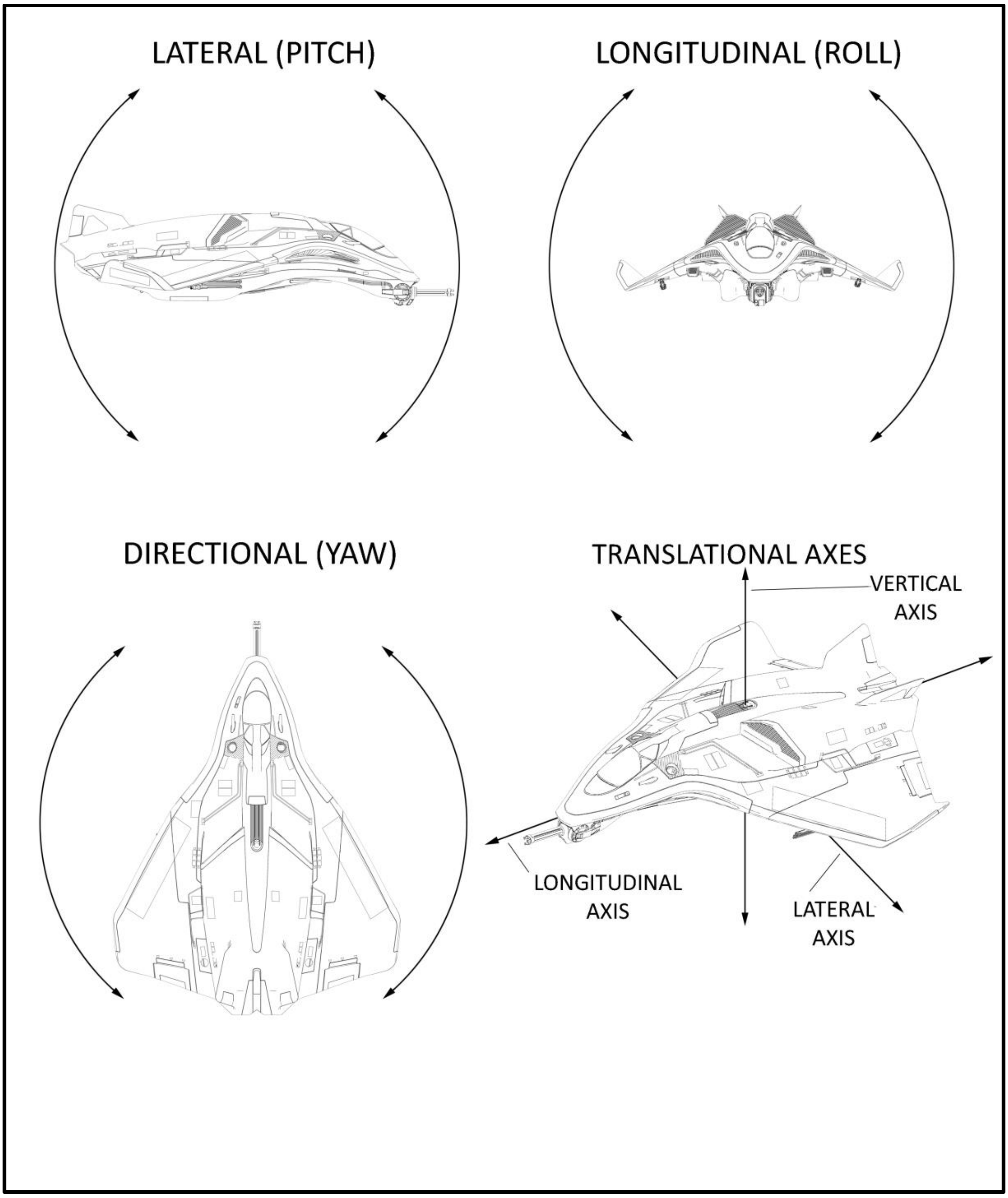


Figure 2-16 Flight Axes

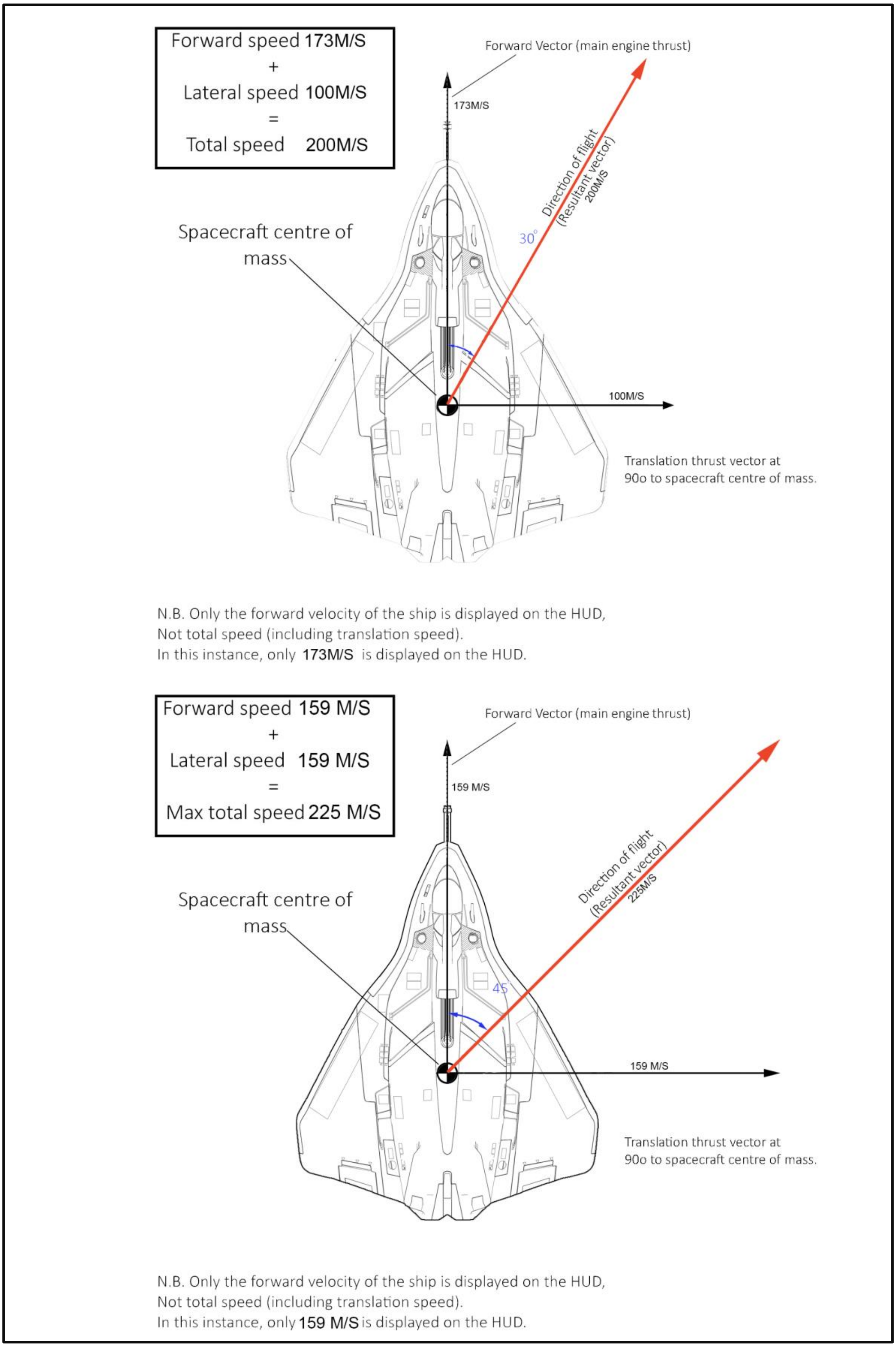


Figure 2-17 Translation effects on Spacecraft flightpath

2.7 SHIELD SYSTEM

The spacecraft utilises a shield to protect spacecraft hull integrity from kinetic energy damage from debris or kinetic weapons, and absorb laser energy. The Shield system is powered by the power plant via the connected power pipe and is also connected to the info and heat pipes.

2.7.1. Shield management Display. Shield management is achieved via the CVI and displayed on the HUD. In normal operation all four shield segments are powered equally. The shield management display allows you to prioritize shield level distribution between all of the ship’s four shield segments.

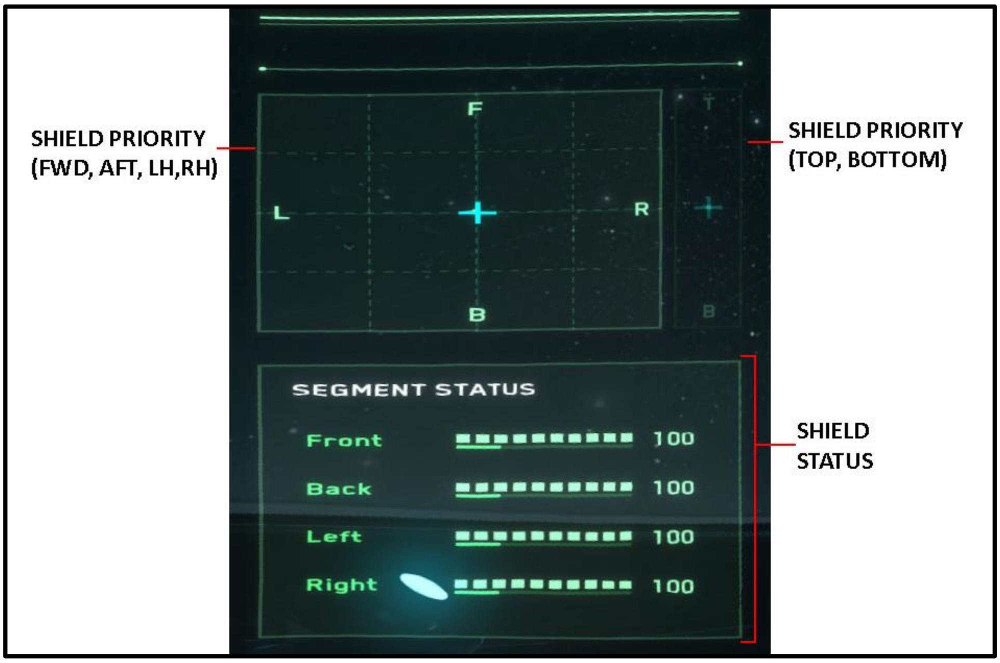


Figure 2-18 Shield Management display

2.8 WEAPON SYSTEMS

The spacecraft weapon systems can be a mixture of ballistic and energy weapons. All weapons are connected to the heat, power, info and avionics pipes.

2.8.1. Weapon system controls. All of the primary controls for the spacecraft's weapon systems are located on the stick grip assembly. The hands on translation-control and stick (HOTAS) control arrangement, allows the aircrew to manipulate the weapon systems without removing the hands from the spacecraft's primary flight controls.

2.8.1.1. Stick Grip controls. The weapons systems controls located on the cockpit stick grips include the pickle button (missile lock/launch), trigger (fire weapons group 1), weapons group 2 fire button, target select/cycle hat, target pin/cycle hat. N.B. buttons are pilot configurable.

2.8.1.2. Translation control weapon controls. The weapon systems controls located on the cockpit translation control are pilot customisable and dependant on the software configuration of the spacecraft.

2.8.2. Missile target acquisition. Missile target tracking information is provided to the targeting computer via the info pipe. The CVI to displays the missile tracking/lock/launch symbology when commanded by the targeting computer. When the selected missile has achieved a "Lock on" to the selected target, the target missile locked symbology (in for form of a red ring around the target) will be displayed.

2.8.3. Weapon Gimbals. The spacecraft's ballistic or laser weapons aiming can be slaved to the pilots CVI. This enables the pilot to aim their weapons independently of spacecraft direction/attitude.

2.8.4. Gimbal lock. If the spacecraft is fitted with gimballed weapons, the gimbals can be locked to the forward boresight position.

2.8.5. Front weapon mount. The N6G has a single size 3 weapon hardpoint mounted under the forward fuselage.

2.8.6. Wing weapon mounts. The wings weapon mounts consist of two size 2 mounts (one on each outer wing). The wing mounts can be either fixed or gimballed with a reduction in weapon size.

2.8.7. Missile racks. Each wing has a single pylon for mounting missile launchers or external fuel tanks. The pylon mount is size 2 which mounts a dual missile launcher rail, capable of holding two size 1 missiles.

2.8.8. Countermeasures. The spacecraft can be loaded with various countermeasure dependant on mission requirements. The countermeasure type and number remaining are indicated on the HUD. Countermeasure dispense button is located on the RH throttle grip (Pilot programmable).

2.8.9. Weapon Group management Display. The weapon management display shows your ship's weapons, sorted by weapon groups. Weapon group assignment can be managed within the display. Weapons can be assigned to a total of three weapons groups. Individual weapons can be assigned to more than one group at a time. Missiles and countermeasures cannot be assigned to weapons groups.

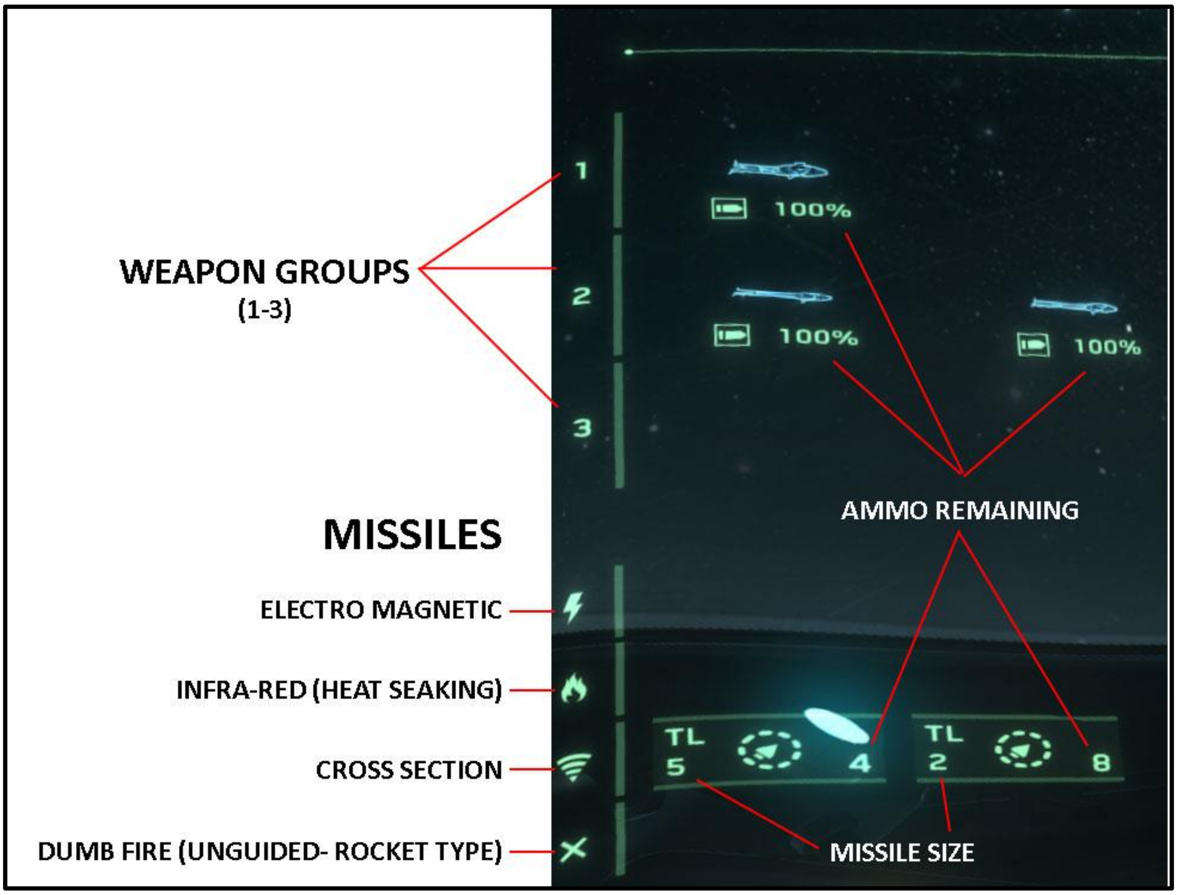


Figure 2-20 Weapon Group management Display

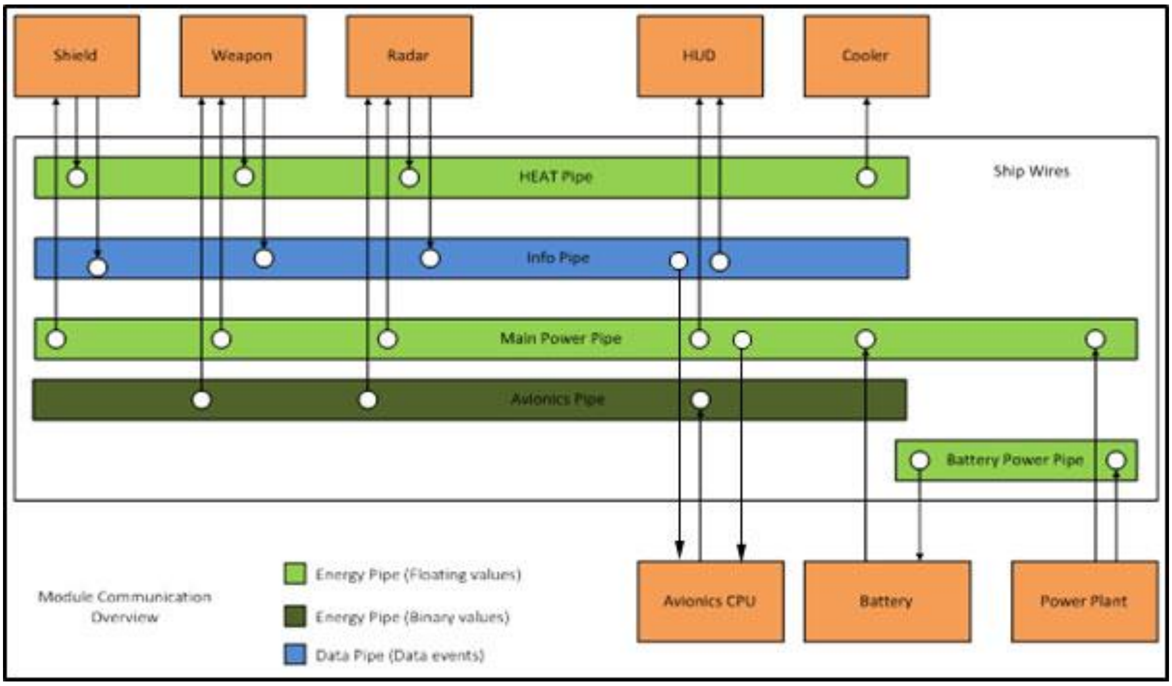
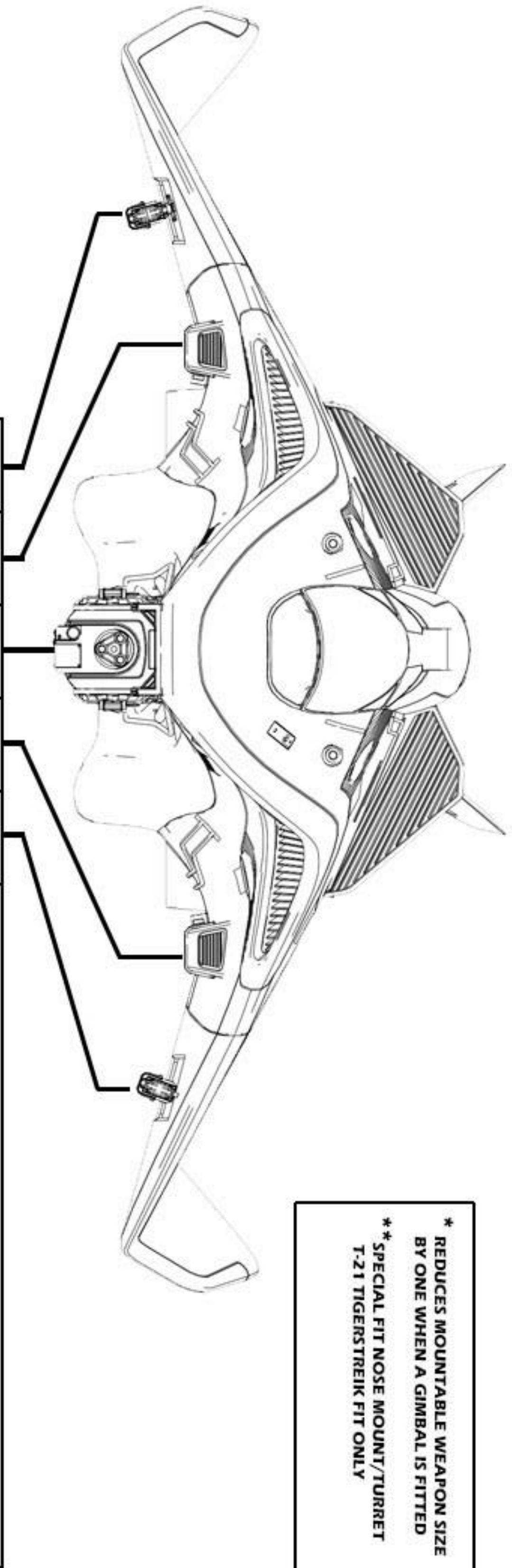


Figure 2-21 Ship system "pipes"



MOUNT SIZES	S2	S2	S3	S2	S2
BALISTIC WEAPON	●		●		●
LASER WEAPON	●				●
GIMBAL MOUNT	●*		●**		●*
MISSILE		●●		●●	
OPTIONAL EQUIP.	●	●		●	●

* REDUCES MOUNTABLE WEAPON SIZE BY ONE WHEN A GIMBAL IS FITTED

** SPECIAL FIT NOSE MOUNT/TURRET T-21 TIGERSTREIK FIT ONLY

Figure 2-22 Weapon/equipment compatibility

2.9 OPTIONAL EQUIPMENT

2.9.1. Tractor beam. The N6G can equip a tractor beam for search and rescue, or downed ship recovery on the wingtip weapon hardpoints. The tractor beam utilises an energy beam which exerts a force on a free floating body in space, attracting it towards the origin of the beam.

2.9.2. External Fuel Tanks. External fuel tanks are able to be mounted on the wing pylon stations. External fuel tanks supplement the spacecraft's internal fuel capacity to increase maximum un-refuelled range.

2.10 CARGO

2.10.1. Cargo compartment. The cargo compartment has an approximate volume of $34m^3$.

2.10.2. Cargo door. The N6G's cargo compartment has a hydraulically operated cargo door and loading ramp located on at the lower rear of the aft fuselage.

2.10.3. Cargo stasis field. The cargo compartment uses a stasis field generator to hold the loaded cargo in position once activated. The cargo stasis field only requires power to change state and therefore is unaffected by electrical power outages or damage to the spacecraft power plant.

2.11 EMERGENCY EQUIPMENT

2.11.1. Warning/Cautions/Advisories. The warning/caution/advisory system provides visual indications of normal spacecraft operation and system malfunctions affecting safe operation of the spacecraft. Warnings and cautions appear on the CVI.

2.11.2. Proximity Warning. The on-board proximity warning system alerts crew when an object is near to the spacecraft that it may cause damage. A warning icon will appear at the edge of the CVI indicating the approaching objects direction.

2.11.3. Ejection seat. The N6G is fitted with an ejection seat. The ejection seat is a ballistic catapult/rocket system that provide the pilot with a quick, safe, and positive means of escape from the spacecraft. Ejection is initiated by pulling the ejection control handle.

2.11.4. Ejection Control Handle. The ejection control handle, located between the crew member's legs on the front of the seat pan, is the only means by which ejection is initiated. The handle, moulded in the shape of a loop, can be grasped by one or two hands. To initiate ejection, pull the handle from its housing.

2.11.5. Self Destruct. The spacecraft is equipped with a self-destruct function that will totally destroy the spacecraft in an emergency.

Figure 2-23 CVI Warnings/Advisories

2.12 CREW ENTRANCE/EGRESS SYSTEMS

2.12.1. Cockpit boarding system. The cockpit boarding system is via the crawl space door accessed by way of the cargo ramp.

2.13 VOICE ALERT SYSTEM

2.13.1. The voice alert system is used to provide the pilot with aural cues in relation to normal spacecraft operation and system malfunctions. A list of the aural cues and their meanings are shown in Table 2-1.

2.13.2. LIFE SUPPORT SYSTEM

2.13.3. The spacecraft if fitted with a robust environmental control and life support system (ECLSS) that maintains cabin pressure (1 atmosphere), atmospheric gas concentration (21% o2/78% n2/1% other), and cabin temperature at optimum levels during normal operation. The ECLSS also provides pressurised air for the pneumatic systems such as Pilot suit anti-G, fuel tank pressurisation and emergency oxy systems maintenance/replenishment. ECLSS is also responsible for processing any waste fluids during flight.

2.13.4. On-board biological oxygen generation system (OBBOGS) maintains the correct oxygen levels within the spacecraft cabin atmosphere for human use. OBBOGS utilises a combination of micro-organisms and algae to recycle expelled CO_2 back into O_2. The Oxygen creating micro-organisms also create O_2 to supplement O_2 levels lost during de-pressurisation and cabin leakage.

2.14 FIRE DETECTION AND EXTINGUISHING SYSTEM

2.14.1. Fire Detection system. The fire detection system is an automatic system that utilises a system of detectors to detect and locate cockpit fires.

2.14.2. Fire extinguishing system. The fire extinguishing system is an automatic system that, in conjunction with the fire detection system, extinguishes detected fires in the cockpit.

(DIRECTION) PROXIMITY ALERT	OBJECT DETECTED CLOSE IN DIRECTION
(DIRECTION) SHIELD UNDER FIRE	SHIELDS TAKING FIRE ON SIDE INDICATED
(DIRECTION) SHIELDS DOWN	SHIELDS DOWN ON SIDE INDICATED
(SYSTEM) OFFLINE	THE STATED SYSTEM IS OFFLINE
AMMO DEPLETED	0 ROUNDS REMAINING (BALLISTIC WEAPONS)
AMMO LOW	<120 ROUNDS REMAINING (BALLISTIC WEAPONS)
AUTOMATED LANDING INITIATED	AUTO LANDING MODE ACTIVE
AP ACTIVATED/DEACTIVATED	AUTO-PILOT ACTIVATED/DEACTIVATED
BEGIN SCAN	NEW TDAS CONTACT
BUZZ-BUZZ----BUZZ-BUZZ-BUZZ!	MISSILE LOCK/TRACKING OR INCOMING MISSILE
CHAFF DROPPED	CHAFF DEPLOYED
CHAFF DRY	ALL CHAFF EXPENDED
CHAFF LOW	<5 CHAFF REMAINING
CHAFF READY	CHAFF COUNTERMEASURE SELECTED
CONTACT	ENEMY TARGET IDENTIFIED
DANGER – SHIELDS 25%	SHIELD INTEGRITY AT 25%
EJECTING	SELF EXPLANATORY
ENGINES	ENGINE DAMAGE DETECTED
ENGINES LOW	ENGINE DAMAGE RESULTING IN LOW THRUST DETECTED
FLARE DROPPED	FLARE DEPLOYED
FLARE LOW	<5 FLARES REMAINING
FLARE READY	FLARE COUNTERMEASURE SELECTED
FLARES DRY	ALL FLARES EXPENDED
KILL	TARGET DESTROYED
LANDING COMPLETE	SELF EXPLANATORY
LANDING GEAR DEPLOYED	SELF EXPLANATORY
LANDING GEAR RETRACTED	SELF EXPLANATORY
LANDING MODE ENGAGED	SELF EXPLANATORY

Table 2-1 Voice Alerts

LANDING REQUEST APPROVED	SELF EXPLANATORY
LAUNCH COMPLETE	SELF EXPLANATORY
MANUAL LANDING INITIATED	AUTOPILOT OFF/MANUAL LANDING MODE
MISSILE LOCK	MISSILE LOCK ACHIEVED
SELF DESTRUCT ABORTED	SELF EXPLANATORY
SELF DESTRUCT INITIATED	SELF EXPLANATORY
SHIELDS CHARGING	SHIELDS ARE RECHARGING
SHIELDS RECHARGING	SELF EXPLANATORY
SHIELDS UP	SHIELD HEALTH FULLY RESTORED
SHIELDS UP	SHIELDS FULL RECHARGED
DANGER, SYSTEMS OVERHEATING	THE DISPLAYED SYSTEM HAS EXCESSIVE HEAT BUILD-UP
WEAPON SYSTEM	WEAPON DAMAGED/OFFLINE
WEAPONS MODE ENGAGED	WEAPONS MODE ACTIVE

Table 2-1 Voice Alerts (Cont.)

Chapter 3

Indoctrination

3.1. INITIAL QUALIFICATION

Initial qualification on the N6G shall be obtained by satisfactory completion of the N6G operational conversion (OPCON) course at any approved UEE Navy fleet air arm or UEE Advocacy training establishment. Minimum training requirements are:

1. Academic familiarisation covering
   a. Aircraft systems and procedures
   b. Emergency procedures
   c. Cockpit orientation
   d. Ejection, egress and survival training
   e. Preflight checkout
2. Sim Pod flight training completed to satisfactory level

3.2. ADDITIONAL TRAINING

Additional training is at the discretion of Unit commanding officers (CO). COs may waive additional training and/or flying requirements in accordance with SOPs.

3.3. PERSONAL FLYING EQUIPMENT

All UEE Navy pilots are entitled to, and are required at a minimum to hold for their personal use:

1. QTY 1 – Flight Helmet
2. QTY 1 – Space flight suit
3. QTY 1 – Anti-G Suit
4. QTY 1 PR – Flight boots
5. QTY 1 – Lightweight personal 0G manoeuvring system
6. QTY 1 – Personal side arm

Chapter 4

Flight Characteristics

4.1. The Avenger's IFCS provides flight characteristics that make for excellent handling and manoeuvrability for effective weapons employment when unladen. A thorough understanding of the IFCS described in Chapter 2 and the information presented here allows the pilot to safely and effectively exploit the spacecraft's full capabilities.

4.1.1. HANDLING QUALITIES

The N6G is designed as an interceptor and utility spacecraft combining both above average combat capabilities with limited cargo carrying capacity. The Avenger's flight characteristics presented here are subject to cargo load and are presented here only taking the spacecraft's basic weight and default weapons load into account.

MAX TURN RATES (YAW-PITCH-ROLL)	COMSTAB ON	COMSTAB OFF
G-SAFE ON	**103 °/sec - 103 °/sec - 144 ° /sec**	**103 °/sec - 103 °/sec - 144 ° /sec**
G-SAFE OFF	**103 °/sec - 103 °/sec - 144 ° /sec**	**103 °/sec - 103 °/sec - 144 ° /sec**

Table 4-1 Max turn rates

Max yaw rate		103 ° /sec (360 ° in ~3.5 seconds)
Max roll rate		144 ° /sec (360 ° in 2.5 seconds)
Max pitch rate		103 ° /sec (360 ° in 3.5 seconds)
Max sustained rotation/turn to maintain G within limits**	**Boost Off/ G-Safe on**	No limit.
	Boost On/ G-Safe Off	**Pitch.** Sustained (8 sec) boosted pitch turns at speeds > 40 M/S will result in G-LOC. **Yaw.** Sustained (>20 sec) boosted yaw turns at speeds > 45 M/S will result in G-LOC. **Roll.** No limit.

**** All turn rates do not take spacecraft secondary movements (translation/slide) into account.**

Table 4-2 Spacecraft turn rates

Max acceleration (FWD/AFT)	98 M/S/S (0-225 M/S in 2.3 seconds)
Max acceleration boosted (FWD/AFT)	225 M/S/S (0-225 M/S in 1 seconds)
Max deceleration (FWD/AFT)	64 M/S/S (225-0 M/S in 3.5 seconds)
Max deceleration boosted (FWD/AFT)	112 M/S/S (0-225 M/S in 2 seconds)
Max translation time to accelerate/decelerate (lateral/vertical)	3 Seconds

Table 4-3 Spacecraft acceleration rates

4.2. SPACE COMBAT MANOEUVRING (SCM)

4.2.1. Gun tracking. The flight characteristics detailed above make for excellent gun tracking during space combat manoeuvring. The spacecraft presents precision nose and weapon pointing ability due to excellent lateral and longitudinal acceleration combined with high pitch and yaw rates. This allows the Avenger to rapidly acquire and fine track targets.

4.3. OUT-OF-CONTROL FLIGHT

4.3.1. Tumbling recovery. In the event that the spacecraft enters into a tumble due to impact or system failure, the IFCS qualities allow for rapid recovery. Un-recoverable tumbles rarely occur without severe system damage.

4.4. DEGRADED MODE HANDLING QUALITIES

The reliability of the IFCS is very high and when failures do occur, they are usually caused by damage rather than system failure. Multiple system failures are required before the spacecraft becomes difficult to fly. The more serious failures that may cause degraded flight capabilities are described below.

4.4.1. Single engine failure. No degradation in flying qualities, however acceleration is affected resulting in slower directional transient acceleration.

4.4.2. Manoeuvring thruster failure/loss. Pitch, roll and yaw rates are directly affected by manoeuvring thruster loss. Higher numbers of manoeuvring thruster failures will degrade roll, pitch and yaw rates further. Total loss of manoeuvring thrusters on a single side of the fuselage may result in uncontrollable roll or yaw. Total loss of thrusters on the forward or aft of the fuselage may result in uncontrollable pitch.

4.4.3. Damaged lost surface. Loss of the outer wing may result in asymmetric roll and yaw rates. Dur to placement of the wing manoeuvring thrusters, loss of an inner wing will result in severely degraded roll, pitch and translation abilities.

4.5. ATMOSPHERIC FLIGHT/RE-ENTRY

4.5.1. Re-entry. Planet side landing in controlled space is accomplished via the autopilot system.

4.5.2. Atmospheric flight. Reserved.

Chapter 5

DISEMBARKED PROCEDURES

5.1. DISEMBARKED PROCEDURES

For all planetside/non-carrier based landing areas the following checks are to be completed by crew.

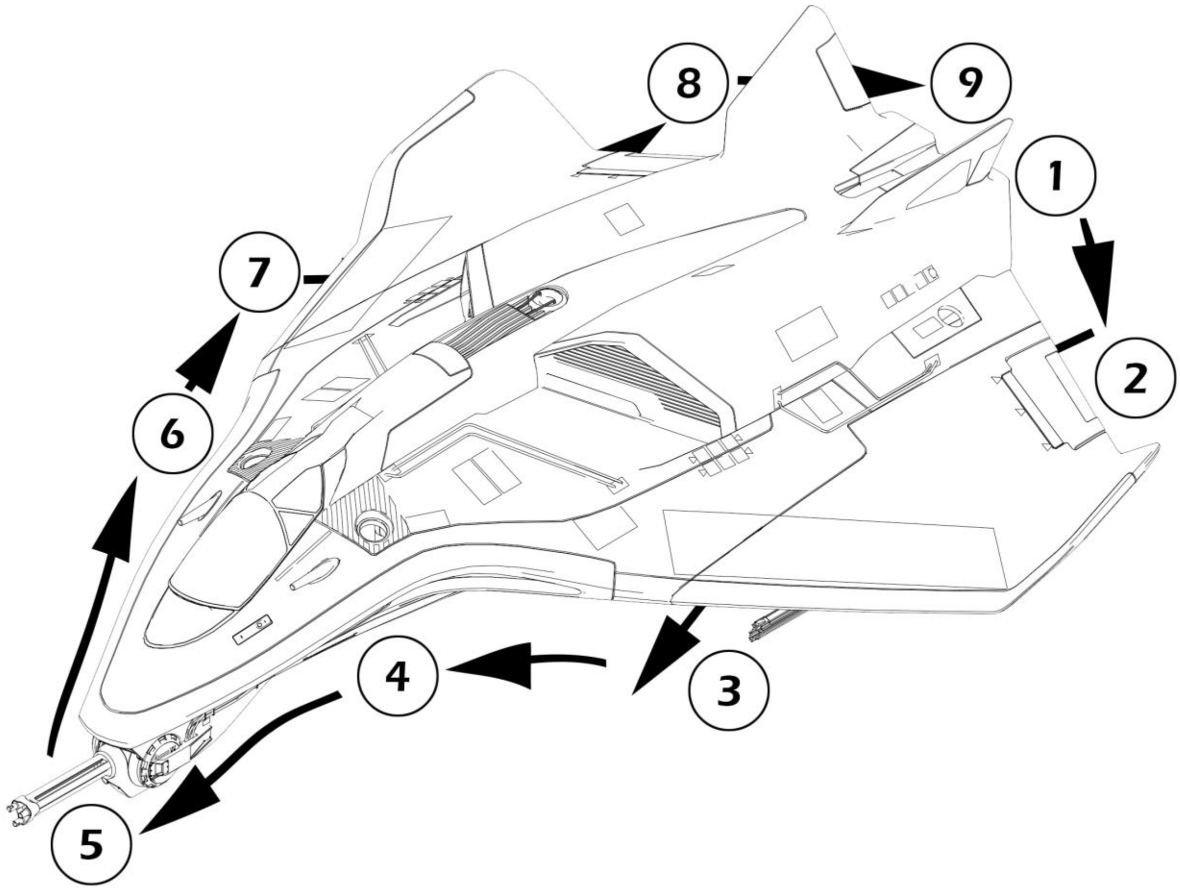


Figure 5-1 Pre-flight inspection points

5.1.1. PRE-FLIGHT CHECKS

5.1.1.1. Exterior inspection. The exterior inspection is divided into 9 areas beginning at rear fuselage, left side of the cargo door/loading ramp and continuing clockwise around the spacecraft. Check the spacecraft skin and structure for obvious damage, ensure all doors and panels are closed and fastened, inspect for fluid leaks, etc.

1. Aft fuselage/Engine exhausts (left side)
   a) LH Engine Exhaust - Ensure clear
   b) LH Vertical stabiliser – CHECK CONDITION

2. Left Wingtip and trailing edge
    a) Omni-directional manoeuvring thruster – CHECK CONDITION
    b) LH Stabilator – CHECK CONDITION
3. Left Wing
    a) LH Main landing gear – CHECK CONDITION
    b) Omni-directional manoeuvring thruster – CHECK CONDITION
    c) LH Leading edge – CHECK CONDITION
    d) Wing hardpoints – CHECK CONDITION and correct weapons installed
4. Left Nose section side
    a) LH Intake - Ensure clear
    b) Lower rotational manoeuvring thruster – CHECK CONDITION
    c) Upper rotational manoeuvring thruster – CHECK CONDITION
    d) LH Pitot – CHECK CONDITION
5. Nose section (including top surface)
    a) Nose landing gear – CHECK CONDITION
    b) Forward fuselage weapon mounts – CHECK CONDITION and correct weapons installed
    c) Nose area – inspect for damage and check secure
    d) Upper surface – CHECK CONDITION
6. Right Nose section side
    a) RH Intake - Ensure clear
    b) Lower rotational manoeuvring thruster – CHECK CONDITION
    c) Upper rotational manoeuvring thruster – CHECK CONDITION
    d) RH Pitot – CHECK CONDITION
7. Right Wing
    a) LH Main landing gear – CHECK CONDITION
    b) Omni-directional manoeuvring thruster – CHECK CONDITION
    c) LH Leading edge – CHECK CONDITION
    d) Wing hardpoints – CHECK CONDITION and correct weapons installed
8. Right Wingtip and trailing edge
    a) Omni-directional manoeuvring thruster – CHECK CONDITION
    b) RH Stabilator – CHECK CONDITION
9. Aft fuselage/Engine exhausts (Right side)
    a) RH Engine Exhaust - Ensure clear
    b) RH Vertical stabiliser – CHECK CONDITION
    c) Cargo door – CHECK CONDITION

5.1.1.2. Cockpit access.

BEFORE ENTERING THE COCKPIT

a) Ejection seat – CHECK SAFE
b) Spacecraft self-destruct handle – SAFE
c) Main power switch - OFF

5.1.1.3. Interior Checks

a) Interior checks – Carry out cockpit setup.
b) Powerplant – **ON**
c) Power Throttle - **MAX**
d) ISD's – **ON**
e) HUD – **ON**, adjust as required
f) CVI – **ON**

5.1.2. Engines - START.

5.1.3. Pre-launch checks

a) Fuel tank quantities – **CHECK**
b) Waypoint – **SELECT** (as required)
c) Carry out IFCS Safeties check:
   i. G-SAFE – **ON**
   ii. COMSTAB – **ON**
   iii. COUPLED MODE – **ON**

5.1.4. Pre-Taxi checks

a) Controls – CYCLE, Ensure all manoeuvring thruster output in nominal on ISD

5.1.5. TAXI CHECKS

a) Landing gear magnets – DISENGAGE
b) Translate vertically to ensure clearance from deck
c) Ensure attitude to remain parallel with taxiway
d) Taxi to launch area

5.1.6. LAUNCH

a) Translate if required to ensure clearance from landing area
b) Launch horizontal from pad to prevent conflicts
c) Throttles – **MAX**

Once airborne

d) Landing gear – **UP**
e) Clearing turn – **PERFORM** (if required)
f) TDAS – **CHECK CONTACTS**

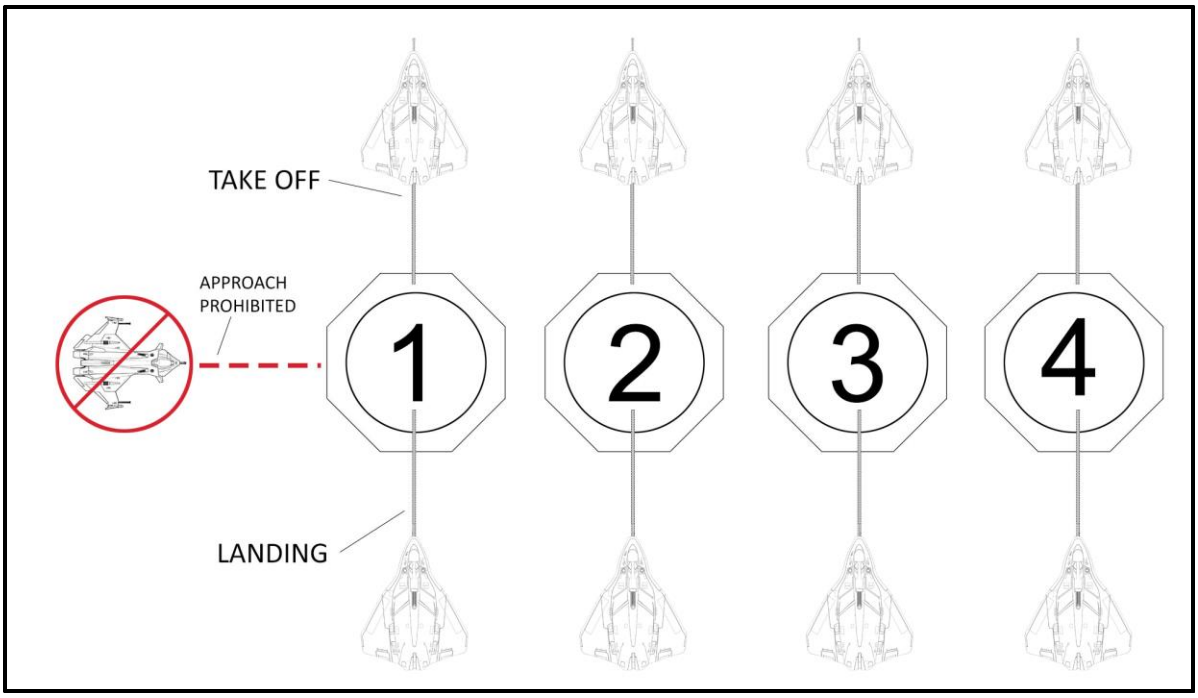


Figure 5-2 Approach angles

5.2. LANDING CHECKS

a) Landing area – SELECT
b) Landing gear – EXTEND
c) Landing permission – GAIN, ENSURE CLEARED FOR LANDING

To prevent landing conflicts, landing approach from sides of multi-landing platforms is prohibited.

d) Approach landing area perpendicular to platform alignment
e) Landing mode – SELECT (AUTO or MAN)
f) TDAS landing mode – CHECK ENGAGED

When above landing area:

g) Landing gear – ENSURE EXTENDED
h) TDAS altitude/attitude/obstacle clearance – CHECK GREEN
i) Translate down until touchdown.

5.2.1. Heavy/overspeed translation landings. Heavy or overspeed translation landings may cause serious structural damage to the spacecraft. The pilot must pay particular attention to vertical translation speed, altitude and attitude during descent to the landing area.

5.3. POST FLIGHT CHECKS

5.3.1. After landing checks.

a) Ejection seat – **Ensure safe**
b) ISD's – **OFF**
c) HUD – **OFF**
d) CVI – **OFF**
e) COMMS – **OFF**
f) Engines – **OFF**
g) Powerplant – **OFF**

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Chapter 6

CARRIER PROCEDURES

6.1. CARRIER BASED PROCEDURES

All flight crewmembers shall be familiar with all procedures listed in this publication as well as the ship SOP's prior to carrier operations. Carrier launch, pattern, and landing procedures aid in preventing collisions, maintain flight discipline and are in place for all crew safety.

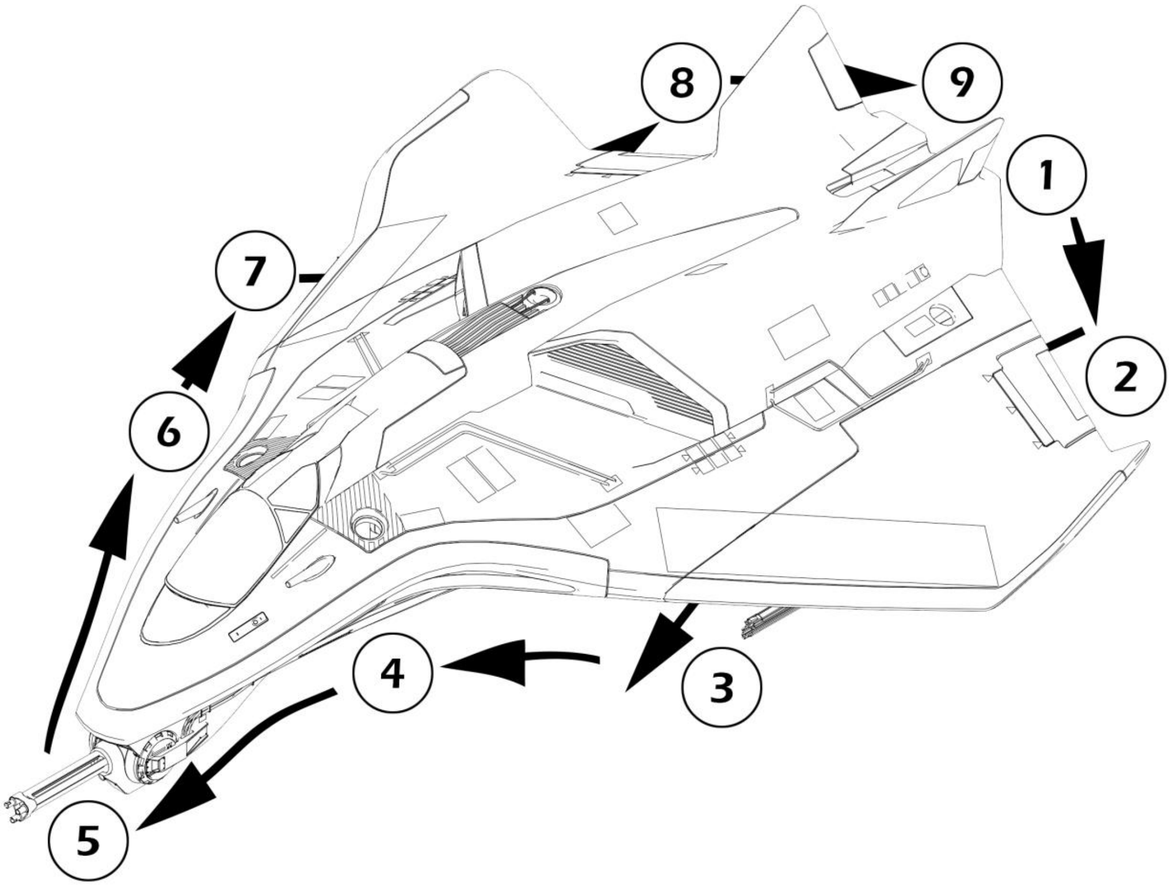

Figure 6-1 Pre-flight inspection points

6.1.1. PRE-FLIGHT CHECKS

6.1.1.1. Exterior inspection. The exterior inspection is divided into 9 areas beginning at the rear fuselage, left side of the cargo door/loading ramp and continuing clockwise around the spacecraft. Check the spacecraft skin and structure for obvious damage, ensure all doors and panels are closed and fastened, inspect for fluid leaks, etc.

1. Aft fuselage/Engine exhausts (left side)
   a) LH Engine Exhaust - Ensure clear
   b) LH Vertical stabiliser – CHECK CONDITION

2. Left Wingtip and trailing edge
    a) Omni-directional manoeuvring thruster – CHECK CONDITION
    b) LH Stabilator – CHECK CONDITION
3. Left Wing
    a) LH Main landing gear – CHECK CONDITION
    b) Omni-directional manoeuvring thruster – CHECK CONDITION
    c) LH Leading edge – CHECK CONDITION
    d) Wing hardpoints – CHECK CONDITION and correct weapons installed
4. Left Nose section side
    a) LH Intake - Ensure clear
    b) Lower rotational manoeuvring thruster – CHECK CONDITION
    c) Upper rotational manoeuvring thruster – CHECK CONDITION
    d) LH Pitot – CHECK CONDITION
5. Nose section (including top surface)
    a) Nose landing gear – CHECK CONDITION
    b) Forward fuselage weapon mounts – CHECK CONDITION and correct weapons installed
    c) Nose area – inspect for damage and check secure
    d) Upper surface – CHECK CONDITION
6. Right Nose section side
    a) RH Intake - Ensure clear
    b) Lower rotational manoeuvring thruster – CHECK CONDITION
    c) Upper rotational manoeuvring thruster – CHECK CONDITION
    d) RH Pitot – CHECK CONDITION
7. Right Wing
    a) LH Main landing gear – CHECK CONDITION
    b) Omni-directional manoeuvring thruster – CHECK CONDITION
    c) LH Leading edge – CHECK CONDITION
    d) Wing hardpoints – CHECK CONDITION and correct weapons installed
8. Right Wingtip and trailing edge
    a) Omni-directional manoeuvring thruster – CHECK CONDITION
    b) RH Stabilator – CHECK CONDITION
9. Aft fuselage/Engine exhausts (Right side)
    a) RH Engine Exhaust - Ensure clear
    b) RH Vertical stabiliser – CHECK CONDITION
    c) Cargo door – CHECK CONDITION

6.1.1.2. Cockpit access.

BEFORE ENTERING THE COCKPIT

a) Ejection seat – CHECK SAFE
b) Spacecraft self-destruct handle – SAFE
c) Main power switch - OFF

6.1.1.3. Interior Checks

a) Interior checks – Carry out cockpit setup.
b) Powerplant – **ON**
c) Power Throttle - **MAX**
d) ISD's – **ON**
e) HUD – **ON**, adjust as required
f) CVI – **ON**

6.1.2. Engines - START.

6.1.3. Pre-launch checks

a) Fuel tank quantities – **CHECK**
b) Waypoint – **SELECT** (as required)
c) Carry out IFCS Safeties check:
   iv. G-SAFE – **ON**
   v. COMSTAB – **ON**
   vi. COUPLED MODE – **ON**

6.1.4. Pre-Taxi checks

a) Controls – CYCLE, Ensure all manoeuvring thruster output in nominal on ISD

6.1.5. Taxi checks.

a) Landing gear magnets – DISENGAGE
b) Translate vertically to ensure clearance from deck
c) Ensure attitude to remain parallel with taxiway
d) Taxi to catapult/launch area. Pay close attention to taxi director marshalling signals to align with catapult.

6.1.6. Catapult Launch.

a) Throttles – **MAX**
b) Controls – CYCLE
c) Warnings/cautions – CHECK

When ready for launch –

d) Salute with right hand. Hold throttles firmly to detent and place head against head rest

Once airborne

j) Landing gear – **UP**
k) Clearing turn – **PERFORM** (if required)
l) TDAS – **CHECK CONTACTS**

6.2. CARRIER LANDING PATTERN

> *****NOTE*****
>
> All altitudes are in Metres (M) above flight deck level
>
> All speeds are in Metres per second (M/S)

On the CVI select and target the ship to obtain distance readout. Approach the ship on an extended centre line of the final approach corridor at 300m altitude. Enter the carrier landing pattern at 300 metres above carrier flight deck. Carry out IFCS safeties check before making the level break to join the pattern:

a) G-SAFE – **ON**
b) COMSTAB – **ON**
c) COUPLED MODE – **ON**
d) Before beginning the 180^{o} turn onto final approach, select AUTOPILOT landing if desired.

Make a level break from a course parallel to the direction of the carrier bow, close aboard to the port side of the ship. Do not commence break until your interval[*1] is abeam or past your wing. Decelerate to 150 M/S to enter landing pattern, apply spacebrake as required. Descend to 150m altitude above flight deck level when established in downwind leg and lower gear. Maintain 1500 – 2000 metres abeam the carrier when in the downwind leg. Begin 180^{o} turn to the final approach when approximately abeam the flight deck aft entrance heat shield and reduce speed to 100M/S. Establish landing bay centre line during turn onto final approach and maintain 100 M/S. When meatball acquired, transmit "Tail number, Avenger, Ball, Auto (if using autolanding) e.g."301, AVENGER, BALL, AUTO". If cleared to land, maintain approach speed and attitude until inside flight deck, then land at designated landing pad. If not cleared to land initiate "Waveoff".

6.2.1. Waveoff. Waveoff signals may be issued if your approach deviates too far from correct, to correct spacing between other spacecraft, or during an on flight deck emergency.

6.2.1.1. When waveoff signal is received, select full power, immediately disengage autolanding mode and climb to 150 metres alt. Manoeuvre to the port of the ship and direction parallel with the pattern until interval is abeam or past your wing no sooner than the bow of the ship.

*1.Interval = the spacecraft you will follow behind.

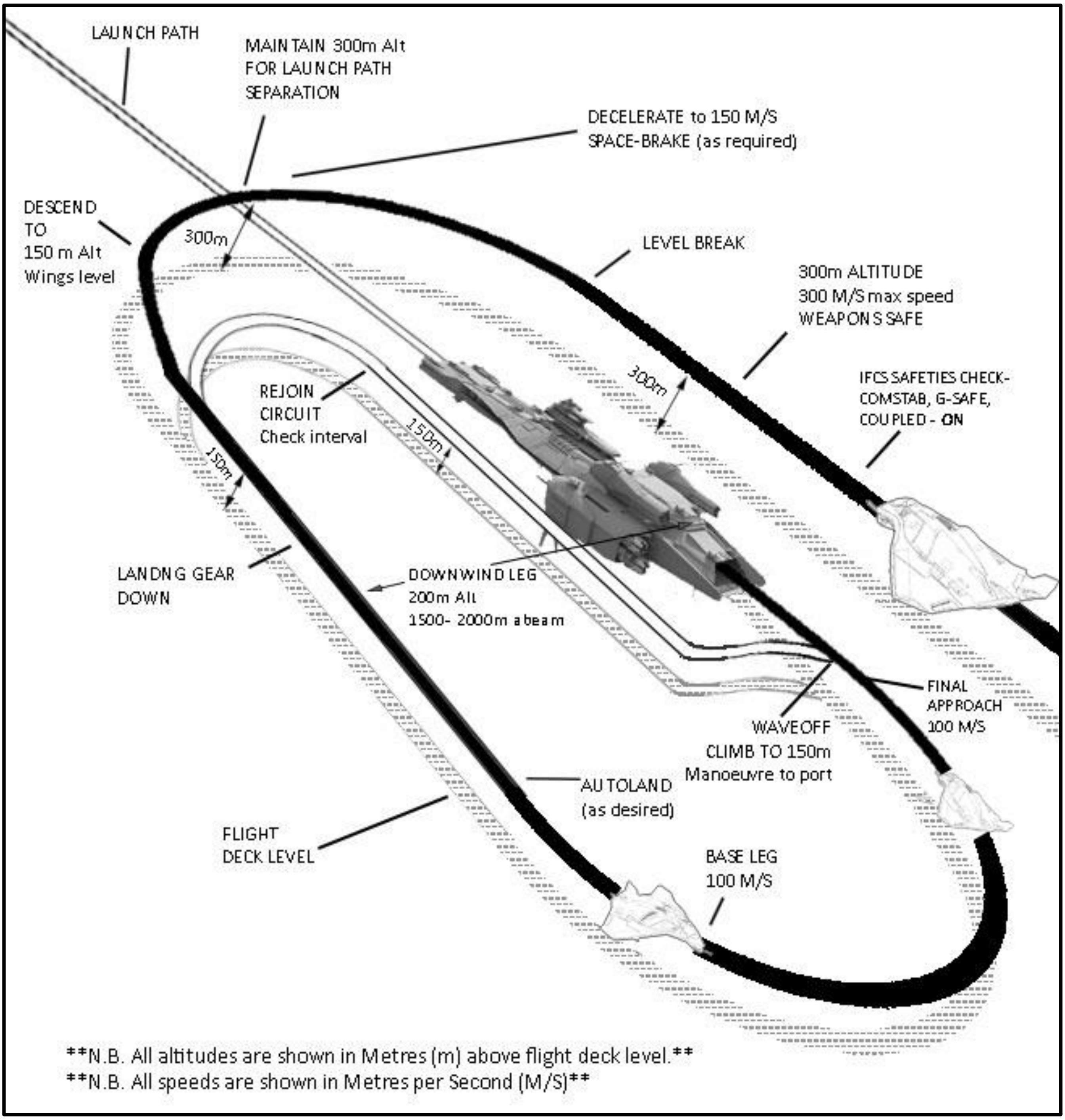

Figure 6-2 Carrier landing pattern

6.3. POST FLIGHT CHECKS

6.3.1. After landing checks.

a) Ejection seats – **Ensure safe**
b) ISD’s – **OFF**
c) HUD – **OFF**
d) CVI – **OFF**
e) COMMS – **OFF**
f) Engines – **OFF**
g) Powerplant – **OFF**

Chapter 7

Combat

7.1. SITUATIONAL AWARENESS

The cornerstone to success in combat is situational awareness (SA). SA is your perception and understanding of what is actually occurring around you and is gained through the use of the spacecraft's on-board systems, visual scanning, other crew members and wingmen.

7.2. WINGMANSHIP

Wingmen have critical responsibilities when working as a team. They help the mission leader in the planning and organisation of any mission. Wingmen are a central part of enabling SA by reporting contacts via TDAS or visually to the formation leader and can perform backup navigation tasks if required. They are essential to mission success especially during strike missions where target destruction is essential. Wingmen must engage as briefed or when directed by the flight leader and to support when their leader engages a target. It is essential that wingmen carry out their responsibilities with discipline and dedication.

Discipline is the most important quality a pilot can possess and leads to success in the spacial arena. Discipline is executing self-control, maturity, and judgment in a high-stress, emotionally charged environment. Teamwork is the foundation of any fighting force and is cornerstone to mission success. If all team members know and perform their respective duties dutifully the chance of mission success and survival increases dramatically.

7.3. RADIO DISCIPLINE

Discipline and effectiveness within a formation starts with communication. All communications must be clearly understood by every member of the team. Radio message discipline requires clarity and brevity. Where possible the message should identify the message initiator by way of call sign followed by the message. The other members of the formation should where possible respond by way of their number in the formation e.g. “Sica 1, TDAS contact, 12 o’clock, 15 clicks” to which the remaining members of the formation would replay “Two, tally”, “Three, tally” etc. When there is a delay in responding the message should again include the transmitters call sign. For brevity keywords see Annex A.

7.4. TDAS EMPLOYMENT

7.4.1. Effective use of the TDAS system is critical to situational awareness (SA) in all situations. In combat SA is critical in mission success. TDAS is capable of tracking multiple targets at all angels at three ranges, Short, Medium and Long. Short range detects and tracks targets up to 1000m range, Medium range detects and tracks targets up to 6000m range and Long range detects and tracks targets up to 15 klms(*1) in range. Targets continuing to be tracked whist within the TDAS max range, but outside the currently set scanning range limit are displayed on the TDAS holo-sphere as a small blue sphere. Targets being tracked in the currently set scanning range identified as friendly are displayed in green. Targets being tracked in the currently set scanning range identified as threats are displayed in orange. The currently selected target is displayed as a 3D render of the ship type within the holo-sphere. Targets can be selected directly using touch(*2) in the TDAS holo-sphere or via the stick grip mounted targeting controls. Selected targets (friendly or Enemy) are able to be pinned using the Pin Target button on the Stick Grip assembly. TDAS can also identify in flight missiles by way of bracketing them on the CVI with a red triangle.

**1 Subject to amendment*

**2 "Touch" means via the mouse*

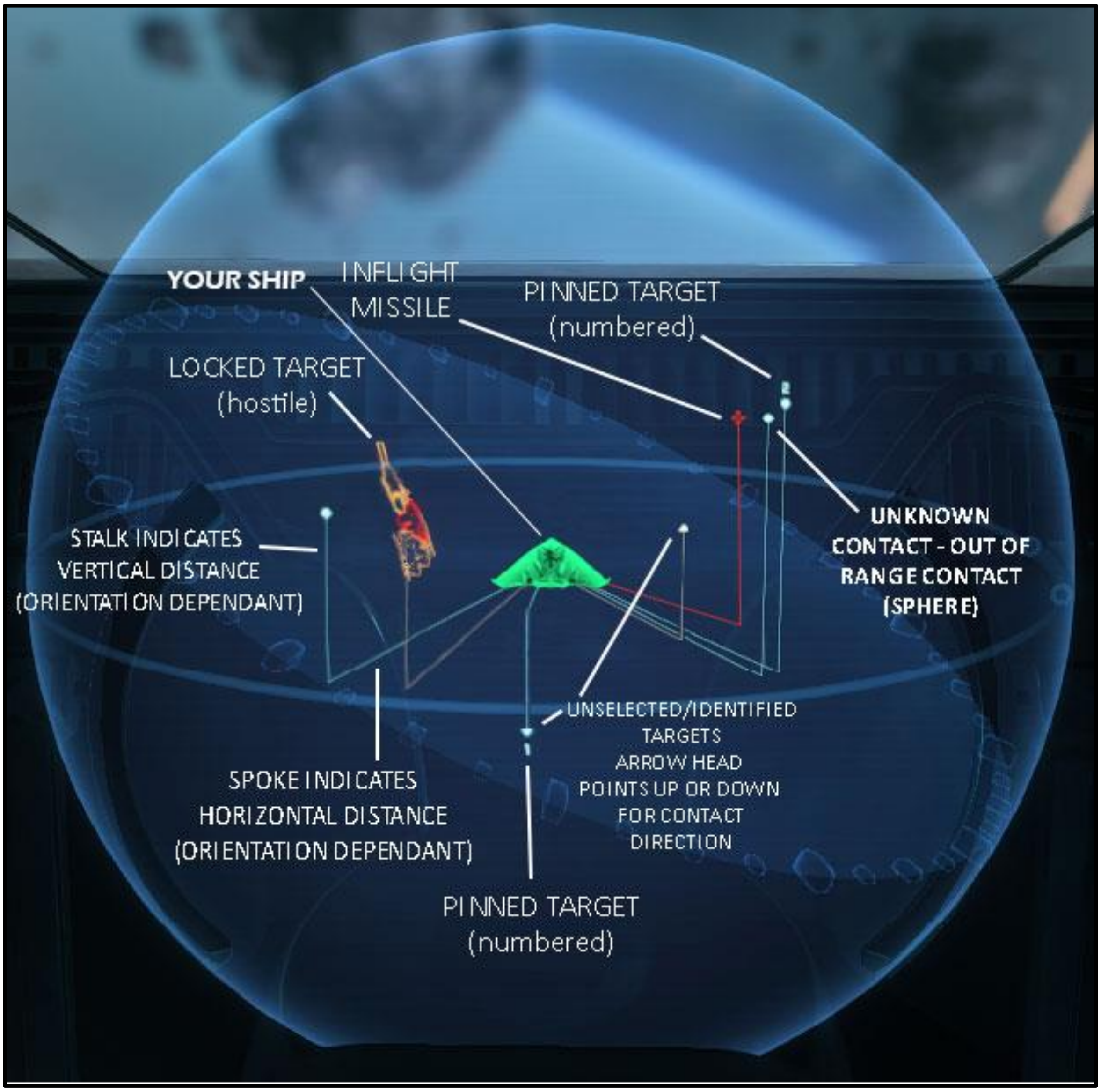

Figure 7-1 TDAS targeting information

7.5. CVI ENHANCED OPTICS

7.5.1. The CVI enhanced optical zoom is useful for target identification and battle damage assessment. The enhanced optical zoom used during weapon employment can analyse the effectiveness of the strike and if the weapon has functioned correctly.

7.6. WEAPON SELECTION

Selecting the best weapon for the mission at hand can make all the difference in combat effectiveness. Flight commanders should consider the number and types of weapons carried during mission planning.

7.6.1. Ordnance.

7.6.1.1. Missiles. The N6G is capable of carrying a wide variety of missile types that can be selected dependent on mission type and pilot preference. Missile selection should take into account range, number and type of enemy anticipated to be encountered, mission objectives, number of ships in the formation. The types of missiles available to the N6G include:

a) **Infrared (IR)** **–** Infrared missiles track the targets heat generated by the target spacecraft.

b) **Electromagnetic (EM)** **–** Electromagnetic missiles track the EM signature of the target spacecraft.

c) **Cross-section (CS)** **–** Cross section missiles utilise active radar tracking to track the cross section of the target spacecraft.

d) **Dumb fire** **–** Dumb fire missiles are essentially a rocket. The rocket when fired will travel in a straight line and do not track targets in any way. Dumb fire missiles (rockets) can not lock on to a target prior to firing.

7.6.2. Guns. The N6G can mount a wide variety of guns ranging from projectile (kinetic) weapons to energy beam weapons on its hardpoints. Each weapon has advantages and dis-advantages and these need to be taken into account during mission planning to ensure flight effectiveness. Mounting like weapons (e.g. Badger repeaters with Bulldog repeaters) will reduce the number of PIPs displayed by the ITTS and will make targeting easier, especially at range. The addition of a gimballed mount to a weapons hardpoint will reduce the weapon size that is possible to be attached to that hardpoint by one (e.g. S3 fixed -> S2 when gimballed). Refer to Whitley's Guide for more detailed weapons information.

7.6.3. Countermeasures. Ordnance employed against your spacecraft can be spoofed through the use of correct countermeasures. Countermeasures do not guarantee missile defeat. Always employ defencive SCM as well as the appropriate countermeasures for the incoming weapon detected. During combat, the avionic systems will display the detected type of missile tracking your spacecraft on the CVI as a warning containing one of the icons shown below.

a) **Infrared (IR)**  **–** Spoofed by flares.

b) **Electromagnetic (EM)**  **–** Spoofed by Flare.

c) **Cross-section (CS)**  – Spoofed by Chaff.

d) **Dumb fire –** As dumb-fire missiles do not use a guidance system, no missile caution will be displayed on the CVI. Due to this, there are no effective countermeasures available. The best defence is manoeuvring.

7.6.4. Effective targeting. During SCM the best manoeuvres will result in the target presenting a large profile. Larger target profile means that more of the targets surface area is exposed resulting in easier targeting and more projectiles on target.

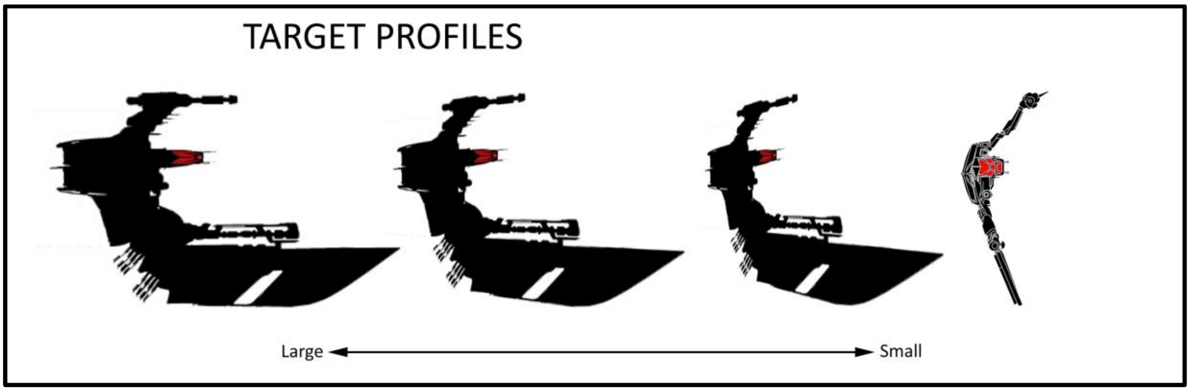

Figure 7-2 Target profile

7.7. SPACE COMBAT MANOEUVRING (SCM)

The primary objective of SCM is to manoeuvre into a position that you can bring weapons to bear, or employ ordnance on enemy spacecraft. To accomplish this you may need to first out manoeuvre you intended target through translation and direction changes to prevent them bringing their weapons to bear on you. The manoeuvers presented here are only intended to be a guide or "play book" of manoeuvres that can be combined as necessary during combat to achieve a kill.

7.7.1. Barrel Roll. The barrel roll is an effective way to avoid fire whilst advancing on, or retreating from an enemy. The barrel roll is carried out by pitching and applying full left or right roll command. Hold this commanded roll and pitch input. The spacecraft should "cork screw" through space until the roll and pitch commands are removed.

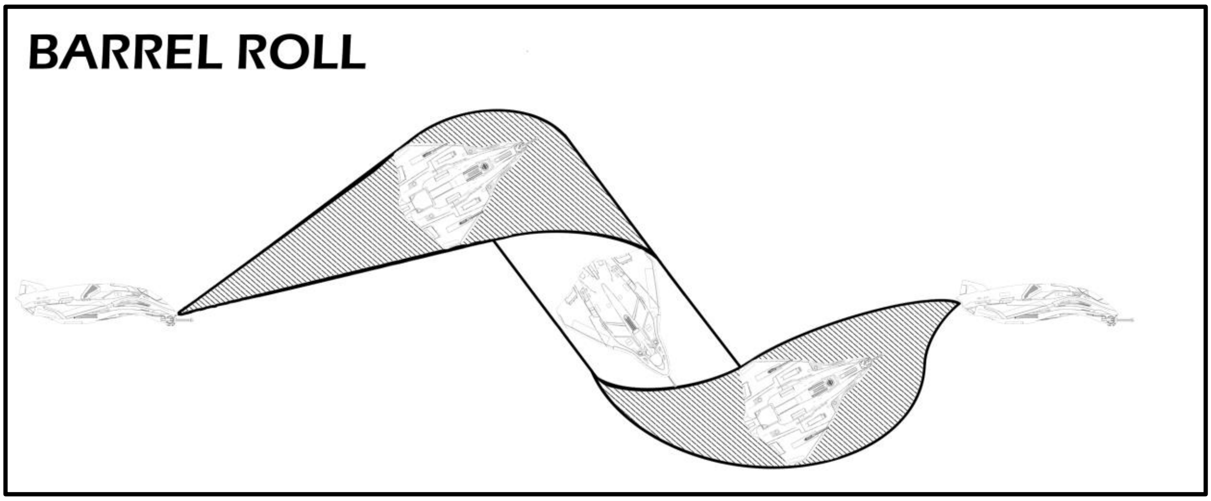

Figure 7-3 Barrel roll

7.7.2. Barrel Yaw. The barrel yaw uses the same principal as the barrel roll manoeuvre with the exception of utilising yaw instead of pitch as the second input. The barrel yaw is carried out by applying yaw and roll at the same rate to produce a flat spiral manoeuver (the spacecraft nose always points forward).

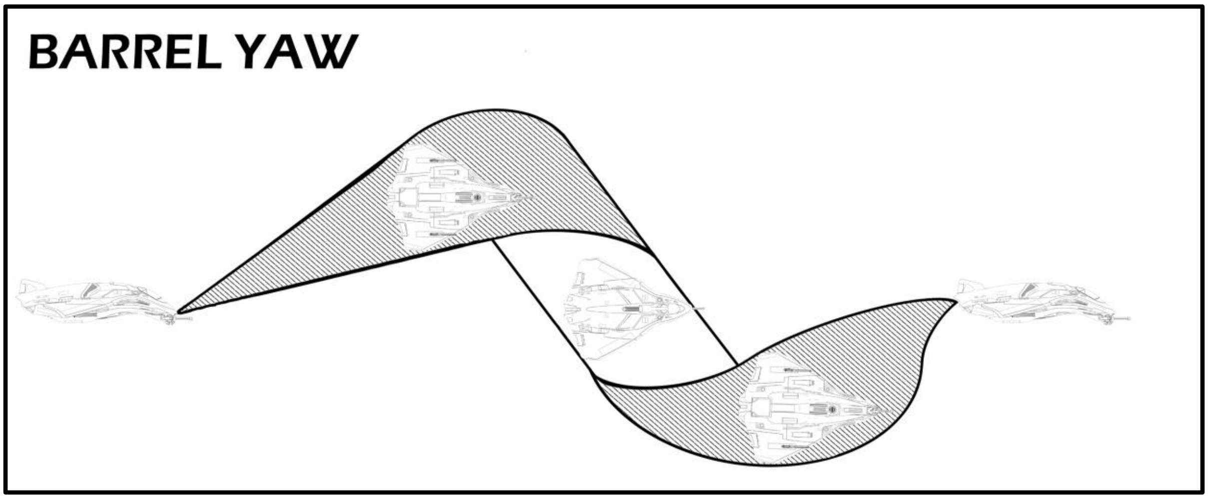

Figure 7-4 Barrel yaw

7.7.3. Pursuit curves. Pursuit in space combat involves aiming the nose of the spacecraft ahead, at, or behind the target ship to manoeuvre your spacecraft into firing position. The direction the target ship's nose is facing is indicated by the cone on the targeted ship bracket. This does not however necessarily indicate the direction of flight of the target. A better method of determining the direction of flight of your target is to use the extending line from the ITTS PIP. The direction of the extending line from the PIP to the boresight cross can be used as a more accurate direction of flight indicator of the target.

a) Lead pursuit is pursuing a target with the nose of the spacecraft is pointing ahead of the target and will decrease the distance between the spacecraft and the target (boresight cross and PIP ahead of the target).
b) Pure pursuit is pursuing a target with the nose of the spacecraft pointing directly at the target and will maintain the distance between the spacecraft and the target (boresight cross directly at the target).
c) Lag pursuit is pursuing a target with the nose of the spacecraft pointing behind the target and will increase the distance between the spacecraft and the target (boresight cross and PIP behind the target).

Pursuit curves are an important consideration during any attack for closure.

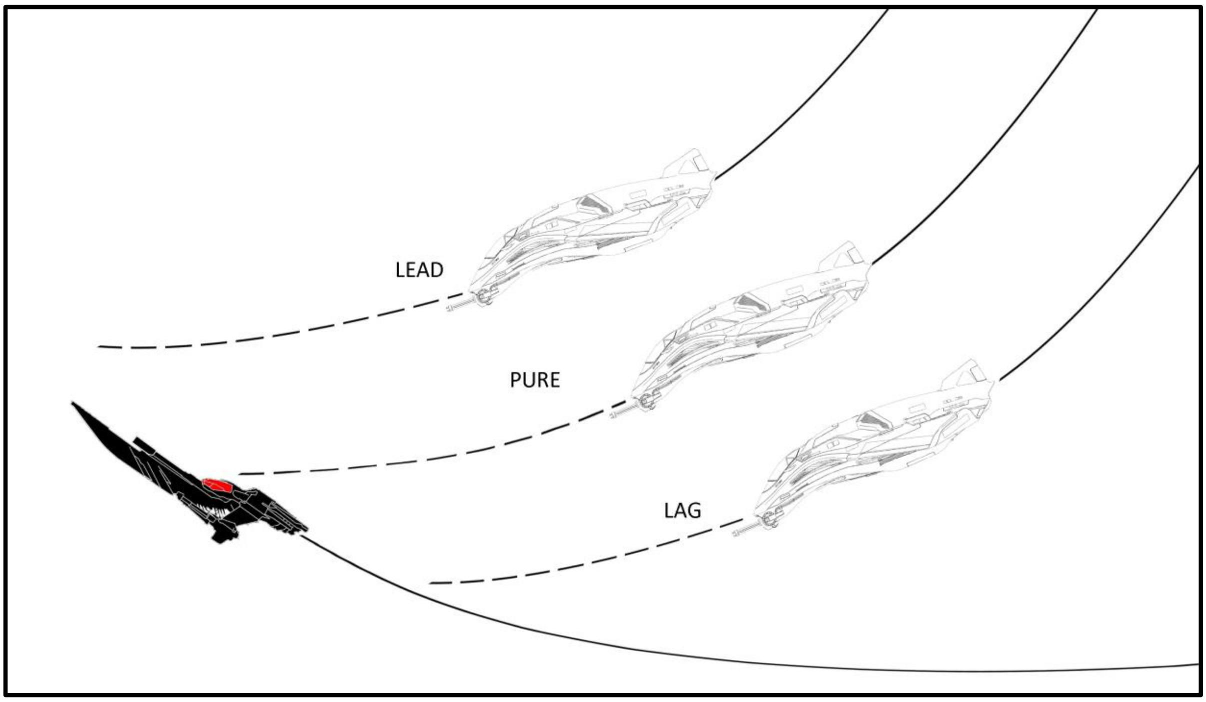

Figure 7-5 Pursuit curves

7.7.4. Instantaneous Turns. The instantaneous turn allows for rapid changes in direction while reducing the effects of G during the manoeuvre. Execution of this manoeuvre is to decouple prior to initiating the turn, carry out the turn by rotating on either the lateral or longitudinal axis (pitch or yaw), recouple, when exiting the turn carry out a 90° roll. After executing the roll, boost to regain speed lost and stabilise flight path.

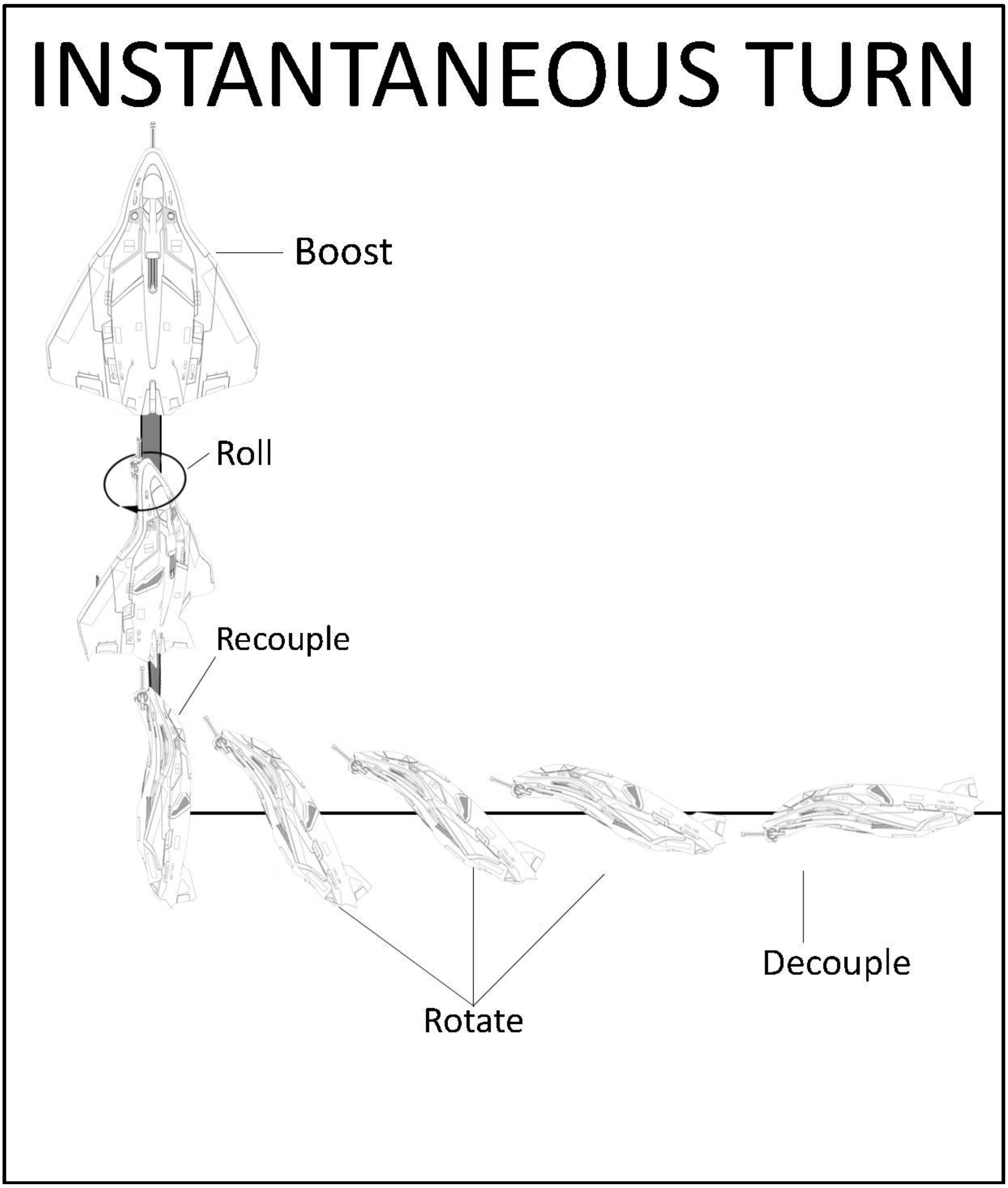

Figure 7-6 Instantaneous turn

7.7.5. Boost Braking. Application of main engine/manoeuvring thruster boost whilst applying spacebrake will increase the effectiveness of the manoeuvring thrusters in arresting spacecraft movement. This will nullify main engine thrust regardless of throttle position.

7.7.6. Translation Commands during Boost Braking. When applying translation commands during the Boost brake will cancel out all spacecraft motion except the commanded translation vector. This effectively nullifies all vectors apart from the newly commanded translation vector.

7.7.7. Circling Attack/Defence. The circling attack/defence (sometimes referred to as an orbit attack) is a common tactic utilised in dogfighting. The circle attack/defence is used to defeat the enemy targeting by continually changing the plane of the spacecraft's manoeuvring. Utilising translation left or right, yaw to rotate about the target. Utilise roll to change the spacecraft's plane of rotation. Always maintain speed with throttle and translation controls. In defence, increase range from the target during this manoeuvre to extend and escape.

Note: enabling COMSTAB will reduce the effectiveness of this manoeuvre due to IFCS reducing speed during the turn.

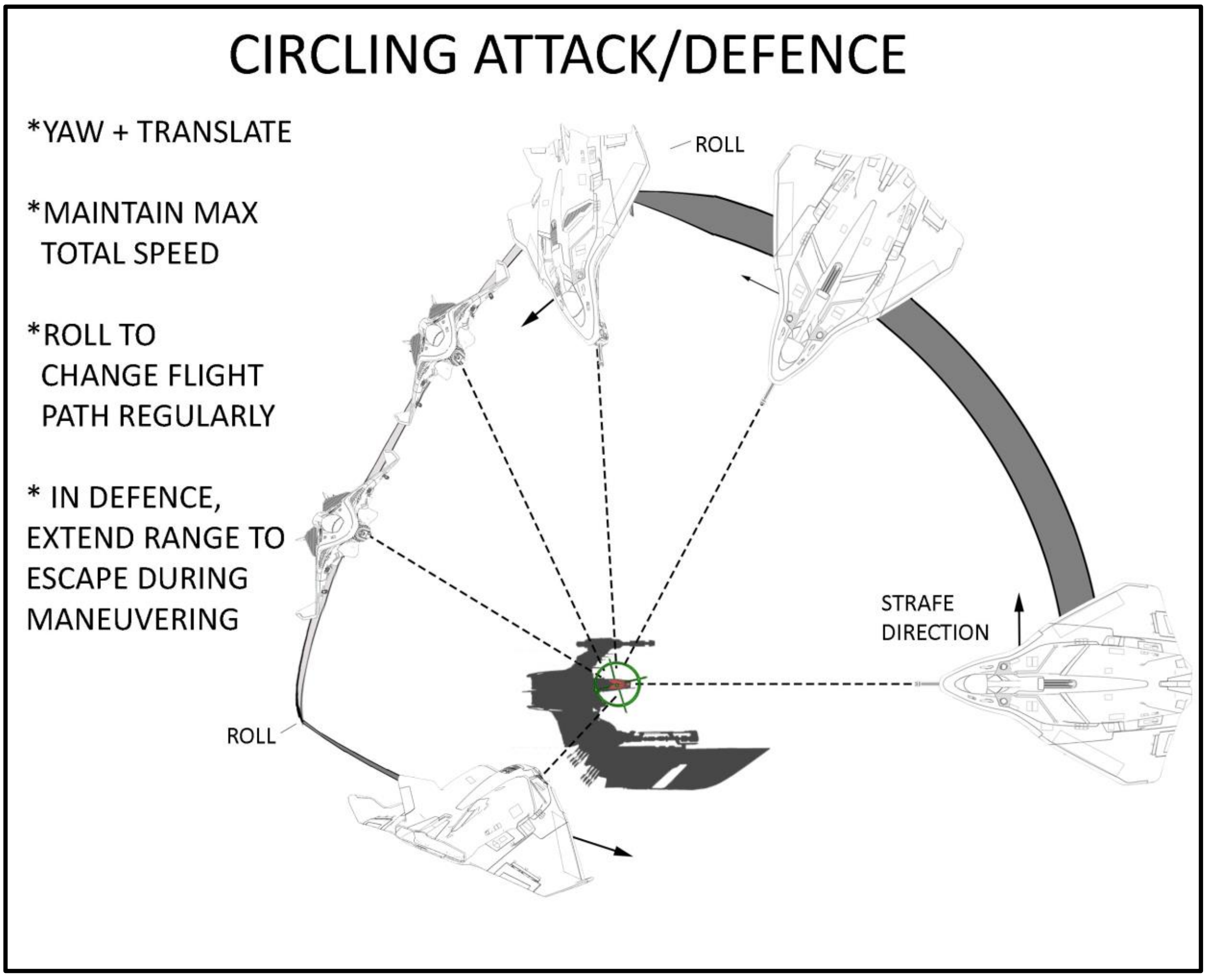

Figure 7-7 Circling attack/defence

7.7.8. RIX Roll. The RIX roll is a variation on the circling attack/defence where by the pilot utilises small roll movements during translation to vary the plane of rotation of the orbit slightly whilst still allowing relatively steady aiming for return of fire. The RIX roll, roll inputs only need to be slight. To execute, roll slightly and boost momentarily to avoid incoming fire whilst executing a circling attack/defence.

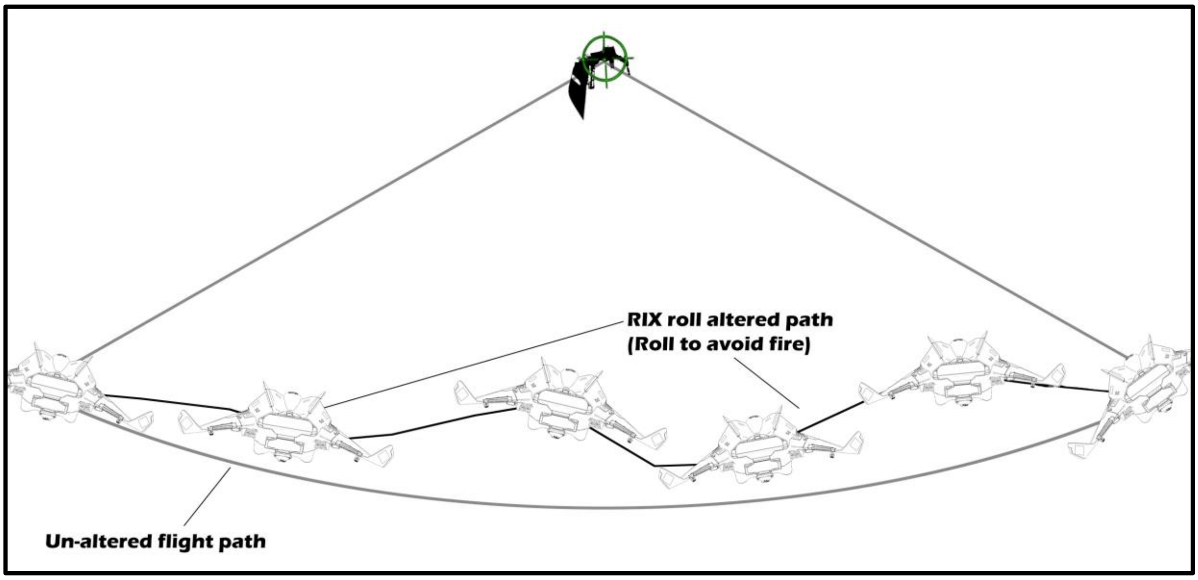

Figure 7-8 RIX roll

7.7.9. Skidded Attack. The skidded attack can be used during head-to-head, high rate of closure attack/defence. This allows for weapons to be aimed independently of spacecraft direction of flight without being decoupled. This manoeuvre is carried out by maintaining max forward speed, applying lateral translation left or right and maintaining the boresight cross on the target. The amount of translation angle can be varied depending of the offset of the targets trajectory. This manoeuvre can be utilised during anti-capitol ship weapons to present minimum cross section for target turrets/guns whilst maintaining visual contact for guided weapons implementation.

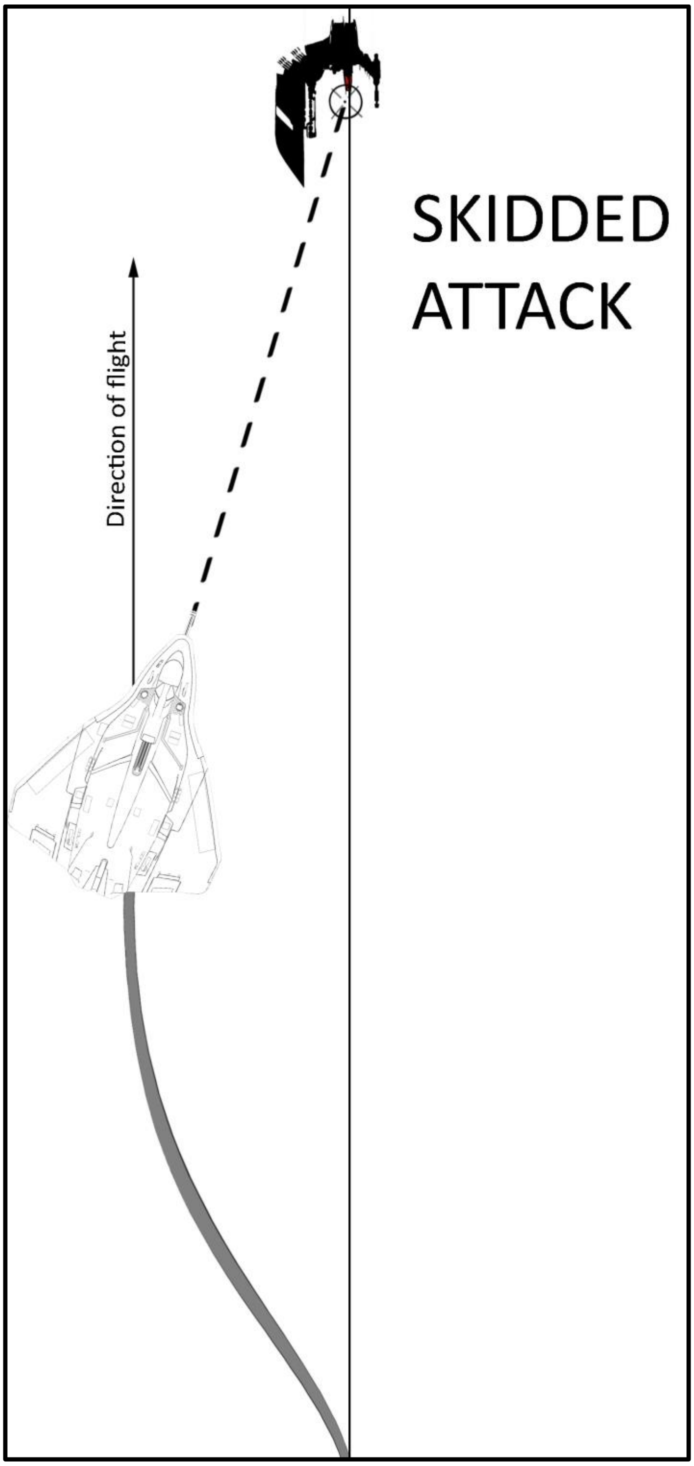

Figure 7-9 Skidded attack

7.7.10. Button hook. The button hook manoeuvre is used to reverse the spacecraft's direction by repositioning for re-attack after a boom and zoom. The manoeuvre is executed by aligning the targets flightpath laterally with your own. Maintain maximum lateral separation at CPA by translating as in a skidded attack. After passing the target, turn into their flightpath arcing behind them whilst maintaining the nose of the spacecraft pointed at your target.

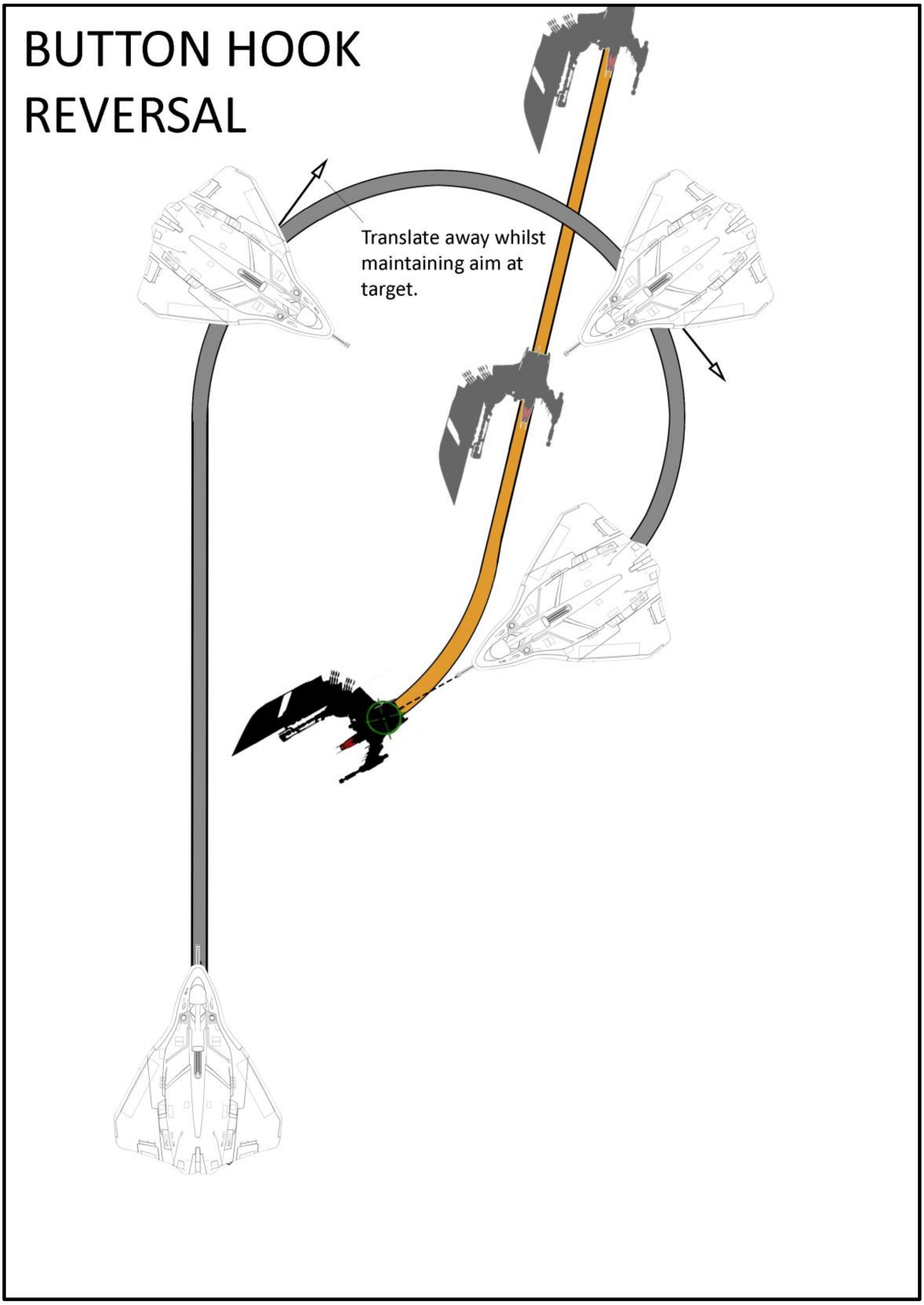

Figure 7-10 Button hook

7.7.11. Lead roll. The lead roll is carried out by rolling into the direction of the target's flightpath at CPA, strafing into the target's flightpath, utilising boost. Re-acquire the target and gain a firing solution. The lead roll will result in losing a large amount of speed to gain a more advantageous position immediately following a high speed pass ("joust"). Best used when yours and your targets velocity vector differ in direction by more than 90°.

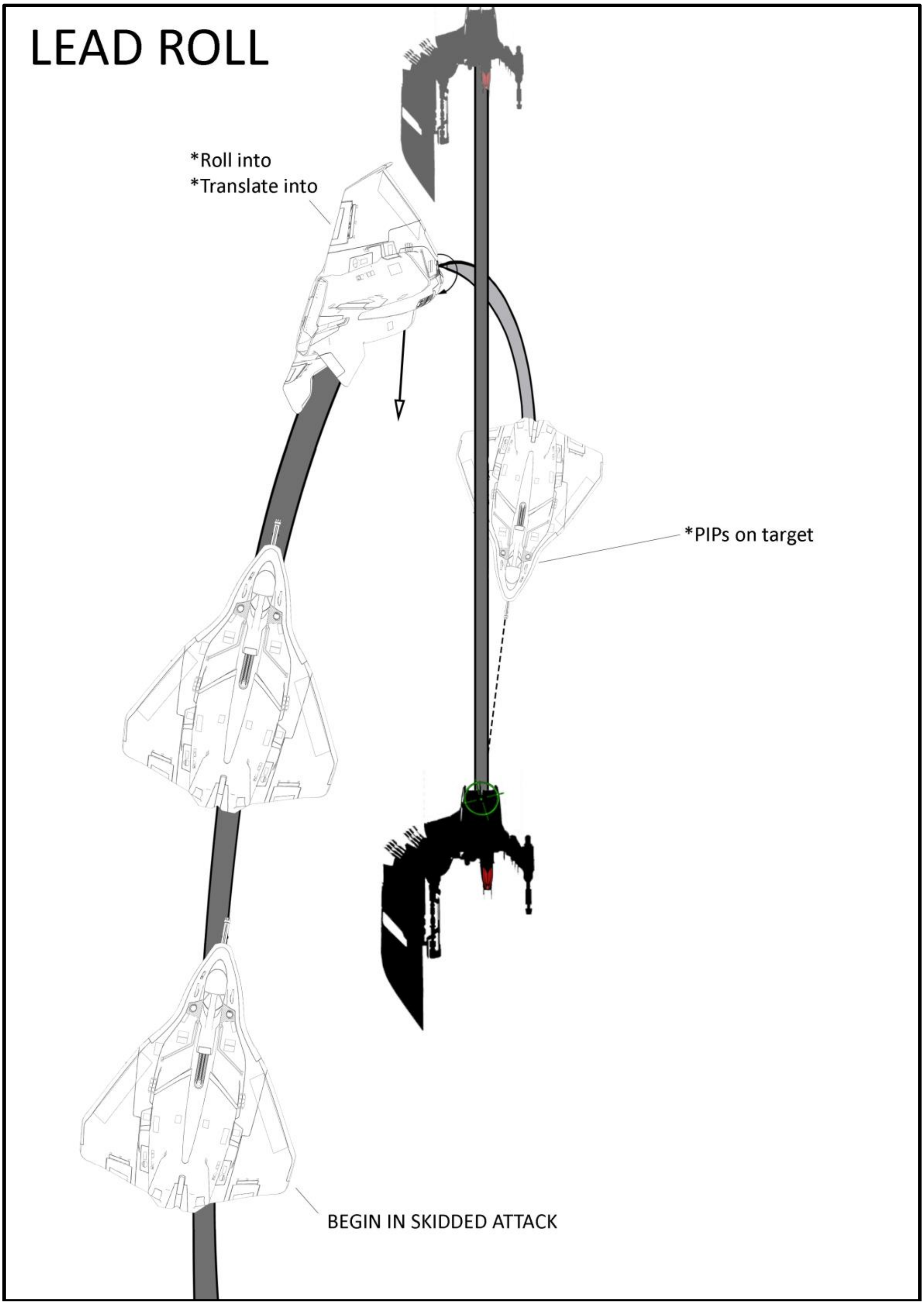

Figure 7-11 Lead Roll

7.7.12. Lag Roll. The lag roll is an attack manoeuvre that uses geometry to control closure rate and maintain movement in all three axes of motion for defensive manoeuvring whilst maximising firing capability and preventing overshoots. This manoeuvre is carried out by rolling into (towards) the target whilst translating in the opposite direction of the inputted roll. Ensure that the target remains insight during the manoeuvre. As the target's closure is checked or reduced, gain a firing solution by bringing the PIP's onto the target profile. If completed optimally, the target profile presented will be large.

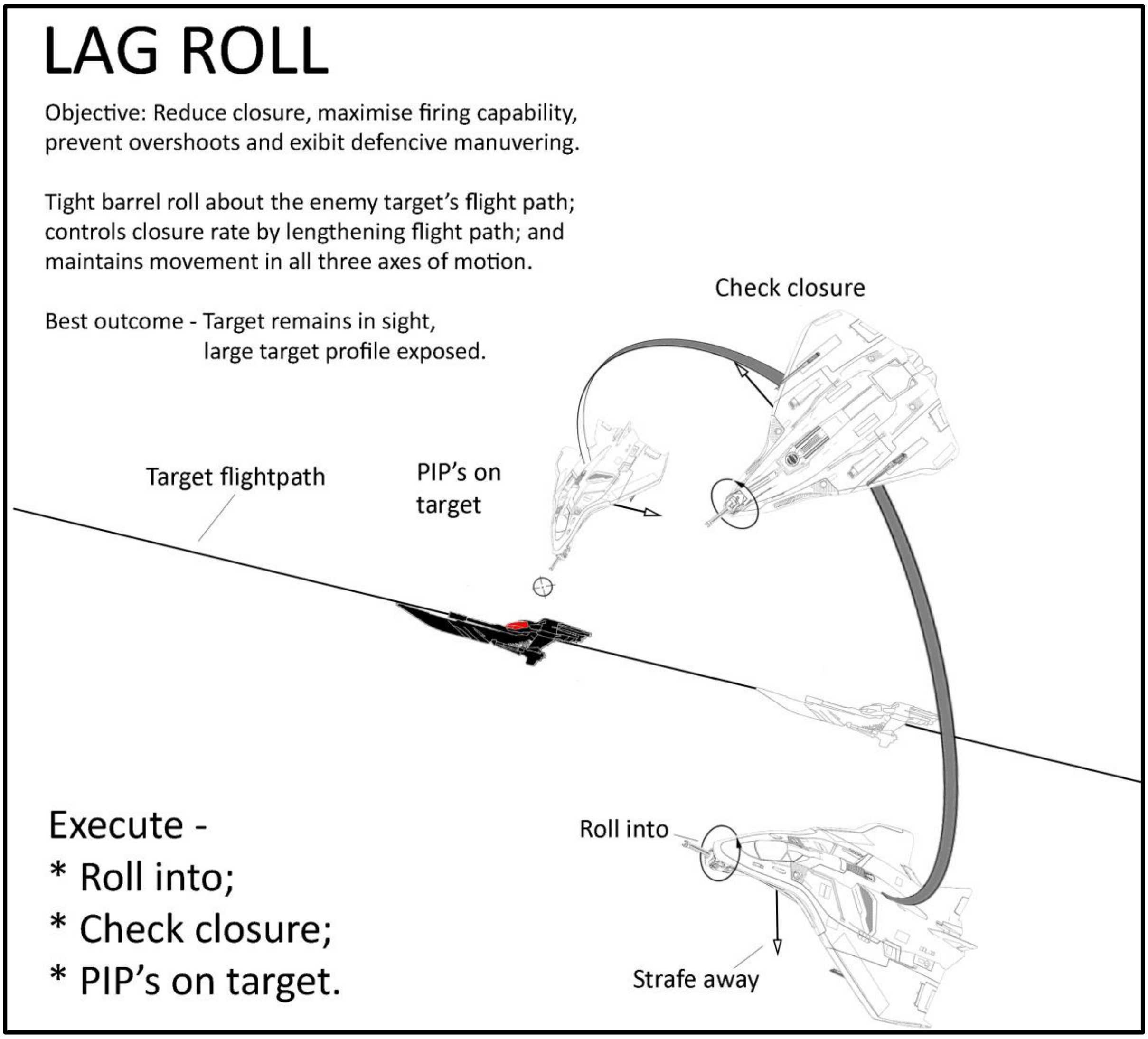

Figure 7-12 Lag roll

7.7.13. Lag reversal. The lag reversal is similar to a flat pirouette where the spacecraft maintains it's relative plane of motion and is an effective reversal when used to counter a high speed pass. The lag roll is executed by translating away from the oncoming target until the TVI is at approximately 45° from the nose of the spacecraft. At this point boost, roll, pitch and yaw into the targets direction of flight. When nearing the roll out point remove the lateral translation and re-acquire the target. The lag reversal has the advantage of speed maintenance, but has a high level of difficulty.

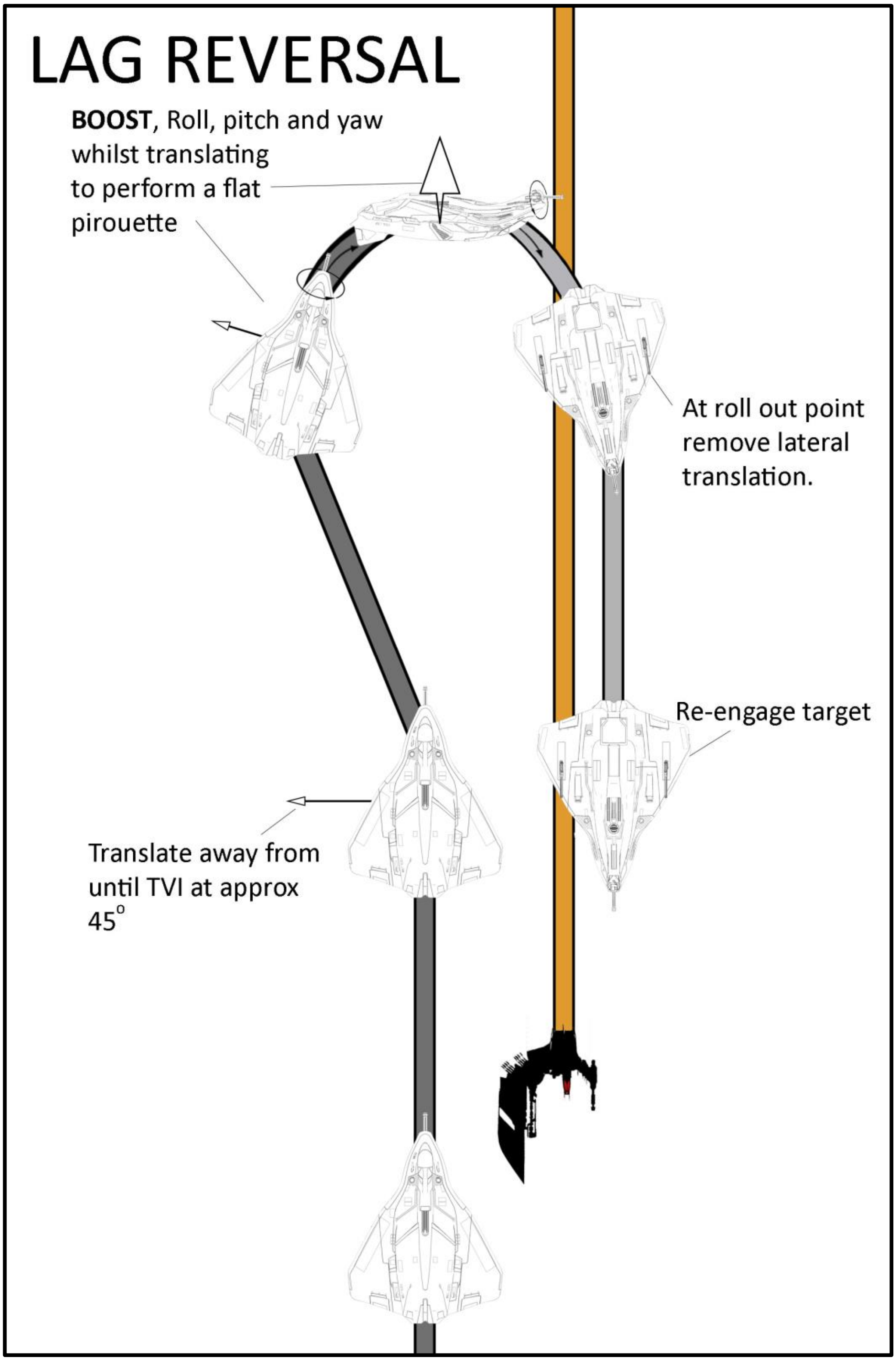

Figure 7-13 Lag reversal

7.7.14. Vertically Skidded (VS) Roll. The VS roll is an offensive manoeuvre that allows you to close on your target, keep your bore-sight cross on the target, whist manoeuvring defensively. Execute by rolling and translating vertically upwards, whilst maintaining the bore-sight cross on target. The VS roll is an offensive version of the barrel yaw.

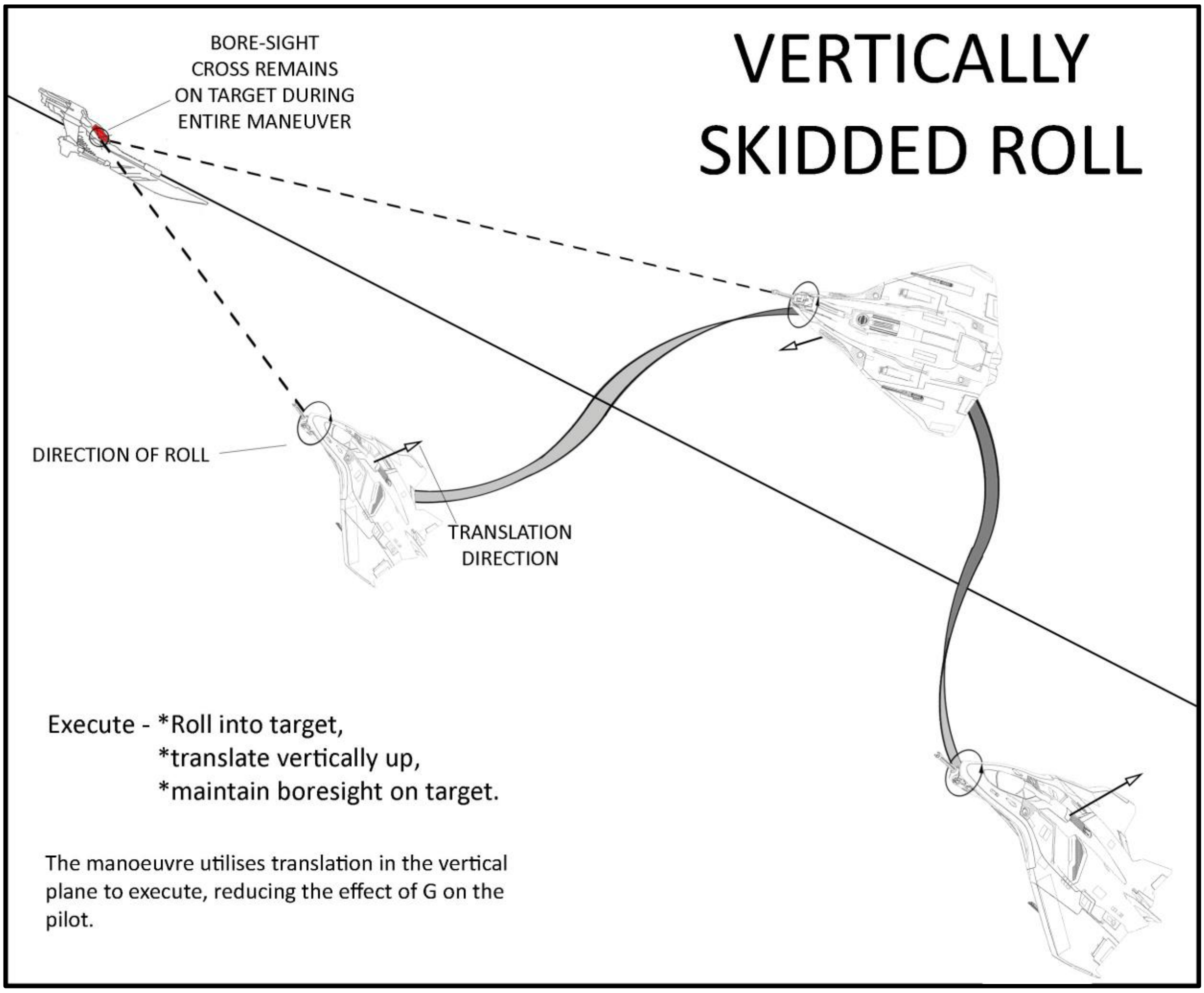

Figure 7-14 VS roll

7.7.15. Boom and Zoom. The boom and zoom refers to a high speed attack where by the attacker strafes by the intended target, firing at the closest point, and then escapes at high speed. Best practice in this manoeuvre is to maintain visual contact with the target at all times by facing the spacecraft toward the enemy. During the zoom phase, carry out defencive manoeuvres to defeat enemy engagement (see Zooms para 6.7.7). Best used against targets who are un-aware of, or ignoring you.

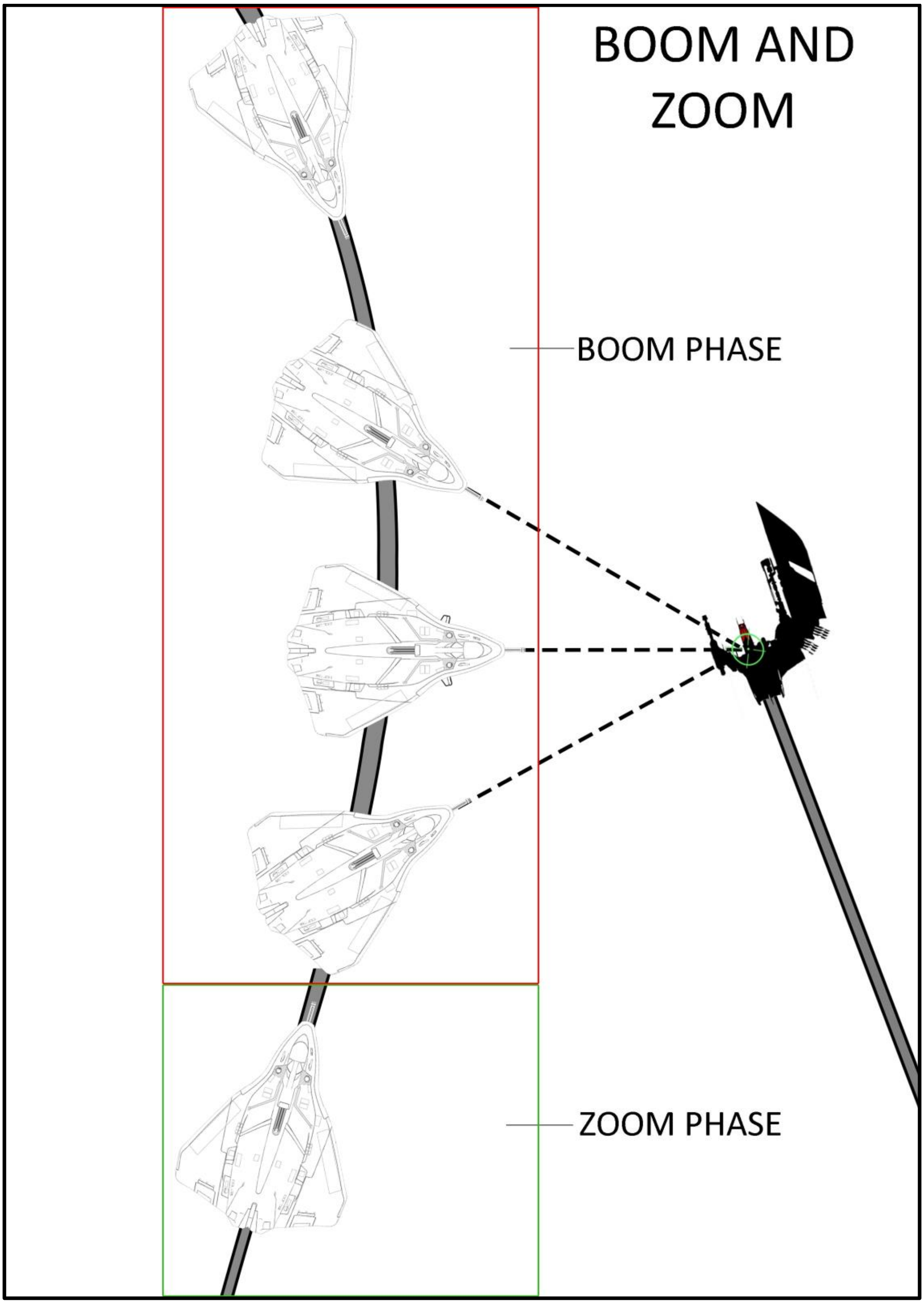

Figure 7-15 Boom and zoom.

7.7.16. Zooms. Zooms refer to a repositioning manoeuvre completed after an attack, or when separating from an area of engagement. Executing a zoom correctly will assist in confounding the enemy's targeting systems, making aiming more difficult for the enemy. In their simplest form zooms can take the form of a barrel roll or barrel yaw whilst translating away from your target. Always ensure to check aft (using the aft facing camera) during zooms when flying to prevent collisions with obstacles.

7.7.16.1. Barrel yaw escape (BYE) zoom. The BYE zoom is a tight barrel yaw whilst translating aft (translate aft, roll and yaw to barrel yaw). Increase the diameter of your flight path via roll as range increases to increase evasion effectiveness.

7.7.16.2. Arcing Zoom. The arcing zoom maintains a closer range to the target than the BYE zoom. The Arcing zoom is carried out by changing your direction and plane of movement by translating aft, translating left (or right). After a second of travel, jink yaw left (or right) to change direction.

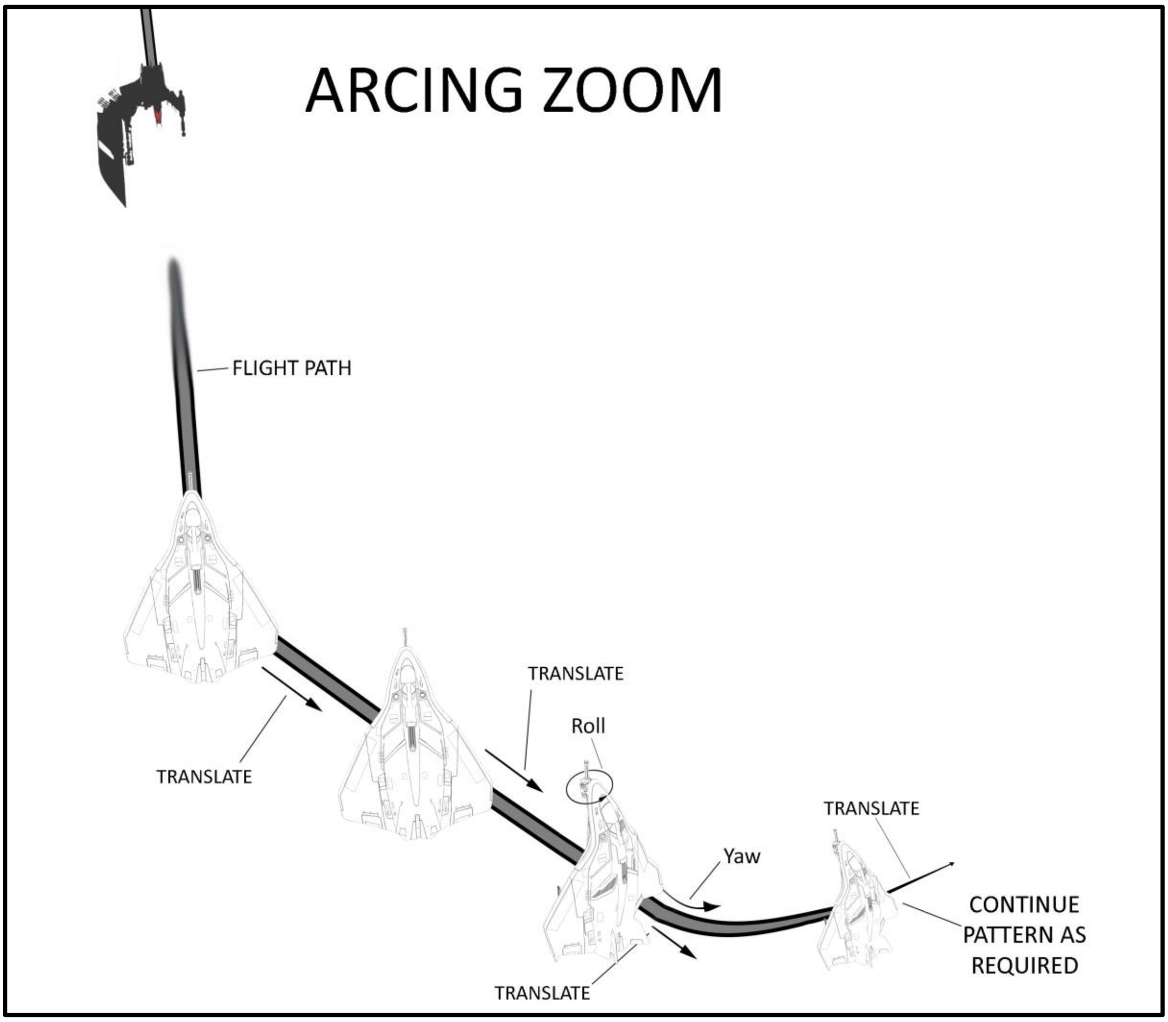

Figure 7-16 Arcing zoom

7.7.16.3. Vertically Skidded (VS) Zoom. The VS zoom is essentially executing the VS roll whilst translating aft. The VS zoom allows you to escape whilst maintaining your boresight cross on target to enable return of fire. By translating in the vertical plane instead of the lateral plane (as in BYE zoom) the effects of G are reduced.

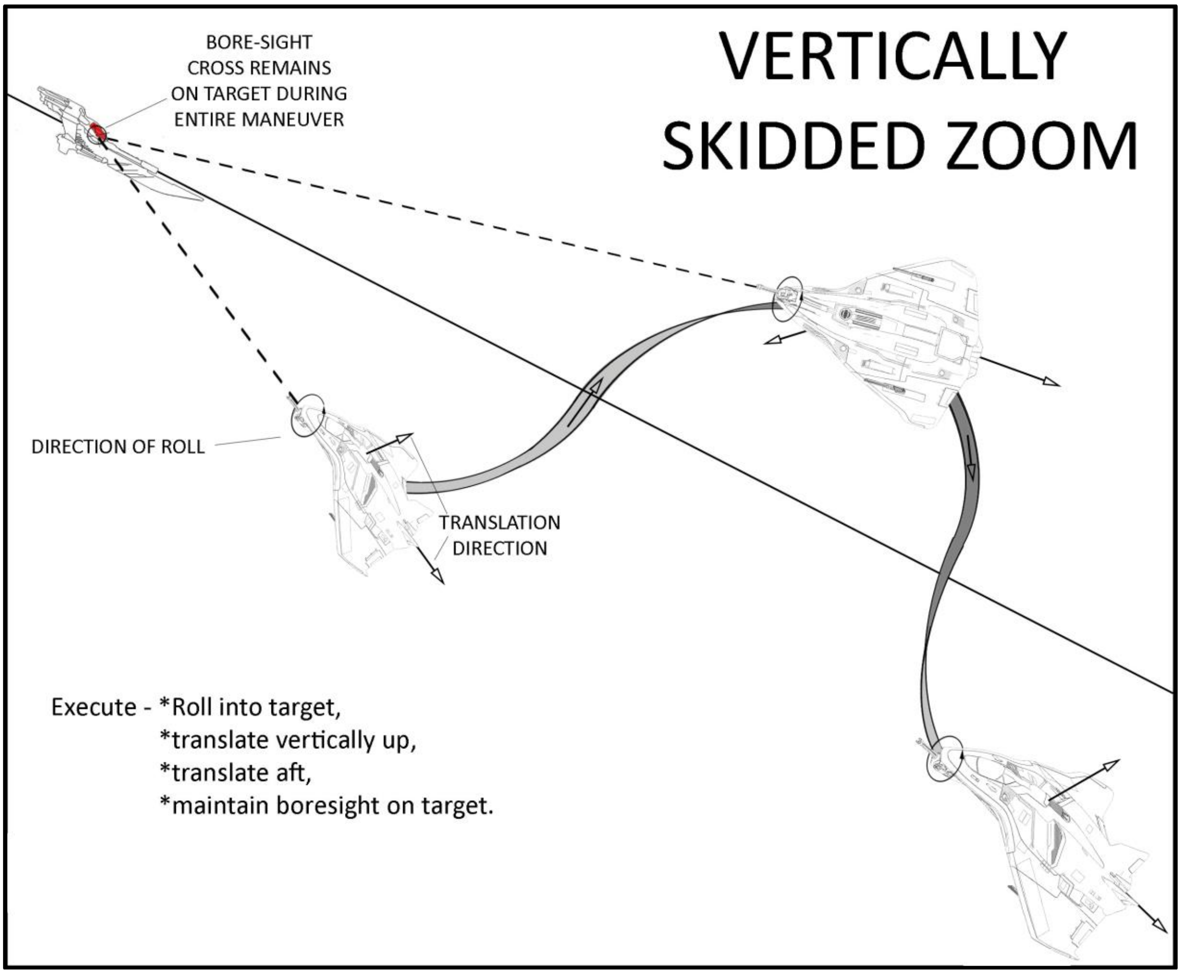

Figure 7-17 VS zoom

7.7.16.4. Missile evasion. Effective manoeuvring for defence from missile attack is essential to ensure survival. Employing countermeasures during maneuvering will increase their effectiveness. Upon detection of hostile missile launch (Visually, via the missile alert warning on the CVI, and/or audibly via alert tone), determine the location of the attacking missile via the CVI and TDAS. When you have located the missile, translate in the opposite direction of the missile's flight path. Pitch, roll and yaw to position the missile on your beam (90^o from the spacecraft's nose), either left or right. Utilise the TDAS to maintain missile location awareness. Maintain minimum vertical separation from the missile to present the minimum cross section possible. Maintain maximum forward speed via boost whilst rolling and yawing to maintain the missile abeam (with minimum vertical separation), and the missile flightpath perpendicular to the spacecraft flight path. This method forces the missile to bleed off velocity to make effective turns during pursuit.

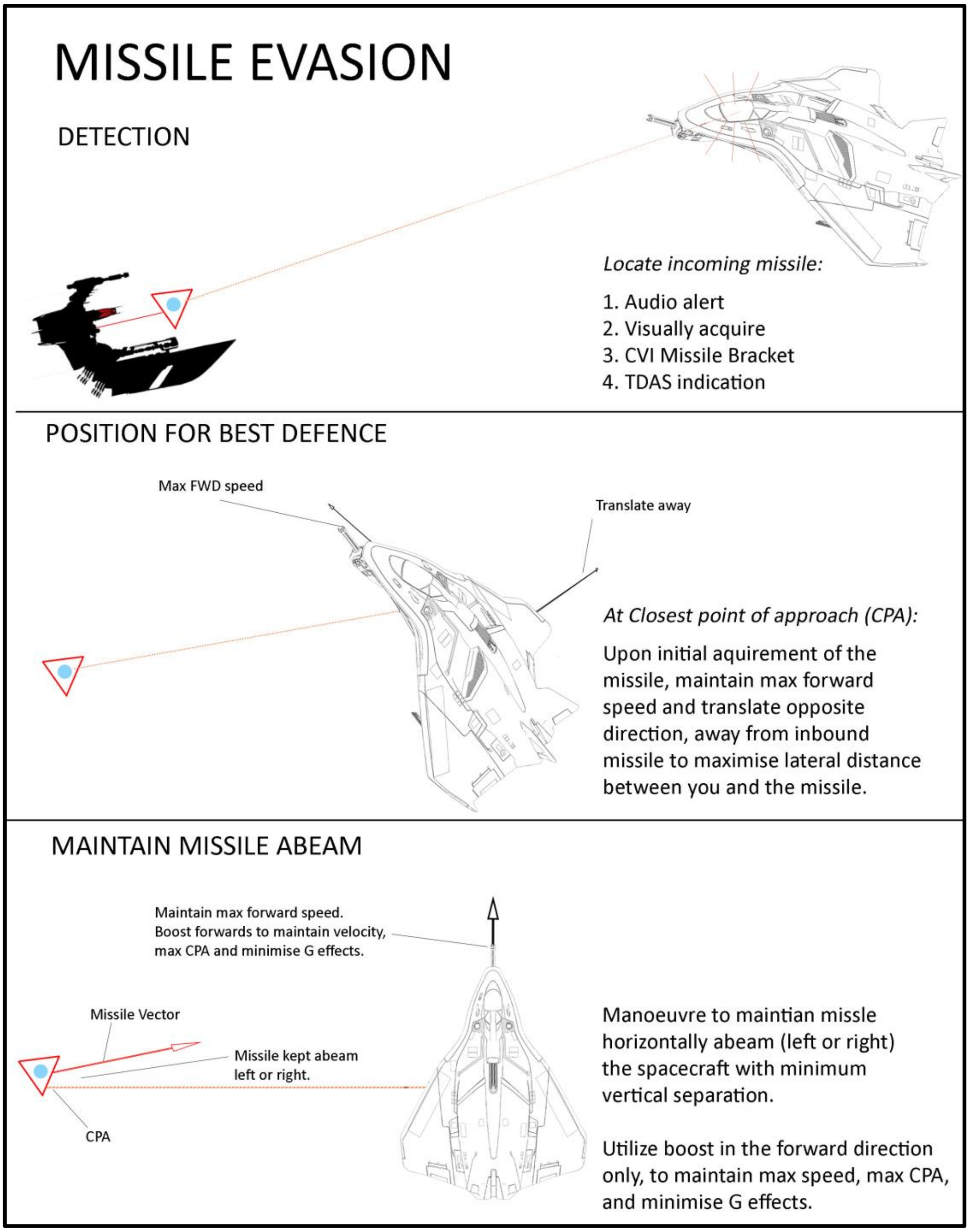

Figure 7-18 Missile evasion technique

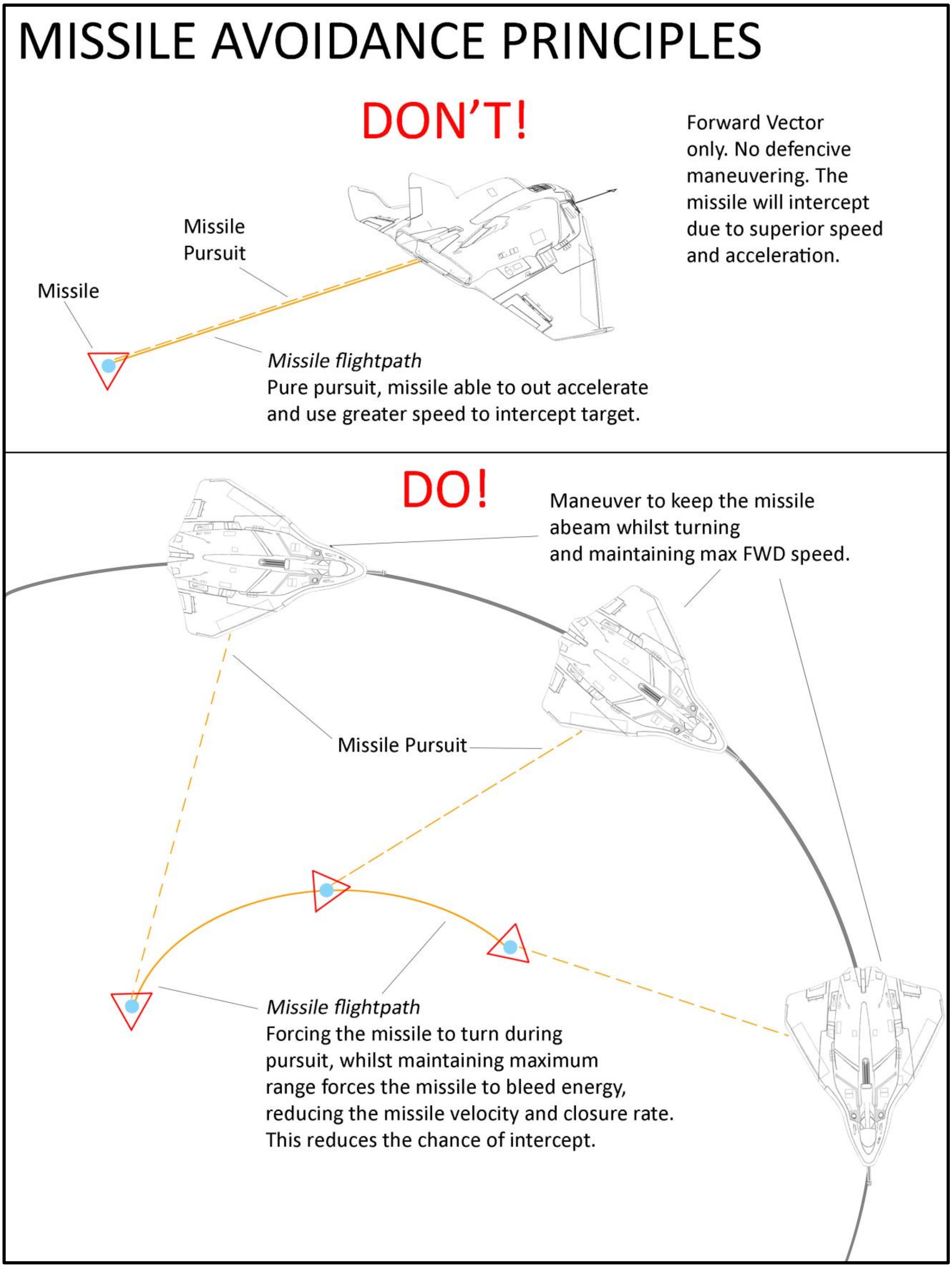

Figure 7-19 Missile avoidance principals.

7.7.17. Re-attacks. Re-attacks are aggressive manoeuvres that can be used to keep the target engaged in lieu of executing a zoom or blow through.

7.7.17.1. Decoupled reversal. To execute a decoupled reversal, carry out an instantaneous 180° turn after passing the target. Boost to recover any speed lost during the manoeuvre in the direction of the target. The decoupled reversal is a one dimensional manoeuvre and due to the 180° turn involved in the manoeuvre a large amount of speed will be lost, therefore this manoeuvre should only be considered when defence is not a primary concern.

7.7.17.2. Turning reversal. The turning reversal is a slightly more defensive reversal and simply requires that the spacecraft be turned back towards the passing target to re-engage. The turning reversal will result in a larger turning arc than the decoupled reversal, but will not result in the same amount of speed lost.

7.7.17.3. Buttonhook. Refer para 7.7.10.

7.7.17.4. Lag roll. The lag roll (covered in para 7.7.10) can be used to re-engage the target when reaching the CPA. Best used when yours and your targets velocity vector differ in direction by less than 90° (especially useful when passing your target in a high speed pass or "joust").

7.7.17.5. Lead roll. Refer para 7.7.11.

7.7.17.6. Lag reversal. Refer para 7.7.13.

7.7.18. Fence Check.

Certain items on your vessel should be checked to ensure that detection time is as long as possible when entering into a combat area. These checks should be carried out as a minimum, but is not necessarily comprehensive depending on mission requirements. Prior to entering into combat complete:

a) **F**ire control - **HOT**
b) **E**mitters – **CHECK SIGNATURE LEVELS**
c) **N**avigation - **SET**
d) **C**amera – **AS REQUIRED**
e) **E**xpendables – **CHECK QTY** (fuel, ammo, countermeasures, etc.)

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Chapter 8

Emergency Procedures

8.1. ANTI TUMBLING PROCEDURE

a) Throttles – **IDLE**
b) Spacebrake – **ON**
c) Boost – **ENGAGE**
d) When tumbling stops - **EXECUTE unusual attitude recovery procedures**
e) If unable to recover - **EJECT**

8.2. UNUSUAL ATTITUDE RECOVERY PROCEDURES

a) Manoeuvre craft to achieve most predictable flight path
b) Minimize control and power inputs as necessary
c) if unable to recover – **EJECT**

8.3. OUT OF CONTROL FLIGHT

a) Controls- **NEUTRALIZE**
b) Power control lever - **IDLE**
c) Flight instruments: attitude, altitude, airspeed, engine parameters **- CHECK**
d) If tumbling or unusual attitude as indicated by flight instruments - **EXECUTE ANTI TUMBLING OR UNUSUAL ATTITUDE RECOVERY PROCEDURES**
e) If time required to execute anti tumbling/unusual attitude procedures insufficient – **EJECT**

8.4. CONTROLLABILITY CHECK

Requirement: Malfunction, failure or damage to manoeuvring thrusters, main engine, or power plant which will degrade flight characteristics for approach and landing.

Purpose: To determine

- Whether to attempt approach or a controlled ejection.
- Safe landing configuration

a. Coordinate visual inspection from wingman/other friendly spacecraft (if possible)
b. Extend landing gear to check condition. If gear extends, do not retract.
  - If normal landing gear extension not possible – signal carrier for support/recovery ship

c. Check manoeuvring thruster operation via controllability check.
  - Perform slow yaw
  - Perform slow pitch
  - Perform slow roll

d. If controllability acceptable to attempt landing
  - Fly straight in approach

e. **If controllability unacceptable for landing**
- If possible – signal carrier for support/recovery ship
- If not possible – consider controlled ejection

8.5. COCKPIT SMOKE/FUME/FIRE ELIMINATION

a) Emergency oxygen - **ACTIVATE (BOTH)**
b) CABIN ATMOSPHERE switch – **DUMP**

If smoke, fumes, or fire persist

c) Power throttle - **ZERO**
d) Required electrical equipment - on, one component at a time. If smoke/fire starts again, secure that equipment.
e) If unable to clear smoke or fire – **EJECT**

8.6. HYPOXIA/LOW SUIT OXYGEN

a) Emergency Oxygen – **ACTIVATE**
b) Oxy system – **OFF**
c) Divert to nearest safe atmosphere immediately
d) Land as soon as possible

8.7. DISPLAY MALFUNCTION

If displays malfunction, attempt to restore power by cycling display power. If cycling does not fix the problem, secure display.

8.7.1. CVI/HUD Failure during landing. If HUD and/or CVI have failed before or during landing, declare a priority assistance needed (PAN) and advise carrier space traffic control (STC) of the problem. Utilise dead reckoning to align spacecraft with carrier landing deck, and carrier precision approach radar (PAR) tracking advice if available to achieve landing.

8.8. EJECTION

8.8.1. Immediate Ejection. For extreme emergency situations, the pilot shall immediately initiate ejection.

8.8.2. Controlled Ejection. If time and conditions permit:

1. Alert crewmember (if applicable)
2. Cockpit canopy – **ENSURE EJECTION PATH CLEAR OF OBSTRUCTIONS**
3. Follow radio distress procedures
4. Stow loose equipment
5. Cabin atmosphere – **DUMP**
6. Throttles – **IDLE**

8.8.3. Ejection Preparations.

EJECTION INJURIES AND BODY POSITIONING
THESE PROPER BODY POSITIONS MUST BE TAKEN TO PREVENT INJURIES

1. Press head firmly against the headrest
2. Elevate shin slightly (10^o)
3. Press shoulders back firmly against seat
4. Hold elbows and arms firmly towards sides
5. Press buttocks firmly against the seat back
6. Place thighs firmly against seat
7. Press outside of thighs against sides of seat
8. Place heels firmly on deck, toes on rudder pedals.

EJECTION INITIATION

Two Handed method -

1. Grip the ejection control handle with the thumb and at least two fingers on each hand, palms facing towards body. Keep elbows close to body.

Single Hand method -

1. Grip the ejection control handle with the master hand, palm towards body. Grip the wrist of the master hand with the other hand, palm towards body. Keep elbows close to body.

Both Methods –

2. Pull the handle sharply up and towards the abdomen, keeping elbows in. Ensure handle is pulled to the end of travel. Continue to hold handle until seat/pilot separation.

8.9. DITCHING

Duties before impact

1. Make radio distress call.
2. External stores **– JETTISON**
3. Landing gear **– UP**
4. Assume position for ditching – **FEET ON PEDALS, KNEES FLEXED**
5. Throttles - **OFF BEFORE IMPACT**

Duties after impact

1. Abandon spacecraft as soon as possible
2. Deploy survival kit
3. If ditching into water – **INFLATE LIFE RAFT**

A

Aborting/Abort/Aborted
Directive/informative call to cease action/attack/event/mission.
Action
Directive to initiate a briefed attack sequence or manoeuvre.
Active
An emitter is radiating**.**
Anchor/anchored
Orbit about a specific point; refuelling track flown by tanker
Informative call to indicate a turning engagement about a specific location.
Authenticate
To request or provide a response for a coded challenge.

B

Bandit
An aircraft identified as enemy, in accordance with theatre ID criteria. The term does not necessarily imply direction or authority to engage.
Beam/beaming
Target stabilized within 70 to 110 degree aspect; generally (direction) given with cardinal directions: east, west, north, or south.
Bent
System indicated is inoperative.
Bingo
Minimum fuel state needed for aircraft to return to base (aka "recovery").
Proceed/am proceeding to specified base (field) or carrier
Blank
A suppression of enemy air defences (SEAD) aircraft does not detect any emitters of interest.
Blind
No visual contact with friendly aircraft/ground position; opposite of visual.
Blow through
Directive/informative call that indicates aircraft will continue straight ahead at the merge and not turn with target/targets.
Blue on blue
Friendly fire, inadvertent hostile engagement between allies.
Bogey
A radar or visual air contact whose identity is unknown.
Bogey dope
Request for target information as briefed/available.
Break (direction)
Directive to perform an immediate maximum performance turn in the direction indicated; assumes a defensive situation.
Breakaway
Tanker or receiver directive call indicating immediate vertical and nose/tail separation between tanker and receiver is required.

Broke lock
Loss of radar/infrared (IR) lock-on (advisory).
Bruiser
Friendly air-launched anti-capitol ship missile (e.g. torpedo).
Buddy lock
Locked to a known friendly aircraft.
Bugout
Separation from that particular engagement/attack/operation; no intent to (direction) re-engage/return.
Buzzer
Electronic communications jamming.

C

Cap/capping
Directive call to establish an orbit at a specified location. An orbit at a specified location.
Captured
Crew has identified and is able to track a specified air-to-ground (A/G) target with an on-board sensor.
Cease
In air defence, break the engagement on the target specified. Missiles in flight engagement will continue to intercept.
Cease fire
Do not open fire and/or discontinue firing; complete intercept if weapons are in flight; continue to track.
Chicks
Friendly aircraft.
Clean
No radar contacts on aircraft of interest. No visible battle damage. Aircraft not carrying external stores.
Cleared
Requested action is authorized (no engaged/support roles are assumed).
Cleared hot
Ordnance release is authorized.
Closing
Decreasing in range.
Come off
Directive to manoeuvre as indicated to either regain mutual support or to (left/right/deconflict flight paths for an exchange of engaged and supporting roles; low/dry) implies both visual and tally.
Commit/committed
Fighter intent to engage/intercept; controller continues to provide information.
Contact
Sensor contact at the stated position. Acknowledges sighting of a specified reference point.
Cover/covering
Directive/informative call to take Surface/Air action or establish an air-to-air (A/A) posture that will allow engagement of a specified target or threat.
Cut-off
Request for, or directive to, intercept using cut-off geometry.

D

Dead stick
Lost all propulsive power due to engine shutoff.
Defensive/defending
Aircraft is in a defensive position and manoeuvring with reference to an active threat.
De-louse
Directive to detect and identify unknown aircraft trailing friendly aircraft.
Deploy
Directive to manoeuvre to briefed positioning.
Divert
Proceed to alternate mission or base.

E

Echelon
Groups/contacts/formation with wingman displaced approximately 45 degrees behind leader's 3/9 (o'clock) line, see Echelon formation.
Engaged
Manoeuvring with the intent to kill; this implies visual/radar acquisition of target.
Estimate
Provides estimate of the size, range, height, or other parameter of a specified contact; implies degradation.
Extend
Short-term manoeuvre to gain energy, distance, or separation; normally with the (direction) intent of re-engaging.
Eyeball
Fighter with primary visual identification responsibility. Normally followed by ( ) number of aircraft observed.

F

Faded
Radar contact is lost.
FENCE (in/out)
Set cockpit switches as appropriate prior to entering/exiting the combat area (mnemonic for fire-control system/ECM/navigation/communication/Emitters).
Fox (number)
Simulated/actual launch of fighter-to-fighter weapons.

- ONE – cross section guided missile.
- TWO - infrared-guided missile.
- THREE – electro-magnetic guided missile.

Friendly
A positively identified friendly contact.

Fur ball
A turning fight involving multiple aircraft with known bandits and friendlies mixed.

G

Gate
Directive/informative call to fly as quickly as possible, using afterburner/maximum power.
Gorilla
Large force of indeterminate numbers and formation.
Go secure
Use encrypted voice communications.
Grand slam
All hostile aircraft of a designated track (or against which a mission was tasked) are shot down.
Green (direction)
Direction determined to be clearest of enemy air-to-air activity.
Group
Radar targets within approximately 6 kilometres of each other.
Guns
A craft-to-craft or air-to-surface gunshot.

H

Hard (direction)
High-G, energy-sustaining turn.
Head/head on
Target headed directly towards.
Heads up
Alert of an activity of interest.
Heavy
A group or package known to contain three or more entities.
High
Targets detected above the TDAS galactic plane.
Holding hands
Aircraft in visual formation.
Hold fire
An emergency fire control order used to stop firing on a designated target, to include destruction of any missiles in flight.
Home plate
Home airfield or carrier.
Hook (left/right)
Directive to perform an in-place 180-degree turn.
Hostile
A contact identified as enemy upon which clearance to fire is authorized in accordance with theatre rules of engagement.

I

Id (pronounced eye dee)
Directive to identify the target. Identification accomplished, followed by type.

J

Joker
Fuel state above BINGO at which separation/bugout/event termination should begin.

K

Kill
Clearance to fire.
Knock it off
Directive to cease air combat manoeuvre /attacks/activities.

L

Lead-trail
Tactical formation of two contacts within a group separated in range or following one another.
Leaker(s)
Airborne threat has passed through a defensive layer. Call should include amplifying information.
Line abreast
Two contacts within a group side by side.
Locked
Final radar lock-on.
Lost contact
Radar contact lost.
Lost lock
Loss of radar/IR lock-on (advisory).
Low
Target detected below the TDAS galactic plane.

M

Marshal/marshalling
Establish/established at a specific point.
Medium
Target approximately in line with the TDAS galactic plane.
Merge/merged
Information that friendlies and targets have arrived in the same visual arena. Call indicating radar returns have come together.
Monitor
Maintain radar awareness on or assume responsibility for specified group.

Mother
Parent ship.
Music
Electronic radar jamming. (On air interdiction (AI) radar, electronic deceptive jamming.)

N

No joy
Aircrew does not have visual contact with the target/bandit/landmark; opposite of tally.

O

Off (direction)
Informative call indicating attack is terminated and manoeuvring to the indicated direction.
Offset
Informative call indicating manoeuvre in a specified direction with reference to (direction) the target.
On station
Informative call unit/aircraft has reached assigned station.
Opening
Increasing in range.

P

Package
Geographically isolated collection of groups/contacts/formations.
Padlocked
Informative call indicating aircrew cannot take eyes off an aircraft or a surface position without risk of losing tally/visual.
Pince/pincer
Threat manoeuvring for a bracket attack.
Playmate
Cooperating aircraft.
Playtime
Amount of time aircraft can remain on station.
Post attack
Directive transmission to indicate desired direction after completion of (Direction) intercept/engagement.
Post hole
Rapid descending spiral.
Press
Directive to continue the attack; mutual support will be maintained. Supportive role will be assumed.
Pump
A briefed manoeuvre to low aspect (where aspect refers to target position—regardless of distance—relative to the friendly aircraft's nose; "high aspect" would be on an azimuth in front of the friendly, while "low aspect" would indicate position along an azimuth behind the friendly) to stop closure on the threat or geographical boundary, with the intent to re-engage.
Pure
Informative call indicating pure pursuit is being used or directive to go pure pursuit.

Pushing
Departing designated point.

R

Reported
Identification of an object or a contact by an intelligence system. (Type)
Reset
Proceed to a pre-briefed position or area of operation.
Resume
Resume last formation/station/mission ordered.
Rifle
Air-to-ground missile launch.
Ripple
Two or more munitions released or fired in close succession.
Roger
Message understood, acknowledged
Rolex (±time)
Time-line adjustment in minutes from planned mission execution time. (Positive is later).

S

SAM (direction)
Visual acquisition of a SAM (surface-air missile) or SAM launch; should include position.
Sandwiched
A situation where an aircraft/element is positioned between opposing aircraft/elements.
Scram
Emergency directive to egress for defensive or survival reasons. (Direction)
Scramble
Take-off as quickly as possible.
Separate
Leave a specific engagement; may or may not re-enter.
Shadow
Follow indicated target.
Shooter
Spacecraft/unit designated to employ ordnance.
Skip it
Veto of fighter commit, usually followed with further directions.
Snap (direction)
An immediate vector to the group described.
Sour
Equipment indicated is operating inefficiently.
Spin
Directive/informative call to execute a pre-briefed timing/spacing manoeuvre.
Splash
(A/A) Target destroyed.
(A/G) Weapons impact.

Split
An informative call that a flight member is leaving formation to engage a threat; visual may not be maintained.
Spoofing
Informative call that voice deception is being employed.
Status
Request for tactical situation.
Sweet
Equipment indicated is operating efficiently.
Switch/switched
Indicates an attacker is changing from one aircraft to another.

T

Tally
Sighting of a target, bandit, bogey, or enemy position; opposite of no joy.
Target
Directive to assign group responsibility to aircraft in a flight.
Targeted
Group responsibility has been met.
Threat
Untargeted hostile/bandit/bogey within pre-briefed range/aspect of a (direction) friendly.
Tiger
Enough fuel and ordnance to accept a commit.
Tracking
Fire control system has solid lock on target (aka a "stabilized gun solution"). Contact heading.
Trailer
The last aircraft within a group(s).
Trashed
Informative call that missile has been defeated.
Tumbleweed
Indicates limited situational awareness; no joy, blind; a request for information.

U

Unable
Cannot comply as requested/directed.

V

Vampire
Hostile anti-capitol ship missile (torpedo).
Very high
Approximately directly vertically above the formation on TDAS.

Visual
Sighting of a friendly aircraft/ground position; opposite of blind.

W

Warning (colour)
Hostile attack is
- RED imminent or in progress.
- YELLOW probable.
- WHITE improbable (all clear)

Weapons (followed by appropriate modifier below)
- Fire only :- return fire if fired upon;
- FREE :- at targets not identified as friendly in accordance with current rules of engagement (ROE);
- TIGHT :- at targets positively identified as hostile in accordance with current ROE;
- SAFE.

What luck
Request for results of missions or tasks.
What state
Report amount of fuel and missiles remaining. Ammunition and oxygen are reported only when specifically requested or critical.
- Active = number of active radar missiles remaining.
- Radar = number of semi-active radar missiles remaining.
- Heat = number of IR missiles remaining.
- Fuel = pounds of fuel or time remaining.

Wilco
Will comply
Winchester
No ordnance remaining.

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