NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-1290 (NEW 07-22)**

FLIGHT TRAINING INSTRUCTION

FIGHTER INTERCEPTS
T-45 STRIKE

2022

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250 LEXINGTON BLVD SUITE 179
CORPUS CHRISTI TX 78419-5041

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1. CNATRA P-1290 (NEW 07-22),"Flight Training Instruction, Fighter Intercepts Strike T-45" is issued for information, standardization of instruction and guidance to all flight instructors and student aviators within the Naval Air Training Command.

2. This publication is an explanatory aid to the T-45 Strike curriculum and shall be the authority for the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via the electronic Training Change Request (TCR) form located on the CNATRA website.

T. P. ATHERTON
By direction

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FLIGHT TRAINING INSTRUCTION

FOR

FIGHTER INTERCEPTS

T-45 STRIKE

P-1290

Written By:

Major Craig "Hippie" McClure
and
LCDR Douglas "Sausage" DeVuono

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INTERIM CHANGE SUMMARY

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CHANGE NUMBER	REMARKS/PURPOSE

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INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

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FIGHTER MISSIONS AND HISTORY

100. INTRODUCTION

The primary purpose of the air combat role of the fighter aircraft is to obtain and sustain air superiority over contested airspace. To successfully accomplish this, fighters must be able to execute an intercept in such a manner as to:

1. Attain a position in space between the attacking aircraft and the defended force.

2. Control the intercept geometry to achieve an optimal weapons Launch Acceptability Region (LAR) and deny an enemy Weapon Engagement Zone (WEZ). This is done to maximize the probability of kill (P_k), while simultaneously preventing the enemy from achieving an employment opportunity.

3. Kill the adversary pre-merge Beyond Visual Range (BVR) or arrive at the merge (if required) with an advantage, either in position and/or in energy, and use Basic Fighter Maneuvering (BFM) Within Visual Range (WVR) to deter or destroy the adversary.

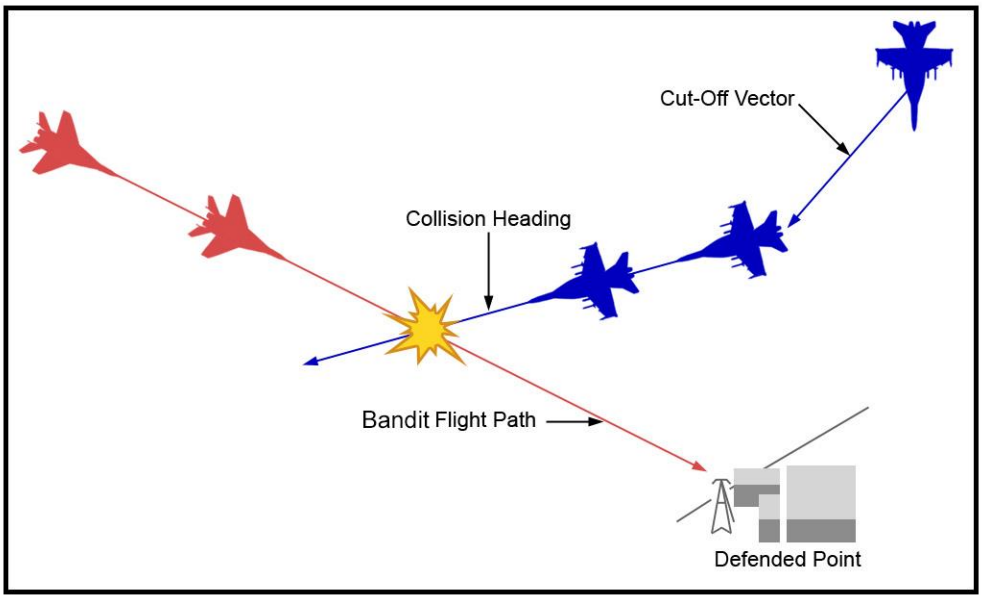

Figure 1-1 Fighter Purpose

101. MISSION PLANNING FACTORS

Each battle space will have unique factors that must be considered to achieve mission success. Since World War I, the necessity for air superiority to win major conflicts has been undisputed. Some of the requirements to gain air superiority include, but are not limited to:

1. Enemy and own force capabilities
2. Rules of Engagement
3. Geographic area
4. Fuel considerations and logistics
5. Terrain
6. Weather
7. Geopolitical environment
8. Acceptable Level of Risk (ALR)

102. INTERCEPT GEOMETRY

Normally, there are two primary methods that a fighter may use to close on a bandit:

1. Establish a cutoff vector in order to obtain positional advantage
2. Establish a collision course

A cutoff vector is one that will place the interceptor in a position between the bandit and the defended force. A collision course is a vector that will allow the fighter to close on the bandit in the fastest possible manner.

103. TYPES OF INTERCEPTS

There are three types of pursuit curves flown during the intercept: Pure Pursuit, Lead Pursuit, and Lag Pursuit.

Pure Pursuit

Pure pursuit is a type of pursuit resulting from keeping the adversary directly off the nose (0° ATA). By keeping the threat directly off the nose, an unobserved fighter will eventually align fuselages. Depending on the geometry initially generated, increasingly harder turns may be required to achieve a position at the bandit's six o'clock.

Pure pursuit (Figure 1-2) may be used to:

1. Fire a forward quarter missile.

2. Increase closure and decrease range to the target.

3. Minimize radar cross-section.

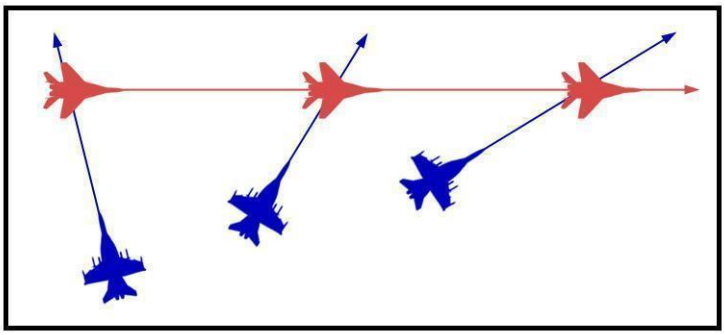

Figure 1-2 Pure Pursuit

Lead Pursuit

Lead pursuit achieved by the fighter placing their nose in front of the bandit's nose. The amount of lead is how far in front of the bandit's nose the fighter is pointing. A collision intercept is a form of lead pursuit.

Lead pursuit (Figure 1-3) may be used to:

1. Fire a forward quarter missile.

2. Increase closure and decrease range to the target.

3. Allow for a gun solution in the rear quarter.

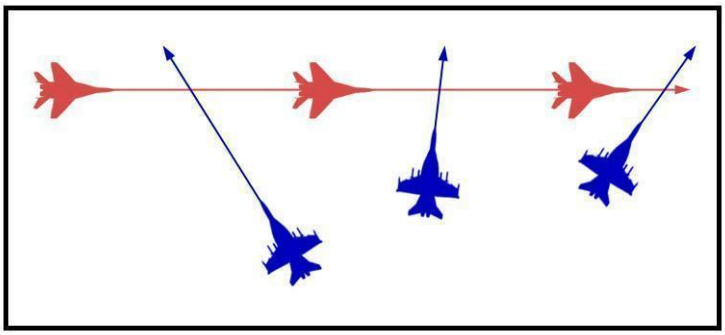

Figure 1-3 Lead Pursuit

Lag Pursuit

Lag pursuit is a situation where the fighter places his nose behind the bandit. The fighter can increase or decrease the amount of range and closure based on how aft the fighter keeps their nose behind the bandit.

Lag pursuit (Figure 1-4) may be used to:

1. Extend range in the rear quarter to complete a sidewinder missile solution.

2. Decrease closure and potentially increase range.

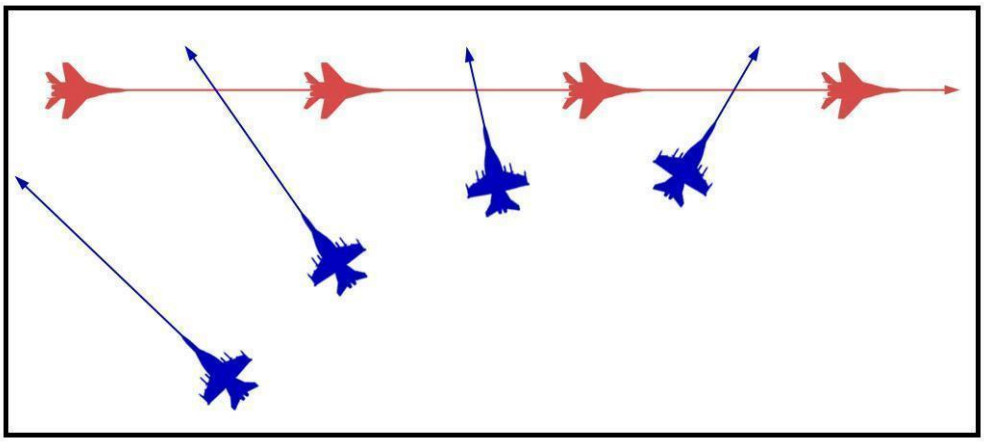

Figure 1-4 Lag Pursuit

104. NAVAL STRIKE FIGHTER MISSIONS

VFA Mission

The VFA Strike Fighter Mission is to provide combat ready fighter assets to conduct carrier based, all-weather, attack, fighter, and support missions as required by the Carrier Air Wing Commander, Strike Group Commander, or higher authority. The missions include Precision Strike, Close Air Support (CAS), Forward Air Control (Airborne) (FAC(A)), Offensive Counter Air (OCA), Defensive Counter Air (DCA), Reconnaissance (Recce), Surface Surveillance Coordination (SSC), and Aerial Refueling.

Descriptions of these missions are as follows:

1. **Precision Strike** – The employment and delivery of Laser, TV, IR, or GPS guided weapons to destroy pre-planned enemy targets with a high probability of destruction.

2. **Close Air Support** – Air support by fixed-wing and/or rotary-wing aircraft against hostile ground targets which requires detailed integration with the Ground Combat Element (GCE) via a Joint Terminal Attack Controller (JTAC) or Forward Air Control-Airborne (FAC(A)).

3. **Forward Air Control (Airborne)** – Working closely with the ground commander, FAC(A) is a mission in which specially qualified fighter aircrew may issue Close Air Support instructions (via a 9-Line) to airborne assets, directing them to targets potentially in close proximity to ground forces. The fighter aircrew may also authorize these assets to release weapons, call for indirect fire assets (i.e., artillery, mortars, naval gunfire) to fire into an area of operation, and control the airborne assets in holding stacks, ensuring there aren't any de-confliction issues in the battlespace.

4. **Offensive Counter Air (OCA)** – Using fighters to project air superiority over a contested airspace.

5. **Defensive Counter Air (DCA)** – Using fighters to defend a high value asset or point of interest through air superiority (i.e., the carrier strike group).

6. **Airborne Reconnaissance** – Gathering intelligence through airborne imagery of points of interest.

7. **Surface Surveillance Coordination (SSC)** – Gathering intelligence for early warning against threats to the battle group as well as engaging enemy surface vessels.

8. **Aerial Refueling –** Refueling other aircraft through tanking in support of aircraft carrier operations. With such a wide range of missions, the F/A-18 E/F must be able to carry multiple types of weapons to achieve mission success. Just some of weapons the aircraft is capable of employing are displayed in Figure 1-5.

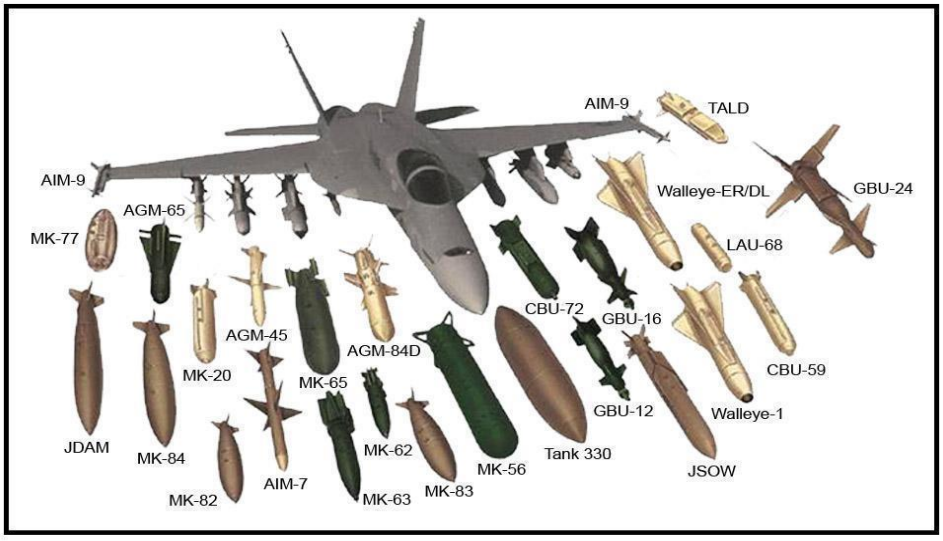

Figure 1-5 F/A-18E/F Weapons

VMFA Mission

The VMFA mission is to support the MAGTF Commander by providing supporting arms coordination, conducting multi-sensor imagery reconnaissance, and destroying surface-targets and enemy aircraft day or night under all-weather conditions during expeditionary, joint or combined operations.

Marine Corps F/A-18 A+/C squadrons do not have supporting arms coordination or multi-sensor imagery reconnaissance missions. These two missions are what set VMFA(AW) squadrons apart.

105. COUNTER AIR MISSIONS

Offensive Counter Air (OCA)

Offensive Counter Air (OCA) is defined as any mission designed to project air superiority over a contested airspace. Examples of this mission include fighter sweep, strike screen, suppression of enemy air defense (SEAD), airfield pin downs, and land grabs. The specifics of these missions will be covered further in the FRS.

Figure 1-6 F/A-18E Performing OCA

OCA Mission Planning Factors (MPF) include but are not limited to: Acceptable Level of Risk (ALR) as defined by Commander's guidance, Rules of Engagement (ROE), type and number of targets, collateral damage potential, integrated air defenses, friendly assets, time of day, weather, terrain, and fuel availability.

Defensive Counter Air

DCA is defined as all defensive measures designed to detect, identify, intercept, and destroy or negate enemy forces attempting to attack or penetrate the friendly air environment. DCA is often referred to as a point or area defense. Point defense is for a specific asset, such as the aircraft carrier or downed aircrew. Area defense is for a broader geographic protection, such as a geopolitical border.

DCA Mission Planning Factors (MPF) include but are not limited to: Acceptable Level of Risk (ALR) as defined by Commander's guidance, Rules of Engagement (ROE), point or area defense, mobility of the defended asset (e.g., aircraft carrier), type and number of enemy forces, friendly asset availability, time of day, and weather.

106. FIGHTER HISTORY

The history and evolution of fighter aircraft dates from the early years of World War I and continues to present-day fighters. While the machines and weapons have undergone evolutionary and revolutionary changes demanding ever-increasing technical expertise, the aggressive and professional spirit of fighter pilots has remained constant.

Post-Vietnam

The post-Vietnam era marked the beginning of the Fourth-Generation fighters. Examples of these include the F/A-18, F-16, F-14, and F-15. Emphasis on speed, sophisticated weapons systems, reduced detection capability, counter measures, infra-red, night vision, and stealth, are just a few of the technologies incorporated with the Fourth-Generation fighters.

Figure 1-7 F-35B Lightning II - Marine Corps STOVL Version

Another important aspect of Fourth-Generation combat aircraft is the emphasis on multi-mission capability. Not only is the ability to have multi-mission, real-time flexibility a tremendous force multiplier, but it also reduces the production and maintenance costs to operate these aircraft. The tradeoff for this flexibility and cost savings are a diminished ability to be truly superior in any one role.

The F-35 Lightning (Figure 1-7) and F-22 Raptor marked the beginning of the Fifth-Generation fighters in the U.S. inventory. These aircraft differ from Fourth-Generation fighters in their unprecedented integration of mission systems. These new systems allow the pilots to avoid or engage threats as soon as they are detected, possibly without the threat knowing the fighter is present.

107. CONCLUSION

As T-45C students who will soon move on to the FRS, it is important to begin your mastery of aerial warfare with a solid foundation as presented in the T-45C Fighter Intercept syllabus. As you move on to the FRS and eventually the fleet, you will need to not only master your understanding of each mission set depicted here, but also your specific airframe's role in a much larger war.

CHAPTER TWO
AIR INTERCEPT CONTROL

200. INTRODUCTION

While fighter aircraft are capable of generating Situational Awareness (SA) through onboard sensors, they benefit from and often require the SA produced by off-board sensors as well. Fighter pilots are part of an integrated team that includes Air Intercept Control (AIC) systems and system operators that work with the fighters to create a complete air picture. This complete picture is communicated to all members of the team via detailed and disciplined communications standards to ensure the proper management of airborne threats. Strike fighter pilots must understand the capabilities, limitations, and roles of the intercept control system.

201. BASIC AIC RADAR

An AIC is the person trained to provide communications, radar direction, and cueing (which they term control) to fighter aircraft during an intercept. Controllers are thoroughly versed on established control procedures, combat performance of aircraft, fuel consumption data, aircraft ranges with respect to remaining fuel, vectoring aircraft, and passing information between the command and control authorities and intercepting aircraft.

Both the Air Intercept Controller and the function of Air Intercept Control use the acronym AIC. When pilots discuss AIC, they are referring to both the systems and the people in place to provide the AIC function. AIC provides an operational picture of the airspace of concern as well as a communication conduit to other command and control nodes throughout the battle space.

Unlike the shorter-range fire control radars equipped on the fighters, AIC typically use long-range radars. These systems usually rotate through 360 degrees in their scan pattern at a low rate. Due to a combination of mechanical and radar theory limitations, the long-range acquisition capability comes at the cost of lower resolution. However, using both onboard and off-board radar information to build the complete air picture, fighters are able to effectively consummate air intercepts.

202. AIC SYSTEMS

AIC radars may be surface or air based. The E-2 Hawkeye is the Navy's carrier-based aircraft designed to provide Air Intercept Control. (Figure 2-1).

E-2C/D Hawkeye

The E-2 Hawkeye is the carrier-based Airborne Early Warning (AEW) platform with a 24-foot diameter saucer-shaped radome housing the APS-145 or APY-9 radar. The E-2C/D Hawkeye can detect, track, and control multiple aircraft simultaneously. The Hawkeye crew is also responsible for the command-and-control coordination of surface and air warfare assets. E-2C/D Hawkeyes are assigned to VAW squadrons in each carrier air wing (CVW).

Figure 2-1 E-2C/D Hawkeye

Surface-Based AIC

In addition to E-2 aircraft, there are a number of ship and land-based radars used for AIC functions. Whether onboard ships or on land, intercept controllers use radars to create a combined air picture for airborne assets. You will learn more about aerial, ship, and land radar capabilities in the FRS.

CHAPTER THREE
FIGHTER SYSTEMS AND WEAPONS

300. INTRODUCTION TO RADAR

Fighter pilots will gain a comprehensive understanding of radar theory during training at the FRS and continue to build on this for their career. This FTI will present the most basic radar concepts to understand for training in the T-45 Fighter Intercept syllabus, and then tie them into timeline development and practical application. Most of the detailed information about military radars is classified, and therefore will not be included in this FTI.

Radar (Radio Detection and Ranging) is a detection system that uses radio waves to determine the distance (range), angle, and velocity of objects. It can be used to detect aircraft, ships, motor vehicles, weather formations, and terrain. A radar system consists of a transmitter producing electromagnetic waves in the radio or microwaves domain, a transmitting antenna, a receiving antenna (often the same antenna is used for transmitting and receiving) and a receiver and processor to determine properties of the object(s). Radio waves from the transmitter reflect off the object and return to the receiver, giving information about the object's location and speed.

Fighters want to detect targets at the longest range possible. However, there is always a trade-off between the ability to scan a large area of airspace and detecting targets at long ranges. The radar transmitters only have a finite amount of power, so fighters are constantly assessing how to best use that power while running an intercept. Prior to meld (discussed in Chapter 4), fighters will prioritize sanitization (discussed in Chapter 4), meaning they will use the radar's available power to scan a wide area of airspace, usually prioritizing looking on the backside of mountain peaks and in valleys below them. This is because they need to be able to detect any threats that may be "hiding" from AIC radars via use of terrain, jamming, etc. Once the fighters are approaching a portion of the timeline in which weapon employment takes priority, the flight lead will select which flight member they want to re-prioritize radar power to longer range detection of a specific threat via a targeting call. The fighter with targeting responsibility will then reallocate radar power from sanitizing a large area, to scanning a very small three-dimensional space via listening to information provided by AIC and executing complex switchology in the cockpit.

Once radar SA is obtained, a fighter has very accurate and timely information about a target's speed, altitude, range, and aspect. Modern radars can also track multiple targets at once, whether they are close together (parade formation), or miles apart. After gaining radar SA, assessing the information provided by the radar, and comparing what they see to information provided by AIC, fighters can correlate a radar contact they see, confirming that it is the same group AIC is talking about, and with weapons release authorized (via a *"Hostile"* declaration), they may employ.

301. INTRODUCTION TO LINK-16

Link-16 (a.k.a - MIDS, L-16), is a secure, jam-resistant, high-speed digital data link that uses members within a network to create and propagate the network, making it a self-contained data link network with extended line-of-sight capabilities. With Link 16, military aircraft as well as

ships and ground forces may exchange their tactical picture in near-real time. Link 16 also supports the exchange of text messages and imagery data, and provides two channels of secure digital voice.

While the T-45C does not have L-16 capability, it is recommended as you progress through the fighter intercepts syllabus to keep in mind this capability and how it will affect everything from flight admin, to formation options, to employment considerations.

302. INTRODUCTION TO AIR-TO-AIR MISSILES

As with most industries, technological innovation has played a critical role in making today's air-to-air missiles extremely lethal. This technological evolution affected everything from unguided rockets to long-range air-to-air missiles with internal radar systems. It is imperative fighter pilots understand the capabilities of modern air-to-air weapons and how to employ them. Understanding the enemy's capabilities is also critical, and those capabilities are briefly highlighted in [Paragraph 308]. This chapter will focus primarily on the history and components of both the AIM-9 and AIM-120 air-to-air missiles.

303. AIR-TO-AIR MISSILE HISTORY

The end of WWII and its aftermath marked a period of furious innovation in air-to-air missile development. The AIM-9 missile project was initiated in the early 1950s and the production models entered operational service in 1956. The late 1960's witnessed the innovation of active missiles with the advent of the AIM-120 AMRAAM, carried on today's U.S. tactical Strike Fighters.

304. AIM-9 SIDEWINDER

The AIM-9 Sidewinder is a short-range, all-aspect, heat-seeking missile. The Sidewinder has proven itself to be the Within Visual Range (WVR) weapon of choice for U.S. and Coalition forces due to its simplicity, reliability, and high probability of kill. Since the missile's inception in the early 1950s, the Sidewinder has seen vast improvements in its basic design. The AIM-9X is the latest version of the Sidewinder family. This extremely capable weapon will be introduced in later training at the FRS. The comm brevity used when launching a heat-seeking missile is *"Fox-2."*

305. AIM-9 DESIGN

The AIM-9 is a small, lightweight, extremely maneuverable missile. The Sidewinder has four major sections: guidance, fuse, warhead, and rocket motor.

Physical Characteristics

Refer to Figure 3-1 for physical characteristics.

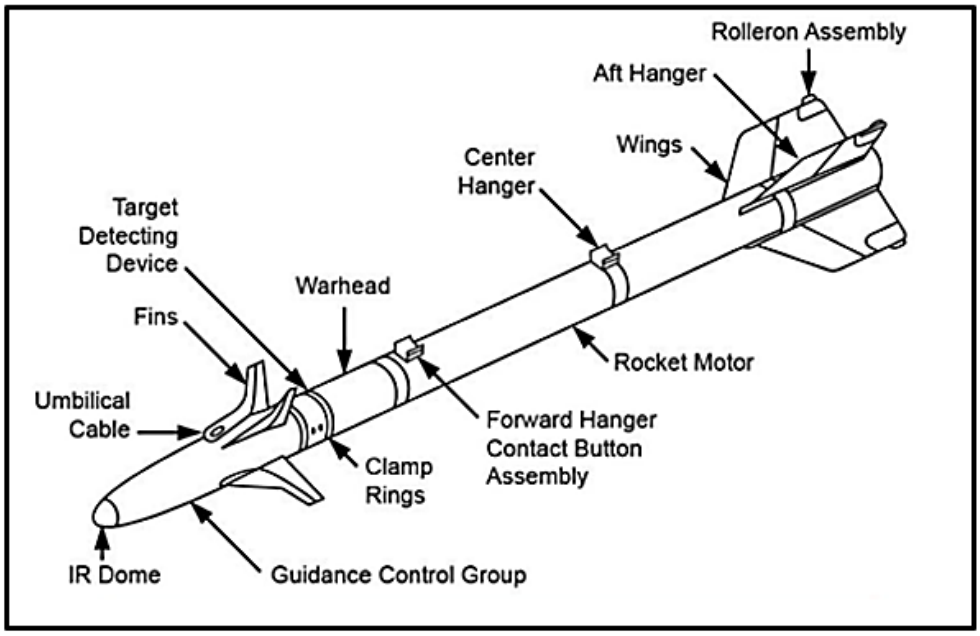

Figure 3-1 AIM-9 Sidewinder

Guidance and Control

The guidance and control section consists primarily of an IR seeker head that is cooled by compressed nitrogen and contains indium antimonide (InSb), which makes it very sensitive to IR emissions.

Target acquisition is indicated by a sharp tone in the pilot's helmet. The tone increases in intensity as the target approaches the center of the seeker head field of view. The missile is guided by the deflection of the 4 forward fins that are pneumatically controlled by a gas generator ignited at launch.

Fuse

The AIM-9 utilizes two types of fusing mechanisms, contact, and proximity. The contact fuse feeds a firing pulse to the warhead upon missile impact. The proximity fuse is a laser-optical system that detects when the missile is within a lethal range, sending a firing pulse to the warhead.

The Sidewinder employs a safe and arm device that senses missile launch and will not allow the warhead to arm until the missile is safely ahead of the firing aircraft.

Warhead

The AIM-9L/M has an annular blast fragmentation (ABF) warhead consisting of a high explosive encased by titanium rods and a zirconium disk. The titanium rods penetrate an aircraft's skin, and the zirconium disk fragments will set fire to any combustible material.

Rocket Motor

The Mk-36 rocket motor produces 2,880 pounds of thrust for a relatively short burn time that accelerates the AIM-9 to multiple Mach above the launch aircraft's airspeed. The "smokeless" motor leaves only a thin wisp of smoke in its trail, which would ideally be imperceptible to the enemy.

306. AIM-120 AMRAAM

The Advanced Medium-Range Air-to-Air Missile (AMRAAM) is the replacement for the aging AIM-7 Sparrow. The AIM-120 provides an all-weather, beyond-visual-range (BVR) capability to allied fighters. The new missile is faster, smaller, and lighter, and has improved capabilities against low-altitude targets. It also incorporates a datalink to guide the missile to a point where its active radar aids in the terminal intercept of the target. An inertial reference unit and micro-computer system make the missile less dependent upon the fire-control system of the aircraft. Once the missile closes in on the target, its active radar guides it to intercept. This feature, also sometimes referred to as "fire-and-forget", frees the fighters from the need to further provide guidance, enabling the fighters to aim and fire several missiles simultaneously at multiple targets and break a radar lock after the missile seeker goes active, at which point the missiles will guide themselves to the targets. The comm brevity used when launching an active air-to-air missile is *"Fox-3."*

307. AIM-120 DESIGN

The AMRAAM has four major sections: guidance, fuse, warhead, and rocket motor. Its appearance is similar to that of an AIM-7 Sparrow.

Physical Characteristics

Refer to Figure 3-2 for physical characteristics.

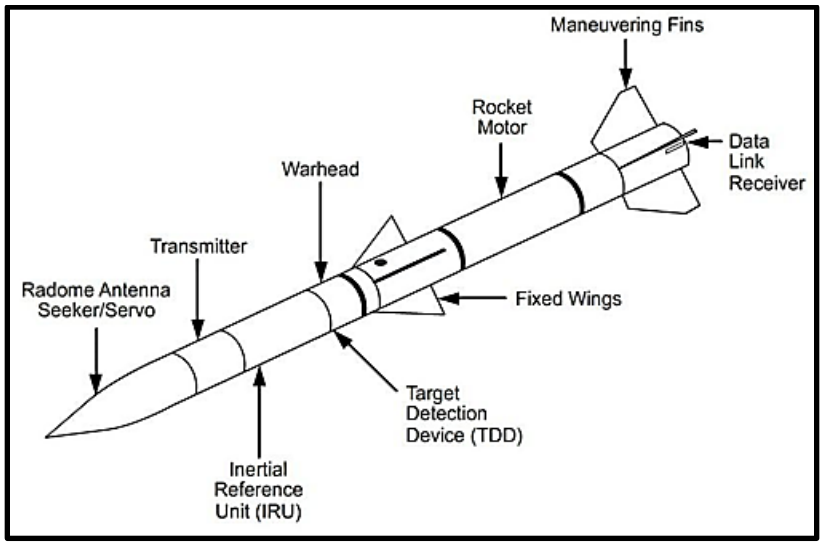

Figure 3-2 AIM-120 AMRAAM

Guidance and Control

At medium to short ranges, advanced tracking techniques allow any fighter carrying the AMRAAM to have simultaneous multi-target capability. The AMRAAM is also an active-missile, meaning that it has the capability to track, guide, and fuse on targets using guidance systems internal to the missile. Once the missile has reached a certain distance from the threat aircraft, the missile will become active and have the ability to guide and fuse on its own.

Fuse

Like the AIM-9, the AIM-120 also has a safe and arm mechanism that delays arming of the missile for the safety of the firing aircraft. The AMRAAM also uses a laser scanning device to aid in fusing and increase probability of kill.

Warhead

The AIM-120 employs a 50 pound annular blast fragmentation (ABF) warhead that explodes into thousands of tiny fragments. Although one third smaller than the warhead of its predecessor (the AIM-7M Sparrow), the AMRAAM utilizes higher density gases to propel fragments more explosively than the Sparrow.

Rocket Motor

The AMRAAM has a high-impulse motor giving rapid acceleration to many Mach above aircraft Mach number. The rocket motor is designed to produce very little smoke to aid in reducing the launch signature.

308. MODERN THREAT CAPABILITIES AND RECOGNITION

Leading up to the Vietnam War, the advent of beyond visual range (BVR) missiles meant that fighter pilots assumed they would no longer have to identify and execute BFM against aircraft they were engaging. This approach proved to be fatally flawed. During the Vietnam conflict, Navy and Marine F-4 fighter pilots found themselves having to visually identify many aircraft prior to engagement. This requirement negated their BVR advantage and resulted in the rebirth of dog fighting.

Aircraft recognition is a required skill for fighter pilots. Being able to visually identify aircraft is a starting point. In follow-on training, you will be required to associate sensors and weapons systems with particular aircraft and sub-models in order to better prepare and brief your mission. The farther out an aircraft can be detected, recognized, and identified, the more time fighter pilots have available to make an engagement decision. However, in the air, identification can be difficult as many aircraft share design features.

Aircraft Identification Fundamentals

All aircraft are built with the same basic elements, recalled as Wings, Engines, Fuselage, and Tail (WEFT) (Figure 3-3):

WEFT Features			
Wings	Engines	Fuselage	Tail
Type Position Slant Shape Taper	Type Number Location Intakes Exhausts	Shape Nose Mid Rear Cockpit Special	Location Slant Number Shape

Figure 3-3 WEFT Identification Chart

The WEFT features are unique to each aircraft and will assist fighter pilots with positive identification. The key to applying these features in visual recognition is studying aircraft and knowing what the NATO identifications are for the aircraft being identified. Pilots need to invest ample amounts of time on-deck studying aircraft from all corners of the globe.

Friendly aircraft that fighter pilots should be able to identify include, but are not limited to:

1. F-15E Strike Eagle
2. F-16C Fighting Falcon
3. F/A-18A+/C/D Hornet
4. F/A-18E/F Super Hornet and E/A-18G Growler
5. F-35 Lightning II
6. E-2C/D Hawkeye
7. E-3 Sentry
8. KC-10 Extender

Conversely, fighter pilots should be able to identify potential enemy aircraft that include, but are certainly not limited to:

1. F-4 Phantom II

2. F-5 Tiger

3. F-14A Tomcat

4. Mirage 2000

5. MiG-21 Fishbed

6. MiG-29 Fulcrum

7. Su-27/30/35 Flanker

8. J-11 Flanker

9. J-10 Firebird

All the above aircraft are good starting places to begin to build a library of knowledge for aircraft identification. When studying, use the WEFT features as the means to discriminate between aircraft and properly identify them.

Threat Air-to-Air Missiles

Being able to neutralize and defeat enemy weapons, and their supportive systems, begins with fighter pilots being able to identify and understand these weapons and their capabilities.

These missiles fall into three categories: Semi-Active Radar, Active Radar, and Infra-Red.

1. Semi-Active Radar (SAR) Guided BVR Missiles. SAR missiles require continuous radar support information from the host aircraft radar system for terminal guidance. Examples include the Matra Super 530, Super 530D, and RS-AA-10a/c "ALAMO" (Figure 3-4).

Figure 3-4 ALAMO (left) and Super-530 (right)

2. Active Radar (AR) Guided BVR Missiles. AR missiles are able to support themselves with internal radar and do not require information from the host aircraft for terminal guidance. Examples include the RS-AA-12a/b "ADDER," CH-AA-7A ADZE, MBDA MICA, and MBDA Meteor (Figure 3-5).

Figure 3-5 MBDA Meteor with Ramjet Intakes

3. Infra-Red Guided WVR Missiles. IR missiles use heat signature from targeted aircraft for guidance. These missiles are widely proliferated and are generally considered shorter-range and/or Within Visual Range (WVR) weapons. Examples include the Matra R550 Magic, Rafael Python III, IV and V, RS-AA-8a/b "APHID," and the RS-AA-11a/b "ARCHER" (Figure 3-6).

Figure 3-6 MiG-29 with A/A Missiles

Threat Surface-to-Air Missiles

In addition to recognition and understanding of airborne threats, fighter pilots need to be familiar with and understand the types of surface-to-air threats that may potentially impact mission accomplishment.

The following surface-to-air missiles (SAMs) and Air Defense Artillery (ADA) are lethal and require pilot knowledge to neutralize and defeat.

1. Man Portable Air Defense Systems (MANPADS). MANPADS are typically shoulder fired rockets with IR guidance.

2. Command Guided Radar Surface to Air Missiles (SAM). Command guidance is equivalent to radio control of the missile. The missile itself has no seeker and is told where to fly to intercept the target by signals from the launching system.

3. Semi Active Radar Homing SAMs. Semi-Active Radar Homing missiles use an internal seeker to detect and guide on the reflected energy from a tracking radar or target illuminator.

4. Air Defense Artillery (ADA). ADA is any weapon system above 12.7 mm (.50 caliber) specifically designed to engage airborne targets.

5. Mobile and Integrated Systems. Mobile systems are designed to accompany troop formations and provide for local air defense, mobile ADA systems are also well deployed worldwide. Integrated air defense systems (IADS) combine the capabilities of multiple systems through a command and control infrastructure greatly increasing the IADS Commander's overall lethality.

309. CONCLUSION

This chapter provided a historical perspective of the development of air-to-air missiles, an in-depth analysis of the designs of the AIM-9 and AIM-120, and an overview of threats to fighter pilots. Strike fighter pilots must know the characteristics and capabilities of both their own air-to-air weapons, and their enemies.

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CHAPTER FOUR
FUNDAMENTALS OF FIGHTER INTERCEPTS

400. INTRODUCTION

In order to execute fighter intercepts, it is imperative to understand the concept of an Air-to-Air Timeline. This timeline is the foundation of all actions taken by fighter pilots during an intercept. In this chapter, we will explore timeline development and use this process as a vessel in which to explain the intricacies behind numbers presented on an intercept timeline. The intercept timeline will drive everything from geometry and formation considerations to employment mechanics.

401. INTERCEPT TERMS

In order to discuss intercept timelines, a vocabulary of intercept terminology must be established. These terms include:

In order to facilitate training with the systems onboard the T-45C, some of these terms have been modified from their original definition.

1. **Air-to-Air Timeline** – A sequence of ranges between fighters and a threat that determine the actions fighters must take in order to successfully intercept a target. Ranges are from the fighter to the threat, and are usually derived from either AIC communications or information displayed on a radar display. In the T-45C syllabus, the ranges will be from the fighters to the active waypoint or offset.

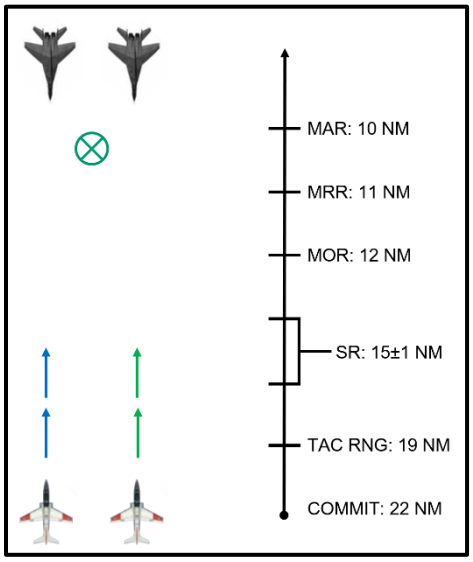

Figure 4-1 Air-to-Air Timeline

2. **Target Aspect (TA)** – Angle between threat heading and the bearing from the threat to the fighter (Figure 4-2).

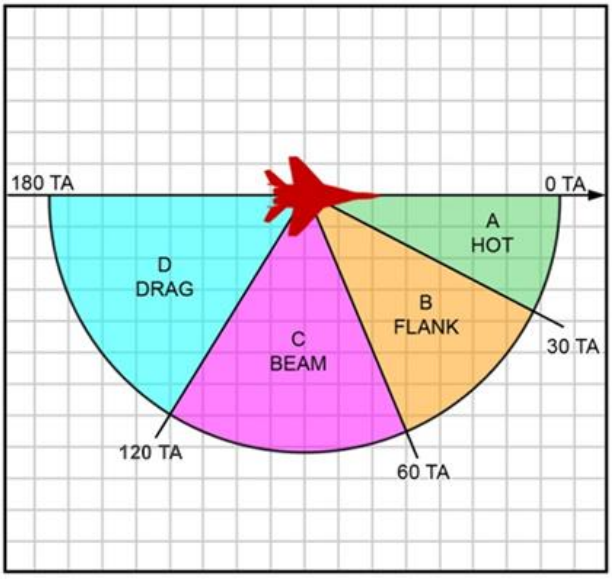

Figure 4-2 Target Aspect

3. **Antenna Train Angle (ATA)** – Angle between fighter's heading and the bearing to a threat (Figure 4-3).

4. **Rate of Closure (Vc)** – Speed in Knots that a fighter and threat are moving towards each other (Figure 4-3).

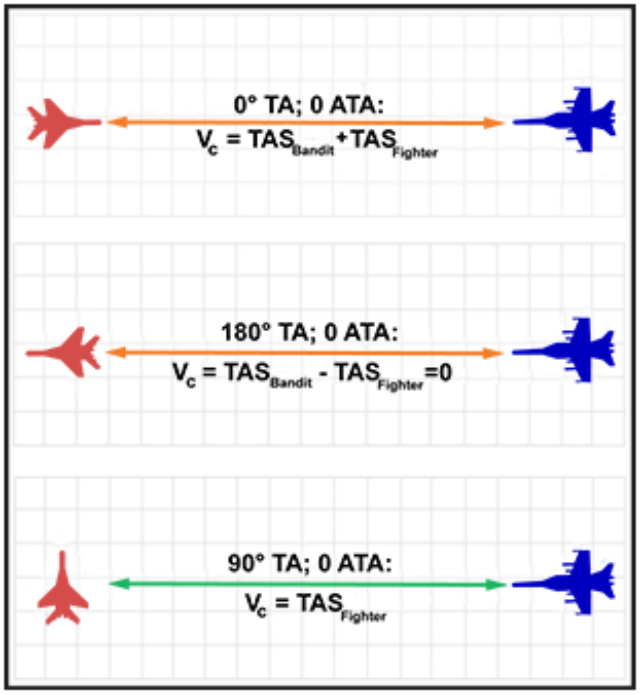

Figure 4-3 ATA / Vc Relationship

4-2 FUNDAMENTALS OF FIGHTER INTERCEPTS

5. **Drag Defense** – A defense designed to kinematically defeat threat missiles by placing the threat at the fighter's 6 o'clock and flowing cold.

6. **Cold Ops** – The time and/or tasks to be executed after a drag defense and prior to a recommit while the fighters are flowing cold.

7. **Minimum Abort Range (MAR)** – The minimum range at which fighters can execute a drag defense and kinematically defeat threat missiles. Does not provide for a recommit.

8. **Minimum Recommit Range (MRR)** – Assessed during and executed from cold ops. The minimum range that fighters can execute a 140 degree turn towards the threat, correlate, shoot, and execute a defense at MAR.

9. **Minimum Out Range** – The range at which fighters may execute a drag defense which kinematically defeats threat missiles and preserves the opportunity for a recommit.

10. **Crank** – A maneuver designed to slow down an intercept and manage closure. In the T-45C, we will crank at 30 degrees ATA.

11. **Shot Range** – A range (±1) at which fighters shall employ.

12. **Meld** – The actions taken to shift from a sanitization role to an employment role. Usually involves manipulating fighter radars. In the T-45C, meld will be accomplished by selecting Bullseye Reference Point 1 (BE1) and boxing O/S.

13. **Sanitization** – The act and mindset of prioritizing fighter's sensors for detecting targets that may be hidden from AIC's radar (by terrain, electronic attack, etc.)

14. **Targeting** – The range at which a flight lead will issue targeting responsibility to the flight. Targeting responsibility includes melding, maintaining SA to the threat, employing, and owning the timeline to the targeted group. Often implies that other aircraft in the flight will not have SA to the targeted group because they are sanitizing.

15. **Tactical Range** – A preparatory range that warrants a call from AIC letting fighters know they are at a pre-briefed range from the threat. Allows fighters time to issue targeting, accelerate to employment airspeeds, gain radar SA to the threat, and employ at the Shot Range.

16. **Commit** – Usually depicted on a timeline as a No Later Than Commit range. The act of taking responsibility for initiating an intercept on a picture (group or multiple groups). The decision to commit is usually based on commit criteria which are derived from mission objectives and mission planning factors that are beyond the scope of this FTI.

402. LAUNCH ACCEPTABILITY REGION

The launch acceptability region, or LAR, is a three-dimensional volume of airspace around a fighter in which it can employ weapons. LARs are often depicted in a two-dimensional top down view that is only valid at the stated altitude and airspeeds (Figure 4-4).

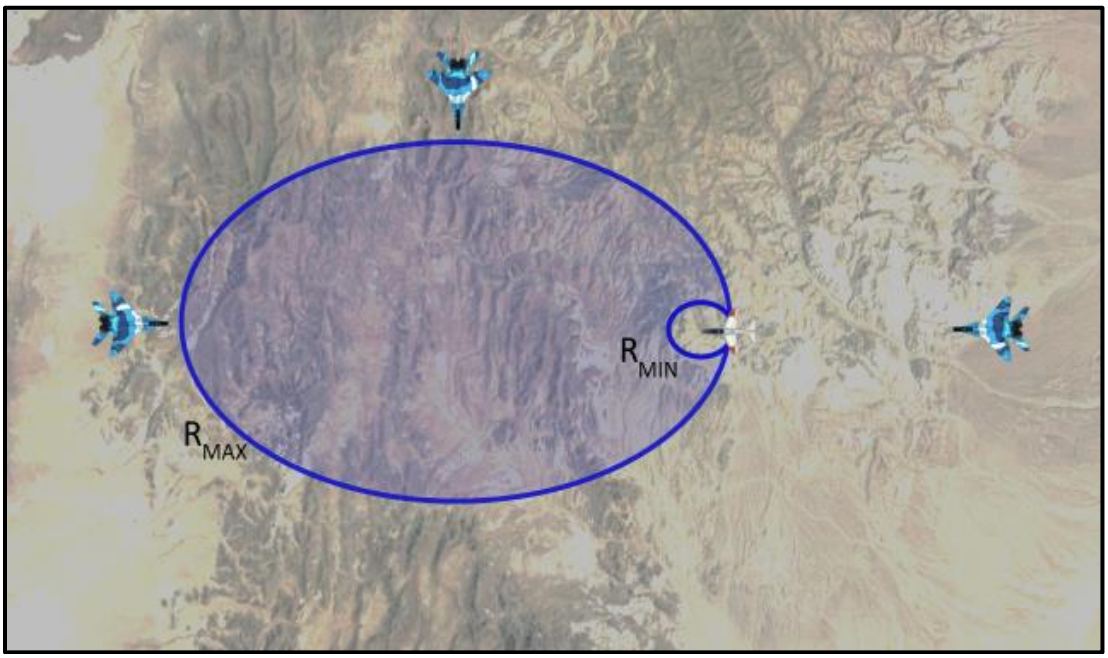

Figure 4-4 Two Dimensional LAR Representation

The fighter will maneuver in altitude, airspeed, and heading in order to achieve the best weapon solution for their opponent. The LAR is largest (i.e., longest R_{MAX}) with 0 TA at high airspeed and high altitude, and is smallest (i.e., shortest R_{MAX}) in the rear quarter at low altitude and low airspeed.

Additional Terminology and Definitions

1. R_{MAX}: Maximum range of an air-to-air missile. The maximum range from which an A/A missile can be fired and reach its target given the current target and fighter conditions (Vc, aspect, altitude, etc.)

2. R_{NE}: No escape range of an air-to-air missile. The range at which a launched missile will have the energy and maneuverability to intercept the target regardless of the target's post launch maneuvering.

3. R_{MIN}: Minimum range of an air-to-air missile. The shortest range a missile can be launched, acquire the target, and fuse its warhead on the target.

4. WEZ: Weapon Engagement Zone. The three-dimensional volume of airspace around a threat aircraft in which he can employ (Figure 4-5).

4-4 FUNDAMENTALS OF FIGHTER INTERCEPTS

LAR vs. WEZ

The fighter's LAR is dynamic based on parameters of airspeed, altitude, aspect, and closure. The bandit's WEZ expands and contracts, just like the fighter's LAR, based on changing flight parameters. As you can imagine, understanding the enemy's weapons capability and how the various parameters affect their WEZ is critical for survival.

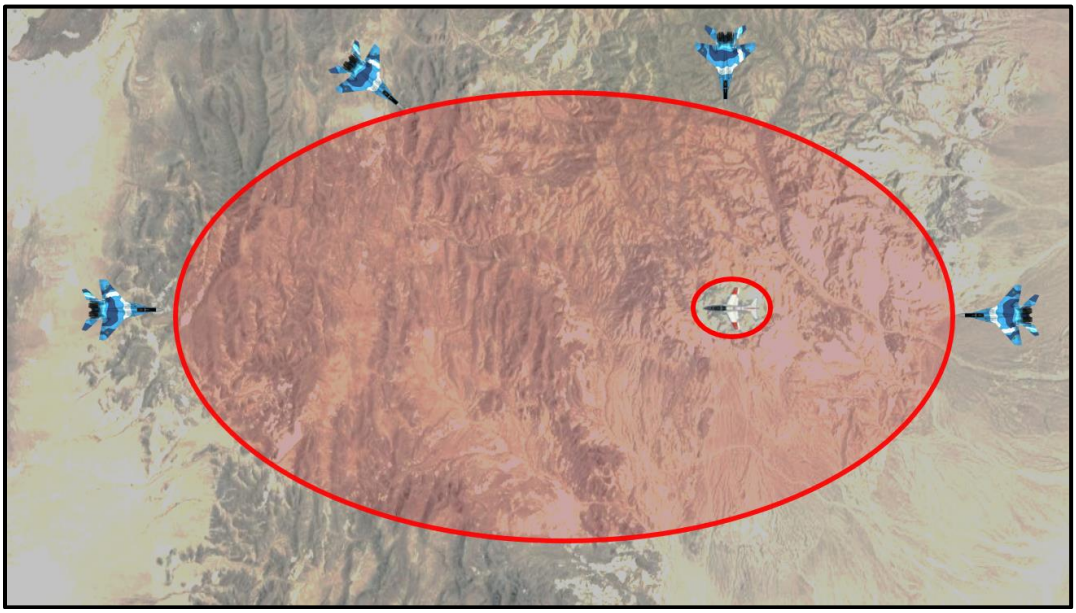

Figure 4-5 Representation of Bandit WEZ

403. CONTROLLABLE EMPLOYMENT FACTORS

There are many factors that can affect the true probability of kill (P_k) for a missile in any given situation. The fighter can control the following conditions in an intercept:

1. Employment range: The range a fighter employs weapons can have a significant effect on the success of the missile. At long range, the bandit has the time to recognize he is being shot at and maneuver to potentially defeat the missile. However, the fighter's may need to employ at longer ranges due to the threat missiles having longer ranges as well. Any shots taken at less than maximum range improve the missile's chance of success due to increased kinematic capability since the missile doesn't have to fly as far to reach the target. The Shot Range developed in the intercept timeline strikes a balance between surviving a threat missile and the likelihood of a bandit maneuver defeating the fighter's missiles.

2. Fighter conditions at launch: The fighter can have an impact on the success of a missile throughout its time of flight by establishing favorable flight parameters prior to launch. Generally, the faster and higher a fighter is, the larger the fighter's available LAR will be. This is because the missile can accelerate from an already higher airspeed in thinner air and use gravity to assist in end game maneuverability.

3. Bandit ATA at launch: Pulling the bandit to pure pursuit (0 ATA) will enhance the shot range and end game kinematics of the missile due to the missile not having to make any significant steering corrections once it is launched.

404. MINIMUM ABORT RANGE

Using the understanding we now have of both fighter and threat missiles, we will begin building our timeline with MAR. We know MAR is the minimum range at which fighters can execute a drag defense and kinematically defeat threat missiles. Using advanced computer modeling and a thorough understanding of threat missile capabilities, fleet fighter pilots are able to calculate the exact distance from the threat they would need to execute a drag defense. For the purposes of this FTI, we will make some generic assumptions on capabilities and limitations of both threat missiles and fighter maneuverability.

We will be approaching MAR at 30 degrees ATA. This is important because, if you recall from (Figure 4-5), the bandit has the longest R_{MAX} when the fighter and threat are pointing at each other. This means we are reducing the bandit's R_{MAX} by not bringing the threat to 0 degrees ATA. More importantly, we are slowing down the intercept, allowing the fighter's missiles more time in the air before the fighter reaches MAR. We will also be turning to 30 degrees ATA from cold, where the bandit does not have a shot available (outside the bandit's rear-quarter R_{MAX}). So, somewhere in between fighters flowing cold and being established with the bandit at 30 degrees ATA, the bandit will have a shot available on the fighters. From this point (bandit R_{MAX}), we have to take into account both threat missile TOF, and kinematic capability of the threat missile based on the employment range and fighter follow on flow. WE know that the fighters will be executing a drag maneuver at MAR, and while the threat missile is definitely faster than the fighters, it will eventually run out of fuel and energy trying to catch up to the fighters.

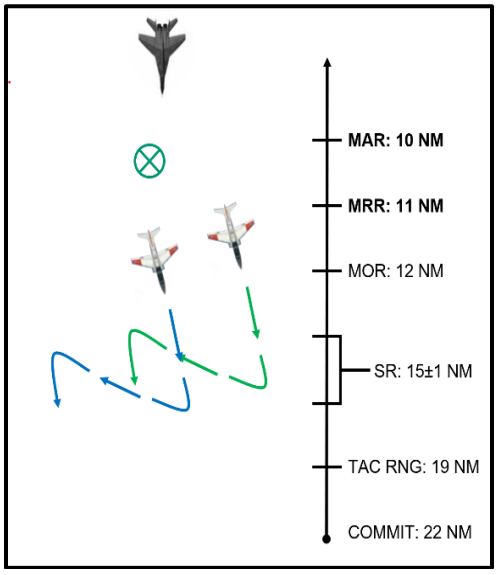

Figure 4-6 Minimum Abort Range

Building on these assumptions, we begin by working backwards. Assume the threat missile has a lethal blast radius of 10 feet. Our starting point will be with the fighter flowing cold just after a drag defense at MAR, the threat missile 11 feet behind the fighter, and the threat missile no longer able to continue the intercept due to having just run out of requisite energy. The turn, or out mechanics the fighter executed to end up here is important. In the Fighter Intercept syllabus, we will execute a 135-degree overbank at MRT with a 17 unit or nibble-of-buffet pull to place the threat at 6 o'clock during drag defenses. If we rewind the tape from our starting point, backwards through the out maneuver to where the fighter is just about to begin proper out mechanics, the range between the fighter and threat is MAR. In the Fighter Intercept Timeline, **MAR is 10 nm**.

It is critical that fighter pilots understand and comply with the assumptions behind MAR. For instance, if the fighter held the bandit at only 20 degrees ATA as they approached MAR, they would reach MAR more quickly than if they held the bandit at the recommended 30 degrees ATA. While this initially may increase survivability due to the fact that the threat missile has not traveled as far (remember, the fighter reached MAR more quickly), the fighter would also have to pull through more degrees of turn to execute their drag defense, which would likely negate any benefit of accelerating the timeline and reduce fighter survivability. Conversely, if the fighter held the bandit at 40 degrees ATA, due to slowing down closure, the threat missile may impact them before even reaching MAR.

405. MINIMUM RECOMMIT RANGE

Working backwards from MAR, we need to provide fighters with the ability to turn around, detect the threat, correlate, and employ by MAR. Our starting point for this discussion will be with the fighters at MAR (10 nm), just prior to executing their out mechanics, and a fighter missile airborne. Our end point will be with fighters flowing cold post-drag defense at MOR. From our starting point working backwards, assuming the fighters are holding the threat at 30 degrees ATA, we need to account for the time it takes for the targeted fighter to acquire radar SA, correlate, assess if a LAR is available, and employ. Finally, we need to account for the turn the fighters execute to get from flowing cold to setting the threat at 30 degrees ATA. In the Fighter Intercept Timeline, we assume that there is zero Vc during the turn to 30 degrees ATA (due to the threat not actually moving) so we will ignore this consideration. We will provide 1 nm for fighters to acquire radar SA, correlate, assess if a LAR is available, and shoot. With MAR being 10 nm, this makes **MRR 11 nm**.

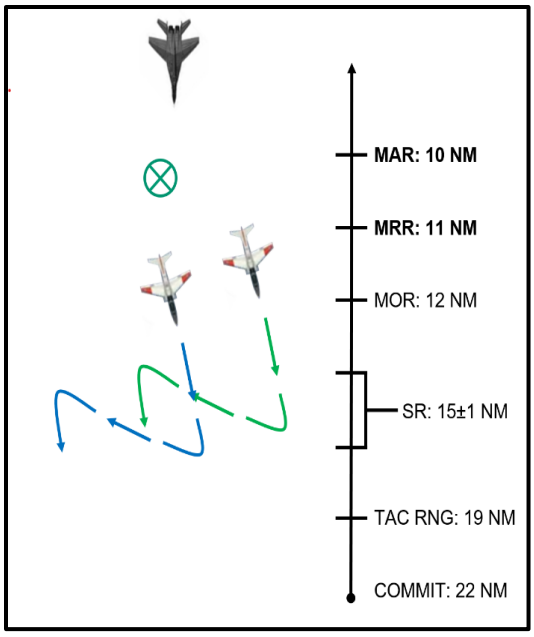

Figure 4-7 Minimum Recommit Range

406. MINIMUM OUT RANGE

In order to have MRR available to the fighters while flowing cold, they need to have a range at which to execute a drag defense that will place them both flowing cold, and no closer to the threat than MRR. In the Fighter Intercept Timeline, there is an artificiality that must be accounted for due to the fact that the threat is not moving towards the fighters. This is primarily evident when calculating MOR. If the threat was moving towards the fighters, the fighters would be losing range (the threat would be closing on the fighters) during any fighter turns into or away from the threat. Because we are using fixed waypoints to define the threat, we need to artificially create closure during the intercept to simulate the group distance traveled between initiating an out at MOR and being established in cold ops. Therefore, we have adopted BE1 and BE2 as two different offsets from a common bullseye, to simulate a group moving closer to the fighters during their drag defense at MOR. BE2 is 5 nm closer to the fighters than BE1.

Taking this into consideration, we still need to develop a range at which fighters will execute a drag defense, which kinematically defeats threat missiles and preserves the opportunity for a recommit. In order to have a timeline that both flows naturally, and accounts for the fact that the threat is not moving, we will simply add 1 nm to MRR and move the threat 5 nm closer to the fighters post-drag defense at MOR, making **MOR 12 nm**. This allows the fighters to reach MOR prior to MRR, execute a defense, and have time to establish themselves flowing cold prior to (or simultaneously with) reaching MRR, at which point they may execute a recommit.

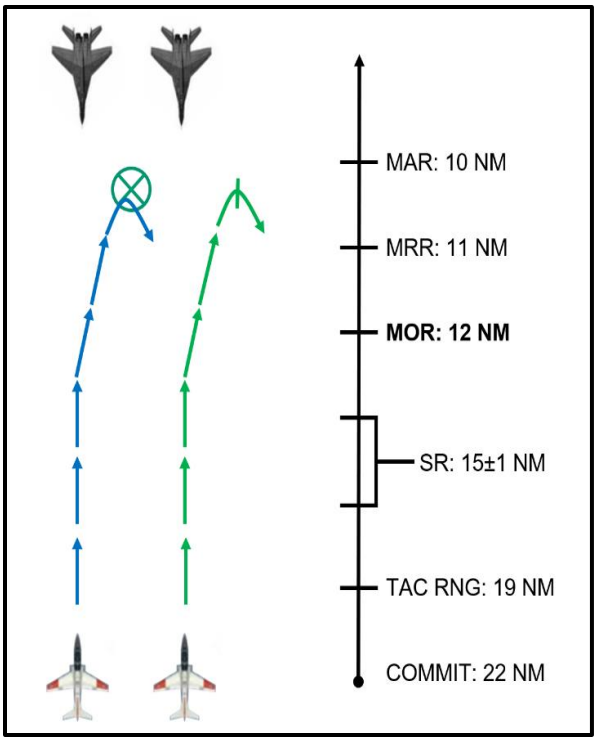

Figure 4-8 Minimum Out Range

407. SHOT RANGE

The shot range is the first employment opportunity the fighters have during the intercept. Our starting point for this discussion will be with the fighters at MOR, just about to execute out mechanics with a missile in the air. Working backwards, we need a range at which the fighter squeezes the trigger to employ the missile that allows it to close on the threat to an acceptable range for target acquisition just prior to MOR. We are also assuming the fighter is established in a 30 degrees ATA crank post employment. This range is 15 nm. We also need to provide a buffer to account for the fighters to transition from a sanitization system setup, to an employment system setup. This includes accounting for any difficulties the fighter may have while acquiring a weapons solution on the target, and to give the fighters enough time to execute shot mechanics. Examples of why the fighter may need a buffer to acquire a weapons solution are related to specific radar mechanics and beyond the scope of this FTI. Since the inter-cockpit mechanics of employment in the T-45 are relatively simple, we will simply add a buffer of ±1 nm to the 15 nm stated earlier, giving us a **shot range of 15 ±1 nm**. It is within these ranges that the fighter is expected to execute shot mechanics, and pull the trigger (with correlation achieved).

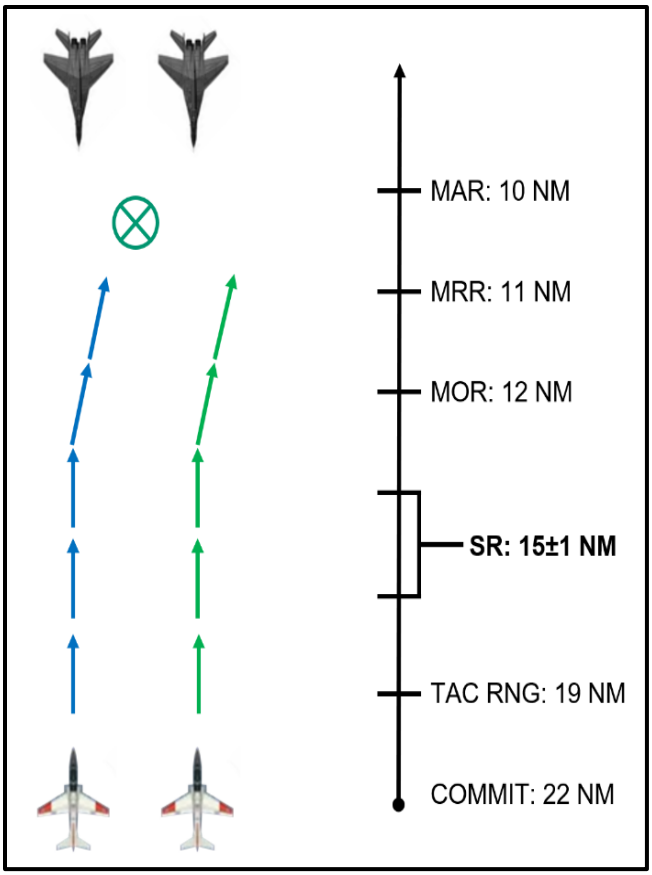

Figure 4-9 Shot Range

408. TACTICAL RANGE

If the fighters are expected to potentially employ at the Shot Range of 15 nm, we need to provide the fighter lead a range at which to issue targeting, and provide the targeted fighter time to accelerate to an airspeed that will enhance his missile kinematics. This range is Tactical Range. By adding 4 nm to the shot range, we allow enough time for AIC to issue a *"Single Group 19 miles"* call, the fighter lead to issue targeting, and the fighters to accelerate at MRT so they arrive at the Shot Range with enough airspeed to execute proper shot mechanics and give their missile a kinematic advantage. **Tactical Range is 19 nm.**

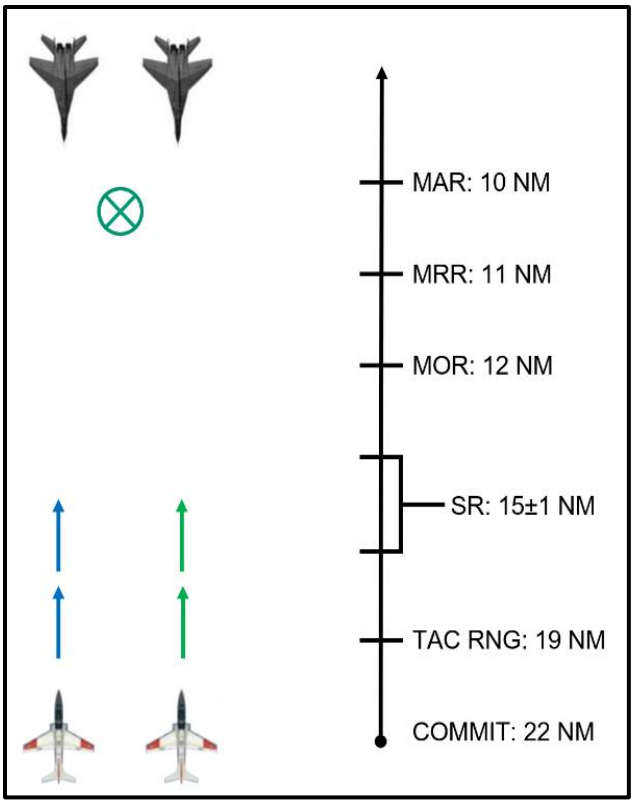

Figure 4-10 Tactical Range

409. COMMIT

As stated earlier, the intricacies of a commit are well beyond the scope of this FTI. What is important to understand is that when fighters commit, they are accepting responsibility to execute an intercept on the picture described by AIC. The range at which a fighter would want to commit can vary widely based on a myriad of factors, so for the purposes of the Fighter Intercept Timeline, we will add 3 nm to Tactical Range, allowing fighters time to manage their formation, integrate with AIC, and prepare themselves for the timeline ahead. **NLT Commit is 22 nm.**

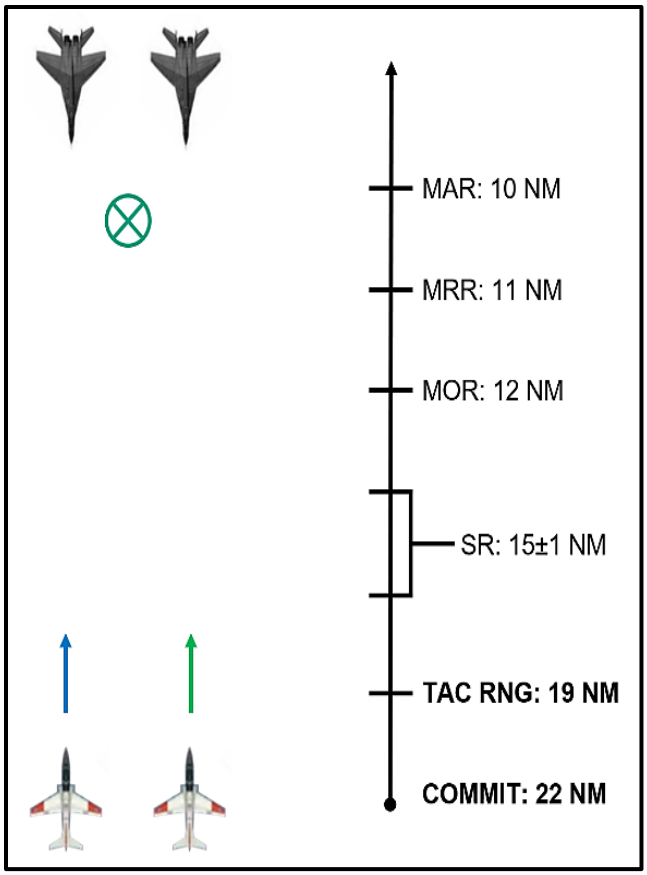

Figure 4-11 Commit

410. CONCLUSION

As you can see, there is a lot that goes into creating an A/A Timeline. The information in this chapter serves as a foundation upon which everything else in the A/A Timeline is built. Luckily, real-world A/A Timelines are already built and used fleet-wide. Once you get to the FRS, you will be expected to study and know all the details of these timelines. In order to understand how to use the A/A Timeline, Chapter Six will be a guided walkthrough of a Fighter Intercept Flight, from AIC check in through Knock-It-Off.

CHAPTER FIVE
FIGHTER INTERCEPT COMMUNICATIONS

501. CONTROL TYPES AND FORMATS

Control Types

Broadcast control is communication from the controller to all aircraft on the net/control frequency and provides information in a way that is useful to all aircraft. This communication format does not reference any specific friendly unit.

Tactical control is communication from a controller to a specific fighter, CAP station, section, or division. Tactical control is tactically and specifically useful to that specific fighter element only. However, all other blue forces may be able to use some of the transmitted information to build SA.

Control Formats

The format of information in either type of control may use either of two formats: bullseye or BRAA (Bearing, Range, Altitude, Aspect).

1. **Bullseye** – type of control where contact information is passed by the controller, referenced to either a specific geographic reference point, or more commonly a waypoint known by all relevant friendly aircraft. Thus, if you do not know where bullseye is, the information is useless to you. Bullseye format can be used with either broadcast control or tactical control.

2. **BRAA** – type of control where contact information is passed by the controller using the acronym for Bearing, Range, Altitude, and Aspect, referenced from the fighter to the contact. The purpose is to give a specific fighter element quicker situational awareness to a called contact.

    a. Bearing – Magnetic bearing from the fighter to the group

    b. Range – Range in nautical miles from the fighter to the contact

    c. Altitude – Contact's altitude in thousands of feet MSL

    d. Aspect – Target aspect using aspect described in (Figure 4-2)

Broadcast control will be in bullseye format while tactical control may be in either bullseye or BRAA format.

502. AIC INFORMATION

When the fighter requests a picture from AIC, AIC will respond with the location of all known hostile, bandit, or bogey groups within the area of responsibility. When providing a picture, AIC will use the following elements to build the fighter's situational awareness:

1. **Label** – AIC will begin calls by labeling the picture. This includes the total number of groups, a label based on their geometric relation to each other, the distances between groups, and a descriptor of any changing conditions. Examples include a single group, two groups azimuth, two groups range, three groups vic, three groups champagne, and four groups box. In the T-45, we will focus solely on "Single Group" labels. Labels will be discussed later in the FRS; however, to provide context, below is a complex picture with a dynamic label.

> "*Paradise**, THREE GROUPS CHAMPAIGN, 8 WIDE, 12 DEEP, OPENING**, West lead group Duval three one five, thirty, twenty-two thousand, track south, hostile, Halfback, two contacts, East lead group Duval three one seven, twenty two, eighteen thousand, track South, hostile, heavy, Fullback, three contacts, trail group 25 thousand, cap, bogey, spades, two contacts*"

2. **Group Name** – A group name is the specific name given to a group within a picture. It is usually derived from the groups relation to any other group within the picture using cardinal directions. For example, a picture may have a North group and South group, or a lead group and trail group. In the event that there is only a single group, the picture's label and group name are the same. For instance, *"Single group"* is both a picture label and a group name.

3. **Location** – In broadcast control, the group's location will be defined from a common reference point. In tactical control, the group's location may use a reference point (bullseye format) or the fighter's nose (BRAA format). In the following example, the West lead group is on a 315 radial from the bullseye (Duval) and 30 nm away from Duval.

> "*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group **DUVAL 315, 30**, twenty-two thousand, track south, hostile, Halfback, two contacts, East lead group **DUVAL 317, 22**, eighteen thousand, track south, hostile, heavy, Fullback, three contacts, trail group 25 thousand, cap, bogey, spades, two contacts*"

4. **Altitude** – Given to the nearest thousand feet.

> "*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group Duval three one five, thirty, **TWENTY-TWO THOUSAND**, track south, hostile, Halfback, two contacts, East lead group Duval three one seven, twenty two, **EIGHTEEN THOUSAND**, track south, hostile, heavy, Fullback, three contacts, trail group, **TWENTY-FIVE THOUSAND**, cap, bogey, spades, two contacts*"

5. **Direction of Movement** – In broadcast control, this will be a cardinal or sub-cardinal direction (i.e., "North" or "Northwest"). In tactical control, this will be a reference to the target aspect the group is presenting to the referenced fighter flight. These aspects are shown in

(Figure 4-2): (A) 0-30° TA "HOT"; (B) 31-60° TA "Flank"; (C) 61-120° TA "Beam"; (D) 121°+ TA "Drag." Flank, beam and drag descriptors will be accompanied by a sub-cardinal direction to denote aspect and track direction. The term "CAP" will be used to denote a group who is orbiting in its current position.

"*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group Duval three one five, thirty, twenty-two thousand, **TRACK SOUTH**, hostile, Halfback, two contacts, East lead group Duval three one seven, twenty two, eighteen thousand, **TRACK SOUTH**, hostile, heavy, Fullback, three contacts, trail group 25 thousand, **CAP**, bogey, spades, two contacts*"

6. **Declaration** – The declaration determines the level of permission the fighter has to destroy the group. There are four declarations:

a. **Hostile** – The group meets rules of engagement criteria (ROE) criteria for engagement and weapons release is authorized.

b. **Friendly** – Group is friendly.

c. **Bandit** – The group is positively identified as enemy but does not meet ROE criteria to engage; weapons release is NOT authorized.

d. **Bogey** – The group's identity is unknown; it may be the fighter's responsibility to obtain a positive identification through sensor or visual means.

e. **Standby/Unable** – Although not a declaration, AIC is attempting, or is unable to determine the identity of the group. Standby implies group identity is pending; unable implies AIC cannot make the ID.

"*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group Duval three one five, thirty, twenty-two thousand, track South, **HOSTILE**, Halfback, two contacts, East lead group Duval three one seven, twenty two, eighteen thousand, track South, **HOSTILE**, heavy, Fullback, three contacts, trail group 25 thousand, cap, **BOGEY**, spades, two contacts*"

7. **Tipper** – The code word assigned to specific aircraft from the enemy air order of battle. For example, if "Halfback" refers to MiG-29, and "Fullback" refers to SU-34, the following example would indicate which group is composed of which enemy aircraft:

"*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group Duval three one five, thirty, twenty-two thousand, track South, hostile, **HALFBACK**, two contacts, East lead group Duval three one seven, twenty two, eighteen thousand, track South, hostile, heavy, **FULLBACK**, three contacts, trail group 25 thousand, cap, bogey, spades, two contacts*"

8. **Strength** – The number of contacts in a group. All groups are assumed to be only one contact. If no contact count is provided, fighters can assume the group is a single only.

Example:

> "*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group Duval three one five, thirty, twenty-two thousand, track South, hostile, Halfback,* ***TWO CONTACTS****, East lead group Duval three one seven, twenty two, eighteen thousand, track South, hostile, heavy, Fullback,* ***THREE CONTACTS****, trail group 25 thousand, cap, bogey, spades,* ***TWO CONTACTS.***"

At range, before the fighters commit to the intercept, AIC will normally use broadcast control in a bullseye format. Once the fighters are committed to intercepting a group, AIC transitions to tactical control in bullseye format.

503. CONTROLLER / FIGHTER TEAM WORK

Effective intercepts require that the fighter and AIC controller work as a team to establish a common understanding of the situation, also called the air "picture." A thorough briefing with AIC prior to the mission will ensure that the controller understands the fighter's intent for employment and the situation prior to fighter commit. Although many of the issues of coordination will be SOP, fighters should always brief and debrief their controllers to ensure communications are open and effective.

504. CONCLUSION

The fighter/AIC controller relationship is very important. Fighters should always include AIC controllers in planning, briefing, and debriefing of any mission in which AIC controllers are involved. Fighter pilots must be thoroughly familiar with control methods and formats in order to be effective air-to-air participants.

CHAPTER SIX
THE INTERCEPT

600. INTRODUCTION

The following chapter details the management of fighters' formation, sensors, and communications during an intercept. It will be a detailed walkthrough of the intercept and provide a guide for how to make the air-to-air timeline discussed in Chapter 4 a reality. For this chapter, we will use fighters' call-signs *Rage 11 and 12,* an AIC call-sign of *Paradise,* and a bullseye of *Duval*.

601. AIC CHECK IN

Prior to executing any air-to-air intercepts, as a part of tactical-admin, fighters must check in with AIC to relay information about system health and ensure all players have a solid reference to the same bullseye. This is initiated by the flight lead; however, all fighters in the same formation need to also check their systems' health.

The flight lead will begin with the "you, this is me" format, followed by their mission number (Usually the event number on the schedule), any system degradations they may have, known as Alibis (i.e., "*negative yard-stick"* indicating that they don't have a working A/A TACAN,) and finally request an Alpha Check to bullseye.

RAGE 11: *"Paradise, Rage 11 Mission Number 069 up as fragged, request alpha check Duval"*

AIC will then reply, indicating that they have radar contact, how many tracks they see (should match the number of fighters in the formation), and proceed with an Alpha Check.

PARADISE: *"Rage 11, Paradise, radar contact, two good tracks, alpha check Duval XXX/XX"*

All members of the formation will check to make sure their systems are indicating what AIC said. If the Alpha Check was good, nothing needs to be said by the wingmen. If it is wrong, check your systems and let the flight lead know you may have a problem. If everyone agrees on the Alpha Check, the flight lead will respond, letting AIC know that the fighters agree with the Alpha Check, and then pass the environmental factors so AIC can have a better idea of what the fighters are working through during an intercept.

RAGE 11: *"Rage 11 good alpha check, fighters have the environmentals: Sun/Winds/Decks/Altimeter XX.XX"*

SCREWTOP: *"Paradise"*

602. BANDIT CHECK IN

During the AIC check in, the bandit lead (in this case *"Viper 1"*) will have been listening, specifically for the environmentals, and any alibis the fighters have. Upon completion of the AIC check in, Viper 1 will initiate the bandit check in.

VIPER 1: *"Rage 11, Viper 1"*

RAGE 11: *"Viper 1, go for Rage 11"*

The bandit lead will then proceed with welcoming the student to their event, pass recommendations for weather, and ensure all players are on the same altimeter setting. The reason for this is that often the bandits will transit through whatever working area is being used to start their presentations furthest from home field (since they usually will use less gas than fighters). This may give them SA to changing weather conditions throughout the airspace that fighters may not be aware of.

The "WAR" is any restrictions to the airspace, usually based on weather. For example, if there is an overcast layer at 20,000 feet, the bandits may say *"Recommend Low War Below 19k, Altimeter 29.92."* If the WAR is subsequently set as such, then no aircraft may transit above 19k during any portion of the intercepts. If there are no restrictions needed due to good weather, then the bandits would recommend "All Altitudes." It is important to know that the bandits are just recommending a WAR; the flight lead is the one who sets the WAR for all players.

VIPER 1: *"Rage 11, welcome to your Fighter X 4101, we have Area Three, Nine To Two Three Zero, bandits concur with your weather, recommend all altitudes, altimeter XX.XX"*

RAGE 11: *"Rage 11 sets the war all altitudes, altimeter XX.XX"*

VIPER 1: *"Bandits echo, all altitudes, XX.XX"*

Once the WAR is set, the bandits will let the fighters know their readiness. If they are not ready yet and need time to set up the initial presentation for the fighters, they will let the fighter lead know "*Bandits Need 2 Mikes",* meaning expect a two minute delay before they call "*set".*

VIPER 1: *"Your bandits are set"*

Once the bandits are set, the fighter lead determines if the fighters are set as well. If they need time to reposition or manage the formation, they only need to reply with their call-sign. If the fighters are ready and the bandits called "*SET*," then they will start the fight by calling:

RAGE 11: *"Tapes on, fights on"*

VIPER 1: *"Bandits echo fights on"*

6-2 THE INTERCEPT

603. PRE-COMMIT AND THE INITIAL PICTURE

The Pre-Commit phase of the intercept can vary widely in its specific objective based on mission planning factors that are well beyond the scope of this FTI. For our purposes, the Pre-Commit phase of the intercept is anything that happens between the fight beginning (*"Tapes on fights on"*) and the Commit.

Using a Bullseye for relaying location information allows multiple friendly forces in different locations to be able to assess bandit locations with respect to a universally known reference point, generically known as Bullseye. The Bullseye location is usually chosen based on tactical or geographical significance. Once the location of a Bullseye is established among friendly forces, controllers can provide contact positions with bearing and range from Bullseye. This way, anyone listening to the common AIC frequency can gain SA concerning the location of bogey, bandit, hostile, neutral, or friendly forces. During an intercept, fighters will utilize both broadcast and tactical control anchored to bullseye. It is important to understand that while in the T-45C, we don't have the capability to manipulate displays in a way to obtain exact bullseye-cuts anywhere other than our own aircraft. However, this will be an extremely important capability of your fleet aircraft. During training in the Fighter Intercept Syllabus, we will have a predetermined location of bandits, so the information provided by AIC will largely be an exercise of understanding your location in relation to waypoint offsets in the jet.

Formation

Fighters will be expected to be in Tac-Wing during AIC / Bandit Check In. After this, normally once hot to the threat sector, fighter leads will push wingmen to combat spread via a "*Rage deploy*" call with a flow heading. At this point, wingmen are expected to push out to combat spread. Remember, wingmen will not respond to flow headings or TACFORM calls during the FTX stage.

Sensors

Prior to commit, fighters will be in their sanitization set:

1. 40 nm range scale on HSI
2. WYPT (BE) Selected – to simulate no radar SA to any bandits
3. A/A Master Mode, Master Arm Safe

Communications

Prior to commit, the fighter lead needs to request a picture. This is the first picture, and the one that will give fighters their initial SA to what's happening downrange.

RAGE 11: "*Paradise, Rage 11, picture*"

Any time fighters have NOT committed, AIC and the fighters will use Broadcast Control to communicate the picture from the controller to all the fighters. Broadcast Control is not directed to one particular flight element. Since the fighters just requested a picture and have not yet committed, AIC will respond in Broadcast Control.

PARADISE: "*Paradise, group Duval three one five, thirty, 15 thousand, track South hostile*"

In order to appreciate the difference between Broadcast Control and Tactical Control, here is an example of a different initial picture that is more complicated than what you will see in the syllabus. The difference between this example and its follow-on, post-commit example will highlight some more important differences between Broadcast and Tactical Control

PARADISE: "*Paradise, three groups, group Duval three one five, thirty, 18 thousand, track South, hostile*"

Notice in the above example that there are three groups of bandits; however, Paradise only anchored one of them to Duval. This is the closest group to the fighters or a defended asset. All other groups are ancillary at this point since the fighters have not yet committed on the picture.

604. COMMIT

Formation

At the Commit call, fighters will accelerate to 330 KIAS at MRT, in combat spread, with the threat at 0 degrees ATA. If lead calls a flow heading, this will always overrule any heading derived from a wingman's system.

Sensors

Post commit, fighters will remain in their sanitization set; however, they will arm at the fighter lead's *"Check tapes, Master Arm"* call:

1. 40 nm range scale on HSI

2. WYPT (BE) Selected – to simulate no radar SA to any bandits

3. A/A Master Mode (RTGS), check Master Arm **Armed**

Communications

Once the fighters have met their commit criteria (see Chapter 4), they will let AIC know via a "*Commit*" call. Simultaneously, the fighter lead needs to make sure all wingmen are ready to employ. This is accomplished with a *"Check Tapes, Master Arm"* call to the formation. At this call, all members of the flight will ensure the Master Arm Switch is in the Armed position and ensure their recording devices are recording (If equipped).

Upon hearing that the fighters have committed, AIC will automatically provide a picture using Tactical Control. One of the major differences between Broadcast Control and Tactical Control is that now AIC will label the picture, name the groups, and also anchor to bullseye all groups they assess the fighters may want to target.

PARADISE: "*Paradise, single group Duval three one five, thirty, 15 thousand, track South, hostile, two contacts*"

In the example above, you can see that AIC labeled the picture, and named the group "*Single Group,"* since it is the only group. Since there is only one group, AIC is labeling the picture *"Single Group"* at the same time they are naming the group. The remainder of the format in this simple example is largely unchanged from Broadcast Control.

If we continue our more complex example from above, you can see there is actually quite a bit of difference between Broadcast Control and Tactical Control once the fighters commit (again, this is not part of your syllabus, just an example).

PARADISE: "*Paradise, three groups Champaign, eight wide, twelve deep opening, West lead group Duval three one five, thirty, twenty-two thousand, track South, hostile, Halfback, two contacts, East lead group Duval three one seven, twenty-two, eighteen thousand, track South, hostile, heavy, Fullback, three contacts, trail group 25 thousand, cap, bogey, spades, two contacts*"

Labels and Names

Recall from the previous chapter, a label is the relationship between groups. Examples include a single group, two groups azimuth, two groups range, three groups vic, three groups champagne, and four groups box.

A name is the title given to each individual group in the labeled picture. Examples include, single group, east group, north group, lead group, west-lead group etc. The only time a label and name are the same is for a single group.

This is not to be confused with a "contact" within a group. For example, if a "West Group" has two contacts in it, and they are line-abreast east-west, then the western bandit within that group would be called "Western, West-Group", and the eastern "Eastern, West Group". This usually only becomes an issue during shot communications, which will be discussed later in this chapter.

605. TACTICAL RANGE AND TARGETING

The Tactical Range call is somewhat of a marker in the A/A Timeline that begins the cadence of the intercept to follow. Roughly 30 seconds later, fighters assigned targeting will be expected to employ at the Shot Range. For this to happen, fighter leads will assign targeting immediately following the Tactical Range call to provide the maximum amount of time for fighters assigned targeting to prepare themselves to employ.

Formation

From when fighters committed, they have been proceeding downrange sanitizing with the threat off the nose. Once targeting is issued just after the Tactical Range call, both fighters will set MRT and accelerate as fast as possible up until employment while maintaining combat spread. This will provide the missile the best kinematic package as it is employed.

Sensors

Once targeting is issued, the fighter with targeting responsibility will meld into the group by selecting Waypoint (BE1) and boxing O/S. This will provide the fighter with SA to where the group is on the HSI, and range to the group in the HUD as well as on the HSI.

1. 40 nm range scale on HSI

2. WYPT (BE1) Selected, O/S Boxed - to simulate radar SA after melding

3. A/A Master Mode, Master Arm Armed

After melding, the fighter needs to ensure he is shooting the correct contact within a group. Standard employment doctrine for fleet aircraft would dictate which / how many contacts the employing fighter(s) would employ on. For the syllabus in T-45C, the employing fighter will simply "sort" to their side of the formation. Just make a mental note of which side of the formation you are on (i.e., running an intercept from South to North, if you are on the right, you are sorted on the Eastern contact), and when it comes time to employ, you will call this sort with your shot comm.

Communications

Just after the Tactical Range call, the fighter lead will issue targeting to the flight

PARADISE: "*Rage 11, Single Group 19 miles"*

RAGE 11: "*Rage 12, target Single Group, skate, Rage 11 sanitize"*

RAGE 12: *"Rage 12"*

From this point forward, fighters will be accelerating towards the Shot Range and employment. It will be Rage 12's responsibility to manage the timeline and ensure fighters skate at the appropriate range (MOR – 12 nm). It will be Rage 11's responsibility to continue sanitizing.

Due to some of the limitations of the T-45C, fighters' only way to correlate that the group they see is actually the group on which they are authorized to employ is for them to request an egocentric Bearing, Range, Altitude, Aspect (BRAA) from AIC. This will be in a similar format to a picture call; however, will be in reference to the requesting fighter's position instead of Bullseye.

RAGE 12: *"Paradise, Rage 12 BRAA Single Group"*

PARADISE: *"Rage 12, Single Group BRAA three six zero, eighteen, fifteen thousand, track South, hostile"*

RAGE 12: *"Rage 12"*

Rage 12 will now need to confirm that the BRAA received from AIC matches the bearing and distance shown at the top right of their HSI. If the two match within three degrees and one nautical mile, then correlation has been achieved.

606. EMPLOYMENT AND CRANK

Once targeting has been issued, melding has been completed, correlation achieved, and approaching the Shot Range, fighters will look to employ.

Formation

Fighters will arrive at the Shot Range in Combat Spread, as fast as possible once selecting MRT post-targeting. Once Rage 12 has arrived at the Shot Range, they will execute T-45C shot mechanics. Since the T-45C cannot replicate the complexities of fleet aircraft employment, these mechanics are designed to challenge students with a 3D maneuver while still considering formation keeping.

1. Maintain MRT
2. Execute smooth (~2-3G), wings level pull to 30 degrees nose high
3. Ensure correlation, then pull the trigger for one second
4. Overbank 135-150 degrees AWAY FROM LEAD, and execute a smooth (~1-2 G) pull to set the nose no less than 25 degrees nose low, and set the target at 30 degrees ATA (this is the crank)
5. Once established in the crank, set throttle to Idle during descent to co-altitude with the threat (15K MSL)
6. Expect to pick up lead at the 5 or 7 o'clock position once the crank is set.
7. Continue to descend no lower than co-altitude with the threat, at which point fighters will level off, maintaining the threat at 30 degrees ATA

To aid in formation management, both fighters will execute shot mechanics, even though only Rage 12 is actually employing. The fighters will crank to slow down the intercept, while descending to the threat's altitude to set up geometry for recommits.

Sensors

Once correlation is complete, the fighter who is employing must ensure correlation is maintained. Correlation is achieved immediately after targeting; therefore, sensors should

remain unchanged throughout the employment. However, after meld, the fighter needs to ensure he is shooting the correct contact within a group. Standard employment doctrine for fleet aircraft would dictate which / how many contacts the employing fighter(s) would employ on. For the syllabus in T-45C, the employing fighter will simply "sort" to their side of the formation. Just make a mental note of which side of the formation you are on (i.e., running an intercept from South to North, if you are on the right, you are sorted on the Eastern contact), and when it comes time to employ, you will call this sort with your shot comm.

Communications

There will be no communication to initiate the shot mechanics or crank. Rage 12 will be responsible for maintaining timeline and executing the appropriate mechanics. At trigger squeeze, Rage 12 will call his shot. In the following example, Rage 12 is on the right side (East) of the formation running from South to North:

RAGE 12: *"Rage 12, Fox-3 Eastern, Single Group"*

There is no reply to this comm; however, it lets everyone involved know that there are missiles downrange.

607. MINIMUM OUT RANGE

Upon reaching MOR, the fighters need to execute a drag defense so they do not get hit with an enemy missile.

Formation

The formation management during the Skate at MOR, and follow on recommits / defenses is critical. It is important that the wingman understand the tactics and headings they are pulling to in order to ensure safety and tactical effectiveness.

From the crank, at 30 degrees ATA, 15K MSL, and with Rage 11 at Rage12's 5 or 7 o'clock position, the defense will be executed as follows:

1. At MOR, execute a 135 degree overbank and initiate a 17-Unit / nibble of buffet pull at MRT
2. Initiate the turn AWAY from both lead and the threat
3. Turn to place the threat at the 6 o'clock position
4. Initial geometry will be ~20 degrees nose-low once the threat is at the 6 o'clock position. Continue a wings level pull with the threat at the 6 o'clock position to set a nose-high attitude that matches lead's
5. Initiate a climb back to 15K MSL while flowing cold, not to decelerate below 330 KIAS.
6. If the formation isn't perfect while flowing cold, fix it on the upcoming recommit.

It is expected that Rage 12 will go blind during the initiation of this maneuver. This is why it is **ABSOLUTELY IMPERATIVE** that Rage 12 initially turns to place the threat at the 6 o'clock position. This is similar to a flow heading called by lead during TACFORM; however, the heading isn't called by lead, it's on your HSI. Anticipate the turn so that you arrive with the Single Group (Wypt [B1] O/S) is directly at your 6 o'clock. **If at any point during the defense lead calls a flow heading, flow the heading lead called. This overrules any heading you are turning to based on your system.** During the turn, passing through roughly 60 degrees of turn, look outside and attempt to pick up lead. If you roll out on your cold flow heading and still can't find lead, call "*Rage 12 blind"* and expect a talk-on from lead. This is a cooperative maneuver.

Sensors

During the out maneuver, no changes to the system are made. Priority during this maneuver is executing a successful drag defense, visual-lookout, and weapon support comm.

Communications

As the fighter with targeting responsibility, Rage 12 needs to assume Rage 11 does not have complete SA to where the Single Group is located. In fleet tactics, Rage 11 may still be sanitizing, or be targeted into a different group. Therefore, it is Rage 12's responsibility to initiate the drag defense via maneuvering and effective comm. The priorities for actions taken at MOR are 1) Execute a timely defense, and 2) Provide an accurate comm call. Ideally, these two will take place simultaneously; however, moving the jet is more important than the comm call. If the comm call doesn't come out at the same time the jet is maneuvering, it still needs to be made as soon as possible. The comm to initiate the out is:

RAGE 12: *"Rage, Skate Left/Right"*

We also need to let all involved know that our missiles were active when we executed our defense. There are other communications related to missile status that are beyond the scope of this syllabus. For the T-45C syllabus, we will assume the AIM-120 reached an appropriate active state and relay this simply via a "*Pitbull"* call.

RAGE 12: *"Rage 12, Pitbull"*

These two calls are usually made together, i.e., during the same transmission.

608. COLD OPS

Cold Ops is initiated by either a flow heading from lead, or by lead saying *"Rage, Flow Cold"*. Once in cold ops, the fighters have a moment to re-cage their systems and brains. The outcome of Cold Ops is to have fighters with an updated picture, enhanced SA to the battlespace, ready to turn the corner and employ a second volley of missiles downrange into any survivors.

Formation

During Cold Ops, the formation may not be perfect. You are left with whatever came out of your previous defense. Ideally, both fighters are visual, in Combat Spread, and climbing back to 15K MSL. Airspeed will be bleeding off during the climb, and fighters shall slow no lower than 330 KIAS during the climb. Rage 12 shall match lead's nose attitude during the climb (not to decelerate through 330 KIAS), while maintaining either the threat at 6 o'clock, or any flow heading(s) called by lead. Don't overthink the formation piece of Cold Ops; you are both running away from the missile(s) that is/are guiding on you and setting up for a recommit followed by another defense, during which the formation can be fixed similar to the way an acute or sucked would be fixed in any TACFORM maneuvers.

Sensors

During Cold Ops, fighters need to set their systems up for a recommit. Also, as discussed in Chapter 4, the group needs to artificially move towards the fighters during cold ops in order to make the geometry work out. Both of these will be accomplished by the fighters executing the Waypoint - Offset - Range or **"WOR" checklist**:

WOR Checklist

1. **Waypoint**: WYPT (B2) Selected
2. **Offset**: O/S Boxed - to simulate the Single Group having moved closer
3. **Range**: 20 nm range scale on HSI

Communications

The most important thing a wingman can do related to communications during cold ops is to listen. Rage 11 is going to call for a picture, issue targeting, and initiate a recommit all via comm. Understanding the picture, realizing that you are about to be targeted into the group, and visualizing the recommit before it happens are keys to success.

10 seconds after initiating cold ops (via a cold flow heading for the flight, or Rage 11 calling *"Rage, Flow Cold"*), AIC will issue an auto-update to the leading edge of the picture.

PARADISE: *"Paradise, Single Group, track South, hostile"*

Upon hearing this call, fighters realize that the Single Group prevails and needs to be dealt with. After any internal / formation comm needed by the fighters, lead will request a full updated picture.

RAGE 11: *"Paradise, Rage 11, Picture"*

PARADISE: "*Paradise, Single Group, single only, Duval three one zero, twenty-five, 15 thousand, track South, hostile*"

There are a couple of differences between this call and the initial picture (other than the group's location). One is the fact that Paradise said, *"Single Only."* This means one of the two original contacts has been killed, likely by Rage 12's initial shot. The other is the lack of *"Two Contacts"* at the end of the call. The lack of a contact count implies that only the assumed contact count for any group (one contact) is present.

609. TARGETING AND RECOMMIT

Upon receipt of the updated picture, Rage 11 will issue targeting once again, and the fighters will execute a recommit. Timeliness of the recommit, employment, and subsequent Short Skate are critical to fighter survivability.

Formation

The recommit will be initiated by Rage 11 via a "Hot" call with a direction. Expect the turn-in direction to be into Rage 11. At this call, both fighters will execute recommit mechanics:

1. Prior to executing the recommit, look at the HSI and calculate a heading 30 degrees off from the Single Group on the same side as the anticipated turn

2. Execute a **level** turn with throttle at MRT, and modulate G to maintain airspeed

3. Pull the threat to 30 degrees ATA and roll wings level

4. Ensure correlation, then squeeze the trigger for one second

5. Call your shot

6. Look at your range to the Single Group and anticipate MAR

It should be relatively easy to maintain sight of lead during the maneuver. Rage 12 will watch lead transition through the HUD and establish at roughly the 11 or 1 o'clock position. However, DO NOT wait for lead to stop turning, or stop turning when lead stops. You are the fighter targeted into the group; it is your responsibility to execute sound recommit mechanics in order to employ on timeline and maintain survivability. Continue your pull to set the Single Group at 30 degrees ATA and employ.

Sensors

Just before executing the recommit, look down at the HSI and calculate a heading that will set the Single Group at 30 degrees ATA. This is critical to success. There is no manipulation of the sensors during the recommit, employment, or Short Skate. Once you have made your shot comm, make sure to take note of where you are on the timeline (what is your range from the Single Group). This will ensure you don't accidentally pass MAR, which would likely result in fighter death.

Communications

The recommit will be initiated by Rage 11 via a "Hot" call with a direction. Upon hearing this call, fighters are expected to immediately execute the recommit mechanics.

RAGE 11: *"Rage 12, target Single Group, short skate, Rage 11 sanitize"*

RAGE 12: *"Rage 12"*

RAGE 11: *"Rage, hot left/right"*

Expect this turn to be called into Rage 11, which will keep the threat along the same relative axis throughout the entire intercept. Once you have the threat established at 30 degrees ATA and correlation is achieved, squeeze the trigger and make your shot comm. At this point, due to the fact that the fighters are about to execute a drag defense at MAR without the capability of a recommit, the employing fighter shoot two missiles to greatly increase the Pk.

RAGE 12: *"Rage 12, Fox-3 Single Group"*

RAGE 12: *"Rage 12, second Fox-3 Single Group"*

There is no sort attached to this call since the group is a single contact.

610. MINIMUM ABORT RANGE AND THE SHORT SKATE

Once fighters have recommitted, they have merely seconds until they reach MAR. Since he is the fighter with targeting responsibility, it is Rage 12's responsibility to maintain the timeline and ensure fighters do not trespass MAR. Upon reaching MAR, Rage 12 will initiate the defense for the section and make the appropriate missile support communications.

Formation

The formation management during the defense at MAR, similarly to the defense at MOR, is critical. It is important that the wingman understand the tactics and headings they are pulling to in order to ensure safety and tactical effectiveness.

From the recommit geometry, holding the threat at 30 degrees ATA, at 15K MSL, and with Rage 11 at Rage 12's 11 or 1 o'clock position, the defense will be executed as follows:

1. At MAR, execute a 135 degree overbank and initiate a 17-Unit / nibble of buffet pull at MRT

2. Initiate the turn INTO lead, and AWAY FROM the threat

3. Turn to place the threat at the 6 o'clock position

4. Initial geometry will be ~20 degrees nose-low once the threat is at the 6 o'clock position

5. Since we are executing our last defense, fighters will continue to the deck (bottom of the area) at MRT to maximize opportunity range between the fighters and the threat

6. If the formation isn't perfect while flowing cold, it is too late to fix it. Do NOT attempt to slow down or use geometry while cold to fix a formation positional error.

It is expected that Rage 12 will go blind during the initiation of this maneuver. This is why it is **ABSOLUTELY IMPERATIVE** that Rage 12 initially turns to place the threat at the 6 o'clock position. This is similar to a flow heading called by lead during TACFORM; however, the heading isn't called by lead, it's on your HSI. Anticipate the turn so that you arrive with the Single Group (Wypt [B2] O/S) is directly at your 6 o'clock. **If at any point during the defense lead calls a flow heading, flow the heading lead called. This overrules any heading you are turning to based on your system.** During the turn, passing through roughly 60 degrees of turn, look outside and attempt to pick up lead. If you roll out on your cold flow heading and still can't find lead, call "*Rage 12 blind"* and expect a talk-on from lead. This is a cooperative maneuver.

Sensors

Approaching MAR, it is critical that Rage 12 maintains SA to where the fighters are on their timeline. Once weapons have been employed, Rage 12 shall ensure the fighters do not trespass MAR through a disciplined scan of fighter's range to the group while maintaining formation with Rage 11.

Communications

As the fighter with targeting responsibility, Rage 12 needs to assume Rage 11 does not have complete SA to where the Single Group is. In fleet tactics, Rage 11 may still be sanitizing, or be targeted into a different group. Therefore, it is Rage 12's responsibility to initiate the out via maneuvering and effective comm via a "Burnt" call. This call lets all involved know that the fighters do not anticipate a recommit will be available after their defense. The priorities for actions taken at MAR are 1) Execute a timely defense, and 2) Provide an accurate comm call. Ideally, these two will take place simultaneously; however, the timeliness of moving the jet is more important than the timeliness of the comm call. If the comm call doesn't come out at the same time the jet is maneuvering, it still needs to be made as soon as possible. The comm to initiate the out is:

RAGE 12: *"Rage, short skate left/right"*

We also need to let all involved know that our missiles were active when we executed our defense. There are other communications related to missile status that are beyond the scope of this syllabus. For the Fighter Intercept syllabus, we will assume the AIM-120 reached an appropriate active state and relay this simply via a "*Pitbull"* call.

RAGE 12: *"Rage 12, Pitbull times two"*

These two calls are usually made together during the same transmission.

611. COLD OPS AND FOLLOW-ON FLOW (VANISHED VS. FADED)

Cold Ops following a defense at MAR is nearly identical to Cold Ops following a defense at MOR with two exceptions. One is that fighters will continue a descent at MRT down to the deck. The reason for this is twofold: 1) Fighters do not have a recommit available, therefore getting fast minimizes threat Vc, and 2) It gets the fighters into thicker air to minimize a threat stern-WEZ. The other difference is that fighters do not have a recommit available. If the Single Group prevails, the fighters are going to be in a very defensive situation. While there are ways to handle this defensive situation, they are beyond the capabilities of the T-45C and scope of the syllabus.

Cold Ops will begin similarly to the previous Cold Ops. Fighters will be flowing cold with the threat at their 6 o'clock position. 10 Seconds after initiating cold ops, AIC will again issue an auto-update to the picture; however, this time it will drive one of two follow-on learning objectives via the Single Group either having *"Vanished"* or *"Faded."*

"Vanished" means a group has disappeared from or degraded on AIC's radar at the same time as anticipated missile impact, likely showing some signs of aircraft breakup / deceleration / rapid descent to the AIC controllers. There is high confidence the group that has *"Vanished"* is no longer a threat.

"Faded" means a group has disappeared from AIC's radar without the assumptions stated above. This is a call that implies there may be, or even most likely is, a group that no one can detect, a very humbling thought.

In order to facilitate training in the T-45C, fighters will execute post-Cold Ops follow-on flow that incorporates both Vanished and Faded calls from AIC, even though in both cases there were valid shots into the Single Group when fighters executed their defense at MAR. The intent is to train future fighter pilots to respect the gravity of a Faded call and enforce disciplined visual lookout doctrine during portions of an intercept with less-than-optimal SA. The fighters will know which follow-on flow is to be executed prior to commencement of each run.

During Cold Ops following a defense at MAR, fighters still need to set up their systems for follow-on flow. Whether the specific syllabus intercept being executed is ending in a *"Vanished"* or *"Faded"* call from AIC, fighters will set their systems back into a sanitization set. Fighters will either be turning back around trying to find a threat that faded in which case sanitization is paramount, or they will resume sanitizing the airspace as they did pre-commit until a knock-it-off is called. This will again be accomplished by the fighters executing the Waypoint - Offset - Range or **"WOR" checklist**:

WOR Checklist

1. **Waypoint**: WYPT (BE) Selected
2. **Offset**: O/S unboxed
3. **Range**: 40 nm range scale on HSI

"Single Group Vanished"

On runs ending in *"vanished"*, formation and sensors during the start of Cold Ops remain unchanged from that discussed in (Paragraph 608) with exceptions to altitude and throttle position stated above. AIC will still provide an auto update to the picture that lets fighters know the group has Vanished.

PARADISE: *"Paradise, Single Group vanished"*

Rage 11 will still request a full update to the picture.

RAGE 11: *"Paradise, Rage 11 picture"*

PARADISE*: "Paradise, picture clean"*

Upon receiving the "*picture clean"* call from AIC, Rage 11 will begin with getting bandit recommendations on whether or not to continue training. Assuming bandits recommend to terminate the run, Rage 11 will subsequently begin the Knock It Off communications.

RAGE 11: *"Bandits evaluate"*

VIPER 1: *"Bandits recommend terminate"*

RAGE 11: *"Knock it off, knock It off, fighters knock it off"*

VIPER 1: *"Bandits Knock It Off"*

PARADISE: *"AIC Knock It Off"*

In order to create accurate habit patterns with what fighters will experience in follow on training, Rage 11 will then make a call including the words *"On Aux."* This is simply because fighters will hear this call made this way on every fighter flight in their career, starting now. This does not imply anything regarding Pri/Aux usage in the T-45C syllabus. All communications throughout the intercept are on Aux.

RAGE 11: *"On Aux, Rage 11 Knock It Off"*

RAGE 12: *"Rage 12 Knock It Off"*

Once the Knock It Off is complete, expect to either be cleared into Tac Wing during the set-up for subsequent runs or to begin FENCE out procedures during RTB.

"Single Group Faded"

On runs ending in *"Faded"*, formation and sensors during the start of Cold Ops remain unchanged from that discussed in (Paragraph 608) with exceptions to altitude and throttle

position stated above. AIC will still provide an auto update to the picture that lets fighters know the group possibly prevails.

> PARADISE: *"Paradise, Single Group faded, Duval three one zero, twenty-five, fifteen thousand, track South, hostile"*

Upon hearing the single group has *"Faded,"* Rage 11 will request a full picture to make sure no other threats are airborne in their vicinity.

> RAGE 11: *"Paradise, Rage 11 picture"*

> PARADISE*: "Paradise, picture clean"*

AIC will respond with *"picture clean"* because, as discussed earlier, AIC cannot see the Single Group anymore.

Based on Mission Planning Factors, our Mission Objective is to "Establish Local Air Superiority Over Downed Aircrew". We will assume the Mission Commander's Acceptable Level of Risk (ALR) is high. The exact meaning and implications of ALR of this is beyond the scope of the syllabus; however, one important takeaway is that if ALR is high, the fighters are willing to accept riskier, potentially dangerous situations if required for mission success.

Turning hot towards a group that has *"Faded"* is a very risky decision that the flight lead has made; however, it is in accordance with an ALR of high, and it is required to turn hot and establish over the downed aircrew in order to achieve mission success. Fighters need to realize the inherent risk in turning towards this location. Visual lookout is paramount, as currently no radars are capable of detecting the group.

Upon receiving the *"Paradise, picture clean"* call, Rage 11 will direct the fighters hot.

> RAGE 11: *"Rage, Hot Left/Right"*

The turn will be at MRT, G to maintain airspeed, into Rage 12. Fighters will be turning to place the downed aircrew off the nose to establish a CAP.

Visual Pickup

While Rage 12 is executing his turn towards the threat sector, in order to drive learning objectives, **Rage 11 will swap roles and become red air.** During the turn, Rage 11 will maneuver the jet in order to make a merge with Rage 12. Upon successfully ensuring de-confliction, Rage 11 will call a break turn as if he just picked up a tally for the section.

> RAGE 11: *"Rage, break left/right, tally one, left/right 9/3 o'clock, one mile, level"*

Rage 12 will execute a max performance break turn in the direction Rage 11 called, while looking outside to gain a tally. Once Rage 12 is tally, they will call it.

RAGE 12: *"Rage 12 tally one"*

From this point, Rage 12 will execute their best High Aspect BFM game plan. If Rage 12 is no joy, call *"Rage 12 no joy,"* and expect a talk-on from lead. Once gaining tally, call it.

Once fighters are established in a BFM engagement, they need to let AIC know that they are not able to leave the engagement at the moment. They also need to let all other fighters in the area know to not shoot into the group with which they are fighting due to the possibility of fratricide. This is accomplished via an "Anchored" call using the fighter's location referenced to bullseye and can be deduced by calculating the reciprocal of the bearing shown on the HSI paired with the range displayed.

RAGE 12: *"Rage 12 anchored Duval three one zero, fifteen"*

While this communication is important, it shall not negatively impact the fighter's ability to execute safe BFM and adhere to training rules. If unable to go heads-down long enough to get an accurate bearing and range from Duval quickly, students are expected to make this call as soon as feasible during the engagement.

Once the fight has reached a logical conclusion, or Bingo fuel is reached, the fight will terminate via standard Knock It Off comm.

612. TAC ADMIN

Before, between, and after all runs, TAC Admin is relatively similar to BFM Stage TAC Admin with a few key differences.

1. After the G-Warm, auto-collapse to Tac Wing

2. Formation before and between runs will be Tac Wing, 300 KIAS

3. Runs will initiate at 300 KIAS, lead at 18K' MSL. At Commit, A/S will increase to 330 KIAS via MRT

4. Remain in Tac Wing on the inside of turns until lead calls *"Rage, deploy [cardinal direction]"*. Once this call is made, push to Combat Spread on the appropriate side of the formation

5. Ensure the sanitization set is accurately setup before each run

6. Do not reply to flow headings, Tac Form maneuvers, or *"Rage, FENCE out."* At the FENCE out call, simply join into parade

613. CONCLUSION

Air to Air intercepts are a complicated, task saturating aerial feat. The intercept presented in the Fighter Intercept syllabus is just a basic foundation upon which future fighter pilots will build indefinitely throughout their careers. With a sound understanding of the tactics, an appreciation of why the tactics are built the way they are, and disciplined execution of formation, sensors, and communications principles, the Fighter Intercept phase of T-45C training can be one of the most intriguing and rewarding phases in the syllabus.

APPENDIX A
MULTI-SERVICE TACTICAL BREVITY CODES

Abort	Cease action or terminate the attack prior to weapons release or event or mission.
Action	Initiate a brief attack sequence or maneuver.
Active	An emitter is radiating.
Alpha Check	Request for confirmation of bearing and range from aircraft to described point.
Anchor	Turning engagement at the specified location.
Angels	Height of FRIENDLY aircraft in thousands of feet from mean sea level.
Azimuth	A picture label describing two GROUPs separated laterally.
Bandit	Positively identified as an enemy IAW theater ID criteria. The term does not imply direction or authority to engage.
Beam	Contact stabilized within 70 to 110° of aspect.
Bent	System indicated is inoperative.
Bingo	Pre-briefed fuel state needed for recovery.
Bird	Friendly surface-to-air missile (SAM).
Bittersweet	Notification of possible BLUE-ON-BLUE (fratricide) or blue-on-neutral situation.
Blind	No visual contact with FRIENDLY aircraft, ship or ground position. Opposite of VISUAL.
Blow Through	Directive call to continue straight ahead at the MERGE and not become ANCHORED with target(s).
Bogey	A CONTACT whose identity is unknown.
Bogey Dope	Request for information on indicated or closest GROUP in BRAA format.
BRAA	Tactical control format providing target bearing, range, altitude, and aspect (BRAA) relative to the specified FRIENDLY aircraft.

Bracket	Maneuver to position on opposing sides, either laterally or vertically from the target.
Break (direction)	Perform an immediate maximum performance turn in the direction indicated.
Buddy Lock	Radar locked to a known FRIENDLY aircraft.
Bugout (direction)	Separation from that particular engagement or attack or operation with no intent to reengage or return.
Bullseye	An established reference point from which the position of an object can be referenced by bearing (magnetic) and range (nautical miles) from this point.
Buster	Fly at maximum continuous speed (military power).
CAP/Capping	1. Establish a combat air patrol at a specified point, used prior to committing forces in support of a defensive operation. 2. Informative call that an aircraft is established in an orbit.
Capture	Specified surface target or object has been acquired and is being tracked with an onboard sensor.
Cease Engagement	A fire control order used to direct air defense units to stop tactical action against a specified target. Missiles in flight will continue to intercept.
Cease Fire	Stop firing, do not open fire. Missiles in flight will continue to intercept; continue to track.
Chattermark	Begin using briefed communication procedures to counter communications jamming. If no modifier specified, “radio” is understood.
Check (Left/Right)	Turn (number) degrees left or right and maintain new heading.
Cherubs	Height of a FRIENDLY aircraft in hundreds of feet above surface.
Chicks	Term used to denote FRIENDLY aircraft.
Clean	1. No sensor information on a GROUP of interest. 2. No visible battle damage. 3. Aircraft not carrying external stores.
Cleared	Requested action is authorized.

A-2 MULTI-SERVICE TACTICAL BREVITY CODES

Cleared Hot	Type 1 and 2 CAS terminal attack control when granting weapons release clearance to an aircraft attacking a specific target.
Closing	Decreasing separation.
Cold	1. Initiate(ing) a turn in the combat air patrol away from the anticipated Threats. 2. Intercept geometry will result in a pass or roll out behind the target. 3. Contact aspect stabilized 0–20 degrees from the tail or 160–180 degrees from the nose.
Come off	Maneuver as indicated to either regain mutual support or to de-conflict flight paths. Implies both VISUAL and TALLY.
Commit	Intercept the GROUP(S) of interest.
Cons/Conning	Aircraft producing contrails
Contact	1. Sensor information at the stated position. 2. Individual radar return within a GROUP or ARM.
Continue	Continue present maneuver, does not imply a change in clearance to engage or expend ordnance.
Crank	Maneuver in the direction indicated. Implies illuminating target at or near radar GIMBAL limits.
Cutoff	Request(s) for, or directive(s) to, intercept using cutoff geometry.
Dash (#)	Aircraft position within a flight. Use if specific call-sign is unknown.
Deadeye	Laser designator system inoperative.
Declare	Inquiry as to the ID of a specified track(s), target(s), or correlated GROUP. Responses include: FRIENDLY, BOGEY, BANDIT, HOSTILE, NEUTRAL, UNABLE, CLEAN, or FURBALL. Full positional data (BULLSEYE) must accompany responses.
Defensive	Aircraft is under attack, maneuvering defensively, and unable to ensure de-confliction or mutual support.
Divert	Proceed to alternate base.
Drag	Contact aspect stabilized at 0– 60 degrees angle from tail or 120–180 degrees angle from nose.

Drop	Stop or stopping monitoring of specified emitter or target or GROUP and resume search responsibilities.
Echelon	Fill-in to a picture label describing GROUPs aligned behind and to the side of the closest GROUP.
Engaged	Call from an aircraft maneuvering in the visual arena to relinquish de-confliction responsibilities.
Extend	Short-term maneuver to gain energy, distance, or separation with the intent of reengaging.
Eyeball	Fighter with primary visual ID responsibility.
Faded	Sensor data is lost on GROUP or CONTACT. Requires information of last known position to include number of CONTACTS and TRACK direction.
Father	Surface tactical air navigation station.
Feet Wet/Dry	Flying over water or land.
Fence (In/Out)	Set cockpit switches as appropriate before entering or exiting the combat area.
Flank	CONTACT aspect stabilized at 120–150 degrees angle from tail or 30–60 degrees angle from nose.
Flash	Temporarily activate specified system for ID purposes (identification, friend or foe (IFF), or afterburner, flare or chaff, etc.).
Float	Expand the formation laterally within visual limits to maintain radar contact or prepare for a defensive response.
Fox (number)	Simulated or actual launch of air-to-air weapons. ONE- semi-active radar-guided missile. TWO- Infrared-guided missile. THREE- active radar-guided missile.
Friendly	A positively identified FRIENDLY aircraft, ship, spacecraft, or ground position.
Furball	Non-FRIENDLY aircraft and FRIENDLY aircraft are inside of 5 nautical miles of each other. Can be response to a DECLARE request.
Gimbal	Sensor target is approaching azimuth or elevation tracking limits.

A-4 MULTI-SERVICE TACTICAL BREVITY CODES

Gorilla	Large force of indeterminate numbers and formation of unknown or non-friendly aircraft.
Green	Direction of no known enemy threats requires [direction] modifier.
Group	Any number of air CONTACT(S) within 3 nautical miles in azimuth and range of each other.
Guns	Aircraft gun is being employed.
Hard (Direction)	High-G-force, energy sustaining turn in the indicated direction (default is a 180-degree turn).
Heads Up	Alert of an activity of interest.
Heavy	A GROUP known to contain three or more CONTACTs.
Hit(s)	1. Momentary radar return(s). 2. Indicates approximate altitude (e.g., GROUP BULLSEYE 360/10, HITS 15 thousand)
Holding Hands	Aircraft in visual formation.
Hold Fire	An emergency fire control order to stop firing on a designated target, to include destruction of missiles in flight.
Home Plate	Home airfield or ship.
Hostile	A contact identified as enemy upon which clearance to fire is authorized IAW theater rules of engagement.
Hot	1. Initiate or initiating a turn in the combat air patrol toward the anticipated threats 2. Defined area is expected to receive fire (enemy or FRIENDLY). 3. Ordnance employment intended or completed. 4. CONTACT aspect stabilized at 160– 180 degrees angle from tail or 0–20 degrees angle from nose. 5. Intercept geometry will result in passing in front of the target.
Hotdog	FRIENDLY aircraft is approaching or is at a specified standoff distance. (Color may indicate additional standoff distance). Follow briefed procedures.
I.D.	1. Directive call to identify the target or track. 2. ID is accomplished, followed by type.

In	Turning toward a known threat. Opposite of OUT.
India	Mode IV IFF.
Jink	Perform an unpredictable maneuver to negate a tracking solution.
Joker	Fuel state above BINGO at which separation or BUGOUT or event termination should begin.
Judy	Aircrew has taken control of the intercept and only requires situation awareness information; controller will minimize radio transmissions.
Kill	In training, shooters are TALLY at assessed missile timeout.
Knock-It-Off	Cease all air combat maneuvers, attacks, activities, or exercises (training use only).
Ladder	Picture label with three or more GROUPs on the same azimuth but separated by range.
Laser On	Directive call to start lasing.
Lead/Trail	Inner GROUP formation of two CONTACTS separated in range.
Leaker(s)	Airborne threat has passed through a defensive layer. Call should include amplifying information.
Line Abreast	Inner GROUP formation of two or more contacts separated in azimuth.
Locked	Radar lock-on; SORT is not assumed.
Magnum	Launch of FRIENDLY anti-radiation missile.
Mapping	Multifunction radar in an air-to-ground mode.
Marking	Challenge and response term for requested aircraft to report contrails.
Marshal	Establish at a specific point, typically used to posture forces in preparation for an offensive operation.
Meld	Shift radar responsibilities from sanitizing to gaining situational awareness on the assigned GROUP.
Merge	FRIENDLIES and targets have arrived in the visual arena.

Monitor	Maintain(ing) sensor awareness on specified GROUP or object. Implies that tactically significant changes will be communicated.
Mother	Parent ship.
New Picture	Used by controller or aircrew when tactical PICTURE has changed. Supersedes all previous calls and reestablishes PICTURE for all players.
No Factor	Stated [object] is not a threat.
No Joy	Aircrew does not have visual contact with the TARGET or BANDIT. Opposite of TALLY.
Off (Direction)	Attack is terminated, and maneuvering to the indicated direction.
Offset	Maneuver in a specified direction with reference to the target.
Opening	Increasing separation.
Out	Turn or turning to a cold aspect relative to a known threat.
Package	Geographically isolated collection of GROUPs outside of briefed range.
Padlocked	Aircrew cannot take eyes off an aircraft, ground target, or surface position without risk of losing TALLY or VISUAL.
Parrot	IFF selective ID feature transponder.
Picture	A request to provide information pertinent to the mission in a digital bullseye format unless briefed otherwise.
Pig's away	FRIENDLY glide weapon(s) (e.g., joint stand-off weapon).
Pigeon	Bearing in magnetic and range in nautical miles to HOME PLATE.
Pince/Pincer	Threat maneuvering for a bracket attack.
Playmate	Cooperating aircraft.
Playtime	Amount of time aircraft can remain on station, given in hours plus minutes (e.g., ONE PLUS THIRTY equals 1 hour and 30 minutes).
Pop	Max performance climb out of low-altitude structure.
Popeye	Flying in clouds or an area of reduced visibility.

Popup	GROUP that has suddenly appeared between the MELD and threat range.
Posit	Request for FRIENDLY position; response in terms of a geographic landmark or from a common reference point.
Post Attack	Desired direction or directives after completion of intercept or engagement.
Post Hole	Rapid descending spiral.
Press	Requested action is approved and mutual support will be maintained, assumes VISUAL.
Pump	A briefed maneuver to minimize closure on the threat or geographical boundary with the intent to reengage.
Pure	Pure pursuit is being used or directive to go pure pursuit.
Push	Switch to designated frequency; no acknowledgment required.
Pushing	Departing designated point.
Range	A PICTURE label describing two GROUPs separated in distance along the same line of bearing.
Reference	Assume stated direction or heading.
Reset	Proceed to a pre-briefed position or area of operations.
Resume	Resume last formation, route, or mission ordered.
Rider	A BOGEY that is complying with airspace control order or safe passage procedures.
Ripple	Two or more munitions will be released or fired in close succession.
Rolex (Time +/-)	Timeline adjustment in minutes for entire mission; always referenced from original preplanned mission execution time. "Plus" means later; "minus" means earlier.
SAM	Visual acquisition of a SAM in flight or a SAM launch; should include position.
Scram	FRIENDLY asset is in immediate danger. Withdraw clear in the direction indicated for survival. No further mission support from the FRIENDLY asset is expected.

A-8 MULTI-SERVICE TACTICAL BREVITY CODES

Separate	Leaving a specific engagement; may or may not reenter.
Shackle	One weave; a single crossing of flight paths; maneuver to adjust or regain formation parameters.
Shooter	Aircraft or unit designated to employ ordnance.
Shotgun	Pre-briefed weapons state.
Skate	Informative or directive call to execute launch and leave tactics at a pre-briefed range. Modifiers can include LONG and SHORT.
Skip It	Directive call for a specific platform to not engage the indicated track. Usually followed with further directions.
Skosh	Aircraft is out of or unable to employ active radar missiles.
Snaplock	Informative call indicating fighter has obtained a radar contact inside briefed threat range with BEAM, FLANK, or HOT aspect and is unable to complete sanitization responsibilities implying ownership. A SNAPLOCK call should be responded to with BRAA.
Sort	Assignment of responsibility within a GROUP; criteria can be met visually, electronically (i.e., radar), or both.
Sorted	Sort responsibility within a GROUP has been met.
Sour	Invalid or no response to an administrative IFF or selective ID feature check.
Spitter	An aircraft that has departed from the engagement or is departing the engaged fighter's targeting responsibility.
Splash	Target destroyed.
Split	Flight member is leaving formation to pursue a separate attack; VISUAL may not be maintained.
Squawk	Operate IFF/selective ID feature as indicated or IFF or selective ID feature is operating as indicated.
Stack	Two or more CONTACTS within GROUP criteria with an altitude separation in relation to each other (typically above >=10,000 foot separation).
Status	Request for an individual's tactical situation.

Stern	Requests for, or directive to, intercept using STERN geometry.
Stinger	Three-ship inner GROUP formation with two lead CONTACTs line abreast and the SINGLE in trail.
Stranger	Unidentified traffic that is not a participant in the action in progress.
Strangle	Turn off system indicated (e.g., STRANGLE PARROT).
Stripped	Aircraft is out of pre-briefed formation.
Sweet	1. Valid response to an administrative IFF or selective ID feature check Request 2. Equipment indicated is operating efficiently.
Tally	Sighting of a target, non-friendly aircraft, or enemy position. Opposite of NO JOY.
Target	Assignment of targeting responsibilities.
Targeted	Fighter has acquired assigned GROUP and has assumed responsibility for it.
Terminate	In training, cease local engagement without affecting the overall exercise.
Threat	Untargeted HOSTILE or BANDIT or BOGEY is within a briefed range of a FRIENDLY aircraft.
Tied	Positive radar contact with element or aircraft.
Tiger	Enough fuel and ordnance to accept a commitment.
Track	GROUP or CONTACTS direction of flight or movement.
Trashed	FRIENDLY missile has been defeated.
Unable	Cannot comply as requested or directed.
Uniform	Ultra-high frequency (UHF)/amplitude modulation (AM) radio.
Victor	VHF/AM radio.
Visual	Sighting of a FRIENDLY aircraft or ground position or ship. Opposite of BLIND.

Weapons (Status)	1. (FREE): at targets not identified as FRIENDLY IAW current ROE. 2. (TIGHT): at targets positively identified as HOSTILE IAW current ROE. 3. (HOLD/SAFE): in self-defense or in response to a formal order.
What Luck	Request for results of missions or tasks.
Words	Directive or interrogative call regarding further information or directives pertinent to the mission.
Yardstick	Use A/A tactical air navigation for ranging

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APPENDIX B
GLOSSARY OF TERMS

ADA	Air Defense Artillery; any weapon system above 12.7 mm (.50 caliber) specifically designed to engage airborne targets.
ALR	Acceptable Level of Risk; risk level assigned to a mission by the Commander to provide Commander's intent for fighter risk decision-making (LOW, MEDIUM, HIGH).
Aerial Refueling (AR)	Refueling other aircraft through tanking in support of aircraft carrier operations.
AIC	Air Intercept Controller; the person trained to provide communications, radar direction, and cueing (which they term control) to fighter aircraft during an intercept.
Airborne Reconnaissance	Gathering intelligence through airborne imagery of points of interest.
Air Superiority	The control of a contested airspace without prohibitive interference by an opposing force.
Air Supremacy	The complete dominance of the air power of an opposing force resulting in the complete control of the skies.
ATA	Antenna Train Angle; angular difference between the fighter's heading and the bearing to a threat.
Bullseye	An established reference point from which the position of an object can be referenced by bearing (magnetic) and range (nautical miles) from this point.
BVR	Beyond-Visual-Range
Close Air Support	Air support by fixed-wing and rotary-wing aircraft against hostile ground targets which require detailed integration with a Joint Terminal Attack Controller (JTAC) or Forward Air Control-Airborne (FAC(A)).
Cold Ops	The time and/or tasks to be executed after a drag defense and prior to a recommit / turn hot while the fighters are flowing cold.
Commit	The act of taking responsibility for initiating an intercept on a picture (group or multiple groups).

Crank	A maneuver in the direction indicated to illuminate a target at or near radar GIMBAL limits.
DCA	Defensive Counter Air; using friendly fighters to defend a high value asset or point of interest through air superiority (e.g., the carrier strike group).
FAC(A)	Forward Air Controller-Airborne; the person responsible for controlling aircraft and ground artillery against hostile ground targets by a qualified Joint Terminal Attack Controller (JTAC) who performs all the functions of a JTAC from the air.
Faded	A group has disappeared from AIC's radar with low confidence of missile impacting threat aircraft.
Label	The relationship between groups.
Lag Pursuit	A pursuit curve where the fighter places their nose behind the adversary.
LAR	Launch Acceptable Region; a three dimensional volume of space around a fighter in which it can employ weapons.
Lead Pursuit	A pursuit curve where the fighter places their nose in front of the adversary.
MANPAD	Shoulder fired rocket with IR guidance.
Meld	The actions taken to shift from a sanitization role to an employment role.
MAR	Minimum Abort Range; the minimum range at which fighters can execute a drag defense and kinematically defeat threat missiles. Does not provide for a recommit.
MOR	Minimum Out Range; the range at which fighters may execute a drag defense which kinematically defeats threat missiles and preserves the opportunity for a recommit.
MRR	Minimum Recommit Range; Assessed during and executed from cold ops. The minimum range that fighters can execute a 140 degree turn towards the threat, shoot, correlate, support missiles to an active state, and execute a defense at MAR.

B-2 GLOSSARY OF TERMS

MPFs	Mission Planning Factors; Unique factors related to each mission that must be considered in order to achieve mission success.
Name	The title given to each individual group in the labeled picture.
OCA	Offensive Counter Air; using friendly fighters to project air superiority over a contested airspace.
P_K	Probability of Kill
Precision Strike	The employment and delivery of Laser, TV, IR or GPS guided weapons to destroy enemy targets with a high probability of destruction and minimal collateral damage.
Pure Pursuit	A type of pursuit curve resulting from keeping the adversary directly off the nose (0° ATA).
R_{MAX}	Maximum range of an air-to-air missile.
R_{MIN}	Minimum range of an air-to-air missile.
R_{NE}	The no escape range of an air-to-air missile.
ROE	Rules of Engagement
SAM	Surface-to-Air missile
Sanitization	The act and mindset of prioritizing fighter's sensors for detecting targets that may be hidden from AIC's radar (by terrain, electronic attack, etc.)
Shot Range	A range at which fighters can employ and have missiles supported to an active state prior to MOR.
Skate	A defense designed to kinematically defeat threat missiles by placing the threat at the fighter's 6 o'clock and flowing cold.
SSC	Surface Surveillance Coordination; gathering intelligence for early warning against threats to the battle group as well as engaging enemy vessels.
Tactical Range	A preparatory range that warrants a call from AIC letting fighters know they are at a pre-briefed range from the threat.

T_A	Target Aspect; the angular difference between the threat heading and the bearing from the threat to the fighter.
Targeting	The range at which a flight lead will issue targeting responsibility to the flight.
Vanished	A group has disappeared from or is degraded on AIC's radar at the same time as anticipated missile impact, likely showing some signs of aircraft breakup / deceleration / rapid descent to the AIC controllers. High confidence that the group is no longer a threat.
V_C	Velocity of Closure; Speed in knots that a fighter and threat are moving towards each other.
WEZ	Weapons Engagement Zone; the three-dimensional volume of airspace around a threat aircraft in which he can employ.
WVR	Within-Visual-Range.

APPENDIX C
THREATS OF THE DAY

SU-27 SM3 FLANKER J

ARMAMENT	PHYSICAL DESCRIPTION

MIG-29 FULCRUM C

ARMAMENT	PHYSICAL DESCRIPTION

RS-AA-10A-D ALAMO

GUIDANCE	CATEGORY

RS-AA-11A ARCHER

GUIDANCE	CATEGORY

C-2 THREATS OF THE DAY