Pocket Checklist

F-14A/B AIRCRAFT

REV: 20220304

Procedures

Systems

AWG-9 Radar

TCS LANTIRN

A/G Weapons

A/A Weapons

DISCLAIMER

This document represents a personal project and is intended for entertainment purposes only. Do not use for training purposes or in real life scenarios.

Contents

Chapter 1

PROCEDURES

Contents

1.1 START-UP

1.1.1 PILOT - PRE-START

1.	**Parking Brake**	**ENGAGED**
2.	**Ground Power**	connected
3.	**Compressed Air**	connected
4.	**ICS**	**HOT MIC**
5.	**TO RIO**	*"Begin Start-Up"*
6.	**ICS**	**Comm Check**
7.	**MASTER TEST Selector**	(a) **LTS** • **Warning Lights** . . . . checked • **Caution Lights** . . . . checked • **Advisory Lights** . . . . checked (b) **FIRE DET/EXT** • **L FIRE GO** . . . . illuminated • **R FIRE GO** . . . . illuminated (c) **INST** • **RPM** . . . . 96% • **EGT** . . . . 960 C • **FF** . . . . 10500 pph • **AOA** . . . . 18 ± 5 • **Wing Sweep** . . . . 45 ± 2.5 • **FUEL QTY** . . . . 2000 ± 200 • **Oxygen QTY** . . . . 2 liters • **L&R FF lights** . . . . illuminated (d) **OFF**
8.	**Ejection Seat**	Armed
9.	**RIO**	Canopy Closed
10.	**Oxygen**	**ON (FWD)**
11	**Emergency Wing Sweep**	**OVERSWEEP**

1.1.2 PILOT - ENGINE START

1.	**AIR SOURCE**	**OFF**
2.	**Hydraulics**	(a) **HYD TRANSFER PUMP** . . . . **SHUTOFF**
		(b) **Emerg. Hyd.** . . . . **AUTO (LOW)**
3.	**L&R MASTER GEN**	**NORM**
4.	**RIO**	*"Ready to Start"*
5.	**Right Engine Start-Up**	(a) **Engine Crank** . . . . **R**
		(b) **R Eng N2** 20%
		(c) **R Throttle** . . . . **IDLE**
		(d) **TIT** . . . . < 890 C during start
		(e) **R GEN CAUTION** . . . . extinguished
6.	**Stabilized Parameters**	• **RPM** 62-78%
		• **TIT** . . . . approx 500 C
		• **Fuel Flow** . . . . 950-1400 pph
		• **NOZ** 5 (100%)
		• **Oil Pressure** . . . . 25-35 psi
		• **Hyd Pressure** . . . . 3000 psi
7.	**Left Engine Start-Up**	(a) **Engine Crank** . . . . **L**
		(b) **L Eng N2** 20%
		(c) **L Throttle** . . . . **IDLE**
		(d) **TIT** . . . . < 890 C during start
		(e) **L GEN Caution** . . . . extinguished
8.	**Stabilized Parameters**	• **RPM** 62-78%
		• **TIT** . . . . approx 500 C
		• **Fuel Flow** . . . . 950-1400 pph
		• **NOZ** 5 (100%)
		• **Oil Pressure** . . . . 25-35 psi
		• **Hyd Pressure** . . . . 3000 psi
9.	**HYD TRANSFER PUMP**	**NORM**
10.	**HYD PRESSURE**	3000 psi
11.	**AIR SOURCE**	**BOTH ENG**
12.	**Ground Power**	disconnected
13.	**Compressed Air**	disconnected

1.1.3 PILOT - POST-START

1.	**TO RIO**	*"Both Engines Running"*
2.	**Displays Control Panel**	• **VDI** . . . . **ON** • **HUD** . . . . **ON** • **HSD** . . . . **ON** • **HDS MODE** . . . .**TID** (monitor INS)
3.	**RIO**	**Select Align Quality** • **INS GO NOW:** shortest but least precise alignment • **INS GO COARSE:** does not meet Launch Criteria for AIM-7 / AIM-54 • **INS GO MIN WPN LAUNCH:** allows AIM-7 / AIM-54 launch • **INS GO FINE** fine align (8 min)
4.	**ACM Panel**	• **GUN RATE** . . . . .as required • **SW COOL** . . . .**OFF** • **MSL PREP** . . . .**OFF** • **Missile MODE/STP** . . . . **NORM**
5.	**Gun Rounds**	**Set**
6.	**ANTI-SKID SPOILER BK**	**OFF**
7.	**Emergency Wing Sweep**	(a) **Handle** . . . . **AFT** (b) **Angle** . . . . Verify 68 deg
8.	**AFCS Panel - SAS STAB AUG**	• **PITCH** . . . .**ON** • **ROLL** . . . . **ON** • **YAW** . . . . **ON**
9.	**WING/EXT TRANS**	**AUTO**
10.	**UHF 1 Function Selector**	**BOTH**
11.	**TACAN Function Selector**	**T/R**
12.	**ARA-63 ICLS RECEIVER**	**ON**

13.	**Radar Altimeter**	(a) **Control Knob** . . . . one click CW to turn on
		(b) **Display** . . . . 6000 ft (warm up)
		(c) **Display** . . . . 0 ft (ready)
14.	**Standby ADI**	erect at least 2 min before T/O
15.	**KY-28 Crypt. Key**	**Set** (refer to GROUND SETTINGS kb)
16.	**RIO**	set D/L frequency
17.	**Lights**	As desired

WARNING

- **PARKING BRAKE MUST BE ENGAGED DURING ALIGNMENT.**
  Lack of parking brake engagement inhibits INS alignment

1.1.4 RIO - PRE-START

1.	**Oxygen**	**ON (FWD)**
2.	**PILOT**	• **Ground Power** .... connected • **Compressed Air** ....connected
3.	**ICS**	Comm Check
4.	**Lights**	As required
5.	**LTS Test**	Coordinate with Pilot
6.	**Ejection Seats**	**ARMED**
7.	**Canopy**	**CLOSED**
8.	**TO PILOT**	*"Ready to Start"*

1.1.5 RIO - POST-START - SHORE

1.	**PILOT**	• **Engines** .... started • **AIR SOURCE** .... BOTH ENG
2.	**INS STARTUP**	(a) **LIQUID COOLING** .... **ON (FWD)** (b) **WCS Switch** ....**STANDBY** (c) **IR/TV Power** ....**STBY/IR/TV** (d) **TID/DDD** .... illuminated after 40 s
3.	**Kneeboard**	Retrieve Coordinates, Elevation, Magnetic Variation from GROUND SETTINGS Page
WARNING Input Coords **BEFORE** selecting **GND ALIGN** if using ASH		

4.	**Start INS Align**	(a) **Nav Mode** .... **GND ALIGN**
		(b) **CAP**
		   • **Category** .... **NAV**
		   • **MESSAGE** .... **OWN AC**
		(c) **Keyboard**
		   • **CLEAR**, **LAT**, latitude, **ENTER**
		   • **LONG**, longitude, **ENTER**
		   • **ALT**, altitude, **ENTER**
		(d) **CAP MESSAGE** .... **MAG HDG VAR**
		(e) **Keyboard** .... **HDG**, mag var, **ENTER**
		(f) **Align Progress** .... Monitor

5.	**U/VHF Mode**	**T/R G**

6.	**Datalink**	(a) **Kneeboard** . . . . TACTICAL DL
		(b) **DL Power** . . . . **ON (FWD)**
		(c) **DL Mode** . . . . **TAC (AFT)**
		(d) **DL Freq.** . . . . **Set**
7.	**TACAN**	**T/R**
8.	**RWR Panel**	(a) **Display Type** . . . . **NORM**
		(b) **PWR** . . . . **ON**
		(c) **TEST** . . . . **SPL**
		(d) **MODE** . . . . **LMT**
9.	**DECM**	**STBY**, then **ACT**
10.	**IFF**	(a) **MASTER** . . . . **STBY**
		(b) **CODE** . . . . as required
11.	**Altimeter**	Reset
12.	**CAP**	Enter Data (WP, FP, *etc.*)
13.	**Displays**	• **DDD** . . . . Set
		• **TID** . . . . Set
		• **Multiple Display Indicator** . . . . Set
14.	**Hand Control Panel**	Set
15.	**AN/ALE-39**	Set (as required)
		• **AUTO (CHAFF)/MAN**
		• **MAN**
16.	**Flare Mode**	**PILOT**
17.	**Complete INS Align**	• **Duration Full Fine** . . . . 8 min
		• **Duration ASH** . . . . much faster
		(a) **Align Complete** . . . . Caret → Diamond
		(b) **NAV Mode** . . . . **INS NAV**
18.	**Standby ADI**	Erect at least 2 min before T/O
19.	**TO PILOT**	*"Ready to Taxi"*
Once Airborne		
20.	**IR/TV Power**	**ON**
21.	**WCS Switch**	**WCS XMT**

1.1.6 RIO - POST-START - CARRIER

1.	**PILOT**	• **Engines** . . . . started • **AIR SOURCE** . . . . BOTH ENG
2.	**INS STARTUP**	(a) **LIQUID COOLING** . . . . **ON (FWD)** (b) **WCS Switch** . . . . **STANDBY** (c) **IR/TV Power** . . . . **STBY/IR/TV** (d) **TID/DDD** . . . . illuminated after 40 s
3.	**Datalink**	(a) **Kneeboard** . . . . TACTICAL DL (b) **DL Power** . . . . **ON (FWD)**
4.	**Start INS Align**	(a) **DL FREQ** . . . . Set (b) **DL Mode** . . . . **CAINS/WAYPT** (c) **Nav Mode** . . . . **CVA**
5.	**U/VHF Mode**	**T/R G**
6.	**TACAN**	**T/R**
7.	**RWR Panel**	(a) **Display Type** . . . . **NORM** (b) **PWR** . . . . **ON** (c) **TEST** . . . . **SPL** (d) **MODE** . . . . **LMT**
8.	**DECM**	**STBY**, then **ACT**
9.	**IFF**	(a) **MASTER** . . . . **STBY** (b) **CODE** . . . . as required
10.	**Altimeter**	Reset
11.	**CAP**	Enter Data (WP, FP, *etc.*)
12.	**Displays**	• **DDD** . . . . Set • **TID** . . . . Set • **Multiple Display Indicator** . . . . Set
13.	**Hand Control Panel**	Set
14.	**AN/ALE-39**	Set (as required) • **AUTO (CHAFF)/MAN** • **MAN**
15.	**Flare Mode**	**PILOT**

16.	**Complete INS Align**	· **Duration Full Fine** .... 9 min · **Duration ASH** .... much faster (a) **Align Complete** .... Caret → Diamond (b) **NAV Mode** .... **INS NAV**
17.	**Datalink**	(a) **DL Mode** .... **TAC (AFT)** (b) **DL Freq.** .... **Set**
18.	**Standby ADI**	Erect at least 2 min before T/O
19.	**TO PILOT**	*"Ready to Taxi"*
Once Airborne		
20.	**IR/TV Power**	**ON**
21.	**WCS Switch**	**WCS XMT**

WARNING

- Input Coords **BEFORE** selecting **GND ALIGN** if using ASH. Else alignment can progress too far to correct coordinates by the time they are input.
- **PARKING BRAKE MUST BE ENGAGED DURING ALIGNMENT.** Lack of parking brake engagement inhibits INS alignment

1.2 TAKEOFF & LANDING

1.2.1 PRE-TAXI

1.	**ANTI-SKID SPOILER BK**	**OFF**
2.	**HOOK BYPASS**	As Required
3.	**Nose Strut**	**RETRACTED**
4.	**HUD MODE**	**TO**
5.	**Parking Brake**	**Released (IN)**
6.	**NWS**	**ENGAGED**
7.	**Path**	verify clear

1.2.2 TAKEOFF - SHORE

		After Lining Up On Runway
1.	**Wing Sweep**	(a) **EM WING SWEEP** . . . . **FWD**, then **IN**
		(b) **MASTER RESET** . . . . **PRESS**
		(c) **Wings** . . . . Verify thumb controller
		(d) **WING SWEEP** . . . . **AUTO**
		(e) **Wings** . . . . Verify at 20 deg
2.	**ANTI SKID SPOILER BK**	**BOTH (UP)**
3.	**FLAPS**	**UP**
4.	**Trim**	0 deg
5.	**NWS**	**DISENGAGED**
6.	**Takeoff**	(a) **Throttle** . . . . **MIL** (90% RPM)
		(b) **Stick** . . . . **Back** at 130 KIAS
		(c) **Rotation** . . . . approx 140 KIAS
		(d) **GEAR** . . . . **UP** < 250 KIAS

1.2.3 TAKEOFF - CARRIER

	Lineup	• Wait behind JBD until Catapult is clear
		• Follow Taxi Directors Instructions to line up on Catapult
1.	**Wing Sweep**	(a) **EM WING SWEEP** . . . . **FWD**, then **IN**
		(b) **MASTER RESET** . . . . **PRESS**
		(c) **Wings** . . . . Verify thumb controller
		(d) **WING SWEEP** . . . . **AUTO**
		(e) **Wings** . . . . Verify at 20 deg
2.	**FLAPS**	**DOWN**
3.	**Launch Bar Preparation**	(a) **Nose Strut** . . . . **KNEEL** when directed
		(b) **Throttle** . . . . **UP** when directed
		(c) **Taxi** . . . . launch bar into shuttle
		(d) **Throttle** . . . . **IDLE** when directed
4.	**Trim**	2-3 deg nose up
5.	**Speed Brakes**	**IN**
6.	**Final Checks**	(a) **Throttle** . . . . **MIL** when directed
		(b) **Control Wipeout**
		• Stick Full Forward
		• Stick Full Aft
		• Stick Full Left
		• Stick Full Right
		• Rudder Full Left
		• Rudder Full Right
		(c) **Eng. Inst.** . . . . **Checked**
		(d) **Caution/Warnings** . . . . **None**
7.	**Catapult Shot**	(a) **Salute** . . . . **CAT SHOT**
		(b) **Gear** . . . . **UP** < 250 KIAS
		(c) **Flaps** . . . . **UP** < 225 KIAS
8.	**Clearing Turn**	

1.2.4 LANDING - OVERHEAD PATTERN
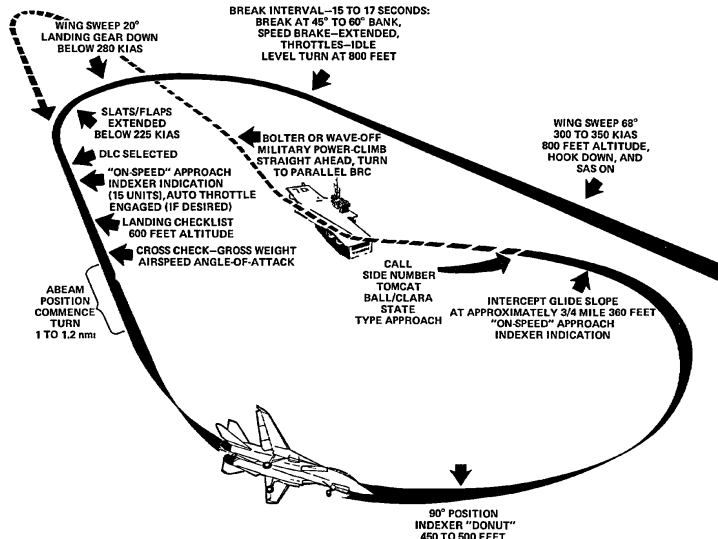
1.	**Initial Approach**	• **WING SWEEP** . . . . **68 deg**
		• **HOOK** . . . . **DOWN**
		• **SAS** . . . . **ON**
		• **HUD** . . . . **LDG**
		• **Airspeed** . . . . **300-350 KIAS**
		• **Altitude** . . . . **800 ft**
2.	**Initial Break**	• **Break Interval** . . . . **15-17 s**
		• **BANK** . . . . **45-60 deg**
		• **SPEED BRAKE** . . . . **EXTEND**
		• **Throttle** . . . . **IDLE**
		• **G** . . . . **3-4 G**
		• **Altitude** . . . . **800 ft**
3.	**Break Turn**	• **Wing Sweep** . . . . **AUTO** < 280 KIAS
		• **Landing Gear** . . . . **DOWN** < 280 KIAS
		• **FLAPS** . . . . **DOWN** < 225 KIAS
4.	**Downwind**	• **DLC** . . . . **Selected** once flaps out
		• **AOA** . . . . **ON-SPEED**
		• **LANDING CHECKLIST**
		• **Altitude** . . . . descend to **600 ft**

5.	**Final Turn**	**180 Deg Position**
		• **Abeam Pos.** . . . . **1-1.2 nmi**
		90 Deg Position
		• **AOA** . . . . **DONUT**
		• **Altitude** . . . . **400-500 ft**
6.	**Intercept Glides-lope**	• **Distance** . . . . **3/4 Mile**
		• **Altitude** . . . . **360 ft**
		• **AOA** . . . . **ON-SPEED**

1.2.5 LANDING - CHECKLIST

1.	**Wing Sweep**	**20 deg AUTO**
2.	**Wheels**	• **Lights** . . . . **3 DOWN**
		• **Transition Light** . . . . **OUT**
3.	**SAS**	**ON**
4.	**FLAPS**	**DOWN**
5.	**DLC**	**Checked**
6.	**Hook**	• **HOOK** . . . . **DOWN**
		• **Transition Light** . . . . **OUT**
7.	**Harness**	**Locked**
8.	**Speedbrakes**	**EXT**
9.	**Brakes**	**Check**
10.	**Fuel**	**Check**

1.3 IN-FLIGHT

1.3.1 AERIAL REFUELING

1.	**REFUELING CHECKLIST**	(a) **WCS** . . . . **STBY**
		(b) **ARMING** . . . . **SAFE**
		(c) **DUMP Switch** . . . . **OFF**
		(d) **AIR SOURCE** . . . . **L ENG**
		(e) **REFUEL PROBE** . . . . **As desired**
		(transition light off)
		(f) **WING SWEEP** . . . . **As desired**
2.	**DISENGAGE-MENT**	(a) **REFUEL PROBE** . . . . **RET**
		(transition light off)
		(b) **AIR SOURCE** . . . . **BOTH**
		(c) **WING SWEEP** . . . . **AUTO**

1.3.2   AIRSTART

•	**Spooldown**	*Before significant spooldown* 　　(a) **Non-Running ENG** . . . . **IDLE** or above *If no relight occurs* 　　(b) **Non-Running ENG** . . . . **OFF** then **IDLE** *If still no relight occurs* 　　(c) **ENG MODE** . . . . **SEC** 　　(d) **Non-Running ENG** . . . . **OFF** then **IDLE**
•	**Cross-Bleed Restart**	*With one ENG running, if Spooldown fails* 　　(a) **Non-Running ENG** . . . . **OFF** 　　(b) **FUEL SHUT OFF** . . . . check 　　(c) **Running throttle** . . . . 80%+ 　　(d) **BACK UP IGNITION** . . . . **ON** 　　(e) **ENG CRANK** . . . . non-running eng 　　(f) **Non-Running ENG** . . . . **IDLE** *If no start occurs* 　　(g) **Non-Running ENG** . . . . **OFF** then **IDLE** *If still no start* 　　(h) **ENG MODE** . . . . **SEC** 　　(i) **Non-Running ENG** . . . . **OFF** then **IDLE**
•	**Windmill Restart**	(a) **Airspeed** . . . . >450 kts 　　(b) **Throttle** . . . . IDLE or above 　　(c) **BACK UP IGNITION** . . . . ON *If no relight occurs* 　　(d) **Throttle** . . . . OFF then IDLE *If still no relight* 　　(e) **ENG MODE** . . . . SEC 　　(f) **Throttle** . . . . OFF then IDLE
•	**Post Restart**	(a) **BACK UP IGNITION** . . . . OFF 　　(b) **ENG MODE** . . . . PRI

Chapter 2

SYSTEMS

Contents

2.1 FLIGHT CONTROL SYSTEMS

2.1.1 AFCS - SAS

• **SAS**	• **Stability Augmentation System** – **Not Fly-by-Wire** – Automatic control surface commands generated by analog computer to improve stability
• **Controls**	• **Three individual Switches** – Pitch – Roll – Yaw
• **Autopilot Emergency Disengage Paddle**	• **Paddle on Stick** – Disengages Autopilot Modes – Deactivates Pitch, Roll SAS Channels

2.1.2 AFCS - AUTOPILOT

• **Attitude Hold**	• **Basic Attitude Hold** – Maintains existing pitch & roll – Attitude can be changed with stick input – If engaged outside limits will automatically move within range • **Limits** – Pitch: 30 deg – Roll: 60 deg • **Engagement** (a) **SAS Switches** . . . . **ON (FWD)** (b) **Alt. Hold Mode** . . . . **OFF** (c) **VEC/PCD/ACL** . . . . **OFF** (d) **Heading Mode** . . . . **OFF** (e) **Autopilot Switch** . . . . . **ENGAGE (FWD)**

• **Altitude Hold**	• **Barometric Altitude Hold**		
	– Maintains current barometric altitude		
	• **Limits**		
	– Vertical velocity: < 100 ft/s		
	• **Engagement**		
	(a) **SAS Switches** . . . . **ON (FWD)**		
	(b) **Autopilot Switch** . . . . . **ENGAGE (FWD)**		
	(c) **Alt. Hold Mode** . . . . **ALT (FWD)**		
	(d) **A/P REF Light** . . . . . . Wait until appears		
	(e) **NWS Button** . . . .**Press**		
• **Heading Hold**	• **Magnetic Heading Hold**		
	– Maintains current magneatic heading		
	• **Limits**		
	– Bank angle < 5 deg		
	• **Engagement**		
	(a) **SAS Switches** . . . . **ON (FWD)**		
	(b) **Autopilot Switch** . . . . . **ENGAGE (FWD)**		
	(c) **Heading Mode** . . . . **HDG (FWD)**		
• **Ground Track**	• **Autopilot follows ground track**		
	– Similar to heading hold		
	– Compensates for wind drift		
	– Uses INS data instead of mag. bearing		
	• **Limits**		
	– Bank angle < 5 deg		
	• **Engagement**		
	(a) **SAS Switches** . . . . **ON (FWD)**		
	(b) **Autopilot Switch** . . . . . **ENGAGE (FWD)**		
	(c) **Heading Mode** . . . .**GT (AFT)**		
	(d) **A/P REF Light** . . . . . . Wait until appears		
	(e) **NWS Button** . . . .**Press**		
• **VEC/PCD**	• **Vector / Precision Course Direction**		
	– Allows Link 4 controller to remotely direct the aircraft		
	– **Not Modelled in DCS**		
• **ACL**	• **Automatic Carrier Landing**		
	– See relevant section		

• **Autopilot Emergency Disengage Paddle**	• **Paddle on Stick**
	
	   – **Disengages Autopilot Modes**
	   – **Deactivates Pitch, Roll SAS Channels**

2.1.3 APC / AUTOTHROTTLE

• **APC**	• **Approach Power Compensator**
	
	   – Automatic throttle control
	   – **Maintains ON SPEED AoA**

• **Conditions**	Engagement is inhibited / APC is disengaged if conditions not met
	   • **Throttles** . . . . 75%-90% RPM
	   • **Landing Gear Handle** . . . . **Down**
	   • **Weight on Wheels** . . . . **No**

• **Engage**	• **Throttle Mode** . . . . **AUTO (FWD)**
• **Disengage**	**Cage/Seam Button**

2.1.4 ACLS

2.1.5 WING-SWEEP

• **Overview**	• **In Flight Limited between 20 deg & 68 deg**
	• **On Ground can Oversweep to 75 deg**
	• **Hydromechanically Controlled**
	
	   – Automatically through CADC
	   – Manually with emergency wing-sweep handle
	
	• **15 deg/s at 1g loading**
	• **Mechanically linked to ensure symmetry**

• **CADC Modes**	• **AUTO**
	
	   – CADC controls wing position as function of current Mach via wing-sweep program
	
	• **MAN**
	
	   – Pilot manually chooses desired wing sweep angle with thumb controller
	
	• **BOMB**
	
	   – Sets wing sweep to **55 deg** or further aft

• **Emergency Mode**	• **Emergency Wing-Sweep Handle**
	– Moved with wing sweep program by spider detent under normal operation
	– Can be forced out of spider detent and moved manually
• **Oversweep**	• **Selected via Emergency Wing-Sweep Handle**
	(a) **Em. Wing-Sweep** . . . . **68 deg**
	Wait for wing-seal airbags to deflate
	(b) **HZ TAIL AUTH** . . . . **Illuminated**
	(c) **Em. Wing-Sweep** . . . . **75 deg**
• **Return to CADC Control**	• **After Emergency Mode / Oversweep**
	(a) **Em. Wing-Sweep** . . . . . . **Spider Detent**
	(Fwd on startup)
	(b) **MASTER RESET** . . . . **Press**

Indicated Mach	Max Forward Wing Position
0.4	20 deg
0.7	25 deg
0.8	50 deg
0.9	60 deg
1.0	68 deg

NOTE

• Indicates **Max** forward selectable wing sweep position

2.2 NAVIGATION SYSTEMS

2.2.1 OVERVIEW

•	**CAINS**	**C**arrier **A**ircraft **I**nertial **N**avigation **S**ystem
		  • **Primary navigation system of F-14**
		  • Additionally provides information for tactical systems
		    – Own position for long-range AIM-7 & AIM-54 modes
		    – Accurate Datalink sharing/receiving

Main Components		

•	**IMU**	**I**nertial **M**easurement **U**nit
		  • 3-Axis, 4-Gimbal system prevents gimbal-lock
		  • 2 gyros provide aircraft attitude and stabilize the platform
		  • 3 accelerometers measure accelerations in all orthogonal axes

•	**CSDC**	**C**omputer **S**ignal **D**ata **C**onverter • Handles data interface between sensors and **WCS**
•	**WCS**	**AWG-9 Computer** • **WCS** performs general navigation computations and provides them to PILOT & RIO through displays
•	**NPS**	**N**avigation **P**ower **S**upply • Provides power to **IMU** & **CSDC**
•	**Subsystems**	• Radar Altimeter • TACAN • AHRS
Controls		
•	**CAP**	• Used for Data Entry • **CATEGORY** – **NAV**

• **NAV MODE Selector**	• **OFF** – Turns off power to IMU • **ALIGN** – Three align modes **See Alignment Section** • **INS** – Selects normal INS navigation mode • **IMU/AM** – Selects backup mode. Uses IMU for aircraft attitude, TAS from CADC, and stored/entered winds for navigation • **AHRS/AM** – Selects further degraded backup mode. Uses magnetic heading from AHRS, TAS and AoA from CADC, and stored wind and mag var for navigation
Failure Indicators	
• **NAV COMP Light**	• If illuminates while **NAV MODE** is in **INS** indicates failure in **INS** or **CSDC** • Navigation system automatically switches to **IMU/AM** • Remains illuminated until **NAV MODE** is set to **IMU/AM**
• **IMU Light**	• Indicates failure of **IMU** • Navigation system automatically switches to **AHRS/AM** • Remains illuminated until **NAV MODE Switch** is set to **AHRS/AM**
• **AHRS Light**	• Indicates **AHRS** self-test detected a failure • Magnetic heading now commanded by WCS computer using last known mag var values • Heading values will degrade over time

2.2.2 ALIGNMENT - OVERVIEW

• **Main Phases**	(a) **Coarse Alignment**	
		• Warm-up of IMU elements
		• Gimbals caged to Airframe
		• Gyros brought up to speed
		• Coarse IMU platform leveling performed with accellerometer outputs
		• Begins upon completion of initializatin sequence
		• Computes Initial coarse estimates of IMU wander angle
	(b) **Fine Alignment**	
		• Uses gryoscopic drift to calculate true heading
• **Primary Align Modes**	• **SAT** – **NOT IMPLEMENTED**	
		– Ground
		– Carrier
	• **NON-SAT**	
		– Ground
		– Carrier
• **Align Submodes**	• **CAT ALIGN** – overrides parking brake requirement	
	• **STORED HEADING** – uses previous aligment as reference for rapid alignment	
	• **HANDSET** – for **CVA ALIGN** when SINS data not available	

NOTE

- Initialization requires Aircraft or Homebase data

    – Lat/Long
    – Pressure Altitude

    If **HANDSET Alignment** used requires Carrier parameters

    – Speed
    – True heading

- **Parking brake must be on during initialization of any mode**

    – If released during coarse align, **STBY** and **READY** lights flash, align program reinitializes
    – If released during fine align, suspend align discrete sent to CSDC, **STBY** or **READY** light blinks, time-to-align clock on **TID** stops

2.2.3 ALIGNMENT - NON-SAT

• **Enter GND Align**	• **GND ALIGN** requires own-aircraft or Home-base parameters
	– Latitude / Longitude – Altitude
	• Can be entered into **CAP** before or within 90-120 s after selecting **GND ALIGN**

NOTE

- Whatever has been hooked when **ALIGN** is selected is injected as own-aircraft coordinates
- If fine align complete not yet achieved, own-aircraft latitude entry will reinitialize the alignment

• **Enter CVA Align**	• **CVA ALIGN** requires **DL CAINS Mode** to align aircraft IMU to ship's INS
	(a) **Datalink** . . . . **ON** (b) **WCS** . . . . **STBY** (c) **D/L Mode** . . . . **CAINS/WAYPT** (d) **NAV MODE Switch** . . . . **CVA ALIGN**

• **Initialization**	• After approx. 20 s **STBY/READY Lights** illuminate
	• **TID** displays alignment time of **0.7** during initialization
	• After 42-45 s **NAV COMP** and **READY** lights extinguish, indicating IMU is ready
	• Upon completion of initialization the **Alignment Status Indicator (CARET)** appears,
• **Coarse Alignment**	• **CARET** before coarse-align complete marker (first tick)
	• Upon completion of coarse alignment phase the **CARET** is directly above the first tick and changes to a **DIAMOND**

NOTE

- Parking brake can be released for taxi after coarse align is complete. Will suspend align
- Suspend align indicated by flashing **STBY** and/or **READY Lights**
- During suspend align taxiing more than 4000 ft will render the **INS** performance unreliable

• **Fine Alignment**	• **DIAMOND** between first and third ticks
	• **Second Tick** – minimum weapon launch criteria met
	– **STBY Light** – extinguishes
	– **READY Light** – light illuminates
	– **INS Mode** – may be selected
	• **Third Tick** – fine alignment complete
	– Dot appears in Diamond
	– Can be left in align for progressively more accurate alignment
• **Exit Alignment**	• **Select INS Mode**
	– **READY Light** – extinguishes
	– Tactical tape appears
	– Normal navigation display available

•	**Reinitialization**	If observable acronym (**O**) or stalled align noticed during fine align. RIO can apply any of following methods

    (a) **NAV MODE SWITCH** . . . . **OFF**
    (b) **WCS** . . . . **OFF**
    (c) Proceed with normal start sequence

    (a) **NAV MODE SWITCH** . . . . **OFF**
    (b) **NAV MODE SWITCH** . . **Desired Align Mode**

    (a) **NAV MODE SWITCH** . . . . **INS**
                      Verify **IN** on **TID**
    (b) **NAV MODE SWITCH** . . . . **OFF**
    (c) **NAV MODE SWITCH** . . **Desired Align Mode**

NOTE

- You will get **Erroneous Heading Readings on a Carrier** even with fine align complete (up to 30 deg) due to ship's magnetic field
- Deviation goes away shortly after takeoff

2.2.4 ALIGNMENT - NON-SAT - SUBMODES

•	**Stored Heading Alignment**	• Reference alignment stored prior to powering-down the aircraft • **ASH** – Automatic Stored Heading displayed on TID when align selected and reference align available

•	**Handset Alignment**	• For use when SINS data not available (indicated by flashing **HS** on **TID**)
		• Similar to **GND ALIGN** but requires additional parameters for the ship movement
		    – Latitude / Longitude
		    – Ship's Speed
		    – Ship's True Heading

•	**Catapult Alignment**	• Inhibits suspend align while positioned on the catapult when parking brake released

2.2.5 ALIGNMENT - FAILURES

•	**TID Status Indicators**	Appear between first and second ticks • **C** – **Cal Data Fail** • **T** – **Temp** (cold IMU) • **S** – **SINS Data Invalid** • **O** – **Observable** (alignment data bad)

•	**INS Status Indicators**	• **STBY ON / READY ON**
		
		    – Normal during align initialization
		    – Else indicates IMU, NAV COMP, NPS or AHRS Failure
		
		• **STBY ON / READY OFF**
		
		    – Normal during align after initialization
		    – Normal when **IMU/AM** selected prior to completion of coarse align
		
		• **STBY FLASHING / READY FLASHING**
		
		    – Alignment not initiated due to suspended alignment (check parking brake)
		
		• **STBY FLASHING / READY OFF**
		
		    – Align suspended (check parking brake)
		
		• **STBY OFF / READY ON**
		
		    – Min weapon launch requirements met
		
		• **STBY OFF / READY OFF**
		
		    – System operating normally
		
		• **STBY OFF / READY FLASHING**
		(After 5 s both off)
		
		    – Occurs when **IMU/AM** selected and IMU is aligned. If another mode not selected within 5 s, alignment lost, INS not available
		
		• **STBY OFF / READY FLASHING**
		
		    – Alignment suspended past mission alert criteria with parking brake off

2.2.6 WAYPOINT

• **Reference Point Types**	• **Navigation Waypoint** – Used for navigation. Maximum of 3 stored simultaneously • **Fixed Point (FP)** – Arbitrary point to establish current position relative to external references • **Initial Point (IP)** – Starting point for A/G attack run • **Surface Target (ST)** – Enemy surface target • **Defended Point (DP)** – Area to protect (i.e friendly forces) • **Hostile Area (HA)** – Area with known ground or air hostiles • **Home Base (HB)** – Airfield / CV

2.2.7 TACAN

• **Overview**	**Tac**tical **A**ir **N**avigation System
	• Indicates Position relative to station
	    – **Slant Range** within 0.1 nm
	    – **Bearing** within 0.5 deg
	• **Operating Range** – approx 300 nm
	• 126 channels, 2 modes of operation

• **Operating Modes**	• **REC** – Receive only • **T/R** – Transmit & Receive, enables ranging • **A/A** – Air to air mode
• **Typical Operation**	**TACAN Setup** (a) **Mode** . . . . **As Desired** (b) **Frequency** . . . . **As Desired** (c) **TACAN CMD** . . . . **As Required** (Corresponding Crewmember) **Pilot Setup** (a) **STEER CMD** . . . . **TACAN** (b) **HSD MODE** . . . . **NAV** (c) **Desired Course** . . . . **Set** via **CRS Knob** **Consult BDHI and HSD to track TACAN station**

2.2.8 VOR/ADF

•	**Overview**	**A**utomatic **D**irection **F**inder
		• Used with **ARC-182 Radio**
		• **BDHI** – Displays **Relative Bearing** to transmitting ground station
		• **Range** – Line of sight
		• **Frequency Range** – 108-399.975 MHz
		• Only operable for RIO
•	**Typical Operation**	**RIO Setup**
		(a) **V/UHF 2 Mode** . . . . **T/R**
		(warm-up, at least 5 min)
		(b) **V/UHF 2 Frequency Mode** . . . . **MAN**
		(c) **V/UHF 2 Frequency** . . . .**As desired**
		(d) **V/UHF 2 Mode** . . . . **DF**

NOTE

• **UHF 1 ADF** is not functional despite controls in **PILOT** cockpit

2.2.9 DISPLAYS

Pilot Cockpit Interface	
· **HUD**	**H**eads **U**p **D**isplay · Displays flight & combat information onto front canopy

· **VDI**	**V**ertical **D**isplay **I**ndicator
	  · **TV Mode**
	    – Displays **TCS** imagery
	  · **NORM Mode**
	    – Displays similar flight & combat information as HUD

· **HSD**	**H**orizontal **S**ituation **D**isplay
	  · **NAV Mode** Information
	    – **Diamond** – Current heading
	    – **Chevron** – **TACAN TO** bearing
	    – **+** – **TACAN FROM** bearing
	    – **House** – **ADF** bearing
	    – **RNG** – Range to Waypoint (nm)
	    – **MODE** – **NAV STEER** mode
	    – **W** – Wind heading / speed (kts)
	    – **TAS** – **T**rue **A**ir**S**peed (kts)
	    – **GS** – **G**round**S**peed (kts)
	  · **TID Mode** Information
	    – **Repeat of TID Symbology**
	    – Overhead View
	    – Waypoint Coordinates

· **BDHI**	**B**earing **D**istance **H**eading **I**ndicator
	  · Displays A/C magnetic heading with nav bearing & range data
	  · 2 Servo driven needles
	    – **No.1** (single bar) – **UHF (ADF)** system
	    – **No.2** (double bar) – **TACAN** System

2.3 COMMUNICATION SYSTEMS

2.3.1 OVERVIEW

• **ARC-159 UHF 1**	• **Air-to-Air & Air-to-Surface Communication**
	• **Pilot Controlled**
	• **Frequency**
	– **Range** – 225.000 - 399.975 MHz
	– **Steps** – 25 kHz
	– **Channels** – 20
• **ARC-182 V/UHF 2**	• **Air-to-Air & Air-to-Surface Communication**
	• **RIO Controlled**
	• **Frequency**
	– **Band 1** – 30 - 88 MHz
	– **Band 2** – 108 - 156 MHz
	– **Band 3** – 156 - 174 MHz
	– **Band 4** – 225 - 399.975 MHz
	– **Steps** – 25 kHz
	– **Channels** – 20
• **ARA-50 UHF ADF**	• **UHF Automatic Direction Finder**
	• **LoS bearing to UHF Transmitter**
	• **Bearing displayed on BDHI, Pilot HSD**
	• **5 min Warmup**
• **KY-28 Voice Security Equipment**	• **Voice Ciphering**
	• **Integrated with UHF 1 and V/UHF 2**
	• **2 min Warmup**

2.3.2 ARC-159 UHF 1

• **ARC-159 UHF 1**	• **Air-to-Air & Air-to-Surface Communication**
	• **Pilot Controlled**
	• **Frequency**
	– **Range** – 225.000 - 399.975 MHz
	– **Steps** – 25 kHz
	– **Channels** – 20
• **VOL Knob**	• **Controls Pilot UHF 1 Audio Level**

•	**BRT/TEST Knob**	•	**Controls Radio FREQ Display**
		•	Turn past max to display **888.888**
•	**SQL Switch**	•	**Toggles radio squelch (noise attenuation)**
•	**READ Switch**	•	**Displays Frequency of Selected Preset Channel**
•	**LOAD Button**	•	**Saves Displayed Frequency to Selected Preset Channel**
•	**TONE Button**	•	**Steady 1.020 kHz Test Tone**
•	**Mode Selector**	•	**Frequency Selection Method**
			– **GUARD** – 243.000 MHz
			– **MANUAL** – Manual tuning
			– **PRESET** – Preset channels
•	**Function Selector**	•	**Selects Transceivers to Energize**
			– **ADF** – Not simulated
			– **BOTH** – Main & Guard
			– **MAIN** – Main
			– **OFF** – Secures UHF 1 radio
•	**CHAN SEL**	•	**Selects from 20 preset Channels**

2.3.3 ARC-182 V/UHF 2

•	**ARC-182 V/UHF 2**	•	**Air-to-Air & Air-to-Surface Communication**
		•	**RIO Controlled**
		•	**Frequency**
			– **Band 1** – 30 - 88 MHz
			– **Band 2** – 108 - 156 MHz
			– **Band 3** – 156 - 174 MHz
			– **Band 4** – 225 - 399.975 MHz
			– **Steps** – 25 kHz
			– **Channels** – 20
•	**VOL Knob**	•	**Controls RIO UHF 2 Audio Level**
•	**BRT/TEST Knob**	•	**Controls Radio FREQ Display**
•	**SQL Switch**	•	**Toggles radio squelch (noise attenuation)**

• **Mode Selector**	• **Transceiver Settings**
	– **OFF** – Secures V/UHF radio unless frequency mode set to **243**
	– **T/R** – Energizes transmitter and main receiver
	– **T/R & G** – Energizes transmitter, main, and guard receiver
	– **DF** – Automatic direction finding from 108 - 399.975 MHz
	– **TEST** – BIT
• **CHAN SEL** **Outer Dial**	• **Selects Frequency Tuning Mode**
	– **243** – Selects UHF Guard
	– **MAN** – Manual Select frequency
	– **G** – Tunes Tranceiver to guard frequecy in last selected band
	– **PRESET** – Allows selection between 40 preset channels (31-40 are Have Quick and not simulated)
	– **READ** – Displays frequency of selected preset channel
	– **LOAD** – Saves displayed frequency to selected preset channel
• **CHAN SEL** **Inner Dial**	• **Selects one of 40 Preset Channels**

2.3.4 KY-28 VOICE SECURITY EQUIPMENT

• **KY-28 Voice Security Equipment**	• **Voice Ciphering** • **Integrated with UHF 1 and V/UHF 2** • **2 min Warmup**
• **ZEROIZE** **Switch**	• **Lift Guard to Erase Preloaded Codes** • Codes loaded via ground crew

• **Power-Mode** **Switch**	• **Selects Mode**
	    – **P/OFF** – Removes power from system
	    – **C** – Transmit / Receive in secure mode
	    – **DELAY** – Between PTT and trans.

- **Radio-Select Switch**
- **Selects Radio Mode**
  - **RELAY** – Acts as relay for other stations (not simulated)
  - **RAD-2** – Secure voice for V/UHF 2
  - **RAD-1** – Secure voice for UHF 1

2.3.5 LINK 4 DATALINK - OVERVIEW

• **Link 4**	• **Modes** – Mutually exclusive
	– **Link 4A** – AWACS / Surface Ship
	– **Link 4C** – Fighter to Fighter
	• **Data Speed** – up to 5000 bit/s!
• **Link 4A**	• **Network** – AWACS / Surface Ship
	• Additionally used for ACLS
• **Link 4C**	• **Network** – Fighter to Fighter
	– Up to four F-14s
	– Unique to F-14
• **Basic Operation**	(a) **Power Switch** . . . . As Desired
	• **Link 4A** . . . . **ON**
	• **Link 4C** . . . . **AUX**
	(b) **Mode Switch** . . . . **TAC**
	(c) **Frequency** . . . . **Set**

2.3.6 LINK 4 DATALINK - CONTROL PANEL

• **Test Switch**	• **Controls Test / Anti-Jam Modes**
	– **TEST** – Initiates BIT
	– **NORM** – Normal Operation
	– **A-J** – Anti-Jam (not simulated)
• **Frequency Thumbwheels**	• **Selects Datalink Frequency**
	– **First Digit** – **Fixed as 3**
	– **Allowable Range** – 300.0 - 324.9 MHz
• **Power Switch**	• **Controls System Power**
	– **ON** – Enables Link 4A
	– **OFF** – Disables system
	– **AUX** – Enables Link 4C

2.3.7 LINK 4 DATALINK - REPLY/ANTENNA PANEL

• **ANTENNA Switch**	• **Selects Antenna**
	    – **Shared with UHF 1** – Mutually exclusive
	    – **UHF 1 LWR / DL UPR**
	    – **UHF 1 UPR / DL LWR**

• **REPLY Switch**	• **Sets Reply Mode**
	    – **NORM** – Own Aircraft replies to datalink messages
	    – **CANC** – Receive only

• **MODE Switch**	• **Controls Overall Mode**
	    – **TAC** – Normal airborne mode
	    – **CAINS/WAYPT** – Enables CV align

• **Address Thumbwheels**	• **Sets Two Least Significant Bits of Aircraft D/L Address**

2.4 DEFENSIVE SYSTEMS

2.4.1 ALR-67 RWR - CONTROLS / OVERVIEW

•	**PWR Switch**	• **Set to ON to Operate**
•	**VOL Knob**	• **Sets RIO Audio Level**
•	**TEST Switch**	• **Springloaded to Center** • **BIT** – Initiates Build In Test • **SPL** – Holds BIT status page while held
•	**MODE Switch**	• **Springloaded to Center** • **OFST** – Separates overlapping symbols • **LMT** – Displays 6 highest threats

•	**DISPLAY TYPE Selector**	• **Changes Priority of Display**
		
		    – **NORM** – Normal threat symbology
		    – **AI** – Airborne Interceptor prioritized
		    – **AAA** – Anti-aircraft artillery prioritized
		    – **UNK** – Unknown prioritized
		    – **FRIEND** – Friendly threats prioritized
		
		• **Indicated by Letter in Display Center**

•	**Display**	• **Outer Band**
		
		    – **Critical Band**
		    – Imminent threat to own aircraft
		    – Blinking indicates engaging own aircraft
		
		• **Middle Band**
		
		    – **Lethal Band**
		    – Potentially threatening emitters
		    – Not actively engaging own aircraft
		
		• **Inner Band**
		
		    – **Non-Lethal Band**
		    – Not currently within capability of emitter
		
		• **Inner Circle**
		
		    – **N, I, A, U, F** – Prioritization type
		    – **O** – Offset
		    – **L** – Limit
		    – **B** – BIT Failure
		    – **T** – Thermal overload

• **Alert Tones**	• **Short Tone** – New emitter / emitter moved
	• **Slow Warbling** – Threat in critical band
	• **Fast Warbling** – Threat actively engaging own aircraft
	• **4-Tone Sequence** – New threat capable of silently engaging own aircraft

2.4.2 ALR-67 RWR - THREAT SYMBOLOGY

SHIPS	
AB	Arleigh Burke
AK	Admiral Kuznetsov
GR	Grisha 5 (Albatros)
HP	Oliver Hazard Perry
J2	Type 054A Frigate, "Jiangkai II class"
KK	Krivak 3 (Rezky)
KV	Kirov (Pyotr Velikiy)
L1	Type 052B Destroyer, "Luyang I class"
L2	Type 052C Destroyer, "Luyang II class"
N	*Ship with Nav Radar*
NE	Neustrashimy
NZ	Nimitz (Vinson, Stennis)
SV	Slava (Moscow)
TC	Ticonderoga
TT	Tarantul 3 (Molniya)
TW	Tarawa
YU	Type 071 Amphibious Transport Dock, "Yuzhao class"

AIRCRAFT	
14	F-14A/B
15	F-15C/E
16	F-16C
17	JF-17
18	F/A-18C
19	MiG-19

21	MiG-21bis
23	MiG-23MLD
24	Su-24M/MR
25	MiG-25PD
29	MiG-29A/G/S Su-27 Su-33 J-11A
30	Su-30
31	MiG-31
34	Su-34
37	AJS-37
39	Su-25TM
50	A-50
52	B-52
AN	AN-26B AN-30M
AP	AH-64D
B1	B-1B
BE	Tu-95 Tu-142M
BF	Tu-22M3
BJ	Tu-160
E2	E-2D
E3	E-3C
F4	F-4E
F5	F-5E
HX	Ka-27
IL	IL-76MD IL-78M
KC	KC-135

KJ	KJ-2000
M2	Mirage 2000-C Mirage 2000-5
S3	S-3B
SH	SH-60B
TO	Tornado
TR	C-130 C-17A

AIR DEFENSE

2	S-75 TR SNR (SA-2) "Fan Song"
3	S-125 TR SNR-125 (SA-3) "Low Blow"
6	Kub SA-6
7	HQ-7 TR
8	OSA (SA-8)
10	S-300PS 30N6 TR (SA-10)
11	Buk (SA-11)
12	S-300V
15	Tor 9A331 (SA-15)
19	Tunguska 2C6M (SA-19)
A	Gepard M-163 Vulcan ZSU-23-4 Shilka
BB	S-300PS 64H6E SR (SA-10/Big Bird)
BF	Rapier Blindfire TR
CS	S-300PS 5N66M SR (SA-10/Clam Shell)
DE	Sborka (Dog Ear)
FF	S-125 P-19 SR (SA-3/Flat Face)
GR	Roland SR

HA	Hawk SR
HK	Hawk TR
HQ	HQ-7 SR
PT	Patriot
RO	Roland
RP	Rapier SR
S	1L13 55G6 EWR
SD	Buk TR (SA-11/Snow Drift)
SN	PRW-11 (Side Net)

MISSILES

M	AIM-54 AIM-120 MICA-EM R-37 R-77 SD-10

ATC

T	Airport ATC Radar

2.4.3 ALE-39 CMS DISPENSER

	Programmer	
• **CHAFF Section**	• **B QTY** – Number of cartridges to eject in burst	
	– **Options** – **1-4** cartridges, **C** continuous, **R** random (4-6 cartridges)	
	• **B INTV** – Time in seconds between each cartridge ejection	
	– **Options** – **.1, .2, .5, .7, 1** seconds, **R** random	
	• **S QTY** – How many salvos of bursts	
	– **Options** – **1, 2, 4, 6, 8, 10, 15** salvos	
	• **S INT** – Time in seconds between salvos	
	– **Options** – **2, 4, 6, 8, 10** seconds	

NOTE

• **R** & **C** burst settings have special **INTV** behavior

• **JAMMER Section**	Jammer cartridges not implemented in DCS
• **FLARE Section**	• **QTY** – Number of cartridges to eject in burst
	– **Options** – **2, 3, 4, 6, 8, 10** cartridges
	• **INTV** – Time in seconds between each cartridge ejection
	– **Options** – **2, 4, 6, 8, 10** seconds
	Control Panel
• **PWR/MODE Switch**	• **AUTO (CHAFF) / MAN** – Enables power to system and allows automatic chaff ejection program initiation
	• **MAN** – Enables power to system
	• **OFF** – Disables system

2.4.4   ALQ-100 / ALQ-126 DECM

• **DECM OVERVIEW**	**D**efensive **E**lectronic **C**ounter **M**easures • Modelled as simple noise jammers in DCS

• **Controls**	• **AUDIO Knob** – Controls volume of audio played to RIO. Audio is generated directly from received PRF signals
	• **Mode Selector**
	
	    – **OFF** – Turns off power to the system
	    – **STBY** – Begins pre-warming systemm
	    – **HOLD 3 SEC** – Prepares system for BIT
	    – **ACT** – BIT of system, takes approx 30 s
	    – **REC** – Receive only mode
	    – **RPT** – Full system functionality

• **STANDBY Light**	Indicates system warmup not yet complete or system has a fault

• **Threat Advisory Indicator**	• **IFF** – Friendly IFF signal received but no reply generated
	• **RCV** – ALQ-126 is receiving a signal
	• **XMIT** – ALQ-126 is transmitting
	• **SAM**
	
	    – **Steady** – Lockon from SAM detected
	    – **Flashing** – SAM launch detected
	
	• **AAA**
	
	    – **Steady** – Lockon from AAA detected
	    – **Flashing** – AAA engagement detected
	
	• **CW** – CW emitter detected
	• **AI** – Airborne Intercepter lockon detected

Chapter 3

AWG-9 RADAR

Contents

AWG-9

3.1 OVERVIEW

3.1.1 MAIN MODES - OVERVIEW

	Pulse		Pulse Doppler			
	Pulse Search	P-STT	PD Search	RWS	TWS	PD-STT
Range	60 nm	50 nm	110 nm	90 nm	90 nm	90 nm
AIM-7	BRSIT	CW	BRSIT		-	PD
AIM-54	BRSIT	ACT	BRSIT		Multi TGT	PD/ACT

3.1.2 MAIN MODES

• **Pulse**	• **Basic Pulse w/o doppler filtering**
	– Cannot be notched
	– Ground Clutter
	– Rudimentary Ground mapping
	• **Pulse Sub-Modes**
	– **Pulse Search**
	– **Pulse-STT**
• **Pulse Doppler**	• **Doppler filter –> no ground returns**
	– Susceptible to notching
	– No ground clutter
	– Greater range
	– Advanced sub modes
	– AIM-54 Guidance
	• **Pulse Doppler Sub-Modes**
	– **PD Search**
	– **RWS**
	– **TWS**
	– **PD-STT**

3.2 PULSE MODES

3.2.1 PULSE - PULSE SEARCH

SEARCH (±10° SCAN)

• **Pulse Search**	**Basic Mode** - AWG-9 does not use pulse doppler filtering	
	• **Advantages**	
	– All aspect target detection	
	– Cannot be notched	
	– Rudimentary ground mapping	
	• **Disadvantages**	
	– Cannot discern ground returns and targets	
	– Lower range	
• **DDD**	• **Range/Azimuth**	
	• Visual representation of radar and erase sweeps	
• **TID**	• **No Information from Pulse**	
	• **Cannot guide AIM-54**	

3.2.2 PULSE - PSTT

TARGET IMAGE

MAXIMUM LAUNCH RANGE SYMBOL

AZ/EL STEERING SYMBOL

RANGE GATE (TRACKS TARGET)

CLOSING RATE SYMBOL

ARTIFICIAL HORIZON

MINIMUM LAUNCH RANGE SYMBOL

ALLOWABLE STEERING ERROR (ASE) CIRCLE

SINGLE TARGET TRACK
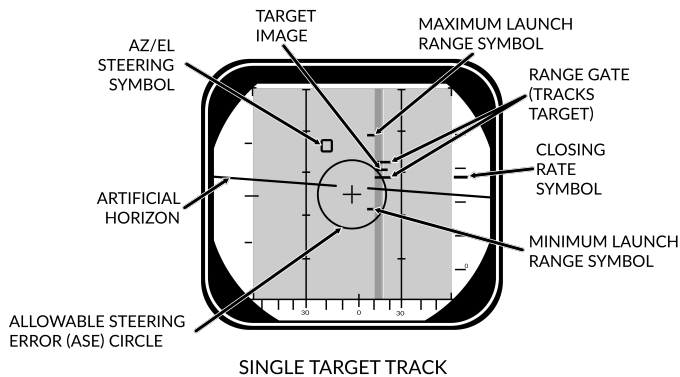
• **Pulse STT**	Lock Target w/o doppler filtering	
	• **Advantages**	
	– Cannot be notched	
	• **Disadvantages**	
	– Susceptible to ground clutter	
• **Lock Target**	• **Conditions**	
	– Pulse Search Mode selected	
	– RDR HCU Mode selected	
	• **Lock Target**	
	(a) Hold HCU Half-action	
	(b) Slew to desired Target	
	(c) HCU Full-Action to lock	
	• **Unlock Target**	
	(d) HCU Half-action	
• **DDD**	• **Track Indications**	
	– ANT TRK light	
	– RDROT light	
	– Tracking gates	
	– Closure rate	
	– Attack Symbology	

3.3   PULSE DOPPLER MODES

3.3.1   PD - PULSE DOPPLER SEARCH

TARGET IMAGE

SELECTIVE ERASE SWEEP

PULSE DOPPLER SWEEP

WRITTEN REGION

MAINLOBE CLUTTER TRACE

JET SIGNAL

PD COVERAGE (ASPECT SWITCH SHIFTS COVERAGE UP OR DOWN; BEAM COVERAGE SHOWN)

AGC TRACE (JAMMING INTENSITY)

SEARCH (±40° SCAN)

• **Pulse Doppler Search**	**"Early Warning" Mode** - Longest Range, cannot display range • **Advantages** – Longest Range – Doppler Filtering – **"Look Down Shoot Down"** • **Disadvantages** – Can be notched – No range information
• **DDD**	• **Closure Rate/Azimuth** • Visual representation of radar and erase sweeps
• **Doppler Filters**	• **Main Lobe Clutter (MLC) Filter** – **Own GS +/- 133 knots** – Removes main ground return – Source of notching • **Zero Doppler Filter** – **Negative own GS +/- 100 knots** – Removes Radar reflection from ground directly beneath own AC

•	**MLC Switch**	• **IN:** Enables MLC filter
		• **AUTO:** Enables MLC filter if look-up angle less than 3 deg
		• **OUT:** Disables MLC filter
•	**Vc Switch**	Changes closure rate DDD scale
		• **X-4:** -800 to 4000 knots
		• **NORM:** -200 to 1000 knots
		• **VID:** -50 to 250 knots
•	**ASPECT Switch**	Changes closure rate processing scale
		• **NOSE:** -600 to 1800 knots
		• **BEAM:** -1200 to 1200 knots
		• **TAIL:** -1800 to 600 knots
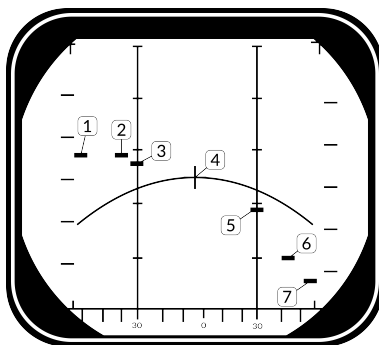
	Look Angle	Line of Sight Rate	Target Heading
1	60 deg	1490	180 deg
2	45 deg	1500	120 deg
3	30 deg	1428	100 deg
4	0 deg	1200	90 deg
5	30 deg	672	80 deg
6	45 deg	210	60 deg
7	60 deg	-300	0 deg

3.3.2 PD - RWS

•	**Range While Search**	**FM Ranging**, used for getting good A/A picture before selecting TWS
		• **FM Ranging**
		– Pulse Doppler with ranging
		– TID shows momentary tracks with ranges
		– Processing reduces max range
		• **Advantages**
		– Long Range
		– Doppler Filtering
		– **"Look Down Shoot Down"**
		– Signal Processing
		• **Disadvantages**
		– Can be notched
•	**DDD**	• **Closure Rate/Azimuth**
		• Visual representation of radar and erase sweeps
•	**TID**	• **Momentary Tracks**
		• Max concurrent tracks: 48
		• **Cannot lock targets from TID**
•	**Filtering**	**Same as Pulse Doppler Search**

3.3.3   PD - TWS

• **Track While Scan**	**Builds Track Files**, high situational awareness, multi-target AIM-54 launch
	• **Track Files**
	– AWG-9 builds Trackfiles for contacts
	– Can launch multiple AIM-54
	– Processing reduces max range
	– Can lock targets from TID
	• **FM Ranging**
	– Pulse Doppler with ranging
	– TID shows momentary tracks with ranges
	– Processing reduces max range
	• **Advantages**
	– Doppler Filtering
	– **Multi-Target AIM-54**
	• **Disadvantages**
	– **Lowest Range**
	– Can be notched
• **DDD**	• **Closure Rate/Azimuth**
	• Visual representation of radar and erase sweeps
• **TID**	• **Tracksfiles**
	• Max concurrent tracks: 24
	• Max displayed tracks: 18
• **Filtering**	**Same as Pulse Doppler Search**
• **Scan Volume**	Trackfiles require update every 2.5 s –>
	• 20 deg 4 bar (if selected)
	• 40 deg 2 bar (else)
• **TID Mode Selector**	• **GND STAB:** Ground Stabilized, True North is up on TID
	• **A/C STAB:** Aircraft Stabilized
	• **ATTAK:** same as A/C STAB with superimposed attack steering symbology
	• **TV:** Displays TCS on TID, dispays LANTIRN on TID if equipped

•	**TID Display Selector Buttons**	• **RID DISABLE:** Not simulated • **ALT NUM:** Enables display of track altitudes on left side of track symbols • **SYM ELEM:** Enables display of all supplementary symbology of tracks and waypoints • **DATA LINK:** Enables display of D/L contacts • **JAM STROBE:** Enables display of jam strobes • **NON-ATTK:** enables/disables display of targets not possible to engage (friendlies) • **LAUNCH ZONE:** Enables display of weapon launch zones • **VEL VECTOR:** Enables display of velocity vectors

•	**TRACK HOLD CLSN Steering Buttons**	• **TRACK HOLD**
		  – Normally: Tracks maintained for 14 s after last observation
		  – Track Hold: maintained for 2 min after last observation
		
		• **CLSN Button**
		  – begins collision steering to currently tracked target
		  – enables Steering Centroid if in TWS
		  – LD CLSN presents azimuth steering only
		  – CLSN presents both azimuth and elevation steering

•	**TWS AUTO / MAN**	• **TWS MAN:** Manual azimuth/elevation control, target designation by RIO • **TWS AUTO:** Automatic prioritization of targets and azimuth elevation control

3.3.4   PD - TWS MAN

· **TWS MAN**	· **Target Selection:** Manual
	· **Scan Azimuth/Elevation:** Manual
· **Target Selection**	· **Conditions**
	– TWS MAN Radar Mode selected
	– TID CURSOR TID Mode selected
	· **Hook Target**
	(a) Hold HCU Half-Action
	(b) Slew TID Cursor over desired Tgt
	(c) HCU Full-Action to select Tgt
	· **TID Symbology**
	– Range (**RA**)
	– Bearing (**BR**)
	– Altitude (**AL**)
	– Magnetic course (**MC**)
	· **Lock Target**
	(d) Press **PD STT** or **Pulse STT** buttons
	· **Deselect Target**
	(e) press HCU Half-Action
· **AIM-54 Launch**	· **Automatically selects TWS AUTO**
	· **Prevents selection of TWS MAN**

3.3.5   PD - TWS AUTO

• **TWS AUTO**	• **Target Selection:** prioritizes contacts based off range, aspect, closure • **Scan Azimuth/Elevation:** Geometric center of targets in scan volume

• **Centroid / Steering Cues**	• **Steering Centroid**
	  – facilitates steering cues
	  – HUD, VDI, TID, DDD
	  – Appears as **X** on TID
	  – Takes Gimbal limits into account
	  – Weights individual Tracks based on parameters
	
	• **Illumination Centroid**
	  – **Not Visible**
	  – Controls azimuth and elevation of scan pattern
	  – Takes scan volume into account

• **Pilot Steering Cues**	• **Conditions**
	  – A-A HUD Mode selected
	  – Master Arm ON (UP)
	  – AIM-54 or AIM-7 selected
	  – TWS-AUTO selected

3.3.6 PD - PDSTT

RANGE GATE (TRACKS TARGET)
MAXIMUM LAUNCH RANGE
CLOSING RATE SYMBOL
TARGET IMAGE
AZ/EL STEERING SYMBOL
TARGET SYMBOL (AZIMUTH AND RANGE)
ARTIFICIAL HORIZON
MINIMUM LAUNCH RANGE SYMBOL
ALLOWABLE STEERING ERROR (ASE) CIRCLE
AGC TRACE
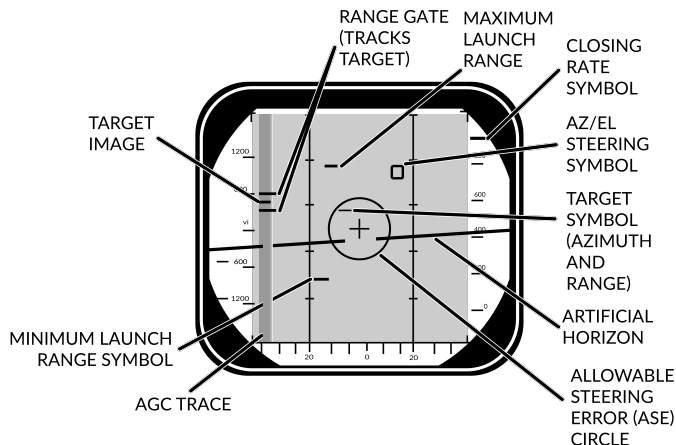
SINGLE TARGET TRACK

|		

• **Pulse Doppler STT**	Lock Target with doppler filtering
	• **Advantages**
	  – Ground Clutter filtering
	• **Disadvantages**
	  – Susceptible to notching	

• **Lock Target**	• **Conditions**
	  – Pulse Doppler Mode selected (PD Search, RWS, TWS)
	  – RDR HCU Mode selected
	• **Lock Target**
	  (a) Hold HCU Half-action
	  (b) Slew to desired Target
	  (c) HCU Full-Action to lock
	• **Unlock Target**
	  (d) HCU Half-action	
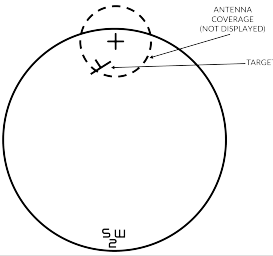
• **DDD**	• **Track Indications**
	  – ANT TRK light
	  – RDROT light
	  – Tracking gates
	  – Closure rate
	  – Attack Symbology	

3.4 ACM

3.4.1 ACM MODES - OVERVIEW

	PLM	**VSL**	**PAL**	**MRL**
Range	5 nm	5 nm	15 nm	5 nm
Description	Boresight	Vertical	Horizontal	RIO
Weapons	Gun + All Missiles			

• **PLM**	• **Pilot Lockon Mode**
	• **Highest Priority ACM**
	• **Search Pattern**
	  – Small Boresight
	  – Range: 5 nm

• **VSL**	• **Vertical Scan Lockon**
	• **HI Search Pattern**
	  – Width: 5 deg
	  – Vertical: +15 to +55 deg
	  – Range: 5 nm
	• **LO Search Pattern**
	  – Width: 5 deg
	  – Vertical: -15 to +25 deg
	  – Range: 5 nm
	• **RIO/PILOT Controlled**

• **PAL**	• **Pilot Automatic Lockon**
	• **Search Pattern**
	  – Width: +/- 20 deg
	  – Vertical: 8-bar
	  – Range: 15 nm

• **MRL**	• **Manual Rapid Lockon**
	• **RIO Controlled**
	• **Search Pattern**
	  – HCU Controlled
	  – Range: 5 nm

3.4.2　APX-76 IFF

3.5 TACTICAL INFORMATION DISPLAY

3.5.1 TID SYMBOLOGY

GENERAL		
Center Dot	·	• **Basic Component of Symbols** – Marks coordinates of symbol

Own AC	⊕	• **Symbol representing own aircraft**
		   – Ground Stabilized: Moves
		   – Aircraft Stabilized: Stationary
		   – Outside TID: line drawn from TID center towards symbol

TID Cursor	◯	• **Hook Cursor**
		   – Controlled by **HCU** in **TID mode**
		 • **Half-Action**
		   – Enables display of symbol
		   – Enables HCU stick to move cursor
		 • **Full-Action**
		   – Hooks closest symbol
		   – If no symbol near, cursor dropped at location

TWS Steering Centroid	✕	• **Steering centroid of TWS tracks** – Selected by WCS for weapons engagement
ONBOARD SENSORS	Symbol Above Dot	
Unknown	⊓•	• **Unknown Sensor Track** • **All Returns in RWS**
Hostile	∧•	• **Sensor Track designated Hostile by RIO**
Friend	⌒•	• **Sensor Track designated Friendly by RIO**

Angle-Tracked Radar Target	$\langle\!\!\!\cdot$	· **Radar Angle Tracking** – Jamming Target

Angle-Tracked Radar Target with Altitude Difference Ranging	$\langle\!\!\!\diamond\!\!\cdot$	· **Radar Angle Tracking**
		  – Jamming Target
		  – Alt. diff. ranging

TCS-Angle Tracked Target	$\cdot\!\rangle$	· **TCS Angle Tracking**
TCS-Angle Tracked Target with Altitude Difference Ranging	$\langle\!\cdot\!\rangle$	· **TCS Angle Tracking** – Alt. diff. ranging

D/L TARGETS		**Symbol Below Dot**
Unknown	$\lfloor\!\cdot\!\rfloor$	· **D/L Track designated Unknown by Source**
Hostile	$\vee\!\cdot$	· **D/L Track designated Hostile by Source**
Friendly	$\cup\!\cdot$	· **D/L Track designated Friendly by Source**

MANUAL REF POINTS		

Home base	$\diamond\!\cdot$	· **Waypoint Representing**
		  – Home Base
		  – Carrier
		  – Airfield

Waypoint	$\diagdown\!\cdot$	· **Nav Waypoint** · **Supplanted by Number** – 1, 2, or 3
Defended Point	$\oslash\!\cdot$	· **Waypoint to Defend**
Fixed Point	$\times$	· **Generic Waypoint**
Hostile Area	$\boxdot$	· **Waypoint Indicating Hostile Area**
Surface Target	$\oplus\!\diamond$	· **Waypoint Indicating Surface Target**
IP	$+$	· **Initial Point** – Waypoint for A/G engagement

D/L REF POINTS

Home Base		• **D/L Waypoint Representing Home Base**
Waypoint		• **D/L Generic Waypoint**
Data Link Fixed Point		• **D/L Waypoint Representing Fixed Point**
Surface Target		• **D/L Waypoint Representing a Surface Target**

POS SYMB MODIFIERS

Mandatory Attack		• **Additional Symbology on TWS Track**
		– Horizontal bar through center dot
		• **Selected by RIO**
		– Only 1 target can be designated
		– Guaranteed WCS priority number
Data Link Destroy		• **Additional Symbology on D/L Track**
		– Horizontal bar through center dot
		• **Selected by Source**
		– No effect on WCS prioritization
Do Not Attack		• **Additional Symbology on TWS or D/L Track**
		– Vertical bar through center dot
		• **If Set by RIO**
		– Removes WCS prioritization
Multiple Targets		• **Additional Symbology on TWS or D/L Track**
		– Horizontal bar on left side of symbol
		• **Indicates Multiple Targets**

Data Link Challenge		• **Additional Symbology on D/L Track** – Small **V** with center at center dot • **Command to Visually Identify**

Track Extrapolated		• **Additional Symbology on TWS or D/L Track**
		
		  – Small **X** with center at center dot
		
		• **No Update within 8 seconds**
		
		  – Track deleted after 14 seconds
		  – Or after 2 min if track hold

Altitude Numerics		• **Altitude to Nearest Ten Thousand** – example: 35000-45000

Firing Order Numerics		• **Indicates AIM-54 Prioritization**
		
		  – Numbers 1-6
		  – Only in TWS

Time-to-Impact (TTI)		• **After AIM-54 Launch** – Prioritization replaced with estimated TTI • **Flashes after Pitbull**

Velocity Vector		• **Additional Symbology from center Dot**
		
		  – Direction represents track heading
		  – Length represents speed
		
		• **Varies with Mode**
		
		  – Ground Stabilized: true heading and ground speed
		  – Aircraft Stabilized: relative heading and velocity

Launch Zone Vectors		
		• **Additional Symbology for AIM-54**
		– Selected manually by RIO
		– Or 60 seconds from max launch
		• **TUMR**
		– Time-Until-Minimum-Range
		– Max: 180 seconds, 1.5 inches
		• **TUOR**
		– Time-Until-Optimal-Range
		– Start of bar is 8 seconds from optimum
		• **TUIR**
		– Time-Until-In-Range
Jamming Strobe		• **Line from own AC towards Jammer**
Radar Antenna Scan Pattern Azimuth Limits		• **Limits of Current Scan Azimuth** • **Single Line in STT**
Data Link Jamming Strobe		• **Line from D/L point towards Jammer**
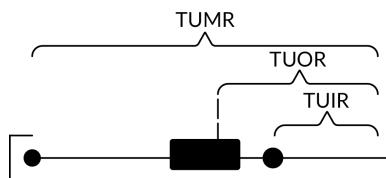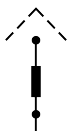
Data Link Pointer		• **Additional Symbology on D/L Track**
		   – Circle
		   – Indicates operator concern

Data Link Priority Kill		• **Additional Symbology on D/L Track**
		  – Square
		  – Indicates target must be destroyed
		  – No effect on WCS prioritization

ATTACK DISPLAY SYMBOLOGY

Artificial Horizon		• **Represents Pitch and Roll**
Steering Guidance Symbol		• **Represents Steering Error** – Should be placed as near as possible to center of ASE circle
Allowable Steering Error Circle		• **Indicates Allowable Steering Error for Missile Launch** • **Size Varies with Geometry, Mode, Missile**
Breakaway Indication		• **Appears when Target Range Less than Minimum for Selected Weapon**

Chapter 4

TCS - LANTIRN

Contents

4.1 TCS

4.1.1 OVERVIEW

4.2 LANTIRN

4.2.1 OVERVIEW

•	**LANTIRN**	**L**ow **A**ltitude **N**avigation and **T**argeting **I**nfra-**R**ed for **N**ight
		• **Only Targeting Pod** – Nav pod was deleted
		• **Incomplete Integration** – Own control panel, supplants TCS feed
•	**Master Modes**	• **A/G** – Allows bomb release guidance
		• **A/A** – Optimized for air targets
•	**FOV Levels Overview**	• **Wide**
		– **FOV** – 5.9 deg
		– **Slew** – 8.5 deg/s
		• **Narrow**
		– **FOV** – 1.7 deg
		– **Slew** – 1.8 deg/s
		• **Expanded**
		– **FOV** – 0.8 deg
		– **Slew** – 0.7 deg/s
		– **Digital Zoom** – Degraded quality

4.2.2 OVERVIEW - STARTUP

1.	**Power Switch**	**POD**
2.	**Pod Startup Sequence**	• 8 min startup sequence • **MODE Switch** shows **STBY** when complete
3.	**MODE Switch**	**Press**
4.	**Initialization Sequence**	• 30 sec initialization • **MODE Switch** shows **OPER** when ready
5.	**VIDEO Switch**	**FLIR**
6.	**TID MODE**	**TV**

4.2.3 OVERVIEW - POINTING MODES

·	**Sensor Modes Overview**	· **Contrast Lock**
		
		    – **Area Track**
		    – **Point Track**
		
		· **Q Designation**
		
		    – **Directional Q** – QSNO / QADL / QHUD
		    – **Location Q** – QWp / QDES

·	**Directional Q**	· **Do Not Allow Weapon Guidance**
		· **QSNO**
		
		    – Pod slaved to **ground 15 nm in front** along own aircraft heading
		
		· **QADL**
		
		    – **Pod slaved to ADL**
		    – In A/A mode
		
		· **QHUD**
		
		    – **Pod slaved to HUD**
		    – In A/G mode

·	**Location Q**	· **Allow Weapon Guidance**
		· **QWp**
		
		    – Pod slaved to WCS waypoint
		    – Cycled with **QWp+ / QWp-**
		
		· **QDES**
		
		    – **Designate targets for engagement**
		    – **LANTIRN Trigger Second Detent** to designate
		    – Coordinates can be manually added to WCS for navigation

4.2.4 OVERVIEW - LASING/DESIGNATION

• **A/G Designation**	(a) **Designate** . . . . **Trigger Full-Action**
	• Laser Fires
	• Slant Range calculated
	• Time-to-Go calculated
• **Steering Cues**	• **Automatically activated when QDES selected/designated**
	• QDES remains even if new Q selected
	• Cues still point towards QDES even if pod at another point
• **Manual Lase**	(a) **Lase** . . . . **Trigger Half-Action Hold**
• **Latched Lase**	• **Effect** – Lases for 60 sec
	(a) **Activate** . . . . **Latch Lase Button Press**
	(b) **Extend** . . . . **Latch Lase Button Press**
	(c) **Deactivate** . . . . **Trigger Half-Action**
• **Auto Lase**	• **Effect** – Fires from -10 to +4 sec TIMP
	(a) **Laser Mode** . . . . **Slider AFT Short**
	(b) **Cycle A/M** . . . . **Right 4-Way Depress**
• **Laser Notes**	• **Always at current Pod location**
	• Can point to different location than QDES

4.2.5 CONTROLS - PANEL

• **Power Switch**	• **OFF** – Disables power to system
	• **IMU** – Only powers LANTIRN IMU **(Not Simulated in DCS)**
	• **POD** – Powers whole system
• **MODE Switch**	• **STBY** – Standby
	• **OPER** – Operational
• **LASER Switch**	• **ARM** – Arms laser
	• **SAFE** – Inhibits laser use
• **VIDEO Switch**	• **FLIR** – Displays LANTIRN FLIR on TID
	• **TCS** – Displays TCS video on TID
• **Indicator Light**	• **Indicate Error States**
• **IBIT Button**	• **Initiates Build-In-Test**

4.2.6 CONTROLS - STICK

•	**Master Mode**	• **A/G Mode – Side 2-Way FWD** • **A/A Mode – Side 2-Way AFT**
•	**Slew**	**Center Slew Hat**
•	**WHOT/BHOT**	**Center Slew Hat Depress**
•	**Contrast Track**	• **Point Track – Left 4-Way Up** • **Area Track – Left 4-Way Down**
•	**Q Select**	• **QADL/QHUD – Right 4-Way Up** • **QDES – Right 4-Way Right** • **QSNO – Right 4-Way Down**
•	**Declutter**	**Right 4-Way Depress**
•	**Zoom Level**	**FOV Button**
•	**Cycle Gain** **Control Mode**	**Slider FWD short**
•	**Manual Gain** **Control**	(a) **Slider** . . . . **FWD long** (b) **Gain** . . . . **Right 4-Way Up/Down** **Level** . . . .**Right 4-Way Left/Right**
•	**Laser Code**	(a) **Slider** . . . . **AFT short** (b) **Select Digit** . . . .**Right 4-Way Left/Right** (c) **Change Digit** . . . .**Right 4-Way Up/Down**
•	**Focus Control**	(a) **Slider** . . . .**AFT hold** (b) **Right 4-Way** . . . .**Up/Down**
•	**Manual Lase**	**Trigger Half-Action**
•	**Latched Laser**	**Latched Laser Fire Button**
•	**Designate** **QDES**	**Trigger Full-Action**

4.2.7 DISPLAY

• **Top Left**	• **Own Aircraft Datablock**
	
	   – **Lat** – deg:min.dec
	   – **Long** – deg:min.dec
	   – **ALT** – Altitude (ft)
	   – **KGS** – Knots Ground Speed
	   – **DIVE** – Dive Angle (deg)

• **Mid Left**	• **Sensor Mode** – **WHOT** / **BHOT** • **Gain Control** – **Auto** / **Manual**

• **Bottom Left**	• **Pod Info Datablock**
	
	   – **SRA** – Slant Range
	   – **AZ** – Pod LoS Azimuth L/R
	   – **EL** – Pod LoS Elevation
	   – **Time** – UTC Time
	   – **IBIT** – Codes

• **Bottom Center**	• **Master Mode** – **A/A** / **A/G**
	• **Track Mode** – **AREA** / **POINT** / **Q**
	• **Current Weapon**
	• **Laser Code**
	• **L**
	
	   – **Steady** – Laser Armed
	   – **Flashing** – Laser Firing

• **Bottom Right**	• **Q Datablock**
	
	   – **TTG** – Time-To-Go
	   – **B/R** – Bearing and Range
	   – **ELEV** – Elevation (ft) of Q
	   – **Lat** – deg:min:dec
	   – **Long** – deg:min:dec

• **Mid Center**	• **Crosshair**
	
	   – **Bounding Box** – Indicates currently tracked target in point mode
	   – **Zoom Boxes** – Indicates next zoom levels
	   – **FLIR Pointing Cue** – Shows Pod LoS, screen center indicates straight down

• **Mid Right**	• **Bomb Rlease Cue**
	– Only shown if current Q is **QDES**, with valid weapon selected
	– **TREL** – Time to release
	– **TIMP** – Time to Impact (after release)
• **Top Center**	• **Steering Guidance to Q**
	– Relative bearing L/R to commanded heading

Chapter 5

A/G WEAPONS

Contents

A/G

5.1 SETTINGS

5.1.1 A/G WEAPON SETTINGS - OVERVIEW

•	**WPN TYPE**	• **Selects Weapon Type**	
		– Configures WCS for selected weapon	
		– Refer to Kneeboard for list of mounted weapons	
		– Mk-81 / 82 / 83 have both **L** and **H** option refering to high and low drag	
•	**DLVY MODE**	• **STP-SGL** – Single weapon per press	
		• **STP-PRS** Single pair per press	
		• **RPL-SGL** – QTY of weapons per press	
		• **RPL-PRS** – QTY of pairs per press	
•	**DLVY OPTNS**	• **INTERVAL** – Interval in ms	
		• **QTY** – Number of stores to be released	
•	**MECH FUZE**	• **NOSE** – Arms nose fuze	
		• **SAFE** – Inhibits arming of fuzes	
		• **NOSE/TAIL** – Arms both fuzes	
•	**ELEC FUZE**	• **SAFE** – Inhibits electrical bomb fuzing	
		• **VT** – Sets air-burst mode at preset burst height for compatible stores	
		• **INST** – Sets instantaneous burst mode	
		• **DLY 1** – Sets preset time delay 1	
		• **DLY 2** – Sets preset time delay 2	
•	**STA SEL**	• **Selects Stations for Employment/Jettison**	
		– Set to **SEL** to activate a pylon	
		– Stations 1 & 8 should be set to **B** for selection	
		– Station 1 & 8 **SW** was used for Sidewinder jettison, is now inoperable	
•	**TANK JETT**	• **Allows Drop Tank Jettison**	
•	**SEL JETT**	• **JETT** – Selective jettison	
		• **SAFE** – Inhibits jettison	
		• **AUX** – Backup mode	
•	**JETT OPTIONS**	• **MER TER** – Jettisons ejector racks	
		• **WPNS** – Jettisons weapons only	

·	**ATTK MODE**	· **CCMPTR TGT**
		– **Computer Target** – Similar to CCRP
		· **CMPTR IP**
		– **Computer initial point**
		– Extended **CMPTR TGT** mode using known IP
		– For use when target hard to spot visually but close to landmark
		· **CMPTR PLT**
		– **Computer Pilot** – similar to CCIP
		· **MAN**
		– **Manual** – HUD displays pipper
		– Backup mode
		· **D/L BOMB**
		– **Data-Link Bomb** – Automatic mode steered by D/L cues
		– **Not Implemented in DCS**

5.1.2 SELECTIVE ORNANCE JETTISON

1.	**Pilot Conditions**	· **MASTER ARM** . . . . **ON**
2.	**RIO Conditions**	· **Desired Stations** . . . . **Selected**
		· **JETT OPTIONS** . . . . **As Desired**
3.	**Jettison**	(a) **SEL JETT Guard** . . . . **Flipped**
		(b) **SEL JETT Switch** . . . . **JETT**

5.2 UNGUIDED

5.2.1 M61 GUN

1.	**Pilot Conditions**	· **MASTER ARM** . . . . **ON**
		· **HUD** . . . . **A/G**
		· **WEAPON SELECTOR** . . . . **GUNS**
		· **Wing Sweep** . . . . **BOMB**
2.	**Employment**	(a) **Dive** . . . . 20-30 deg
		(b) **Pipper** . . . . on target
		(c) **TRIGGER** . . . . **FIRE**
·	**Note: TCS**	· TCS slaved to radar impact point
		· Rio can select **NAR** or **WIDE**

5.2.2 FFAR / ZUNI ROCKETS

1.	**RIO Conditions**	• **WPN TYP** **LAU-10**
		• **Attack Mode** . . . . **Pilot Attack**
		• **Deliver Mode** . . . . **RPL-SGL**
		• **Mechanical Fuze** . . . . **NOSE**
		• **Electronic Fuze** . . . . **INST**
		• **Delivery Options** . . . . **As Desired**
		• **Stations** . . . . **Armed**
2.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/G**
		• **WEAPON SELECTOR** . . . . **OFF**
		• **Stations** . . . . verify selected
		• **Wing Sweep** . . . . **BOMB**
3.	**Employment**	(a) **Dive** . . . . 20-30 deg
		(b) **Pipper** . . . . on target
		(c) **TRIGGER** . . . . **FIRE**

5.2.3 UNGUIDED BOMB - CCIP

1.	**RIO Conditions**	• **WPN TYP** **MK-8X**
		• **Attack Mode** . . . . **Pilot Attack**
		• **Deliver Mode** . . . . **STP-PRS**
		• **Mechanical Fuze** . . . . **NOSE**
		• **Electronic Fuze** . . . . **INST**
		• **Delivery Options** . . . . **As Desired**
		• **Stations** . . . . **Armed**
2.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/G**
		• **WEAPON SELECTOR** . . . . **OFF**
		• **Stations** . . . . verify selected
		• **Wing Sweep** . . . . **BOMB**
3.	**Employment**	(a) **Dive** . . . . 40 deg
		(b) **Pipper** . . . . on target
		(c) **STORE RELEASE** . . . . **Press and Hold**

5.2.4 UNGUIDED BOMB - CCRP

1.	RIO Conditions	• **WPN TYP** **MK-8X**
		• **Attack Mode** . . . . **Target Attack**
		• **Deliver Mode** . . . . **STP-PRS**
		• **Mechanical Fuze** . . . . **NOSE**
		• **Electronic Fuze** . . . . **INST**
		• **Delivery Options** . . . . **As Desired**
		• **Stations** . . . . **Armed**
2.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/G**
		• **WEAPON SELECTOR** . . . . **OFF**
		• **Stations** . . . . verify selected
		• **Wing Sweep** . . . . **BOMB**
3.	**Designation**	(a) **Slew Diamond** . . . . **VSL HI/LO**
		(b) **Designate** . . . . **PAL**
4.	**Employment**	(a) **Flight Path** . . . . Straight, Level
		(b) **Vel Vector** . . . . on Bomb Fall Line
		When Solution Cue meets Velocity Vector
		(c) **STORE RELEASE** . . . . **Press and Hold**

5.3 GUIDED

5.3.1 LASER GUIDED BOMB

1.	**LANTIRN PREP**	(a) **Target Pod Power** .... **POD**
		• Warm up takes approx. 8 min
		• Automatically switches to **STANDBY**
		(b) **Laser Code** .... as desired
		• **MUST BE SET ON THE GROUND**
		• **Default:** 1688
		(c) **LANTIRN Mode** .... **OPERATE**
		• **STANDBY** caution will flash for 30 s
		• Then switches to **OPER**
		(d) **VIDEO Switch** .... **FLIR**
		(e) **TID Mode** .... **TV**
2.	**RIO Conditions**	• **WPN TYP** .... **GBU-XX**
		• **Attack Mode** .... **Manual**
		• **Deliver Mode** .... **STP-SGL**
		• **Mechanical Fuze** .... **NOSE**
		• **Electronic Fuze** .... **INST**
		• **Delivery Options** .... **As Desired**
		• **Stations** .... **Armed**
3.	**Pilot Conditions**	• **MASTER ARM** .... **ON**
		• **HUD** .... **A/G**
		• **WEAPON SELECTOR** .... **OFF**
		• **VDI Mode** .... **TV**
		• **Stations** .... verify selected
		• **Wing Sweep** .... **BOMB**
4.	**Slew LANTIRN**	**Refer to LANTIRN Control Section**
		• **Slave to WYPT** .... **Left-4-Way RIGHT**
		• **QSNO (Snowplow)** .... **S4 HAT Down**
		• **Toggle FOV** .... **LANTIRN Toggle FOV**
		• **Slew** .... **LANTIRN Stick**
		• **Area Track** .... **Left-4-Way UP**
		• **Point Track** .... **Left-4-Way Down**
		• **Undesignate** .... **LANTIRN Undesignate**

4.	Designate	**Refer to LANTIRN Designation Section**
		(a) **Designate** . . . .**Trigger Full-Action**
		· Slant Range calculated
		· Time-to-Go calculated
		Once Time-to-Realease (TREL) is 0
		(b) **Auto-Lase** . . If selected: lases 10s to impact
		(c) **Manual Lase** . . . . **Trigger Full-Action**
		(d) **While Lasing** . . . . **L** blinks
5.	**Employment**	**Once Time-to-Realease (TREL) is 0**
		(a) **STORE RELEASE** . . . .**Press and Hold**
		(b) **Flight Path** . . . . Gentle right-hand turn
		(to prevent masking)

5.3.2 TALD DECOYS

1.	RIO Conditions	· **WPN TYP** . . . .**TALD**
		· **Deliver Mode** . . . .**STP-SGL**
		· **Delivery Options** . . . . **As Desired**
		· **Stations** . . . .**Armed**
2.	**Pilot Conditions**	· **MASTER ARM** . . . .**ON**
		· **HUD** . . . .**A/G**
		· **WEAPON SELECTOR** . . . . **OFF**
		· **HSD Mode** . . . .**TID**
		· **Stations** . . . . verify selected
3.	**Employment**	(a) **Flight Path** . . . . High / Fast
		(b) **RWR** . . . . Monitor to locate emitters
		(c) **STORE RELEASE** . . . .**Press and Hold**

Chapter 6

A/A WEAPONS

Contents

6.1 M61 GUN

6.1.1 M61 GUN - OVERVIEW

• **GUN RATE Button**	• **Cycles Gun Rate**
	  – **HIGH** – 6000 rpm
	  – **LOW** – 4000 rpm

• **A/A Gun Modes**	• **RTGS**
	  – **Real-Time Gunsight Mode**
	  – Selected automatically with guns
	  – **If No WCS Data Available** displays bullet location at 2000 ft with diamond and 1000 ft with pipper
	  – **If WCS Data Available** pipper displays bullet location at targets current range out to 4000 ft
	
	• **MANUAL**
	  – Fixed manual pipper
	  – Adjust with **GUN ELEV** knob
	  – Press **CAGE/SEAM** to select

• **CAGE/SEAM Button**	• **Cycles RTGS / MANUAL Gun Modes**
• **ROUNDS Knob**	• **Allows selection of remaining gun rounds**

6.1.2 M61 GUN - MANUAL

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **Gun Rate** . . . . **HIGH**
		• **Gunsight Lead** . . . . as required
		• **WEAPON SELECTOR** . . . . **GUNS**
2.	**Employment**	(a) **Gun Mode** . . . . **MANUAL**
		(b) **Pipper** . . . . on target
		(c) **Trigger** . . . . **FIRE**

6.1.3 M61 GUN - RTGS / NO RADAR

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **Gun Rate** . . . . **HIGH**
		• **WEAPON SELECTOR** . . . . **GUNS**
2.	**Employment**	(a) **Gun Mode** . . . . **RTGS**
		(b) **Pipper** . . . . on target
		(c) **Trigger** . . . . **FIRE**

6.1.4 M61 GUN - RTGS / RADAR

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **Gun Rate** . . . . **HIGH**
		• **WEAPON SELECTOR** . . . . **GUNS**
2.	**Employment**	(a) **Gun Mode** . . . . **RTGS**
		(b) **Radar** . . . . **STT**
		(c) **Pipper** . . . . on target
		(d) **Trigger** . . . . **FIRE**

6.2 AIM-9 SIDEWINDER

6.2.1 AIM-9 - OVERVIEW

• **Missile Preparation**	• **MSL PREP**
	  – AIM-9 seeker must be cooled
	  – Either press **SW COOL** button
	  – Or activation of **ACM**

• **Seeker Head Modes**	• **SEAM**
	  – **Sidewinder Expanded Acquisition Mode**
	  – **Double-D search pattern** invisible to pilot
	  – 4.5 sec search time
	  – **Allows AIM-9 to be uncaged and track target**
	  – 40 deg track limit
	  – **Allows WCS to slave AIM-9 to radar track**
	
	• **Boresight**
	  – AIM-9 locked to ADL
	  – 2.5 deg FOV
	  – Selected if **MODE/STP** set to **BRSIT**
	  – And **ACM** not active

• **MODE/STP Switch**	• **NORM**
	  – Allows **SEAM** seeker mode
	
	• **BRSIT**
	  – Forces Boresight seeker mode
	  – Overridden if **ACM** active

• **CAGE/SEAM Button**	• **Uncages Seeker**
	  – Starts 4.5 second double-D search
	  – If no IR source found cages again
	
	• **Slaves Seeker**
	  – If radar STT locked

6.2.2 AIM-9 - SILENT

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **SW COOL** . . . . **ON**
		• **MODE/STP** . . . . **As Desired**
		• **WEAPON SELECTOR** . . . . **SW**
2.	**Employment**	(a) **CAGE/SEAM** . . . . **Uncage Seeker**
		(b) **IR-Lock** . . . . **Good Tone**
		(c) **Trigger** . . . . **FIRE**

6.2.3 AIM-9 - RADAR

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **SW COOL** . . . . **ON**
		• **MODE/STP** . . . . **NORM**
		• **WEAPON SELECTOR** . . . . **SW**
2.	**Employment**	(a) **Radar** . . . . **STT**
		(b) **CAGE/SEAM** . . . . **Slave Seeker**
		(c) **IR-LOCK** . . . . **Good Tone**
		(d) **Steering** . . . . . center T-shaped cue with ASE
		(e) **Trigger** . . . . **FIRE**

6.3 AIM-7 SPARROW

6.3.1 AIM-7 - OVERVIEW

• **Missile Preparation**	• **MSL PREP**
	
	  – AIM-7 must be tuned to AWG-9
	  – Either press **MSL PREP** button
	  – Or activation of **ACM**

• **Launch Modes**	• **Normal**
	
	  – Standard operation, STT target designated before launch
	  – AIM-7 uses SARH all the way to target
	  – WCS can use CS or PD for guidance set with **MSL OPTIONS** Switch
	
	• **Boresight**
	
	  – Uses CS flood antenna of AWG-9
	  – Missile will **track strongest return** in Flood area
	  – Automatically activated if STT broken
	  – Selected if **MODE/STP** set to **BRSIT**
	  – **Or if no STT available**
	  – **Shown Below**

• **MSL SPD GATE Switch**	• **NOSE QTR**
	
	  – Standard setting in DCS
	
	• **All Others**
	
	  – Not simulated

• **MSL OPTIONS Switch**	• **NORM**
	
	  – WCS uses dedicated CW antenna for AIM-7 guidance
	
	• **SP PD**
	
	  – WCS uses PD from main flood antenna for AIM-7F/M guidance

• **MODE/STP Switch**	• **NORM**
	
	  – Sets normal launch mode logic
	
	• **BRSIT**
	
	  – Forces Boresight launch mode

6.3.2 AIM-7 - STT

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **MSL PREP** . . . . **ON**
		• **MODE/STP** . . . . **NORM**
		• **WEAPON SELECTOR** . . . . **SP**
2.	**RIO Conditions**	• **MSL SPD GATE** . . . . **NOSE QTR**
		• **MSL OPTIONS** . . . . **As Desired**
3.	**Employment**	(a) **Radar** . . . . **STT**
		(b) **Steering**
		• **Target** < 20 deg from ADL
		• **ASE** center T-shaped cue within
		(c) **Trigger** . . . . **Press and Hold** (until weapon release)
		(d) **Radar** . . . . **Maintain Lock** (until impact)

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6.4 AIM-54 PHOENIX

6.4.1 AIM-54 - OVERVIEW

• **Missile Preparation**	• **Weapon Cooling**
	  – AIM-54 requires liquid cooling
	  – RIO enabled **LIQUID COOLING** switch
	• **MSL PREP**
	  – AIM-54 must be tuned to AWG-9
	  – Either press **MSL PREP** button
	  – Or activation of **ACM**

• **Launch Modes**	• **PDSTT SARH**
	  – AIM-54 uses SARH all the way to target
	  – Faster update rate than TWS
	  – **Slightly increased effective range** as compared to a TWS launch
	• **TWS SARH/ARH**
	  – Allows **6 AIM-54 launches at 6 targets**
	  – Missile is initially SARH guided
	  – When within AIM-54 seeker range AWG-9 sends activation command
	  – **Not Fire and Forget:** Requires automatic activation command
	• **ACM Active**
	  – Activated when **BRSIT** selected
	  – Or when **ACM** active with no radar track
	  – Missile commanded active **before launch**

• **MSL SPD GATE Switch**	• **NOSE QTR**
	  – Standard setting in DCS
	• **All Others**
	  – Not simulated

•	**MSL OPTIONS** **Switch**	• **NORM**	
		– Normal guidance (SARH or SARH/ARH)	
		• **PH ACT**	
		– WCS immediately sends AIM-54 activation command on launch	
		– Reverts to SARH if no target detected	
		– **Must be selected before launch**	
•	**TGTS** **Switch**	• **SMALL** – 6nm activation range	
		• **NORM** – 10nm activation range	
		• **LARGE** – 13nm activation range	
•	**Missile Next** **Launch Button**	• **Selects Hooked Track as Next Target for AIM-54 TWS Engagement**	
•	**MODE/STP** **Switch**	• **NORM**	
		– Normal operation	
		• **BRSIT**	
		– Commanded active **before launch**	
		– Missile follows ADL and locks strongest return	
•	**TWS Symbology**	**Refer to TID Symbology Section**	
		• **Pre-Launch**	
		– Prioritization numbers assigned to tracks automatically or manually	
		– Blinking indicates optimal launch parameters	
		• **Post-Launch**	
		– Target prioritization number replaced with TTI	
		– Other prioritization numbers collapsed by one	
		– Tracks under missile attack brightened	
		– **TTI blinks when missile active**	
•	**Launch To Eject (LTE) Time**	• **Normal Operation** – 3-4 seconds	
		• **When in ACM** – 1 second	

6.4.2 AIM-54 - PD-STT

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **MSL PREP** . . . . **ON**
		• **MODE/STP** . . . . **NORM**
		• **WEAPON SELECTOR** . . . . **PH**
2.	**RIO Conditions**	• **LIQUID COOLING** . . . . **ON (FWD)**
		• **MSL SPD GATE** . . . . **NOSE QTR**
		• **MSL OPTIONS** . . . . **As Desired**
		• **TGTS Switch** . . . . **As Desired**
3.	**Employment**	(a) **Radar** . . . . **STT**
		(b) **Steering**
		• **Target** < 20 deg from ADL
		• **ASE** center T-shaped cue within
		(c) **Trigger** . . . . **Press and Hold**
		(until weapon release)
		(d) **Radar** . . . . **Maintain Lock**
		(until impact)

6.4.3 AIM-54 - TWS / MULTI

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **MSL PREP** . . . . **ON**
		• **MODE/STP** . . . . **NORM**
		• **WEAPON SELECTOR** . . . . **PH**
2.	**RIO Conditions**	• **LIQUID COOLING** . . . . **ON (FWD)**
		• **MSL SPD GATE** . . . . **NOSE QTR**
		• **MSL OPTIONS** . . . . **As Desired**
		• **TGTS Switch** . . . . **As Desired**
		• **WCS Mode** . . . . **TWS MAN/AUTO**
4.	**Employment**	(a) **Radar** . . . . **TWS**
		(b) **Trigger** . . . . **Press and Hold**
		(until weapon release)
		(c) **Repeat** . . . . for remaining targets
		(d) **Radar** . . . . **Maintain Track**
		(until active)

6.4.4 AIM-54 - ACM

1.	**Pilot Conditions**	• **MASTER ARM** . . . . **ON**
		• **HUD** . . . . **A/A**
		• **MSL PREP** . . . . **ON**
		• **ACM COVER** . . . . **UP**
		• **WEAPON SELECTOR** . . . . **PH**
2.	**RIO Conditions**	• **LIQUID COOLING** . . . . **ON (FWD)**
		• **MSL SPD GATE** . . . . **NOSE QTR**
		• **MSL OPTIONS** . . . . **As Desired**
		• **TGTS Switch** . . . . **As Desired**
4.	**Employment**	(a) **Steering**
		• **Range** < 10 nm for immediate tracking
		• **Azimuth** near ADL
		(b) **Trigger** . . . . **Press and Hold** (until weapon release)
		(c) **Repeat** . . . . Can fire additional missiles (no guarantee good missile distribution to targets)

WARNING

- **MISSILE IS PITBULL OFF THE RAIL** – No IFF capabilities