DCS GUIDE

BY CHUCK LAST UPDATED: 19/08/2023

DISCLAIMER

This document has been created for recreational purposes only. Do not use for training or real life flying.

The author of this document has never had access to restricted or classified documentation on the F-14 Tomcat. The author has never had access to OEM (Original Equipment Manufacturer) data related to the F-14 Tomcat, its armament systems nor its defensive systems. All the information within this document is taken from public documentation (i.e. Heatblur F-14 Wiki) and non-official tutorials (player-made videos on Youtube). The list of references used is listed in Part 17 – Reference Material & Acronyms.

The procedures listed in this document are deliberately simplified for gameplay purposes due to the limitations of the DCS World simulation environment and the limitations of the DCS F-14 module by Heatblur.

This document is merely a free, personal project that is used for entertainment. This document is not meant nor designed to teach someone to fly a real F-14 Tomcat.

TABLE OF CONTENTS

- PART 1 INTRODUCTION & JESTER AI PART 9 RADAR & SENSORS
- PART 2 CONTROLS SETUP
- PART 3 COCKPIT & EQUIPMENT
- PART 4 START-UP PROCEDURE
- PART 5 TAKEOFF
- PART 6 LANDING
- PART 7 ENGINE MANAGEMENT
- PART 8 FLIGHT & AERODYNAMICS

- PART 10 OFFENCE: WEAPONS & ARMAMENT
- PART 11 DEFENCE: RWR AND COUNTERMEASURES
- PART 12 DATALINK & IFF
- PART 13 RADIOS
- PART 14 AUTOPILOT
- PART 15 NAVIGATION & ACLS LANDING
- PART 16 AIR-TO-AIR REFUELING •
- PART 17 REFERENCE MATERIAL & AGRONYMS

The **<u>Grumman F-14 Tomcat</u>** is an American supersonic, twin-engine, twoseat, twin-tail, variable-sweep wing fighter aircraft. It was the first such U.S. jet fighter with twin tails. The Tomcat was developed for the United States Navy's Naval Fighter Experimental (VFX) program after the collapse of the F-111B project. The F-14 was the first of the American Teen Series fighters, which were designed incorporating air combat experience against MiG fighters during the Vietnam War.

The F-14 first flew on 21 December 1970 and made its first deployment in 1974 with the U.S. Navy aboard USS Enterprise (CVN-65), replacing the McDonnell Douglas F-4 Phantom II. The F-14 served as the U.S. Navy's primary maritime air superiority fighter, fleet defense interceptor, and tactical aerial reconnaissance platform into the 2000s. The Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) pod system were added in the 1990s and the Tomcat began performing precision ground-attack missions.

In the 1980s, F-14s were used as land-based interceptors by the Islamic Republic of Iran Air Force during the Iran–Iraq War, where they saw combat against Iraqi warplanes. Iranian F-14s reportedly shot down at least 160 Iraqi aircraft during the war, while only 12 to 16 Tomcats were lost; at least half of these losses were due to accidents.

The Tomcat was retired from the U.S. Navy's active fleet on 22 September 2006, having been supplanted by the Boeing F/A-18E/F Super Hornet. The F-14 remains in service with Iran's air force, having been exported to Iran in 1976. In November 2015, reports emerged of Iranian F-14s reportedly flying escort for Russian Tu-95 bombers on air strikes in Syria.





F-14B TOMCAT A JESTER Š INTRODUCTION PART

The F-14 Tomcat was designed as both an air superiority fighter and a long-range naval interceptor, which enabled it to both serve as escort attack aircraft when armed with Sparrow missiles and fleet air defense loitering interceptor role when armed with Phoenix missiles. The F-14 was designed with a two-seat cockpit with a bubble canopy which affords all-around visibility aiding aircrew in air-to-air combat. It features variable geometry wings that swing automatically during flight. For high-speed intercept, they are swept back and they swing forward for lower speed flight. It was designed to improve on the F-4 Phantom's air combat performance in most respects. The F-14's fuselage and wings allow it to climb faster than the F-4, while the twin-tail arrangement offers better stability.

The F-14 is equipped with an internal 20 mm M61 Vulcan Gatling cannon mounted on the left side (unlike the Phantom, which was not equipped with an internal gun in the US Navy), and can carry AIM-54 Phoenix, AIM-7 Sparrow, and AIM-9 Sidewinder anti-aircraft missiles. The twin engines are housed in widely spaced nacelles. The flat area of the fuselage between the nacelles is used to contain fuel and avionics systems, such as the wing-sweep mechanism and flight controls, as well as weaponry since the wings are not used for carrying ordnance. By itself, the fuselage provides approximately 40 to 60 percent of the F-14's aerodynamic lifting surface depending on the wing sweep position, mainly due to the lifting body characteristics of the fuselage.





The F-14A was the initial two-seat, twin-engine, all-weather interceptor fighter variant for the U.S. Navy. It first flew on 21 December 1970. The first 12 F-14As were prototype versions (sometimes called YF-14As). Modifications late in its service life added precision strike munitions to its armament. The U.S. Navy received 478 F-14A aircraft and 79 were received by Iran. The final 102 F-14As were delivered with improved Pratt & Whitney TF30-P-414A engines. Additionally, an 80th F-14A was manufactured for Iran, but was delivered to the U.S. Navy.

The F-14 received its first of many major upgrades in March 1987 with the F-14A Plus (or F-14A+). The F-14A's TF30 engine was replaced with the improved GE F110-GE-400 engine. The F-14A+ also received the state-of-the-art ALR-67 Radar Homing and Warning (RHAW) system. Much of the avionics suite, as well as the AWG-9 radar, were retained. The F-14A+ was later redesignated F-14B (or "Bombcat") on 1 May 1991. A total of 38 new aircraft were manufactured and 48 F-14A were upgraded into B variants.





The TF30 of the F-14A had been plagued from the start with susceptibility to compressor stalls at high AoA and during rapid throttle transients or above 30,000 ft. The F110-GE-400 engine installed on the F-14B provided a significant increase in thrust, producing 23,400 lbf (104 kN) with afterburner at sea level, which rose to 30,200 lbf (134 kN) at Mach 0.9. The increased thrust gave the Tomcat a better than 1:1 thrust-to-weight ratio at low fuel quantities. The basic engine thrust without afterburner was powerful enough for carrier launches, further increasing safety. Another benefit was allowing the Tomcat to cruise comfortably above 30,000 ft, which increased its range and survivability. The F-14B arrived in time to participate in Desert Storm.

Unfortunately, while the Tomcat was eventually upgraded in the F-14D "Super Tomcat" in 1991 and remained a superb fighter... the F-14's complex airframe and tricky servicing became extremely expensive to maintain as the aircraft aged. After all, this was an aircraft designed in the 1960's. The wing movement mechanism needed constant attention and the engines were also very troublesome in the early years of F-14 service. When new engines solved the engine problems, the constant need to repair the variable wing sweep mechanism and the servicing of the radar and other avionics drove the cost up again.

The Tomcat was equipped with the AIM-54 Phoenix, a radar-guided, long-range air-to-air missile (AAM), carried in clusters of up to six missiles. The Tomcat was its only operational launch platform. The Phoenix was the United States' only long-range air-to-air missile. The combination of Phoenix missile and the AN/AWG-9 guidance radar was the first aerial weapons system that could simultaneously engage multiple targets. Both the missile and the aircraft were used by Iran and the United States Navy. In US service both are now retired, the AIM-54 Phoenix in 2004 and the F-14 in 2006. They were replaced by the shorter-range AIM-120 AMRAAM, employed on the F/A-18 Hornet and F/A-18E/F Super Hornet-in its AIM-120D version, the latest version of the AMRAAM just matches the Phoenix's maximum range.

The F-14 fleet was smaller than the F-18 fleet. This made production runs of parts shorter, which had the adverse effect of making them more expensive. The AIM-54 Phoenix missile, while revolutionary in terms of capabilities and technological advancements, was an incredibly expensive one... Which added to the burden of operational costs. All these increasing costs eventually forced the Navy to retire both the Tomcat and the Phoenix.





In 1986, 20 years before the Tomcat's retirement, the movie "Top Gun" dominated the box office, but the success of the film did far more than just fill up American movie theaters. Navy recruitment boomed as recruiters set up tables right outside of screenings to field questions from aspiring aviators. Tom Cruise may have been the star, but for young Americans with dreams of flying a fighter jet, it was the Tomcat that truly stole the show.

One of the best articles I have seen on the Tomcat was written by Tyler Rogoway and hosted on FoxtrotAlpha. Link: https://foxtrotalpha.jalopnik.com/an-elite-f-14-airman-explains-why-the-tomcat-was-so-imp-1610043625

"With the 1960's technology in the jet and a multitude of sensors, weapons, and equipment, the Tomcat was too complicated and too cumbersome to be controlled by one individual. A typical mission's workload would be divided into segments: think on the around, administrative in the air, combat, and then administrative back with a final of landing/trapping.

[...]

In the Tomcat, the pilot's job was to maneuver the jet to get into a position where he could give a "Cleared Hot" call. With multiple strikers inbound separated by time (normally 30 seconds to a minute), this could be a challenge. Typically, one striker is off target with bombs away while the next striker is inbound and in a dive. This is where the RIO tends to earn his money as he visually acquires the inbound striker, talks his pilot's eyes onto him, and then switches to see where the first striker's bombs' hit. When you add SEAD and artillery coordination, close proximity of friendly troops, buddy lasing (having one jet designating a target while another drops the weapons) for laser quided bombs and a MANPAD being launched at someone, it becomes a dynamic and challenging mission; one where two aviators in the cockpit provides an added level of tactical advantage and situational awareness.

[...]

The hardest part for new WSO's (Weapon Systems Officers) is to not get "sucked inside" the cockpit by all of your sensors. You are still a co-pilot, not just R2D2 in the back. I used to tell new guys to strive for looking 50% inside the jet and 50% outside the jet. By looking outside you build air sense and situational awareness. This makes you a better crew member/co-pilot, which is the ultimate objective. Unfortunately for new guys, the ratio was 90% inside, 10% outside, but that is why you train."



As mentioned earlier, one of the peculiarities of the Tomcat is that it is an aircraft crewed by a Pilot and a RIO (Radar Intercept Officer). The RIO, a category of NFO (Naval Flight Officer), was the second crewman in the F-14 Tomcat. For crew coordination purposes, RIOs were primarily responsible for communication and navigation, as well as operating the AWG-9 radar. RIOs in the F-14 did not have flight controls (throttles, control stick, and rudder pedals), but could control weapon release parameters and provide the pilot with all sorts of relevant information. As you are about to see in the next sections, operating the Tomcat is not limited to being a pilot; it is all about creating a team that is more than the sum of its parts. A pilot's situational awareness is exponentially better with a second set of eyes in the sky, and good pilot/RIO teams can do some real damage if they work well together. Flying in multiplayer with a buddy as your pilot or RIO is insane amounts of fun. The Tomcat brings to DCS an unexpected social aspect to flying in the virtual skies. Try it out!



This brings us to the Tomcat's AI for the RIO : JESTER. JESTER is Heatblur's solution to one of the biggest technical challenges in flight simulation : how to implement a RIO AI (Artificial Intelligence) that is smart, functional, useful, and intuitive to use.

JESTER looks deceptively simple at first : you press "A" to show a contextual menu with different options/commands available, which can be selected by either using the "LCTRL + 1" to "LCTRL + 8" keys or by moving your cursor with TrackIR. As you start flying the Tomcat for a couple of hours, you will learn to enjoy the elegant yet robust AI solution.

JESTER can accomplish a number of functions, which greatly reduces your workload. He can provide you assistance with start-up checklists, he can set up navigation systems for you, he can tune in on radio frequencies or datalink networks... all you need to do is ask.

Also, JESTER will dynamically scan the sky with his radar to find and call out targets. He will deploy countermeasures if needed, crack jokes give you advice in all sorts of situations. He also has access to the ejection handle... so be nice to him!

Graywolf (who lent his voice to JESTER) did not only a stellar job in creating a compelling voice-over for the AI, but also succeeded in giving different emotions to JESTER based on different situations. He will sound excited and encourage you when you're on a bandit's tail, he will sound focused when calling out bandit bearings, he will sound scared when telling you to break to evade a missile, he will sound annoyed when you mess up your landing or bolter, he will crack jokes once in a while... JESTER feels like a living, breathing person. JESTER is more than a set of functions glued together – He's **your** buddy.

Heatblur has successfully done a tremendous technological achievement in the world of flight simulation: creating a crew member that is functional, helpful, relatively smart, and funny all at once.



You can access JESTER by pressing "A" once or twice depending on the situation. If you have TrackIR, I strongly suggest that you tick the "Use Head Movement in order to select items in JESTER Menu" in the Special F14 Options menu.



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INTRODUCTION

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If you are in Single Player and occupy the RIO seat, you can give the AI Pilot "ICEMAN" some basic commands to set heading, speed and altitude (angels). Take note that ICEMAN will not be able to takeoff, land or fight while you are in the RIO seat.



Note: In your controls, make sure you check your "Trim" controls since the default version of the game has your trim hat set to changing your view rather than trim the aircraft. Since most of you are probably equipped with a TRACKIR already, I suggest you make sure the Trim Hat Switch is set up properly.



CONTROLS	GAMEPLAY	MISC.		AUDIO	SPECIAL	VR	
Axis Commands	*	Reset category to def	ault Clear ca	itegory	Save profile as	Load profile	
		Category	Keyboard	Throttle - HOTAS W	Joystick - HOTAS W	a Saitek Pro Flight Co	TI [®] Constant of the second s
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	To contract 1		(JOY_Y		
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	menu.						
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				JOY_Z	т	o modify curves and	consitivitios of avos
						o mouny curves and	sensitivities of dxes,
					0	n the axis you want t	to modify and then cl
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	CONTROLS Axis Commands	CONTROLS GAMEPLAY	CONTROLS GAMEPLAY MISC. Axis Commands Category To assign axis, click on Axis Assign. Y select "Axis Commands" in the upper menu.	CONTROLS GAMEPLAY MISC. Axis Commands Reset category to default Clear category Category Keyboard To assign axis, click on Axis Assign. You can also select "Axis Commands" in the upper scrolling menu.	CONTROLS GAMEPLAY MISC. AUDIO Axis Commands Reset category to default Clear category Category Keyboard Throttle - HOTAS W. Category Keyboard Throttle - HOTAS W. To assign axis, click on Axis Assign. You can also select "Axis Commands" in the upper scrolling menu. JOY_Z	CONTROLS GAMEPLAY MISC. AUDIO SPECIAL Axis Commands Reset category to default Clear category Save profile as Category Keyboard Throttle - HOTAS W Joystick - HOTAS W. To assign axis, click on Axis Assign. You can also select "Axis Commands" in the upper scrolling menu. JOY_Z To	CONTROLS GAMEPLAY MISC. AUDIO SPECIAL VR Axis Commands Reset category to default Clear category Save profile as Load profile Category Keyboard Throttle - HOTAS W Joystick - HOTAS Wa Saltek Pro Flight Co To assign axis, click on Axis Assign. You can also select "Axis Commands" in the upper scrolling menu. JOY_Y JOY_X JOY_RZ JOY_Z To modify curves and on the axis you want to n "Axis Tune". JOY_X

Special Options Setup

OPTIONS						×
SYSTEM	CONTROLS	GAMEPLAY	MISC.	AUDIO	SPECIAL	VR
Voice Chat	^	F-14				
CA	.					
Supercarrier	Radio	Menu And PTT Behaviour	Default		•	
A-10C	Jester —	Al Contract				
📉 A-10C II	v v	se head movement to select iten ster Landing Callouts	ns in Jester menu			
AH-64D	🔲 s	witch PD-STT to P-STT lock when	going WVR			
AJS37	🗹 je 🔳 R	ster menu camera epeat RIO weapon type wheel on	TID			
AV-8B N/A	R	equire weapon selector press bet	ween OFF and GUN			
Bf 109 K-4	- A - U	llow weapon selector up to emula se FFB trim implementation	te press in SP/PH position			Sec. 1
👩 C-101EB	E	nable Afterburner Gate				
Christen Fagle II	A 🗹	utomatic external lights at carrie	r launch			
		nable Alternate AOA Buffet	ised condition			
🥵 F-15E						
 F-16C						
F-5E						
5-86F						
😨 F-14						
F/A-18C						
🗙 Fw 190 A-8						-
Fw 190 D-9						
CANCEL	M					ОК



Bind the following axes:

- PITCH (DEADZONE AT 4, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 10)
- ROLL (DEADZONE AT 4, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 10)
- RUDDER (DEADZONE AT 0, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 10)
- THROTTLE BOTH CONTROLS ENGINE RPM
- WHEEL BRAKE LEFT / RIGHT





CONTROLS N PART

MY SENSORS CONTROL SETUP JESTER AI INTERFACE



For the JESTER AI, the menu can be accessed by pressing the "Toggle Menu" binding ("A"). If you have a TrackIR device, I highly suggest that you activate the "Use head movement in order to select items in Jester Menu" option in the SPECIAL options tab. This way, the JESTER menu will be selectable by moving your head towards the desired sub-menu, then pressing "A" again.

If you do not have a TrackIR, you can use the "LCTRL+1", "LCTRL+2" [...] "LCTRL+8" bindings to select the desired sub-menu.



CONTROL OPTIONS								
F-14B Pilot - All		-	Reset category to de	fault Clear ca	tegory			
Action			Category	Keyboard	Throttle - HOTAS W.			
Toggle Menu			Jester Al	А	JOY_BTN2			

MY SENSORS CONTROL SETUP HCU STICK (RIO)



MY SENSORS CONTROL SETUP HCU STICK AXES (RIO)

X axis of the stick is mapped to the HCU left/right axis. Y axis of the stick is mapped ot the HCU up/down axis.

STSTEM	CONTROLS	GAMEPLAY	MISC		AUDIO	SPECIAL	VR
F-14B RIO A	xis Commands	•	Reset category to de	efault Cle	ar category	Save profile as	Load profile
Action			Category	Keyboard	Throttle - HOT	AS W Joystick - HOTAS Wa.	Saitek Pro Flight Co
HCU left/right						JOY X	
HCU up/down						JOY Y	
HCU vernier thumbwheel							
HCU vernier thumbwheel rel	lative adjustment						
Head Tracker : Forward/Bac	kward						
Head Tracker : Pitch							
Head Tracker : Right/Left							
Head Tracker : Roll							
Head Tracker : Up/Down							
Head Tracker : Yaw							
Horizontal View							
Horizontal View (Mouse)							
ICS Button ICS (Intercom) PT	IT (axis threshold)						JOY_X
ICS Button ICS (Intercom) PT	rr (axis threshold) - SRS Only / No M	Menu					
ICS Button MIC (UHF) PTT (a	axis threshold)						JOY_Y
ICS Button MIC (UHF) PTT (a	axis threshold) - SRS Only / No Men						
LANTIRN S3 HAT X Axis (WP	P-, WP+)						
LANTIRN S3 HAT Y Axis (ARE	EA, POINT)						
LANTIRN S4 HAT X Axis (QD	ES)						
LANTIRN S4 HAT Y Axis (QSM	NO, QHUD)						
LANTIRN Slew X							
LANTIRN Slew Y							
LANTIRN Trigger Axis (Latch	ed, Lase, Designate)						
Radar azimuth control							

MY SENSORS CONTROL SETUP LANTIRN STICK (RIO)





MY SENSORS CONTROL SETUP LANTIRN STICK AXES (RIO)

OPTIONS								For the LANTIRN Slew Y axis, click on AXIS	
SYSTEM	CONTROLS	GAMEPLAY	MISC.	AUDI	O SPECIAL	. VF		TUNE and tick the "Invert" box.	
F-14B RIO - A	Axis Commands	•	Reset category to defau	ult Clear categor	y Save profile as	i Load prof	ile .	AXIS TUNE PANEL	
Action Head Tracker : Roll Head Tracker : Up/Down Head Tracker : Yaw Horizontal View Horizontal View (Mouse) ICS Button ICS (Intercom) F ICS Button ICS (Intercom) F ICS Button MIC (UHF) PTT ICS Button MIC (UHF) PTT LANTIRN S3 HAT X Axis (M LANTIRN S3 HAT X Axis (QI LANTIRN S4 HAT X Axis (QI LANTIRN S4 HAT X Axis (QI LANTIRN SHAT X	PTT (axis threshold) PTT (axis threshold) - SRS Only / f (axis threshold) (axis threshold) - SRS Only / No M P-, WP+) REA, POINT) DES) 5NO, QHUD) hed, Lase, Designate) ustment	No Menu Ienu	Category 2	Keyboard Th	rottle - HOTAS W Joystick - H	IOTAS Wa Saitek Pro Flig JOY_X JOY_Y Node + JOY_ Node + JOY_		Deadzone Saturation X Saturation Y Curvature Sider Sider User Curve Axis Tune JOY_Y	
Radar elevation relative ad	justment								
Vertical View Vertical View (Mouse) Zoom View Zoom View (Mouse)				o	Y_SLIDER1			CANCEL	
	fiers Add	Clear	Default A:	xis Assign Axis	Tune FF Tune	Make HTML	ок		

IMPORTANT NOTE: Every control in this page uses the "Paddle Lever" modifier.



Grumman F-14A Tomcat. (Mike Badrocke) 96 Wing pivot carry through 127 Wing glove pneumatic seal 157 AN/ALR-45(V) tail warning 169 Port ventral fin 181 Rear spar 190 Port wing integral fuel tank 196 Port mainwheel (electron beam welded 128 Fin root fairing 170 Engine accessory 182 Rap hinge brackets 191 Front spar 197 Torque scissor links radar antenna titanium box construction) 129 Fin spar attachment joints 158 Tailplane boron fibre skin compartment 183 Port roll control spoilers 192 Leading edge rib 198 Main undercarriage front 1 Pitot tube 57 Cockpit aft decking 97 Wing pivot box integral fuel 130 Starboard fin leading edge 171 Ventral engine access doors 184 Flap leading edge eyebrow construction bracing strut panels AT 2 Radar target horn 58 Electrical system 131 Starboard all-moving 159 Port wing (fully-swept 172 Hydraulic reservoir seal fairing 193 Slat guide rails 199 Mainwheel well door 3 Glass-fibre radome controller 98 Fuselage longeron/pivot box tailplane position) 173 Bleed air ducting 185 Port manoeuvre flap 194 Port leading edge slat 200 Ventral pylon attachment honeycomb construction 4 IFE aerial array 59 Rear radio 132 Starboard wing (fully swept 160 All-moving tailplane 174 Port engine bay segments, open 201 External fuel tank (capacity attachment joint TOMC/ 5 Hughes AWG-9 flat plate and electronics 99 UHF datalink/IFF aerial 175 Intake compressor face 186 Wing tip fairing construction 195 'Slat honeycomb 265 US gal/1,011 litres) F-14B position) construction radar scanner equipment bay 100 Honeycomb skin panelling 133 AN/ALR-45 tail warning 161 Tailplane pivot fixing 176 Wing variable sweep screw 187 Low-voltage formation construction 202 Sparrow missile launch 6 Scanner tracking mechanism 60 Boundary layer bleed air duct 101 Wing glove stiffeners/dorsal radar antenna 162 Jet pipe mounting jack lighting adaptor 7 Ventral Al Q-100 antenna 61 Port engine intake lip 134 Fin aluminium honeycomb 163 Fin/tailplane attachment 177 Main undercarriage leg strut 188 Port navigation light 203 AIM-7F Sparrow air-to-air fences 8 Gun muzzle blast trough 62 Electrical system relay 102 Starboard wing pivot skin panel construction mainframe 178 Hydraulic retraction jack 189 Wing rib construction 9 Radar electronics equipment controls bearing 135 Fin-tip aerial fairing 164 Cooling air louvres 179 Wing skin panel 204 Wing glove pylon 63 Glove vane pivot 136 Tail navigation light 103 Slat/flap drive shaft gearbox 165 Tailplane hydraulic jack 180 Fuel system piping attachmen 10 AN/ASN-92 inertial navigation 64 Port air intake 104 Starboard wing integral 137 Electronic countermeasures 166 Hydraulic system 205 Cranked wing glove pylon unit 65 Glove vane housing fuel tank (total internal fuel antenna (ECM) equipment pack 206 Sidewinder missile launch 11 Radome hinge 66 Navigation light capacity 2,364 USgal/8,951 138 Rudder honeycomb 167 Formation lighting strip 103 rail 12 In-flight refuelling probe 67 Variable area intake ramp 168 Oil cooler air intake 207 AIM-9C Sidewinder air-toconstruction litres) (extended) doors 105 Leading edge slat drive 139 Rudder hydraulic jack air missile 13 ADF aerial 68 Cooling system boundary shaft 140 Afterburner ducting 208 Phoenix launch pallet 14 Windscreen rain removal air laver duct ram air intake 106 Slat guide rails 141 Variable area nozzle control 209 AIM-54A Phoenix air-to-air 69 Intake ramp door hydraulic duct 107 Starboard leading edge slat jack missile 15 Temperature probe iacks 142 Airbrake (upper and lower segments (open) 70 Air system piping 16 Cockpit front pressure 108 Starboard surfaces) bulkhead 71 Air data computer navigation 143 Airbrake hydraulic jack 17 Angle of attack transmitter 72 Heat exchanger 144 Starboard engine exhaust light 18 Formation lighting strip 73 Heat exchanger exhaust duct 109 Low-voltage formation nozzle 19 Cannon barrels 74 Forward fuselage fuel tanks 145 Anti-collision light lighting 20 Nosewheel doors 75 Canopy hinge point 110 Wing tip fairing 146 Tail formation light 21 Gun gas vents 76 Electrical and control system 111 Outboard manoeuvre flap 147 ECM aerial 22 Budder pedals ducting segments (down position) 148 Port rudder 23 Cockpit pressurisation valve 77 Control rod runs 112 Port roll control spoilers 149 Beaver tail fairing 24 Navigation radar display 78 UHF/TACAN aerial 150 Fuel jettison pipe 113 Spoiler hydraulic jacks 25 Control column 79 Glove vane hydraulic jack 114 Inboard, high lift flap (down 151 ECM antenna 26 Instrument panel shroud 80 Starboard glove vane. position) 152 Deck arrester hook (stowed 27 Kaiser AN/ANG-12 head-up extended 115 Inboard flap hydraulic jack position) 81 Honeycomb panel display 153 AN/ALE-29A chaff and flare 116 Manoeuvre flap drive shaft 28 Windscreen panels construction 117 Variable wing sweep screw dispensers 29 Cockpit canopy cover 82 Navigation light 154 Nozzle shroud sealing flaps jack 30 Face blind seat firing handle 83 Main undercarriage wheel 118 Starboard main 155 Port convergent/divergent UIPMEN 31 Election seat headrest bay undercarriage pivot fixing afterburner exhaust nozzle 32 Pilot's Martin-Baker GRU-7A 84 Starboard intake duct spill 119 Starboard engine 156 Tailplane honeycomb election seat door compressor face construction 33 Starboard side console panel 85 Wing slat/flap flexible drive 120 Wing glove sealing plates 34 Engine throttle levers shaft 121 Pratt & Whitney TF30-P-412 35 Port side console panel 86 Dorsal spine fairing afterburning turbofan 36 Pitot static head 87 Fuselage top longeron 122 Rear fuselage fuel tanks 37 Canopy emergency release 88 Central flap/slat drive motor 123 Fuselage longeron joint handle 89 Emergency hydraulic 124 Control system artificial feel 38 Fold out step generator units 39 M-61-A1 Vulcan 20mm six-90 Bypass door hydraulic jack 125 Tailplane control rods barrel rotary cannon 91 Intake bypass door 126 Starboard engine bay 40 Nose undercarriage leg strut 92 Port intake ducting 41 Catapult strop link 93 Wing glove sealing horn O 42 Catapult strop, launch 94 Flap/slat telescopic drive position shaft 43 Twin nosewheels Ш. 95 Port wing pivot bearing 44 Folding boarding ladder 45 Hughes AIM-54A Phoenix air-QQ to-air missile (6) 46 Fuselage missile pallet 47 Cannon ammunition drum (675 rounds) 159 0 48 Rear boarding step 49 Ammunition feed chute 50 Armament control panels CKP . 51 Kick-in step 52 Tactical information display hand controller 53 Naval Flight Officer's instrument console 54 NFO's ejection seat 55 Starboard intake lip 0 56 Ejection seat launch U m -Ż ◀ Δ





PART

SEE.

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BEN O'NEILL













Pilot Cockpit

 HUD (Heads-Up Display) **Camera Control Switch**

Hydraulic Transfer Pump Switch

• FWD: Shutoff - turns off the transfer pump in case it can't supply enough pressure to the failed system as that would risk disabling the still operational system. AFT: Normal - hydraulic transfer pump pressurizes a failed hydraulic system from the other functioning system when it drops below 2,100 psi

VTR (Video Tape Recording) Power Switch

C

OTH

EXT ENVIRONE M

FLASH

STEADE

AUTO

FORM

MASTERTEST

EMERG GET

08

THE DETTER

TER GEN

OFFET

AIR CONDITION

VTR (Video Tape Recording) Record Switch

AYC IIBTAME



EQUIPMENT Q COCKPIT m Ż

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<u>Pilot Cockpit</u>

FLEW LEAD

ARA-63 ICLS BIT (Built-In Test) Switch

ARA-63 ICLS (Instrument Carrier Landing System) Power Switch *FWD: ON / AFT: OFF*

> Hook Bypass Switch FWD: Field / AFT: Carrier

PEN

Taxi Light Switch FWD: ON / AFT: OFF

> White Flood Light Switch FWD: BRIGHT / MIDDLE: OFF/ AFT: DIM

Red Flood Light Switch FWD: **BRIGHT** / MIDDLE: **MEDIUM** / AFT: **DIM**

Wing Position Lights Switch FWD: BRIGHT / MIDDLE: OFF / AFT: DIM

ARA-63 ICLS Channel Selector

 Tail Position Lights Switch

 FWD: BRIGHT / MIDDLE: OFF / AFT: DIM

Position Lights Flash/Steady Switch

Anti-Collision Lights Switch FWD: ON / AFT: OFF Light Intensity Setting Thumbwheels

- ACM: Air Combat Maneuver Panel Lights
- INDEXER: AoA (Angle of Attack) Indexer
- INSTRUMENT: Instrument Panel Lights
- **CONSOLE**: Console & Red Flood Lights
- FORMATION: External Formation Lights

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<u>Pilot Cockpit</u>

EQUIPMENT

Canopy Control Switch (under the rail)

- **Boost**: Closes canopy using boost, used during cold weather or with a strong headwind
- Close: Closes canopy ٠
- Hold: Holds canopy at current position ٠
- **Open**: Opens canopy ٠
- Aux Open: Allows manual opening of canopy if system pressure is too low ٠

Pilot Cockpit

N-S Switch

Selects which hemisphere (North/South) is in for DG and SLAVED modes.

SYNC IND

OFF

Shows sync between AHRS gyro and magnetic azimuth detector. Used in SLAVED mode.

HDG (Heading) Knob

On As

In DG mode the button is depressed and rotated to select desired heading on the BDHI (Bearing Distance Heading Indicator).

Inboard Spoiler Override Switch

- FWD: **ORIDE** Overrides inboard spoiler symmetry protection, allowing a functional inboard spoiler to continue to operate after a MASTER RESET if one fails.
- AFT: NORM Normal (guarded position), in this mode, if an inboard spoiler fails up the rest are commanded to droop and the SPOILERS light illuminates on the caution panel.

Outboard Spoiler Override Switch

- FWD: ORIDE Overrides outboard spoiler symmetry protection, allowing a functional outboard spoiler to continue to operate after a MASTER RESET if one fails.
- AFT: NORM Normal (guarded position), in this mode, if an outboard spoiler fails up the rest are commanded to droop and the SPOILERS light illuminates on the caution panel.

Compass LATITUDE Correction Indicator (deg)

Compass LATITUDE Correction Setting Knob

Compass Mode Switch

- **COMPASS:** Uses magnetic azimuth detector directly without stabilization from the directional gyro, used only for emergency operation and the displays automatically uses the manual magnetic variation.
- SLAVED: Normal mode, uses the magnetic azimuth detector stabilized by the directional gyro.
- **DG**: Directional gyro mode, uses only gyro and not the magnetic azimuth detector.

TOMCAT
Pilot Cockpit	Caution/Advi	isory Indicator	
	Caution/Adv	isory marcator	
PITCH STAB 1 : Inoperative Pitch Channel 1	ROLL STAB 1 : Inoperative SAS Roll Channel 1	YAW STAB OP: One inoperative yaw channel	EMERG JETTI : Activation of EMERG STORES JETT button
PITCH STAB 2 : Inoperative Pitch Channel 2	ROLL STAB 2 : Inoperative SAS Roll Channel 2	YAW STAB OUT: Two inoperative yaw channels	LADDER: boarding ladder not correctly stowed
FLAP : flap failure or airspeed greate than 225 knots with flaps down	r -	SPOILERS: Spoilers system failure	START VALVE : starter solenoid air valve is open after start
HZ TAIL AUTH: Lateral Tail Authority Failure	y RUDDER AUTH : Rudder Authority Failure	AUTO PILOT: Autopilot system failure	INLET ICE : accumulation of ice on ice detector in left engine inlet
L INLET: Left AICS programmer and/or system failure	R INLET : Right AICS programmer and/or system failure	OIL PRESS : left/right engine oil pressure below 11 psi	BLEED DUCT : high temperature air leak in the engine compartments
L RAMPS: left ramp not locked in position during critical flight conditions	R RAMPS : right ramp not locked in position during critical flight conditions	LENG SEC: left engine AFTC is in secondary mode	R ENG SEC : right engine AFTC is in secondary mode
L GEN: left engine generator is inoperative	R GEN : right engine generator is inoperative	CANOPY: canopy is not down and locked	BINGO : fuel quantity at or below set BINGO quantity
L OIL HOT: left engine oil too hot	R OIL HOT : right engine oil too hot	CADC: Air Data Computer failure	HYD PRESS: pressure in either engine hydraulic pump below 2,100 psi
L FUEL PRESS : pressure below 9 psi in left engine fuel boost pump	R FUEL PRESS : pressure below 9 psi in right engine fuel boost pump	L FUEL LOW : fuel quantity below 1,000 pounds in aft and left feed	R FUEL LOW : fuel quantity below 1,000 pounds in aft and right and forward feed
-	WING SWEEP: failure of a single channel in wing-sweep system	RATS : RATS (Reduced Arrestment Thrust System) enabled	-
TRANS/RECT : failure in one or both transformer-rectifiers	MACH TRIM: failure in Mach trim actuator	WINDSHLD HOT: central windshield overheat	LAUNCH BAR: Weight on wheels - Aircraft kneeled, either throttle below MIL and launch bar not up and locked. Weight off wheels - Launch bar not up and locked, launch bar not within 15° off center (cocked nosegear) or nose strut not fully extended.
INTER TRIM : failure in trim system or computer failure	-	AHRS: attitude or heading information from the AHRS is unreliable	-
ENG FIRE EXT : low pressure in the fire extinguishing container (90 psi below nominal 600 psi)	AUX FIRE EXT: low pressure in the auxiliary fire extinguishing container (90 psi below nominal 600 psi)	-	-

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HUD (Heads-Up Display) Display Mode Selectors:

• TO: Takeoff

Pilot Cockpit

- CRUISE: Cruise
- A/A: Air-to-Air
- A/G: Air-to-Ground

QTY

• LDG: Landing

Navigation Steer Command Selectors:

- TACAN: Selects TACAN as steering command source
- **DESTINATION**: Selects RIO set waypoint as steering command source
- **AWL/PCD**: AWL (All-Weather Landing)/PCD (Precision Course Direction), selects glideslope guidance (ILS/ACLS) for landing or PCD for air-to-ground engagement directions as steering command source
- VECTOR: selects data link deviation steering as steering command source
- **MANUAL**: selects manually selected course and heading as steering command source

HUD Pitch Ladder Brightness Tuning Knob

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Gun Elevation Lead Setting Indicator (mils)

Gun Elevation Lead Setting Knob

QTI

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HUD (Heads-Up Display) Declutter Switch



VDI (Vertical Display Indicator) Mode:

- **TV**: Displays video from TCS or LANTIRN on VDI
- NORMAL: Displays normal VDI display

HSD (Horizontal Situation Display) Mode:

- **NAV**: Navigational display, shows steering information depending on selected steering command source
- **TID** (Tactical Information Display): Display repeating the RIO TID information. If RIO has TID set to TV the screen will be blank

VDI (Vertical Display Indicator) Power Switch UP: ON / DOWN: OFF

HUD AWL (All-Weather Landing System) Mode:

- ILS (Instrument Landing System): Selects ILS as source for AWL information.
- ACL (Automatic Carrier Landing): Selects ACL as source for AWL information

VDI AWL (All-Weather System) Mode:

- *ILS* (Instrument Landing System): Selects ILS as source for AWL information.
- **ACL** (Automatic Carrier Landing): Selects ACL as source for AWL information

HSD ECM (Electronic Countermeasures) Override Switch

> HSD (Horizontal Situation Display)/ECMD (Electronic Countermeasures Display) Power Switch UP: ON / DOWN: OFF

HUD (Heads-Up Display) Power Switch UP: ON / DOWN: OFF

TOMC

F-14B





Gun Rounds Remaining Indicator

Arresting Hook Lever

SHUT OFF PULL

FIRE EXT SW

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UHF TEST +

TEST

DIM

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TAKE BRAKES FUEL CANOPY SEAT STAB AUG TRIM WINGS FLAPS CONTROLS HARNESS

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ROUNDS

DISPLAYS

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BRT

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AUL

9 8

VHF/UHF

• UP: Hook Retracted

81

• DOWN: Hook Deployed

A HALLAND

• PULLED & TURNED: Hook Deployed (Emergency)

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EQUIPMENT Š COCKPIT m PART

F-14B TOMCAT

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Pilot Cockpit

Delle

HUD

VDI

8A











Right Engine Compressor STALL Light

-20

-30

-40 --50 --60

-68

8

VIII

9

FIRE EXT SI

UHF TEST + DIM

VHE/UHF

ECM (Electronic Countermeasures) / ALR-67 RWR Warning Lights / Threat Advisory Indicator

- **SAM**: steady illumination when detecting lock on from a SAM tracking radar. Flashes when missile launch is detected.
- **AAA**: steady illumination when detecting lock on from an Anti-Aircraft Artillery tracking radar. Flashes when AAA firing is detected.
- **AI**: steady illumination when detecting lock on from an Airborne Interceptor radar.





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Vertical Speed Scale (x1000 ft/min) Appears when HUD Takeoff Mode is selected

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Pilot Cockpit

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VOI CONT 15

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PART

F-14B TOMCAT



Left Engine Compressor STALL Light

Approach Indexer

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	APPROACH LIGHT	INDEXER	ANGLE -OF- ATTACK UNITS	AIRSPEED
	G R E E N		16 TO 30	SLOW
	A M B E R		15.5 TO 16	SLIGHTLY SLOW
	A M B E R		14.5 TO 15.5	OPTIMUM ON SPEED
(RED) ANGLE-OF-ATTACK	A M B E R		14.0 TO 14.5	SLIGHTLY FAST
			0 TO 14	FAST

Reference: Heatblur F-14 Wiki

Warning Lights

- WHEELS: Landing gear is not down and locked, flaps below 10 deg and either throttle below 85 %
- BRAKES: Antiskid or brake failure or Parking Brake • is set
- ACLS/AP: Automatic Carrier Landing System or Autopilot is disengaged
- NWS ENGA: Nosewheel Steering is engaged

GUN RATE

• **AUTO THROT**: Disengagement of automatic throttle control mode not resulting from throttle mode switch

SW COOL

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MAS ARN





CHECKERBOARD - Weapon is selected and ready for launch. On the ground indicates that fuselage rails are up and locked and that loaded weapons are armed.

F-14B

EQUIPMENT

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COCKPIT

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CHECKERBOARD - Weapon is selected and ready for launch. On the ground indicates that fuselage rails are up and locked and that loaded weapons are armed.

VHF/UH

TEST





Left Engine Fire Indicator

HUD

BRT

Pilot Cockpit

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VDI (Vertical Display Indicator) Caution Lights

- ADJ A/C: Other aircraft adjacent to your own traffic pattern
- LANDING CHK: carrier has a channel ready for ACL and that the crew should prepare for carrier landing
- ACL READY: CATCC (Carrier Air Traffic Control Center) has acquired aircraft and is transmitting glidepath information to aircraft
- **A/P CPLR**: CATCC is ready to control aircraft
- **CMD CONTROL**: aircraft is under data link control for landing
- **10 SECONDS**: indicates that carrier motion is added to data link info and commands during landing. Indicates 10 seconds to arrival at the next point in approach pattern in other modes.
- **TILT**: no data link command received for the last 2 seconds during ACL (Automatic Carrier Landing)
- **VOICE**: CATCC not ready for ACL, switch to standard voice procedures
- **AUTO THRO**: Auto throttle system is disengaged by other means than the throttle mode switch.
- **A/P REF**: autopilot selected but not engaged. Exception altitude and heading hold.

VDI (Vertical Display Indicator) Caution Lights

• WAVEOFF: Waveoff commanded during carrier landing **Right Engine Fire Indicator**

HUD

TRIM

- WING SWEEP: failure in both wingsweep channels or disengagement of spider detent.
- **REDUCE SPD**: flap retraction failure with greater than 225 knots indicated airspeed. Also indicates safe Mach number exceeded.
- ALT LOW: Not functional



HSD Course (CRS) Setting Knob Controls desired course in MAN (manual) and TACAN mode.

HSD Test Button

HSD BIT (Built-In Test) Failure Indicator Light White flag indicates failure. Black flag indicates normal operation mode. Rotate clockwise to reset.

TOTAL

QTY

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EED WO DRME

Cabin Pressure Altitude Indicator (x1000 ft)

<u>Pilot Cockpit</u>

-SP/PH

SW

-GUN

OFF

ENERS DOWN PUSH TURN

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1/2 RALIN

COME 41 FLT

SPD BRK

FUEL

WING/EXT TRANS

ORIDE

DUMP

MASTER

Emergency Brake Pressure Indicator Hydraulic pressure available from the emergency brake accumulators to the auxiliary and parking wheelbrake systems

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FUEL

CRS

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RNG 010

PART 3 – COCKPIT & EQUIPMENT Tomcat

Reference: Heatblur F-14 Wiki





Control	Function
1.Bomb release button	Stores release button, used for air-to-ground ordnance (except rockets) and loaded external countermeasures.
2.Pitch and roll trim hat	Hat used to control trim, up/down trims pitch and left/right trims roll.
3.Weapon select hat	Selector hat moveable up and down and depressable. SP or PH - Selects AIM-7 or AIM-54, depression toggles between type. SW - Selects AIM-9, depression toggles between stations.
	GUN - Selects M-61A1 Vulcan gun.
	OFF - Inhibits weapon release.
	Thumbwheel used to control DLC or maneuver flaps.
4.DLC & maneuver flap command wheel	With DLC engaged forward rotation extends spoilers and aft rotation retracts spoilers.
	With gear and flaps up and DLC disengaged forward rotation retracts maneuvering flaps/slats and aft rotation extends them.
	Momentary depression with flaps down, throttles less than MIL and no spoiler system failure engages DLC.
5.DLC engage/disengage & countermeasure dispense button	With flaps up button sends command to ALE-39 to dispense chaff or flares according to RIO setting.
	DLC is disengaged by further momentary depression of button, raising flaps or advancing either throttle to MIL.
6.Autopilot reference &	Button toggling nosewheel steering with weight on wheels.
nosewheel steering button	Without weight on wheels is used to engage enabled autopilot modes.
7.Autopilot emergency disengage	Disengages all autopilot modes and DLC and releases all autopilot switches and roll and pitch SAS switches to OFF position.
paddle	With weight on wheels additionally reverts throttle mode to MAN (manual) while depressed.
8.Weapon firing trigger	Two-stage trigger. First detent enables CTVS and gun camera. Second detent releases selected forwards firing weapon.









Nose Strut Switch

- **EXTD** Extend, extends nosewheel strut and raises and • locks launch bar.
- OFF Turns off nosewheel strut movement, springloaded ٠ to this position.
- **KNEEL** Releases pressure from nosewheel strut to retract it, kneeling aircraft. Also unlocks launch bar.

Parking Brake Lever Pulled OUT: Brake Engaged Pushed IN: Brake Released

EJECT CMD Indicator

LER BK

QTY SEL

WING

• PILOT - Pilot ejects both crewmembers, RIO only himself. MCO - Each position ejects both crewmen.

MASTER

FWD

NORM

Landing Gear Lever

UP

EMERG DOWN

UP

FUEL

WING/EXT

ORIDE

TRANS

- Left Click to Toggle UP/DOWN
- Right Click to push handle in, turn clockwise and pull out (emergency extension in DOWN position) This releases a compressed nitrogen charge for emergency extension.

Landing Gear Transition Light Illuminates when gear position does not correspond to lever position

HYD ISOL Switch

Isolates landing gear, nosewheel steering and wheel brakes from the combined hydraulic system. Is automatically moved to T.O./LDG by LDG GEAR in DOWN position.

FLT - In flight operation, isolates systems listed above.

• T.O./LDG - Take-off/landing, connects systems listed above, allowing them to operate.

Down Lock Override Switch Indicates weight on wheels when moved down by solenoid. Can be lifted up to override. Not functional.

EQUIPMENT Q OCKP 2 4

TOMCAT

F-14B

4

Launch Bar Abort Switch FWD: ABORT AFT: NORMAL

Spoiler Position Indicator

- DN Down, flush with wings.
- Up-arrow Extended above wing.

En

DUMP

Down-arrow - Drooped below wing surface.

Left/Right Rudder Position Indicator

Fuel FEED Switch Switch selecting fuel feed to the engines. Guard locks the switch to NORM until lifted.

Refueling Probe Indicator Light

Transition light illuminated when refueling probe is not in extended or retracted position

Wing/External Transfer Switch

- **ORIDE** Override.
- AUTO Normal position.
- **OFF** Turns off fuel feed from the wing and external tanks.

Refuel Probe Switch

- ALL EXTD All extended, extends refueling probe and allows refueling of all tanks. Also resets WING/EXT TRANS switch to AUTO.
- **FUS EXTD** Fuselage extended, extends refueling probe and allows refueling of only fuselage tanks.
- **RET** Retracted, retracts refueling probe.

Fuel Dump Switch

Allows fuel dump when speed brakes are retracted, afterburner off and weight off wheels.

Anti-Skid Spoiler Brakes switch

- **BOTH** Enables both anti-skid and spoiler brake function with weight on wheels.
- **OFF** Turns off both systems.
- **SPOILER BK** Spoiler brake, enables spoiler brake function with weight on wheels.

Left/Right Horizontal Stabilizer **Position Indicator (deg)**

Fuel QTY SEL Switch

Switch selecting what the fuel quantity tapes on the fuel quantity display shows.

- FEED Shows respective feed and fuselage tank fuel quantity.
- **WING** Shows respective wing tank fuel quantity.
- **EXT** Shows respective external fuel tank quantity.

Master Reset button

Resets CADC failure detection system and associated fault displays.

TOMC/ F-14B

62

COMP HYD PRESS





Throttle Control	Function		
1.Speed brake switch	Switch controlling extension of the speed brake. EXT - Momentary position returning to center when released. Incrementally extends speed brake while held. Speed brake remains in position it's at when released. RET - Toggle position retracting speed brake.		
	Switch controlling wing-sweep function. Manual mode only allows positions aft of CADC set position.		
2.Wing-sweep switch	 AUTO - Wing-sweep automatically set by CADC. FWD - Sweeps wings forward manually. AFT - Sweeps wings aft manually. BOMB - Sets wing-sweep to 55° if forwards of that. When the CADC position is aft of 55° it will follow that setting instead. 		
3.PLM button	Button used to command pilot lockon mode (PLM) of AWG-9. Also used to disengage autopilot while in ACL.		
4.CAGE/SEAM button	Button used to command CAGE/SEAM to AIM-9 initiating lockon. Also used to disengage APC when in use.		
5.Exterior light switch	Switch used to control exterior lights. OFF disable all exterior lights and increases approach light intensity. ON enables all exterior lights and dims approach lights.		
	Switch allowing pilot to key one or both radios and intercommunication to RIO.		
	ICS - Keys intercommunication to RIO.		
6.ICS PTT switch	BOTH - Keys both UHF 1 and V/UHF 2 for transmission.		
	UHF1 - Keys UHF 1 for transmission.		
	UHF2 - Keys V/UHF 2 for transmission.		



EQUIPMENT Š COCKPIT M PART

Target Designate Switch

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HDG

OFF

<u>Pilot Cockpit</u>

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position. DITY SEL

REFUE

FUS

BUIN

WING

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In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.

Backup Ignition Switch ON / Normal

ASYM LIMITER Switch *ON/OFF switch enabling afterburner thrust asymmetry limiter.*

> Throttle TEMP (Computer Gain) Switch Hot / Normal / Cold

Left Engine Mode Select SwitchPRI - Primary engine control mode.

Throttle Mode Switch

AUTO: Automatic

BOOST: Boosted

MAN: Manual

• **SEC** - Secondary engine control mode.

Yaw SAS (Stability Augmentation System) Switch FWD: ON / AFT: OFF

Roll SAS (Stability Augmentation System) Switch *FWD: ON / AFT: OFF*

Pitch SAS (Stability Augmentation System) Switch *FWD: ON / AFT: OFF* Rudder Trim Control Switch

Right Engine Mode Select Switch

- **PRI** Primary engine control mode.
- SEC Secondary engine control mode.

UF

TOMCAT

F-14B

ICS (Intercommunication System) Volume Control

VEC/PCD/ACL Autopilot Selector

VEC/PCD: Vector/PCD mode. Roll and pitch axis is controlled by data link. Engaged by NWS button on pilot stick.

• OFF

ACL: Automatic carrier landing mode. Engaged by NWS button on pilot stick.

Autopilot Altitude Hold Mode AFT: OFF / FWD: ON

Autopilot Heading Mode

- AFT: **GT** Ground track mode, engaged by NWS button on pilot stick.
- MIDDLE: OFF
- FWD: HDG Heading Hold Mode

Amplifier Selector

- **B/U** Backup amplifier.
- NORM Normal amplifier.
- EMER Emergency amplifier

ICS (Intercommunication System) Switch

- **RADIO OVERRIDE** Makes ICS audio override radio audio.
- **HOT MIC** Allows talking to the RIO without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.
- **COLD MIC** Allows talking to the RIO only while the PTT is pressed.

Autopilot Engage Switch AFT: OFF / FWD: ON AN/ARC-159 UHF 1 Radio Control Panel

3 – COCKPIT & EQUIPMENT

PART

TOMCAT

F-14B

ALR-67 RWR Volume Control

Pilot Cockpit

Sidewinder Volume Control

AN/ARC-182 V/UHF 2 Radio Volume Control

TACAN CMD Indicator

Indicates current crewmember in command of the TACAN.

- PLT: Pilot
- NFO: Naval Flight Officer (RIO)

TACAN X/Y Frequency Selector

TACAN Mode Selector

- OFF
- REC: Receive Only
- T/R: Transmit/Receive
- A/A: Air-to-Air TACAN Mode
- BCN: Beacon TACAN Mode (not Functional)

TACAN Frequency Selectors

TACAN BIT (Built-In Test) GO Light

TACAN BIT (Built-In Test) NO GO Light

TACAN BIT (Built-In Test) Button

TACAN Mode Normal/Inverse Switch

TACAN Volume Control



G-Valve Button *Pressed to test inflation of G-suit*

> **Pilot Oxygen Switch** FWD: ON / AFT: OFF

> > C. S.

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No.

Ventilation Airflow Thumbwheel Used to control airflow through the pressure suit or seat cushions if no pressure suit is worn. M PART





MR SOURCE



EQUIPMENT ø COCKPIT M PART

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Emergency Harness Release Handle 🛛 🔤

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BEO 1

BRT MED DEM

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F-14B TOMCAT

<u>RIO Cockpit</u>

Electrical Power System Test Panel

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ENG STALL WARN

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RAMP

HUD (Heads-Up Display) Camera Control Swtch

AN/APX-72 IFF (Identify-Friend-or-Foe) Transponder Control Panel

IFF (Identify-Friend-or-Foe) Mode 4 Power Switch ON (FWD) / OFF (AFT)

Data/ADF Switch

Controls display of data and ADF on the HSD and ECMD. BOTH enables display of the ADF bug and navigation data block. DATA enables display of only the navigation data block. OFF disables display of either.

IFF (Identify-Friend-or-Foe) Antenna Switch

Allows control of which antenna the IFF transponder uses (AUTO/Lower Antenna)

Test Switch IND LT: Indicator Lights Test DDI BIT: Digital Data Indicator Built-In Test

Nº4

GND CLG Switch

- **OBC/CABIN** Allows for external air into the cabin and to cool electronics and AWG-9/AIM-54 with reduced performance for OBC.
- **OFF** External air not used for these functions.
- **AWG-9/AIM-54** Uses the external air to cool AWG-9 and AIM-54 coolant with better performance but disables external air to cabin.

F-14B TOMC/

Flare Program - Quantity Thumbwheel Sets quantity of flares to be released in a program.

Chaff Program Thumbwheels

- **B QTY**: Quantity, sets quantity of chaff to release in ٠ one program salvo, can also be set to C (continuous) or R (random).
- **B INTV**: Interval (sec), sets interval between chaff burst to release in one program salvo, can also be set to R (random).
- **S QTY**: Quantity, selects number of salvoes to release in a program.
- SINTV: Interval (sec), selects interval between salvoes in a program.

AN/ALE-39 Countermeasures Program Panel

Jammer Program Thumbwheels Quantity / Interval Hundreds (sec) / Interval Tens (sec) / Interval Units (sec) **AN/ALE-37 Programmer Reset Switch**

LOAD Control Thumbwheels

Thumbwheels inputting into AN/ALE-39 what is loaded into each launcher subsection.

- L10 Sets loaded countermeasure in Left 10 subsection.
- L20 Sets loaded countermeasure in Left 20 • subsection.
- R10 Sets loaded countermeasure in Right 10 ٠ subsection.
- **R20** - Sets loaded countermeasure in Right 20 subsection.

Flare Program - Interval Thumbwheel Sets interval between flare releases in a program (sec)

TOMC F-14B



DATA

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- NORM Normal, each flare ejection command will eject one flare in total. Affects both manual and programmed releases.
- **PILOT** Enables the pilot to manually release flares with the pilot stick DLC button, the other positions releases chaff with DLC button depression.



Datalink Transmission Mode Switch

- **TEST** Starts system test.
- NORM Normal operational mode.
- A/J Anti-jam mode.

DECM AN/ALQ-126 Volume Control Knob

AN/ALQ-126 DECM (Defensive Electronic Countermeasures) Jammer Mode Selector

- OFF Turns off power to AN/ALQ-126.
- **STBY** Standby, applies power to warmup system.
- **TEST/HOLD 3 SEC** Should be held in this position for 3 seconds to prepare for system test.
- **TEST/ACT** Starts AN/ALQ-126 BIT, used after 3 seconds in TEST/HOLD 3 SEC position.
- **REC** Receive, enables AN/ALQ-126 to receive and analyze threat signal. Detected missile launch may force the system into repeat mode.
- **RPT** Repeat, enables AN/ALQ-126 to use programmed responses to received threat signals.

DECM Standby Light

Amber light indicating warmup when system is placed in STBY. Goes out after complete warmup. Indication during test or operation indicates a fault has occurred.

Datalink Frequency Select Wheels *First digit is already preset (3). Shown: Frequency 312.0*

Datalink Power Switch

- FWD: ON
- MIDDLE: OFF
- AFT: Auxiliary Mode

Antenna UHF/Datalink Selector Switch selecting antenna in use for UHF 1 and data link.

> **Datalink Reply Switch** Used to transmit data link reply, transmits in NORM (normal), disabled in CANC (cancelled).

> > **Datalink Address Thumbwheel** Sets what data link address own aircraft uses. (Sets two least significant digits, others set by groundcrew.)

Datalink Mode Switch Switch springloaded to TAC but held by solenoid. Enables data link alignment and waypoint update.

- **CAINS/WAYPT** Enables data link alignment with Carrier Aircraft Inertial Navigation System (CAINS) and waypoint update.
- **TAC** Enables manual selection of frequencies, stops data link alignment.



F-14B TOMC/

RWR Test Switch

Switch springloaded to center. Momentary selection of BIT indicates BIT in ALR-67. Selection of SPL (special) while BIT page 1 is displayed shows the special BIT status page while held and then for 3 seconds when released.

RWR Mode Selector Switch springloaded to center (OFF) position. Can be held to OFST (offset) and LMT (limit) position to enable respective function while held.

AN/ALR-67 RWR (Radar Warning Receiver) Display Mode Selector

Selector switch controlling what type of threats to prioritize and display.

- NORM (Normal)
- AI (Airborne Interceptor)
- AAA (Anti-Aircraft Artillery)
- UNK (Unknown)
- FRIEND

AN/ALR-67 RWR (Radar Warning Receiver) Power Switch FWD: ON / AFT: OFF

RWR Volume Control Knob

TOMCAT

ĮL	RIO Cockpit DDI (Digital Data Indicator) Displays commands received via Datalink				
	WAVE OFF: Automatic AFCS disengagement	TILT : No datalink message received in last 10 sec. In ACL, indicates no messages in last 2 seconds, will disengage AFCS.	CMD CHN : Command to change datalink channel	TO WAY PT : Proceed to the point being indicated by target information.	FRE LAN: Free to attack most suitable target
	LAND CHK: CATCC has datalink channel available for AFCS	CMD CHG : Imminent or recently changed command instructions	HDG CHN: Imminent or recently changed heading command	HANDOVER: TDS is handing own aircraft over to another control center	DISGAGE : Cease fire, Disengage.
	ACL BEAC: Directed by carrier to enable APN-154 beacon	ALT CHG: Imminent or recently changed altitude command	CANC RPY : TDS (Tactical Data System) has cancelled reply messages	ORBIT : Assume orbit at present position maintaining maximum endurance	ABORT : Abort action.
	ACL RDY: Automatic Carrier Landing system has locked onto aircraft APN-154 beacon and is transmitting in zero pitch and bank signals. Glideslope information is now available to pilot.	MON ALT : Altitude command not being followed with enough precision – you need to monitor altitude.	-	CHALNGE : Intercept and visually identify (challenge) target	BEAC ON : Enable APN-154 tracking beacon.
	A P CPLR: Automatic Carrier Landing system is ready to take control of aircraft for ACL approach, autopilot should be engaged	MANUAL : Autopilot should not be engaged.	FWD VEC : Aircraft is being vectored to approach target from the front hemisphere	ARM 1 : Intercept and destroy indicated hostile target using AIM-54	BEAC DUB : Set APN-154 to double-pulse mode.
	10 SEC : Indicates 10 seconds to next action or waypoint. In ACL, indicates that ships motion is taken into account for ACL.	SPD CHG: Imminent or recently changed speed command	AFT VEC : Aircraft is being vectored to approach target from the rear hemisphere	ARM 2 : Intercept and destroy indicated hostile target using AIM-7	DROP : Command to releas weapon in data link A/G attack, manually or automatically if in datalink attack mode.
	ADJ A C : Indication from control station of another adjacent aircraft near own aircraft	MON SPD: Speed command not being followed with enough precision – you need to monitor airspeed.	COI VEC : Aircraft is being vectored on a collision course to target	ARM 3: Intercept and destroy indicated hostile target using AIM-9	BEAC OFF : Turn off APN-15 tracking beacon.
	VOICE : Indicates ACL not available, switch to voice procedures	CMD CTRL: Aircraft under datalink control for landing	NO MSG : No message at this time. Indicates presence of datalink communication while not receiving a command.	NOT CMD : Ignore currently received heading, speed and altitude.	RET BASE : Return to indicated home base.







- **Open**: Opens canopy
- Aux Open: Allows manual opening of canopy if system pressure is too low ٠

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RIO Cockpit

ECMD BIT (Built-In Test) Failure Indicator Light White flag indicates failure. Black flag indicates normal operation mode. Rotate clockwise to reset.

ECMD (Electronic Countermeasure Display) Display used for navigational information. Has a brightness control knob, test button and a BIT indicator showing status of display (solid black when operational, showing white flags when indicating a fail condition).

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Called ECMD as the F-14A and later PMDIG (Programmable Multi-Display Indicator Group). The F-14B used this display for RWR presentation as well. ECMD Test Button

ECMD Brightness Control Knob



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Caution/Advisory Indicator

C & D HOT: Overheat in RIO controls and displays	-	
-	CABIN PRESS: Cabin pressure is too low	
FUEL LOW : Fuel below 1000 lbs in either aft and left or forward and right fuel feed groups.	OXY LOW : Oxygen quantity is below 2 liters or pressure too low.	
CANOPY: Canopy not down and locked	FUSE HV: AWW-4 electric fuse inoperative	
RDR ENABLED : Caution light indicating that radar operation with weight on wheels is possible.	-	
COOLING AIR : Overtemperature condition in the electronic forced air cooling system	-	
MSL COND : Overtemperature or underpressure in missile coolant flow. Can also indicate that the LIQ COOLING switch is not in the AWG-9/AIM-54 position with the WCS in STBY or ON when the Phoenix fairing are installed	AWG 9 COND : Overheat or overpressure in AWG-9 coolant flow or overtemperature switch has shut down the coolant pump	
-	NAV COMP : Failure in INS or CSDC with the NAV MODE switch in INS	
FILM LOW: Low remaining quantity of mission recorder film	IMU : Failure in Inertial Measuring Unit or navigation system is in AHRS/AM mode	
-	AHRS: Attitude or heading information from AHRS is unreliable	



missile launch is detected.

AAA: Warning light, steady illumination when detecting lockon from a AAA tracking radar. Flashes when AAA engagement is detected.

CW: Detection of a continuous wave (CW) emitter

IFF

RCV

XMIT

Al: Warning light, steady illumination when detecting lockon from an airborne interceptor radar.

Threat Advisory Indicator

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Master Caution

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RIO Cockpit

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Chaff/Flare Dispense Hat Switch

- DOWN: Initiates set chaff release program.
- UP: Initiates a single chaff release.
- LEFT (Outboard): Initiates set flare release program.

ARGE

CLEAF

JAM/JET

RIGHT (Inboard): Initiates set jammer release program.

FAST

OUT

CLUTTER

THRLD

OF

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-60-

PULSE VIDEO

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Chaff/Flare Dispense Hat Switch

- DOWN: Initiates set chaff release program.
- UP: Initiates a single chaff release.

XMTR

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WCS MO

NORM

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MSL CHAN

- LEFT (Inboard): Initiates set jammer release program.
- *RIGHT* (Outboard): Initiates set flare release program.



RDROT Radar Track Indicator Light Indicates the target is within the range or rate gate and being tracked.

ANT TRK Radar Track Indicator Light Indicates the radar is tracking the target's angle.

PULSE VIDEO Knob Controls video strength of pulse video

OFF

ECT

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on the DDD. No effect on pulse doppler video.



ASPECT Switch

Used to control the rate region covered by the doppler filters in pulse doppler modes and if to use edge or centroid tracking in pulse mode. These settings correspond to expected target aspect.

PULSE GAIN Knob

Used to control the gain of the AWG-9 in pulse mode, normally left in detent unless needed because of clutter or jamming. **Selected Radar Range Indicator (nm)** *Blank if no range scale is used on the DDD.*

> **Radar Range Selector Buttons** 5/10/20/50/100/200 nm

> > **JAT Radar Track Indicator Light** Indicates the radar is tracking a jamming source's track angle.

IROT Radar Track Indicator Light *TCS angle tracking, called IROT as this was originally used for the IRST in the early F-14-A.*

XMTR MSL CHAN CHAN

DDD BRIGHT (Brightness) Knob

DDD (Detailed Data Display) Radar Display *Main AWG-9 radar display.*

V_c Switch

Switch used to select different closing velocity scales on the DDD in PD (Pulse Doppler) modes.

ERASE Knob

Used to control the intensity of the ERASE beam on the DDD, controlling how quick the image on the DDD fades.



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MLC Filter Switch Selects MLC (Main Lobe Clutter) mode of operation

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CLUTTER

TGTS Switch Selects target size for missile launch zones and WCS track calculations

RIO Cockpit

PD THRLD Clear Knob Controls pulse doppler video threshold in the CLEAR (upper half of the DDD) region

JAM/JET Knob Sets threshold at which a radar return is considered a jamming target.

EKNOTS 8

AGC Switch Controls Automatic Gain Control speed.

Land V

PARAMP Switch Controls Parametric Amplification.

PD THRLD Clutter Knob

Controls pulse doppler video threshold in the CLUTTER (lower half of the DDD) region

Radar Antenna EL (Elevation) Indicator

Meter with indicator needles indicating sensor elevation. Left indicator shows current actual radar antenna elevation. The right indicates commanded radar elevation while RDR is selected on HCU and TCS elevation while IR/TV is selected.

G

ACM THRLD Knob

Controls radar sensitivity level at close range (Air Combat Mode). Usually set automatically with the knob in the detent position.

CCM (Countermeasures) Mode Buttons (Not Simulated)
Buttons used to set AWG-9 functionality countering jamming targets
SPL
ALT DIFF

VGS



WPN TYPE (Weapon Type) Selector Switch Selector wheel selecting type of weapon used for WCS A/G calculation.

Weapon DLVY (Delivery) Mode Switch

- **STP**: Step (Releases single bomb per bomb release button press)
- **RPL**: Ripple (Release multiple bombs per bomb release button press)

Weapon DLVY (Delivery) Mode Switch

- **SGL**: Step (Releases single bomb per bomb release button press)
- **PRS**: Pairs (Release a pair of bombs per bomb release button press)

Selective Jettison Switch Guard

Selective Jettison Switch

- JETT: Selective Jettison
- SAFE: Safety On
- AUX: Auxiliary (Backup) Mode

Mechanical Fuze Mode Selector Switch • Nose

- Safe
- Suje • Noco/T
- Nose/Tail

WPN TYPE (Weapon Type) Selected

ARMAMENT

MODE

A/G GUN

DLVY OPTNS-

MIXED

ECH FUZE

Weapon Delivery Option

Interval Selector Wheels &

Indicator (milliseconds)

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Armament ATTK (Attack) Mode Selector Selects Air-to-Ground Attack Mode

- **CMPTR TGT**: Computer target, a semi-automatic computer guided mode similar to a CCRP mode in newer aircraft
- CMPTR IP: Computer initial point, an extended CMPTR TGT mode using a known initial point (IP) as reference for store delivery.
- **CMPTR PLT**: Computer pilot, a manual computer and pilot guided mode using the WCS for store impact point indication on HUD. Similar to a CCIP mode in newer aircraft
- **MAN**: Manual backup mode in which the HUD displays a pipper (crosshair) on the HUD at the deflection set by the pilot. Used in case of a systems failure prehibiting the other modes.
- **D/L Bomb**: Data-link bomb, an automatic mode in which the pilot is steered via data-link cues for remotely controlled store delivery.

Electrical Fuze Mode Selector

Sets the electrical fuse of the store to be released:

- **SAFE** Inhibits electrical bomb fusing.
- **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.

A/G Gun Mode Switch

Gun mode in A/G master mode. MIXED enables gun in addition to selected A/G ordnance.

Weapon Delivery Option Quantity Selector Wheels & Indicator

PLT-

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ALIG

GN

- Station 2 External Fuel Tank Jettison Switch
- SEL: Selected
- SAFE: Safety On

Station 7 External Fuel Tank Jettison Switch

• SEL: Selected

• SAFE: Safety On

PD

Jettison Options Switch

- MER TER: Jettisons Multiple Ejector Racks / Triple Ejector Racks
 - WPNS: Jettisons weapons only

Weapon Station Safety Switches UP = Armed / DOWN = Disarmed (Safety On)

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A/A (Air-to-Air) Launch Button Button used for RIO launch of AIM-7 or AIM-54, hot trigger is indicated by button illumination

Missile Speed Gate Selector Switch

Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier

- WIDE: Not Simulated
- NARROW : Not Simulated
- NOSE : Not Simulated
- **NOSE QTR**: In DCS, this position is used for standard missile operation
- TAIL QTR : Not Simulated
- TAIL : Not Simulated

Missile Next Launch Button Button used by RIO to select a hooked target as the next target to launch at in TWS.

Missile Options Switch

- **SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode
- NORM: Normal
- **PH ACT**: AIM-54 Phoenix Active Launch Mode

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TID (Tactical Information Display) Display Selector Buttons <u>UPPER ROW:</u>

- RID DISABLE: Not simulated.
- **ALT NUM**: Altitude numerals, enables display of track altitudes on the left side of track symbols. Shows a single digit representing tenthousands of feet
- **SYM ELEM**: Symbology elements, enables display of all supplementary symbology of tracks and waypoints.
- DATA LINK: Enables display of data link tracks.
- JAM STROBE: Enables display of jam strobes on the TID.
- NON-ATTK: Non-attack, enables or disables display of targets which aren't possible to engage, friendly targets being an example.
 LOWER ROW:
- LAUNCH ZONE: Enables display of weapon launch zones depending on selected missile type. These replace the velocity vectors on relevant targets. This function is automatically enabled by the WCS 60 seconds prior to a target entering maximum launch range.
- **VEL VECTOR**: Velocity vector, enables display of velocity vectors on tracks.

TID (Tactical Information Display) Mode Selector

- **GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.
- **A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.
- **ATTAK**: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.
- **TV**: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.

TID Range Selector (nm) 25 / 50 / 100 / 200 /400

9

/N

WCS (Weapon Control System) Switch

- **STBY** turns on power to the WCS and begins radar warmup without transmission.
- **XMT** enables radar transmission if radar is ready. Display warmup time is 30 seconds, radar warmup is 3 minutes.
- OFF

HCU (Hand Control Unit) Main Radar & TCS (Television Camera Set) Control Stick

HCU Trigger

HCU OFFSET Button Used to offset TID to hooked location on the display

Radar Antenna Elevation Thumbwheel

HCU Power Reset Button

HCU Light Test Button

IR/TV Switch

Switch controlling TCS power. Enables selection of OFF/STBY and ON.

HCU (Hand Control Unit) Mode Selector Buttons

- *IR/TV Mode* Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.
- **RADAR Mode** Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.
- **DDD Mode** Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.
- **TID Mode** Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.

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MRL Button

Button selecting the ACM Manual Rapid Lockon (MRL) mode. Overrides all operational modes except PLM and VSL.

IR/TV Overtemperature Indicator Light *Light indicating the presence of an overtemperature condition in the TCS.*

> **PWR RESET Indicator Light** *Light indicating one or more inoperative secondary power supplies.*

> > WCS Indicator Light Indicates selection of STBY or XMT with the radar not yet timed out or selection of XMT with radar transmission remaining off.

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ICS Foot Button Left footrest containing ICS PTT (Intercom System Push-to-Talk) for COLD MIC intercommunication

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STAB

LIGHT

Microphone Foot Button Right footrest containing PTT (Push-to-Talk) for transmission on UHF 1, V/UHF 2 or both depending on ICS (Intercom System) setting.











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SCAN

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AN/ARC-182 V/UHF 2 Radio Control Panel

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Liquid Cooling Switch

Controls the liquid cooling system for the AWG-9 and AIM-54. The AWG-9 circuit can be enabled independently of the AIM-54. This switch need to be enabled for the respective system before AWG-9 operation or AIM-54 missile preparation.

TACAN Frequency Selectors

TACAN X/Y Frequency Selector

TACAN Mode Selector

- *OFF*
- REC: Receive Only
- T/R: Transmit/Receive
- A/A: Air-to-Air TACAN Mode
- BCN: Beacon TACAN Mode (not Functional)

TACAN BIT (Built-In Test) GO Light

TACAN BIT (Built-In Test) NO GO Light

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TACAN BIT (Built-In Test) Button

TACAN Mode Normal/Inverse Switch

TACAN Volume Control

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CAP (Computer Address Panel)

The CAP is used to enter data into the WCS. The MESSAGE indicator drum and buttons works similarly to the buttons on MFDs on newer aircraft.

CAP Keyboard CLEAR Button

CAP Message Selector Buttons

TNG (NBR) Button *Not Simulated.*

> **PRGM RESTRT Button** Button used to restart the program running in the WCS.

CAP Keyboard ENTER Button

CAP Numeric Keypad

CAP Message Indicator Drum *Changes with position of CATEGORY SELECTOR switch*

CAP Message Selector Buttons

CAP Category Selector Switch

- BIT: Built-In Test
- **SPL**: Special, contains message button functions for display and entry of the heading for the data files representing the four catapults on the aircraft carrier.
- **NAV**: Navigation, contains message button functions used for navigational fixes and updating data used by for INS operation and alignment
- **TAC DATA**: Tactical Data, contains message button functionality allowing for hook/selection of the different waypoints available in the WCS navigational system.
- **D/L**: Datalink, contains message button functionality for RIO data link responses to data link controller commands.
- **TGT DATA**: Target Data, contains message button functionality used to modify hooked track symbols. 107

TOMCAT






<u>RIO Cockpit</u>

Transmitter Select Switch Selects which VHF/UHF radio the RIO PTT keys. UHF 1 - Selects the ARC-159 UHF radio.

- BOTH Selects both radios.
- V/UHF 2 Selects the ARC-182 VHF/UHF radio.

KY-58 Radio Encryption Mode Select Knob

(Not simulated since the F-14B is equipped with the KY-28, not the KY-58.)

ICS (Intercommunication System) Volume Control

Amplifier Selector

- **B/U** Backup amplifier.
- NORM Normal amplifier.
- EMER Emergency amplifier

UHF 1 Radio Volume Control Knob

V/UHF 2 Radio Antenna Select Switch Upper/Lower

TACAN CMD Indicator

Indicates current crewmember in command of the TACAN.

- PLT: Pilot
- NFO: Naval Flight Officer (RIO)

TACAN CMD Switch Sets crewmember in command of the TACAN.

ICS (Intercommunication System) Switch

- **RADIO OVERRIDE** Makes ICS audio override radio audio.
- **HOT MIC** Allows talking to the Pilot without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.
- **COLD MIC** Allows talking to the Pilot only while the PTT is pressed.



Center Slew Hat Switch

Used to slew the sensor line of sight itself and depression of this hat switches between white hot (WHOT) and black hot (BHOT) sensor modes.

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IR Sensor FOV Toggle Button

Cycles between the three fields of view (zoom levels) of the IR sensor.

LANTIRN Targeting Pod Control Stick

LANTIRN Operation Mode Selector

- AFT: A/A (Air-to-Air) Mode
- FWD: A/G (Air-to-Ground) Mode
- DEPRESSED: LANTIRN Undesignate

Left Four-Way Hat Switch

Selection of QWp- and QWp+ (Cue-to-Waypoint) (left/right) in addition to Point Track (up) and Area Track (down) modes.

Two-Way Slider (Front)

This switch changes the function of the right four-way hat switch. Springloaded to return to center.

- Sliding it forwards allows for selection of manual gain while releasing and sliding it forwards again reselects automatic gain. Change of the manual gain with manual gain already selected can be done by sliding the switch forwards and holding it for 2 seconds. With this mode active up/down on the right hat increases and decreases the gain while left/right decreases and increases level.
- Sliding the switch aft momentarily allows selection of used laser code, while sliding it aft and holding allows for focus control. When set to laser code change, the right four-way hat selects digit to change with left/right and increases and decreases the selected digit with up/down. In focus control up/down increases and decreases focus.

Right Four-Way Hat Switch

Note: The left two-way slider changes the right hat function as detailed in the Two-Way Slider description.

- Allows for selection of **QADL/QHUD (up)**, **QDES (right)** and **QSNO (down)** in addition to declutter level which is cycled by momentary depression of the hat.
- **QADL** = Cue to Armament Datum Line , **QHUD** = Cue to Heads-Up Display, **QDES** = Cue to Designate, **QSNO** = Cue to Snowplow.

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LANTIRN Two-Stage Trigger

First detent manually lasing while the second detent fires the laser and designates QDES (Cue-to-Designate) at current sensor position.

Laser-Fire Button

Fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent. A renewed press on the laser latch button resets the latched laser fire timer to 60 seconds, beginning a new 60 second countdown.

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F-14B



LANTIRN Targeting Pod Power Switch

- **OFF** disables power to the system
- **IMU** (Inertial Measurement Unit) powering only the LANTIRN IMU
- **POD** powers the whole system •

Laser Armed Light

LANTIRN Laser Switch

ARM/SAFE

LANTIRN Mode Switch (OPER/STANDBY)

LANTIRN Failure Indicator Lights

LANTIRN IBIT (Initiated **Built-In Test) Button**

LANTIRN VIDEO Switch Controls what video is fed to the TID and VDI, FLIR selecting LANTIRN FLIR video and TCS selecting TCS video.

<u>RIO Cockpit</u>

KY-28 Radio Encryption Power-Mode Switch P/OFF (Power Off) / C (Cipher) / DELAY

KY-28 Radio Encryption Radio Select Switch

- **RELAY:** Not Functional
- RAD-1: Radio 1
- RAD-2: Radio 2

KY-28 Radio Encryption Zeroize Switch

AN/APN-154 Radar Beacon Selector Switch

- **SINGLE** Enables beacon response to single • pulse codes.
- **DOUBLE** Enables beacon response to set double pulse code.
- **ACLS** Enables augmenter operation for ACLS. • Required for CATCC radar lockon for ACLS.

ACLS (Automatic Carrier Landing System) Push-to-Test Switch

ACLS Radar Beacon Power Switch

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F-14B

G-Valve Button Pressed to test inflation of G-suit **Ventilation Airflow Thumbwheel** Used to control airflow through the pressure suit or seat cushions if no pressure suit is worn.

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RIO Oxygen Switch FWD: ON / AFT: OFF

CUIPMENT F-148 TOMCAT EQUIPMENT ø COCKPIT m PART

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Emergency Harness Release Handle

Ejection Seat Alternate Firing Handle





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Yaw String

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F-14B TOMCAT

Performs the same function as the slip-skid indicator ball, but is more sensitive, and does not require the pilot to look down at the instrument panel. Technically, it measures sideslip angle, not yaw angle, but this indicates how the aircraft must be yawed to return the sideslip angle to zero.

AN/AWG-9 Radar

V

M-61 Vulcan Gun

LT WARE WEWELLIN

LT SHANN SCHADE







Tail Position Light

Formation Lights

Exterior Lights Master Switch ON (pressed) / OFF (released)

Switch on throttle used to control exterior lights. OFF disable all exterior lights and increases approach light intensity. ON enables all exterior lights and dims approach lights.



Anti-Collision Light (Strobe)

Formation Lights

Formation Lights

Formation Lights





Wing Position (Navigation) Light (Red) Illuminates when wings are un-swept

Wing Position (Navigation) Light (Green) Illuminates when wings are un-swept









F-14B F-14B TOMCAT

Landing Gear Angle of Attack Indexer



Night Vision Goggles (NVG) Controls: • RSHIFT+H: On/Off

- RALT+RSHIFT+H: Gain Night Vision Goggles Down •
- RCTRL+RSHIFT+H: Gain Night Vision Goggles Up

OPTIONS						
SYSTEM	CONTROLS	GAMEPLAY		MISC.		A
F-14B Pilot - All 🔤			oldable view	able view Reset category to default		
						•
Night Vision Goggles			Night Vision Goggles		RShift + H	
Night Vision Goggles Gain Down			Night Vision Goggles		RAIt + RShift + H	
Night Vision Goggles Gain Up			Night Vision Goggles		RCtrl + RShift + H	

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JBD (Jet Blast Deflector)

Deflects engine jet blast in order to not damage any aircraft or injure carrier crew. They also act as heat shields since many carrier-launched aircraft takeoff with afterburners on.

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Arresting Wires

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These wires are used to help the aircraft brake when landing on the carrier. The aircraft hook catches one of these wires and brings the aircraft to a full stop. When landing, you have to aim for the third wire. The first wire landing is a short landing, while a fourth wire landing is a long one.

F-14B TOMCAT











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F-14B TOMCAT

Yellow Shirts

These include the **Plane Directors** who will guide you around the deck and into position for launch. All taxi guidance comes from these personnel. Other yellow shirts include Flight Deck Officers, Arresting Gear Officers, Catapult Officers (Shooters), Catapult Spotters and Aircraft Handling Officers.

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Green Shirts

You will encounter these personnel during launch as Catapult and Arresting Gear crews position the holdback bar and ensure proper attachment to the catapult shuttle. Maintenance personnel of various specialties may also be on hand to troubleshoot last minute problems with the aircraft.

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Other green shirts include Helicopter Landing Signal Enlisted (LSE), Cargo-handling personnel, Ground support equipment troubleshooters, Hook runners and Photographers mates.







White Shirts

USS Enterprise

You will encounter these personnel during launch as **Final Checkers** give your aircraft a last-minute look for problems. The Landing Signal Officers (LSO) are also white shirts.

Other white shirts include Safety personnel, Medical personnel, Quality Assurance personnel and Air Transfer Officers (ATO).



Red Shirts

These are the **Aviation Ordnancemen** who build, test, transport, and load **weapons** on the aircraft. They also test and maintain the aircraft gun systems, as well as avionics and release equipment used to employ weapons in the air.

Crash and salvage crews and Explosive Ordnance Disposal (EOD) personnel are also red shirts.



These include Plane Captains and Line Petty Officers. **Aircraft general maintenance and servicing** is performed by these personnel. They are responsible for the safe operation of the aircraft in flight and are often referred to as 'owning' the aircraft.

Blue Shirts

These personnel **position aircraft** on the deck when they are not being taxied by the pilot. They include Aircraft handlers (pushers, chockers, chainers, etc.), Tractor Drivers, Messengers and Phone Talkers and Elevator Operators.

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Purple Shirts

These are the **Fueling** personnel who are responsible for safely refueling aircraft and equipment on deck. This is an important job due to the extreme risk fire poses to a crowded flight deck.




SUMMARY

The start-up procedure will be separated in the following sections:

- 1. PILOT PRE-START
- 2. PILOT ENGINE START
- 3. PILOT POST-START
- 4. RIO INS (INERTIAL NAVIGATION SYSTEM) ALIGNMENT (SHORE)
- 5. RIO INS (INERTIAL NAVIGATION SYSTEM) ALIGNMENT (CARRIER)
- 6. RIO POST-ALIGNMENT PROCEDURE

Note: Steps preceded by [J] are done with the JESTER AI, which means that a human RIO can perform them too.

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1 – PILOT PRE-START

1. Ensure Parking Brake Lever is ENGAGED (Pulled AFT)

Note: The Tomcat does not have a battery switch nor an APU (Auxiliary Power Unit) - its electrical systems run strictly on either engine generator power or an external power source. GE F110 engines have pneumatic starters and require an external air pressure source, which can be provided by contacting the Ground Crew.

- 2. Call ground crew to connect Ground Electric Power
 - Press "\" (Communication Menu) and "F8" a) to select ground crew
 - Select "Ground Electric Power" by pressing b) "F2"
 - Select "ON" by pressing "F1" to turn on c) ground power
- 3. Connect compressed air supply unit:
 - a) Press "\" to open radio menu and "F8" to select ground crew
 - b) Press "F5" to select Ground air supply
 - Press "F1" to connect air supply unit c)





1 – PILOT PRE-START

- 4. Once ground power is connected, the RIO can proceed with his own start-up procedure.
- 5. Set ICS (Intercom Set) switch to HOT MIC
- [J] Use the JESTER Contextual Menu by pressing "A" and selecting 6. "STARTUP" (LCTRL+3) to request start-up.
- 7. [J] After a few seconds, your RIO will request a Comm Check to test the ICS (Intercom Set).
- 8. [J] Use the JESTER Contextual Menu again by pressing "A" and confirm that you heard him by selecting "LOUD AND CLEAR" (LCTRL+4).
- 9. Arm the pilot ejection seat by clicking the Ejection Seat Arming Handle (DOWN) or pressing "LSHIFT+E".





1 – PILOT PRE-START

F-14B TOMCAT

- 10. [J] Jester will automatically close the canopy for you once your ejection seat is armed properly. He will then resume running through his start-up checklist. If flying with a human RIO, the RIO can close the canopy with "LCTRL+C".
- 11. Set Oxygen Switch ON (FWD)
- 12. Set Emergency Wing Sweep Handle OVERSWEEP (AFT)









F-14B TOMCAT

2 – PILOT ENGINE START

- 13. Verify that Ground Power and Air Pressure Cart are connected 14. Set AIR SOURCE OFF
- 15. Set HYD TRANSFER Pump SHUTOFF
- 16. Set Emergency Flight Hydraulics Switch AUTO (LOW)
- 17. Verify that L MASTER GEN and R MASTER GEN switches are set to NORM (FWD)







14

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- 18. Start right engine first by setting Engine Crank switch R (RIGHT) using right-click.
- 19. Right Engine cranking will initiate and the START VALVE caution will appear. Engine N2 (High-Pressure Compressor Speed) will rise to approx. 20 % RPM.
- 20. When Right Engine N2 reaches 20 % RPM , click on the Right Throttle to move it from the OFF detent to the IDLE detent to open the fuel valves and introduce fuel. Igniters will kick in and trigger an engine lightoff. EGT should rise within 5 to 15 sec.
- 21. Verify that oil pressure rises and that EGT (Exhaust Gas Temperature) does not exceed 890 deg C until engine stabilizes.
- 22. Around 50 % RPM N2, Engine Cranking switch will spring back to the OFF position, starter will disengage and START VALVE caution will disappear

EGT (Exhaust Gas Temperature) (x100 deg C)







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MASTER GEN

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PROCEDURE

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START

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- 23. Wait for Right Engine RPM to stabilize around 70 % RPM N2. Confirm that right generator is running by checking that the R GEN caution is extinguished. Engine should be stabilized at the following parameters:
 - RPM between 62 and 78 %
 - EGT around 500 deg C
 - Fuel Flow between 950 and 1400 lbs/hour (pph)
 - NOZ (Nozzle) position fully open at 100 % (5)
 - Oil Pressure between 25 and 35 PSI (15 psi minimum)
 - Flight Hydraulic Pressure 3000 psi





PROCEDURE **START** 4 ART Δ

TOMCAT

- 24. Start left engine first by setting Engine Crank switch L (LEFT) using left-click.
- 25. Left Engine cranking will initiate and the START VALVE caution will appear. Engine N2 (High-Pressure Compressor Speed) will rise to approx. 20 % RPM.
- 26. When Left Engine N2 reaches 20 % RPM , click on the Left Throttle to move it from the OFF detent to the IDLE detent to open the fuel valves and introduce fuel. Igniters will kick in and trigger an engine lightoff. EGT should rise within 5 to 15 sec.
- 27. Verify that oil pressure rises and that EGT (Exhaust Gas Temperature) does not exceed 890 deg C until engine stabilizes.
- 28. Around 50 % RPM N2, Engine Cranking switch will spring back to the OFF position, starter will disengage and START VALVE caution will disappear

EGT (Exhaust Gas Temperature)





8PM % X 10

FF PPH X1000

26c

EGT





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F-14B

PROCEDURE

START

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- 29. Wait for Left Engine RPM to stabilize around 70 % RPM N2. Confirm that left generator is running by checking that the L GEN caution is extinguished. Engine should be stabilized at the following parameters:
 - RPM between 62 and 78 %
 - EGT around 500 deg C
 - Fuel Flow between 950 and 1400 lbs/hour (pph)
 - NOZ (Nozzle) position fully open at 100 % (5)
 - Oil Pressure between 25 and 35 PSI (15 psi minimum)
 - Flight Hydraulic Pressure 3000 psi



100 F1 00 OFF 300 800 FF (Fuel Flow) (x1000 lbs/hour) EGT (Exhaust Temperature) (x100 deg C) Engine RPM (%) **Nozzle Position** EG **Oil Pressure (psi)** * HYD PRESS FLT COMB OFF OFF A 2 Flight Hydraulic Pressure (x1000 psi) A FE FERRE I 155

TOMCAT F-14B

PROCEDURE

START

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ART

2 – PILOT ENGINE START

- 30. Set HYD TRANSFER PUMP NORM
- 31. Confirm that both the COMBINED HYDRAULIC PRESSURE and FLIGHT HYDRAULIC PRESSURE indications are equal to 3000 psi each.
- 32. Confirm that no HYD PRESS caution is visible
- 33. Set Air Source BOTH ENG
- 34. Call ground crew to disconnect Ground Electric Power
 - Press "\" (Communication Menu) and "F8" to select ground a) crew
 - Select "Ground Electric Power" by pressing "F2" b)
 - Select "OFF" by pressing "F2" to turn off ground power c)
- 35. Disconnect compressed air supply unit:
 - a) Press "\" to open radio menu and "F8" to select ground crew
 - b) Press "F5" to select Ground air supply
 - Press "F2" to disconnect air supply unit c)









32

33



- 36. [J] Now that our engines are started, the RIO will automatically start flicking more switches to **start the INS** (Inertial Navigation System) alignment process.
- 37. Switch your VDI (Vertical Display Indicator), HUD (Heads Up Display) and HSD (Horizontal Situation Display) Power switches ON.
- 38. Set the HSD Mode switch to "TID". This will make the HSD screen act as a repeater for the RIO's Tactical Information Display (TID) and allow you to monitor the progress of the INS alignment.





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PROCEDURE

START-UP

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F-14B

39. [J] Use the Jester Contextual Menu by pressing "A" and select your INS alignment precision (press either "LCTRL+4", "LCTRL+5", "LCTRL+6", or "LCTRL+7"). We will use FINE.

- INS GO NOW: Shortest but least precise INS alignment
- INS GO COARSE: Coarse alignment does not meet Alert Launch Criteria to use AIM-7 or AIM-54
- INS GO MIN WPN LAUNCH (Alert Launch Criteria): Alignment meets Alert Launch Criteria to use AIM-7 or AIM-54
- INS GO FINE: Fine alignment, longest but most precise INS alignment
- 40. [J] If you choose the FINE precision, the INS alignment takes about 8 minutes.



INS (Inertial Navigation System) Alignment Progress Caret



Coarse Alignment Complete Marker

HDG

BRT

Alert Launch Criteria

(Alignment meets the minimum criteria to launch AIM-7 and AIM-54 missiles non-boresight modes)

Fine Alignment Complete Marker

LN 27°04'0 LE 0°00'0



CRS

TEST



41. [J] While INS is aligning, JESTER will also automatically enter all Waypoint and Target Point coordinates of your flight plan. A player-controlled RIO will have to enter all this data manually.

Once INS alignment is complete, the INS Alignment progress bar will disappear and JESTER will call out "Ready to Taxi"







- 42. Set GUN RATE switch As required (LOW/HIGH)
- 43. Set SW COOL switch OFF
- 44. Set MSL PREP switch OFF
- 45. Set Missile MODE/STP switch NORM
- 46. Set ANTI-SKID SPOILER BK switch OFF before taxiing.

Note: When the ANTI SKID SPOILER BK switch is in BOTH during low-speed taxi (less than 10 knots for more than a few seconds), subsequent acceleration of the aircraft through approximately 15 knots will cause a temporary loss of brakes lasting from 2 to 10 seconds.



- 47. Verify that the Emergency Wing Sweep Handle all the way AFT. This will ensure the Wing Sweep Angle remains set to FULLY SWEPT BACK (or in OVERSWEEP).
- 48. Ensure the Wing Sweep Angle is at 68 deg (swept back). This is very important since the carrier deck is typically very crowded and you will want to avoid bumping your wings into someone.

Wing Sweep Mode (EMERGENCY/OVERSWEEP)

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Wing Sweep Angle (deg)

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48

F-14B TOMCAT

161



- 49. Turn AFCS (Automatic Flight Control System) SAS (Stability Augmentation System) PITCH, ROLL & YAW switches ON
- 50. Set WING/EXT TRANS switch AUTO
- 51. Set UHF 1 Radio Function Selector to BOTH
- 52. Set TACAN function selector to T/R (Transmit Receive)
- 53. Set ARA-63 ICLS (Instrument Carrier Landing System) Receiver Power switch ON
- 54. Set Radar Altitude by turning the control knob one click clockwise. The RADALT will display 6000 ft for about 2 to 3 minutes while it is warming up, then revert back to 0 ft once the BIT (Built-In Test) is complete.
- 55. At least 2 minutes before takeoff, erect the standby attitude gyro (ADI) by clicking on the control knob and turning it until the indicator matches the current attitude.



SAS (Stability Augmentation System) Switches – ON

UHF 1 Radio Function

Selector - BOTH

51

Selector – T/R

52

TACAN Radio Function



WING/EXT TRANS Switch - AUTO



Standby ADI (Attitude Director Indicator) Knob





Turn Radar Altimeter knob clockwise to start BIT (Built-In Test)



Radar Altimeter Test Complete





- 56. Open up your kneeboard using "RSHIFT+K". This will bring you to the GROUND SETTINGS page.
- 57. Press "RSHIFT+RALT+ Numpad+" or "RSHIFT+RALT+ Numpad-" to request the ground crew to change the KY-28 encryption key if mentioned in the mission briefing. Most missions stick to Key #1.
- 58. Cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
- 59. [J] Set Datalink Mode to the Tactical Datalink System. Use the JESTER Contextual Menu by pressing "A" twice and selecting "DATA LINK RADIO" (LCTRL+7). Then, select "SET MODE" (LCTRL+1) and select "TACTICAL DATALINK SYSTEM" (LCTRL+1).
- 60. [J] Set Datalink Frequency to the desired network. Use the JESTER Contextual Menu by pressing "A" twice and selecting "DATA LINK RADIO" (LCTRL+7). Then, select "SET HOST" (LCTRL+1) and select desired datalink host (AWACS, CVN74 Stennis Carrier, etc.).
- 61. Close your kneeboard using "RSHIFT+K".
- 62. Set lights as required, then start taxiing when ready.





GROUND SETTINGS	s
M-61 BURST : BURST 200 RSHIFT-RALT-4	
LAT LONG : N 42°07'4 E 41°20'6 ELEV MSL : 68FT MAG VAR : +4.9° CARRIER : TH -44° 11 KTS	
	V



PROCEDURE ART 5 4 ART 0



TOMCAT

F-14B

4 – RIO INS ALIGNMENT (SHORE)

- 1. Set ICS (Intercom Set) switch to HOT MIC
- 2. Before starting INS (Inertial Navigation System) alignment, make sure ground power is connected.
- 3. Communicate with the pilot to know when engines are started and engine bleed air is available. Why? The INS (Inertial Navigation System) alignment requires the WCS (Weapon Control System). The WCS requires cooling air from the ECS (Environment Control System), which in turn means:
 - a) Both engines need to be running (started by the pilot)
 - b) The AIR SOURCE selector needs to be set to BOTH ENG in the pilot's cockpit.
 - c) The LIQUID COOLING switch needs to be set to FWD in the RIO's cockpit
- 4. Set WCS (Weapon Control System) Switch STANDBY (MIDDLE)
- 5. Wait approx. 40 seconds for the TID (Tactical Awareness Display) and DDD (Detail Data Display) to power on.











4 – RIO INS ALIGNMENT (SHORE)

- 6. Set Navigation Mode Selector to GND ALIGN to start INS alignment from the ground
- 7. Open up your kneeboard using "RSHIFT+K". This will bring you to the GROUND SETTINGS page. This will display your coordinates, elevation and magnetic variation.
- 8. Set CAP (Computer Address Panel) CATEGORY selector to NAV and verify that OWN AC (Own Aircraft) Message Button is selected.
- 9. From the GROUND SETTINGS page, our coordinates are:
- **25°01'4 North 55°22'6 East** in deg, min, tenth of a min 10. On the CAP keyboard, press the CLEAR button.

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F-14B

- 11. On the CAP keyboard, press the « 1 » (LAT for Latitude) button.
- 12. On the CAP keyboard, press « N+E » to select North coordinates, then type « 25014 »
- 13. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.
- 14. On the CAP keyboard, press the « 6 » (LONG for Longitude) button.
- 15. On the CAP keyboard, press « N+E » to select East coordinates, then type « 55226 »
- 16. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.





15a

13b

15b

4 – RIO INS ALIGNMENT (SHORE)

- 17. From the kneeboard GROUND SETTINGS page, our current altitude is 197 ft and our magnetic variation is +1.7 deg.
- 18. On the CAP keyboard, press the « 4 » (ALT for Altitude) button.
- 19. On the CAP keyboard, press « N+E » to select a positive altitude, then type « 197 »
- 20. Look at the top of the TID and confirm that the altitude is correct, then press "ENTER" to enter altitude.
- 21. Press the CAP Message Selector Button next to « MAG VAR HDG » (Magnetic Variation / Heading) button.
- 22. On the CAP keyboard, press the « 8 » (HDG for Heading) button
- 23. On the CAP keyboard, press « N+E » to select a positive magnetic variation, then type « 17 » for +1.7 deg.
- 24. Look at the top of the TID and confirm that the magnetic variation heading is correct, then press "ENTER" to enter heading.



24b



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20c

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23a 22 20b 19b 23b 21



4 – RIO INS ALIGNMENT (SHORE)

25. Monitor the alignment progress

CONTRAST

-00%

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NAV MODE

CAT

27

CVA

AM

26. INS alignment takes about 8 minutes to reach the FULL FINE marker. Fine alignment is complete when the INS Progress Caret turns into a diamond with a dot in the center.

BRIGHT

465

IN

LE 55°22'6

DEST

27. When alignment is complete, set Navigation Mode Selector to INS NAV MODE.

LN 25°01'4

INS (Inertial Navigation System) Alignment Progress Caret

NAV MODE



Coarse Alignment Complete Marker

Alert Launch Criteria (Alignment meets the minimum criteria to launch

AIM-7 and AIM-54 missiles non-boresight modes)

Fine Alignment Complete Marker

23



25

BRIGHT

TH O

STEERING

AAN

DEST

PROCEDURE ART 5 4 ART 0



F-14B

4 – RIO INS ALIGNMENT (SHORE)

Note:

The alignment will be much guicker if you have an Automatic Stored Heading (ASH), which is an option set through the Mission Editor. You will recognize the presence of a stored heading with the "ASH" indication on the TID or a green arrow next to the CAP Message Button "STORED HDG ALIGN". You do not need to set up anything more than the usual alignment procedure to use the Stored Heading.

Keep in mind that since ASH alignment is faster, I suggest that you enter the aircraft coordinates BEFORE starting the GND ALIGN process since you could run into issues if the alignment finishes before you are done entering the coordinates.



AIRPLANE GR	OUP					
NAME	New Airplan	e Gro	up			
CONDITION						> 100
COUNTRY	USA					
TASK	Intercept					
UNIT	$\langle \rangle 1$		DF <> 1			
ТҮРЕ	F-14B					
SKILL	Player					
PILOT	Pilot #001					
TAIL #	010	~	СОММ	124		
CALLSIGN	Enfield		1	1		
HIDDEN O	N MAP					
HIDDEN O	N PLANNER					
LATE ACTIN	ATION					
A 17 9	но г		0	⊒ിക		
σο μ d	no 4					
M-61 Burst Mode			Burst 200)		
AN/ALE-39 Loadout		60 Flares / 0 Chaff ×				
Fill I AU-138 With Chaff			✓			
INS Reference A	lianment Sto	red	- 	_		
TACAN Channel	Presel (0 = A	uto)	< > 0			
TACAN Band			X ~			
ILS Channel Pres	sel		<> 1			
KY-28 Encryptior	n Key		< > 1			
Laser Code 1st [Digit		<>1			
Laser Code 2nd	Digit		< > 6			
Laser Code 3rd [Digit		< > 8			
Laser Code 4th [Digit		< > 8			





TOMCAT

F-14B

5 – RIO INS ALIGNMENT (CARRIER)

- 1. Set ICS (Intercom Set) switch to HOT MIC
- 2. Before starting INS (Inertial Navigation System) alignment, make sure ground power is connected.
- 3. Communicate with the pilot to know when engines are started and engine bleed air is available. Why? The INS (Inertial Navigation System) alignment requires the WCS (Weapon Control System). The WCS requires cooling air from the ECS (Environment Control System), which in turn means:
 - a) Both engines need to be running (started by the pilot)
 - b) The AIR SOURCE selector needs to be set to BOTH ENG in the pilot's cockpit.
 - c) The LIQUID COOLING switch needs to be set to FWD in the RIO's cockpit
- 4. Set WCS (Weapon Control System) Switch STANDBY (MIDDLE)
- 5. Wait approx. 40 seconds for the TID (Tactical Awareness Display) and DDD (Detail Data Display) to power on.













5 – RIO INS ALIGNMENT (CARRIER)

- 6. Open up your kneeboard using "RSHIFT+K".
- 7. Cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
- 8. Set Datalink Power Switch ON (FWD)
- 9. Set Datalink Frequency to the desired network (in our case the CVN74 John C. Stennis Carrier). Our desired frequency is listed on the kneeboard TACTICAL DATALINK SYSTEMS as 320.90 MHz. Rotate the Datalink Frequency Select wheels to 20.9 as shown (the 3 is preset and cannot be modified).
- 10. Close your kneeboard using "RSHIFT+K".
- 11. Set Datalink Mode switch to CAINS/WAYPT (FWD). This allows communication between the aircraft and the Carrier Aircraft Inertial Navigation System (CAINS).
- 12. Set Navigation Mode Selector to CVA (Carrier INS Alignment) to start INS alignment from the carrier







INS (Inertial Navigation System) 5 – RIO INS ALIGNMENT (CARRIER) Alignment Progress Caret TOMCAT 13. Monitor the alignment progress. There is no need to input aircraft position coordinates since the aircraft's INS system takes information directly through the aircraft carrier's own INS system. F-14B 14. CVA INS alignment takes about 9 minutes to reach the FULL FINE marker. Fine alignment is NAV MODE complete when the INS Progress Caret turns into a diamond with a dot in the center. CAT INS 15. When alignment is complete, set Navigation Mode Selector to INS NAV MODE.

BRIGHT

CONTRAST

INS alignment has been running 20 = 2.0 min = 120 sec **Coarse Alignment Complete Marker Alert Launch Criteria** (Alignment meets the minimum criteria to launch AIM-7 and AIM-54 missiles non-boresight modes)

Number of Minutes (in tenths)

Fine Alignment Complete Marker

CONTRAST

AHRSAM



CONTRAST BRIGHT -NAV MODE LN 0°00'0 LE 0°00'0 90 **Fine Alignment Complete!** 14 171

BRIGHT

13

LE 0°00'0

LN 0°00'0

STEERING

DEST

1. Set RIO Oxygen Switch – ON

TOMCAT

PROCEDURE

START

4

ART

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F-14B

- 2. Arm the RIO ejection seat by clicking the Ejection Seat Arming Handle (DOWN) or pressing "LSHIFT+E".
- 3. Close the canopy with "LCTRL+C"
- 4. Set V/UHF radio Function Selector to T/R +G (Transmit Receive + Guard)
- 5. Set TACAN function selector to T/R (Transmit Receive)
- 6. Set Liquid Cooling Switch ON (FWD). This will start the AWG-9 radar cooling process.
- 7. At least 2 minutes before takeoff, erect the standby attitude gyro (ADI) by clicking on the control knob and turning it until the indicator matches the current attitude.
- 8. Set IR/TV Power switch STANDBY
- 9. Set AN/ALR-67 RWR Power switch ON. RWR will only activate once aircraft is in the air.
- 10. Set AN/ALQ-126 DECM Jammer Mode Selector Switch - STANDBY













Standby ADI (Attitude Director Indicator) Uncaged





Note:

The alignment will be much quicker if you have an Automatic Stored Heading (ASH), which is an option set through the Mission Editor. You will recognize the presence of a stored heading with the "ASH" indication on the TID or a green arrow next to the CAP Message Button "STORED HDG ALIGN". You do not need to set up anything more than the usual alignment procedure to use the Stored Heading.



AIRPLANE GROUP										
NAME	New Airplane Group									
CONDITION						> 100				
COUNTRY	USA									
TASK	Intercept									
UNIT	<>1 OF <>1									
ТҮРЕ	F-14B									
SKILL	Player									
PILOT	Pilot #001									
TAIL #	010	~	СОММ	124						
CALLSIGN	Enfield		1	1						
HIDDEN O	N MAP									
HIDDEN O	N PLANNER									
LATE ACTIV	ATION									
A 17 9	е х	-	0	副ふ						
00 H 0	~ ∼		v							
M-61 Burst Mode			Burst 20	0						
			60 Elaros / 0 Chaff							
AN/ALE-39 LOBOOUL										
Fill LAU-138 With Chaff										
TACAN Channel										
TACAN Channel Presel (0 = Auto)										
TACAN Band			X V							
ILS Channel Presel		\leftrightarrow 1								
KY-28 Encryption Key			\leftrightarrow 1							
Laser Code 1st Digit			$\leftrightarrow 1$							
Laser Code 2nd Digit			<> 6							
Laser Code 3rd I	Digit		< > 8							
Laser Code 4th I	Digit		<> 8							



- 11. Open up your kneeboard using "RSHIFT+K".
- 12. Cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
- 13. Set Datalink Power Switch ON (FWD)
- 14. Set Datalink Mode Switch TAC (AFT)
- 15. Set Datalink Frequency to the desired network. Our desired frequency for the E2C AWACS is listed on the kneeboard TACTICAL DATALINK SYSTEMS as 309.20 MHz. Rotate the Datalink Frequency Select wheels to 09.2 as shown (the 3 is preset and cannot be modified). Not a mandatory step, but recommended.
- 16. Close your kneeboard using "RSHIFT+K".
- 17. Set IFF Mode 4 Power Switch ON (FWD)
- 18. Set AN/ALE-39 PWR/Mode Switch to either AUTO(CHAFF)/MAN or MAN, as required.
- 19. Set Flare Mode Switch to PILOT (allows pilot to deploy flares with DLC button).
- 20. Once the three-minute warm-up period for the radar is done and aircraft is in the air, set WCS (Weapon Control System) Switch – WCS XMT (Transmit)
- 21. Set IR/TV (TCS Power) Switch to STBY, wait for a 2-minute warm-up period. Then, when aircraft is in the air, set to ON.
- 22. You should now be ready to taxi.







19



12

STENNIS (NTDS) 316.60 MHZ CV-74 E-2C (ATDS) 309.20 MHZ PILOT #011



Note: Keep in mind that while your INS system is aligned and functional, you will still need to add the coordinates of every waypoint. Adding waypoints will be done in the NAVIGATION section.





SHORE TAKEOFF

- 1. Set ANTI-SKID SPOILER BK switch OFF before taxiing. Note: When the ANTI SKID SPOILER BK switch is in BOTH during low-speed taxi (less than 10 knots for more than a few seconds), subsequent acceleration of the aircraft through approximately 15 knots will cause a temporary loss of brakes lasting from 2 to 10 seconds.
- 2. Set HOOK BYPASS switch to FIELD if operating on an airfield
- 3. Check that Nose Strut is RETRACTED (OFF)
- 4. Set HUD Display Mode to TO (Takeoff)
- 5. Release Parking Brake Lever (Pushed IN)
- 6. Throttle up and start taxiing

F-14B TOMCAT

TAKEOFF





SHORE TAKEOFF

F-14B TOMCAT

TAKEOFF

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PART

- 7. Aircraft is steered using the nosewheel steering (NWS), controlled with rudder pedals.
 - The NWS Mode allows +/- 70 deg steering, which is useful on aircraft carriers or small spaces. You can activate it by pressing the «Nosewheel Steering button» (key binding: « N ») button on your HOTAS.
 - When engaged, the NWS ENGA indication will illuminate.
 - Disengagement of this system occurs automatically with weight off wheels (take-off), electrical supply failure or lowering of the launch bar. It's also possible to deactivate the system by depression of the nosewheel steering button.







SHORE TAKEOFF

- 8. Once lined up on the runway, set the Emergency Wing Sweep Handle all the way forward to 20 degrees (scroll mousewheel or left click & drag), then push the lever down with a right click and flip the handle cover over it.
- 9. Press the MASTER RESET button (very important or the Wing Sweep AUTO mode will not work properly).









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- 10. Use the Wing Sweep AFT & FWD (Manual) buttons on your Wing Sweep Thumb switch (throttle) to exercise the wings through their whole range of motion. Don't forget to press the Master Reset switch before using the Wing Sweep Thumb switch.
- 11. Set the Wing Sweep Thumb Switch UP to AUTO mode. The Wing Sweep Angle indicator should show that the wings automatically set themselves to 20 deg.






SHORE TAKEOFF

- 12. Once lined up on the runway, set ANTI-SKID SPOILER BK switch BOTH (UP)
- 13. Set Flaps Up
- 14. Set Takeoff Elevator Trim to 0 deg using the Trim Hat switch
- 15. Disengage Nosewheel Steering. NWS ENGA caution should extinguish.

14a



Nosewheel Steering / Autopilot Reference Switch









SHORE TAKEOFF

- 16. Throttle up to MIL Power (90 % RPM N2).
 - **Note**: Full afterburner takeoff is prohibited with the GE F110 engines of the F-14B. This limitation is based on controllability concerns in the event of an engine failure during takeoff.
- 17. When reaching approx. 130 kts, slowly hold stick back. Rotation should occur at approx. 140 kts.
- 18. Set Landing Gear lever UP (before reaching 250 kts)
- 19. You may engage afterburners as required once you have your wheels off the ground.









PART 5 – TAKEOFF TOMCAT

1. Make sure the INS alignment was done with the INS Selector switch to CVA. With CVA mode and the Datalink Mode set to CAINS (Carrier Inertial Navigation System), the alignment will take its positional data directly from the carrier. Once alignment is finished, remember to verify that the INS Selector switch is set back to INS NAV.





- 2. Set ANTI-SKID SPOILER BK switch OFF before taxiing.
- 3. Set HOOK BYPASS switch to CARRIER if operating on a carrier
- 4. Check that Nose Strut is RETRACTED (OFF)
- 5. Set HUD Display Mode to TO (Takeoff)
- Release Parking Brake Lever (Pushed IN) 6.
- 7. Throttle up and start taxiing

Note: In a carrier environment, it is highly recommended to taxi with your wings fully swept back (in OVERSWEEP) to facilitate movement on the deck and minimize any risk of collision with obstacles or other aircraft.





F-14B TOMCAT

TAKEOFF

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PART

CARRIER TAKEOFF

- 8. Aircraft is steered using the nosewheel steering (NWS), controlled with rudder pedals.
 - The NWS Mode allows +/- 70 deg steering, which is useful on aircraft carriers or small spaces. You can activate it by pressing the «Nosewheel Steering button» (key binding: « N ») button on your HOTAS.
 - When engaged, the NWS ENGA indication will illuminate.
 - Disengagement of this system occurs automatically with weight off wheels (take-off), electrical supply failure or lowering of the launch bar. It's also possible to deactivate the system by depression of the nosewheel steering button.





Nosewheel Steering / Autopilot Reference Switch





- 9. Verify the way is clear to the catapult first. You wouldn't want someone to accidentally land on you while you line up on Catapult 3, eh?
- 10. Taxi to approach the catapult from directly behind it. If an aircraft is occupying the catapult, wait behind the JBD (Jet Blast Deflector).
- 11. If the Taxi Director (yellow shirt) is not present on the catapult, you can use the "Ground Crew" menu to request a launch.
 - a) Press "\" (Communication Menu) and "F8" to select ground crew
 - b) Select "Request Launch" by pressing "F8"

ICS	
Mai	n
F1.	Flight
F2.	Wingman 2 🥙
F3.	Wingman 3
F5.	ATC
F8.	Ground Crew <
F12.	Exit

TOMCAT

AKEOFF

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F-14B

- ICS 2. Main. Ground Crew
- F1. Rearm & Refuel
- F2. Ground Electric Power...
- F3. Request Repair
- F4. Wheel chocks
- F5. Ground Air Supply...
- F6. Select AN/ALE-39 Loadout...
- F7. KY-28 Encryption...
- F8. Request Launch ←
- F9. Salute!
- F11. Previous Menu
- F12. Exit

JBD (Jet Blast Deflector)

Deflects engine jet blast in order to not damage any aircraft or injure carrier crew. They also act as heat shields since many carrier-launched aircraft takeoff with afterburners on.





- 12. When ready, advance on the retracted JBD (Jet Blast Deflector) and follow the Taxi Director's hand signals to align the aircraft on the catapult track.
- 13. When the Taxi Director closes his fists, gently stop the aircraft with the wheel brakes.





Turn Left

Taxi Forward

Turn Right





- 14. When the Taxi Director extends his arms, he directs you to unsweep your wings.
- 15. Set the Emergency Wing Sweep Handle all the way forward to 20 degrees (scroll mousewheel or left click & drag), then push the lever down with a right click and flip the handle cover over it.
- 16. Press the MASTER RESET button (very important or the Wing Sweep AUTO mode will not work properly).



15c

Emergency Wing Sweep Handle







TOMCAT

F-14B

- 17. Use the Wing Sweep AFT & FWD (Manual) buttons on your Wing Sweep Thumb switch (throttle) to exercise the wings through their whole range of motion. Don't forget to press the Master Reset switch before using the Wing Sweep Thumb switch.
- 18. Set the Wing Sweep Thumb Switch UP to AUTO mode. The Wing Sweep Angle indicator should show that the wings automatically set themselves to 20 deg.
- 19. Deploy Flaps (Flaps Lever Fully AFT)

TOMCAT

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F-14B

20. While all of this is going on, the flight crew raises the jet blast deflector (JBD) behind the aircraft.





19a





Extend Launch Bar

21. When the Taxi Director unfolds his arm, he directs you to extend your launch bar ("kneel" the aircraft).

SPD BRK

EMERG DOWR

TURE

PUL

23

LILL GEAR

M A VIZCARRA

CDR

SCAR

RUT

COR R J KELLEY

22

20

In:

- 22. Set Nose Strut switch to KNEEL to deploy the launch bar and lower the aircraft nose. Once launch bar is deployed, Nosewheel Steering will automatically disconnect.
- 23. The Catapult crew (Green Shirt) will install the holdback bar, which is used to maintain the aircraft in place until the steam catapult is fired.



21b – Extend Launch Bar

PART 5 – TAKEOFF

F-14B TOMCAT

- 24. When the Taxi Director moves his arms back and forth, he directs you to throttle up and move forward to hook the launch bar into the catapult shuttle. Significant power may be required.
 - Note: If you do not own the Supercarrier, press "U" ("Catapult Hook Up" binding) to hook Launch Bar into the Catapult Shuttle.
- 25. The catapult crew (green shirt) will monitor the catapult shuttle and tell the Taxi Director when you are hooked up.
- 26. When the launch bar drops over the shuttle, the aircraft will be stopped as the holdback engages the catapult buffer. Reduce power to idle.



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24







Stop





TOMCAT

F-14B

- 27. The Catapult crew will verify that the aircraft launch bar is hooked into the catapult shuttle and that the holdback bar is installed properly.
- 28. When checks are complete, the crew located in the ICCS (Integrated Catapult Control Station), also called the "Bubble", will apply tension to the catapult. You will see steam emanating from the catapult rail.
- 29. The Final Checkers (White Shirts) will inspect your aircraft for any last-minute problems.



TAKEOFF

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- 30. Set Takeoff Elevator Trim to 2 to 3 deg Nose Up using the Trim Hat switch. There is a Catapult Launch Trim Requirements chart in the F-14 NATOPS, but since we don't have the longitudinal CG location... this chart is more or less useless for the purposes of DCS.
- 31. Verify Speed Brakes are retracted (IN).
- 32. When the Shooter gives you the « Engine Run Up » hand signal, throttle up to MIL Power (90 % RPM N2).

Note: Full afterburner takeoff is prohibited with the GE F110 engines of the F-14B. This limitation is based on controllability concerns in the event of an engine failure during takeoff.













33. Perform a control wipeout to check flight controls

- Stick Full Forward •
- Stick Full Aft
- Stick Full Left
- Stick Full Right
- Rudder Full Left ٠
- Rudder Full Right
- 34. Check the engine instruments and monitor the caution and warning lights.
- **35.** For day operations, press "LSHIFT+U" to salute the Shooter. Alternatively, you can also do this through the ground crew menu.
 - a) Press "\" (Communication Menu) and "F8" to select ground crew
 - b) Select "Salute!" by pressing "F9"
- 36. For night operations, flash your navigation lights instead to signal the Shooter for launch. Use the Exterior Lights Master Switch on the throttle.
- 37. All Final Checkers and crew will do a quick last check, then give a thumbs up.



ICS

Main

F1. Flight...

F5. ATC...

F12. Exit

F2. Wingman 2... 🥗

F8. Ground Crew...

F3. Wingman 3...

ICS 2. Main. Ground Crew F1. Rearm & Refuel F2. Ground Electric Power... F3. Request Repair F4. Wheel chocks F5. Ground Air Supply... F6. Select AN/ALE-39 Loadout... F7. KY-28 Encryption... F8. Request Launch F9. Salute! F11. Previous Menu F12. Exit

E

DIAMONDBACKS



37

Exterior Lights Master Switch

36

AKEOFF F L PART

TOMCAT

F-14B





- 38. The Catapult Officer (Shooter) will make final checks, looking fore and aft, and then touch the deck.
- 39. The Shooter will then extend his arm, giving the signal to fire the catapult.
- 40. The aircraft will accelerate, reaching end speed in about two seconds.
- 41. Set Landing Gear lever UP (before reaching 250 kts)
- 42. Set Flaps lever UP (before reaching 225 kts)
- 43. After take off, perform Clearing Turn, which is 20 degree left and heading BRC (Base Recovery Course). Maintain 500 ft and 300 kts.
- 44. After away from carrier about 7 nm, you are cleared to climb more than 500 ft.















- 1. Set ANTI-SKID SPOILER BK switch BOTH (UP) & Landing Lights ON
- Set HOOK BYPASS switch to FIELD (FWD) 2.

EXTO

- -30

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FUE SHU OFF

- Enter Initial Point at approx. 300-350 kts at about 800 ft altitude 3.
- 4. Set Wing Sweep Mode to MANUAL and use the Wing Sweep Thumb Switch to adjust Wing Sweep to 68 deg
- 5. Trim the aircraft to compensate for the loss of lift





- 6. Select HUD LDG (Landing) Mode
- 7. At the **break interval**, extend Speed Brake, set throttle to IDLE and perform a 45-60 deg bank level turn.















- 8. When turning from the Crosswind leg to the Downwind leg:
 - a) At 280 kts, set Wing Sweep Mode to AUTO and confirm that Wing Sweep is set to Wing Sweep to 20 deg
 - b) At 250 kts, set Landing Gear Lever DOWN
 - c) At 225 kts, set Flaps Lever DOWN
- When flaps are down, press the DLC Toggle button. Confirm DLC (Direct Lift Control) is on by checking if the Maneuvering Flaps/Spoilers are deployed
- 10. Speedbrake extension causes a mild pitch down, gear extension a moderate pitch down, flaps a moderate pitch down and finally DLC extension causes a mild pitch down. All require nose up trim.
- 11. When entering Downwind leg, slow down to 150 kts and fly at 600 ft









DLC (Direct Lift Control) Thumbwheel Controls maneuvering flaps extension/retraction



DLC (Direct Lift Control) Engage Button





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SHORE LANDING VFR

- 12. As you enter downwind leg, slow down to ON SPEED AOA by setting the aircraft reticle in the middle of the "E" AoA (Angle of Attack) bracket on the HUD using elevator trim and throttle input (in theory). *In practice*, forget using the pitch on the HUD or the E Bracket. Both are not very accurate in the Tomcat and update too slowly to be of use. Use the AoA Indexer instead.
- 13. You should reach an airspeed of about 140-150 kts for an AoA (Angle of Attack) to 15 Units approx. Make sure to maintain your 600 ft altitude. The AoA Indexer will also give you a good reference if you have the correct Angle of Attack or not.
- 14. When you are 1 to 1.25 nm abeam the runway, you should be ON SPEED (yellow AoA).
- 15. Turn left towards to 90-deg heading point (altitude should drop down to 450-500 ft AGL), then to the 45-deg heading point (350-400 ft AGL)



Approach Indexer





- 16. Using coordinated rudder and lateral stick ONLY (do not use longitudinal stick input), smoothly roll into a 25 degree angle of bank. You are looking for a slight rate of descent, about 150 fpm in order to arrive at the 90 heading at 450 ft AGL. This requires a very slight addition of power. Simply trying to stay level can result in the correct descent rate. Pitch attitude should be about a degree or less than level.
- 17. When lined up with the runway, control your glide slope and angle of attack with slight throttle adjustments. That's called flying "pitch for speed, power for altitude".
- 18. You can check your speed to see if you are too slow, but keep in mind that if you have a good AoA, you'll be on speed.
- 19. Once AoA Indexer shows that you are ON SPEED (orange donut), just let yourself touchdown on the runway. It will feel like a controlled crash into the ground; that's normal.









A "case 1 recovery" is simply a fancy term to qualify what kind of landing you perform.

<u>CASE I</u>: occurs when flights are anticipated to not encounter instrument conditions during daytime departure/recovery, and the ceiling and visibility around the carrier are no lower than 3000 ft and 5 nm.

<u>CASE II</u>: occurs when flights may encounter instrument conditions during day time departure/recovery, and the ceiling and visibility in the carrier control zone are no lower than 1000 ft and 5 nm.

<u>CASE III</u>: occurs when flights are expected to encounter instrument conditions during a departure/recovery because the ceiling or visibility around the carrier is lower than 1000 ft and 5 nm, or for night departures/recoveries.

The procedure to land on a carrier is in fact quite similar to the procedure shown in the SHORE LANDING tutorial. The only things that change is that the runway is moving, may pitch up and down and is much smaller. Here is a video I recommend you watch before attempting a carrier landing:

 Carrier Landing Tutorial by 104th_Maverick: <u>https://youtu.be/NMDuXrtHWno</u>

Note: The maximum weight allowable for a carrier landing is 54,000 lbs. If you are too heavy, you can either fly around to burn fuel, jettison fuel or jettison your ordnance.





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TOMCAT

F-14B



- 1. Contact Carrier on the carrier's frequency to turn on the lights.
 - a. Set either ARC-182 V/UHF 2 or ARC-159 UHF 1 radio frequency to the carrier's radio frequency. This can be done with:
 - JESTER i.
 - From the pilot's seat with UHF 1 (if carrier frequency is within UHF1 ii. range). Frequencies range from 225.000 MHz to 399.975 MHz.
 - iii. From the RIO's seat with V/UHF 2. Frequencies range from:
 - VHF 30-88 MHz FM close air support
 - VHF 108-118 MHz AM navigation, receive only
 - VHF 118-156 MHz AM air traffic control
 - VHF 156-174 MHz FM maritime
 - UHF 225-400 MHz AM/FM military/NATO
 - b. Press the MIC BUTTON UHF 2 (RCTRL+\) switch or the MIC BUTTON UHF 1 (RALT+\) switch on your throttle to contact the carrier. If the RIO is in charge of the radio, use the pedal in the appropriate ICS mode to communicate.
 - c. Go in F5 AT5 menu, then to the CVN-74 menu, then to the F1 Inbound menu.
 - d. The carrier will give you a QFE (Barometric Pressure Setting), a pattern altitude and other relevant information.
 - e. And that's it, the carrier is now illuminated.
- 2. Set Barometric Pressure (QFE) stated by the carrier controller (29.93 in Hg)

Player: Marshal, 10, Marking mom's 227 for 6, angels 0.9, state 6.5 ^{1d}

Enfield 1-1, fly heading 206 for 2, QFE 29.93, runway 31, to pattern altitude



VHF/UHF ARC-182

F1. Inbound

F2. Request Azimuth

F11. Previous Menu F12. Exit

1d

3. Main. ATC. CVN-74 John C.





Note: Radio communications will be further explained in the RADIO section.





RIO Microphone Foot Button *Right footrest containing PTT (Push-to-Talk) for transmission on UHF*

1, V/UHF 2 or both depending on ICS (Intercom System) setting.

Pilot ICS Push-to-Talk Switch

Switch allowing pilot to key one or both radios and intercommunication to RIO.

- ICS Keys intercommunication to RIO.
- BOTH Keys both UHF 1 and V/UHF 2 for transmission.
- UHF1 Keys UHF 1 for transmission.
- UHF2 Keys V/UHF 2 for transmission.



RIO AN/ARC-182 V/UHF 2 Radio Control Panel





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CARRIER LANDING CASE I RECOVERY

- 3. Set ANTI-SKID SPOILER BK switch OFF (MIDDLE) & Landing Lights ON
- Set HOOK BYPASS switch to CARRIER (AFT) 4.
- Set Hook Lever DOWN 5.
- Enter pattern (Initial Point) at approx. 300-350 kts at about 800 ft altitude 6.
- 7. Set Wing Sweep Mode to MANUAL and use the Wing Sweep Thumb Switch to adjust Wing Sweep to 68 deg
- 8. Trim the aircraft to compensate for the loss of lift







9. Select HUD LDG (Landing) Mode









10. At the **break interval**, extend Speed Brake, set throttle to IDLE and perform a 45-60 deg bank level turn.











- 11. When turning from the Crosswind leg to the Downwind leg:
 - a) At 280 kts, set Wing Sweep Mode to AUTO and confirm that Wing Sweep is set to Wing Sweep to 20 deg
 - b) At 250 kts, set Landing Gear Lever DOWN
 - c) At 225 kts, set Flaps Lever DOWN
- 12. When flaps are down, press the DLC Toggle button. Confirm DLC (Direct Lift Control) is on by checking if the Maneuvering Flaps/Spoilers are deployed
- 13. Speedbrake extension causes a mild pitch down, gear extension a moderate pitch down, flaps a moderate pitch down and finally DLC extension causes a mild pitch down. All require nose up trim.
- 14. When entering Downwind leg, slow down to 150 kts and fly at 600 ft









DLC (Direct Lift Control) Thumbwheel Controls maneuvering flaps extension/retraction



DLC (Direct Lift Control) Engage Button

TOMCAT

F-14B



214



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CARRIER LANDING **CASE I RECOVERY**

- 15. As you enter downwind leg, slow down to ON SPEED AOA by setting the aircraft reticle in the middle of the "E" AoA (Angle of Attack) bracket on the HUD using elevator trim and throttle input (in theory). *In practice*, forget using the pitch on the HUD or the E Bracket. Both are not very accurate in the Tomcat and update too slowly to be of use. Use the AoA Indexer instead.
- 16. You should reach an airspeed of about 140-150 kts for an AoA (Angle of Attack) to 15 Units approx. Make sure to maintain your 600 ft altitude. The AoA Indexer will also give you a good reference if you have the correct Angle of Attack or not.
- 17. When you are 1 to 1.25 nm abeam the boat, you should be ON SPEED (yellow AoA).
- 18. Turn left towards to 90-deg heading point (altitude should drop down to 450-500 ft AGL), then to the 45-deg heading point (350-400 ft AGL)



Approach Indexer





Once flying abeam the ship on the downwind leg, start your approach turn when your wing meets the ship's Round Down.





Groove (Short Final)


CARRIER LANDING CASE I RECOVERY

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217



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CARRIER LANDING CASE I RECOVERY

Note: Don't use the radar altimeter for your altitude source when doing a carrier landing. The radar altimeter measures off of the seafloor, which was apparently an issue in real life.

- 19. Using coordinated rudder and lateral stick ONLY (do <u>not</u> use longitudinal stick input), smoothly roll into a 25 degree angle of bank. You are looking for a slight rate of descent, about 150 fpm in order to arrive at the 90 heading at 450 ft AGL. This requires a very slight addition of power. Simply trying to stay level can result in the correct descent rate. Pitch attitude should be about a degree or less than level.
- 20. When lined up with the boat, control your glide slope and angle of attack with slight throttle adjustments. That's called flying "pitch for speed, power for altitude".
- 21. You can check your speed to see if you are too slow, but keep in mind that if you have a good AoA, you'll be on speed.
- 22. When lined up with the ship, you will be entering the "groove" (short final).
- 23. Once wings are level, you would normally "call the ball". Example: "403, Tomcat Ball, 3.0". (Side number of your Tomcat, Aircraft Type, "Ball", Fuel State/Remaining in thousands of pounds). The LSO (Landing Signal Officer) would then respond with "Roger Ball" and then give you corrections to land properly. Think of the fuel state as basically the time on station available you have.
- 24. Once AoA Indexer shows that you are ON SPEED (orange donut) and that your velocity vector is sort of lined up with the boat's crotch, just let yourself touchdown on the carrier. **DO NOT FLARE**. Ever. It will feel like a controlled crash into the deck; that's normal. **Don't use brakes either**.





CARRIER LANDING CASE I RECOVERY



LANDING

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CARRIER LANDING CASE I RECOVERY

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CARRIER LANDING **CASE I RECOVERY**

But what is "the ball" (or "meatball"), exactly? In fact, it's the IFLOLS (Improved Fresnel Lens Optical Landing System), which acts a bit like PAPI lights but for aircraft carriers. The color of the lights you see will depend on what your angle with the lights and will tell you your glide slope, or in other words "if you need to add or reduce power". The lights that will matter the most are the vertical center lights.

- If you see the bottom red lights ("Atomic Sunrise"), you're about to hit the back of the ship. Throttle up and go around!
- If you see a centered orange light, you're on the ball and should catch a wire.
- If the ball is high, this means you should reduce power very slightly.
- If the ball is low, you need to add power
- Avoid making large power corrections and stay lined up as much as possible.
- Overall, keep your eyes glued to your AoA Indexer and the "ball". It will tell you what to do.

AoA Indexer: provides a similar function to the IFLOS.



CUT LIGHTS

Also called as "the ball" or "meatball", the IFLOLS is used as visual aid to land on the carrier.

Stay lined up Maintain an energized ball High ball is better than a low ball No large power corrections

At the start 1 ball vertically is 16ft At the ramp 1 ball vertically 1ft but is 14ft of deck travel

That picture shows the AoA Indexer telling me that I am

too fast and the meatball telling me I am too low. It will

not tell me that I am too far left of lineup though.

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221



CARRIER LANDING CASE I RECOVERY

25. You should aim for the third arrestor wire. First and second wires indicate a short landing, while the fourth wire indicates a long landing.

26. When crossing the back of the deck, throttle up to MIL power (just before afterburner detent). This will make sure that you have enough power to go around if your hook misses an arrestor wire (this is what we call a "bolter") or you catch a wire and it snaps. Throttling up to MIL will also automatically retract the speed brake and disengage DLC. Note: Be very careful to NOT touch the brakes.





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PART

CARRIER LANDING CASE I RECOVERY

27. Once the aircraft has come to a full stop:

- a) Throttle down
- b) Raise arrestor hook
- c) Set flaps UP
- d) Set Wing Sweep Mode to MANUAL and use the Wing Sweep Thumb Switch to adjust Wing Sweep to 68 deg. Alternatively, set it to BOMB mode (55 deg) with a quick Wing Sweep Thumb Switch click.
- e) Verify that Speed Brake is IN (Retracted)
- 28. Set Nosewheel Steering Switch ON (NWS ENGA caution should illuminate), then taxi to the nearest parking area.















CARRIER LANDING CASE I RECOVERY

29. Once the aircraft is parked into parking spot, set parking brake ON (Pulled)

30. To take less space on the carrier deck, set wings in full Oversweep Mode (75 deg). The wing will sweep over the stabilizers on the tail and the horizontal tail authority system is enabled to prevent the wings and stabilizers from damaging each other by restricting movement of the stabilizer.

- a) Flip the Emergency Wing Sweep Cover Up
- b) Pull on the Emergency Wing Sweep Handle (UP). The EMER flag on the wingsweep indicator will appear.
- c) Set Emergency Wing Sweep Handle to 68 deg. This will deflate the wing-seal airbags and activate the horizontal tail authority system (HZ TAIL AUTH caution appears). The handle will remain locked to 68 deg for as long as the wing-seal airbags are not completely deflated (takes approx. 15 sec).
- d) When OVER flag on the wing-sweep indicator appears and the HZ TAIL AUTH caution disappears, the oversweep interlocks are free. Set the Emergency Wing Sweep Handle to the 75° position. This will stow the wings.











LANDING

PART 6

CARRIER LANDING CASE I RECOVERY



PART

LANDING TIPS DLC

DLC (Direct Lift Control) Thumbwheel Controls maneuvering flaps extension/retraction. Forward rotation extends spoilers and aft rotation retracts spoilers.

On the control stick, there is a small spring-loaded thumbwheel for the DLC (Direct Lift Control) system. DLC is primarily a function of spoilers to maintain a correct glide slope without power or attitude adjustment. Since power or pitch adjustments screw up your precious "On Speed AoA", DLC comes in really handy when you are flying with a good AoA but you are a bit too high or too low on the glide slope.





LANDING TIPS DLC

DLC (Direct Lift Control) Thumbwheel Controls maneuvering flaps extension/retraction



Vertical Speed Indicator (x1000 ft/min)

AoA Indexer

AoA (Angle of

Attack) Indicator

Rotating the thumbwheel aft causes the DLC spoilers to go flush with the wing, thereby increasing lift. This causes the aircraft to climb a little without ever having to adjust either engine power or pitch attitude. However if we are a little above glide slope, rotating the thumbwheel forward causes the spoilers to increase their deflection, thus causing even more drag, making the aircraft descend slightly, again without any needed power or attitude adjustments. There is no DLC indicator in the cockpit, but you can check if the DLC is engaged by looking over your shoulder and checking if the Maneuvering Flaps/Spoilers are deployed.

Don't hold the button down, but don't be timid, hit it twice to keep the ball from rising while easing the power a smidge and get it back on when you see the ball stop going up. You may need a burst of throttle if you hold the button and come down like a ton of proverbial bricks, but usually not. If you need more DLC than what I described, you're probably out of parameters.

DLC Active Spoilers Deployed (Thumbwheel Forward) Aircraft Pitch is maintained, but descent rate

DLC Active

Spoilers Retracted (Thumbwheel Aft) Aircraft Pitch is maintained, but descent rate decreases since less drag is generated







LANDING TIPS STICK AND RUDDER

As with all inputs in the F-14, you have to know about them before doing them, and then perform them smoothly and precisely. Erratic stick and rudder movements are a recipe for disaster. The Tomcat has many aerodynamic peculiarities and the majority of them are deadly (I'm looking at you, roll reversal!). Adverse yaw (natural tendency for an aircraft to yaw in the opposite direction of a roll, caused by the difference in lift and drag of each wing) can be quite dangerous if you don't pay attention to it.

When trimming the aircraft in a "On Speed AoA" attitude, you will have about 13 AoA units, which means that you need to avoid combining lateral stick, longitudinal stick and rudder input all at once. I recommend using coordinated lateral stick and rudder input when performing a roll in the pattern. Aircraft pitch attitude should only be controlled with trim and throttle input. When increasing the angle of bank in a roll, you need to increase power. When decreasing the angle of bank in a roll, you need to decrease power. This will help you maintain your altitude during turns.





CARRIER LANDING LSO (LANDING SIGNAL OFFICER)

You can also roleplay in multiplayer as the "LSO" (Landing Signal Officer), you can! You can select the LSO camera by pressing "LALT+F9". The camera can be moved and zoomed in or out using LCTRL+[Numpad *] or LCTRL+[Numpad /]

You can help the pilot line up properly for landing by giving him corrective commands like "Come right for lineup, Come Left, You're high, (Add) Power". Once the pilot has landed, you can also give him a "grading" based on how he landed.

There once was a cool LSO mod by the VFA-113 Stingers that gives you a slick overlay, but unfortunately it appears to be discontinued as of 2022/11/17. LSO Mod Video: https://www.youtube.com/watch?v=vDG1_v1CJVI



Landing Grade: (LOX) (/IM) (HCDIC) (SAR) OK

(LOX) - Little low start (/IM) - Little fly through up in the middle (HCDIC) - Little high come down in close (SAR) - Little settle at the ramp GRADE: OK

() = A Little
= A Lot (you don't want these)
Now this is probably generous
(FAIR may be more appropriate, but this is my video...OK?)





www.VFA-113.com

CARRIER LANDING LSO COMMUNICATIONS & GRADING

The VFA-113 Stingers have a short course on LSO & Carrier Landing Grading LSO Training Course Link: <u>https://youtu.be/BbMw4PcvMyY</u>

BOX GRADING START: "ROGER BALL" INSIDE BLACK BOX : OK 4pt OUTSIDE BLACK BOX : FAIR 3pt OUTSIDE RED BOX : NO GRADE 2pt

BOX GRADING END: "IN CLOSE" OUTSIDE RED BOX : CUT 1pl (WAVE-OFF! WAVE-OFF! WAVE-OFF!) NO BALL CALL - or - BOLTER : NO GRADE 2.5pt

'Paddles Contact'	You are abeam the LSO platform, begin your final turn	Color legend:
or4 mile can the ban	You are at 3/4 mile, can you see the meatball ?	Virtual LSO
"304 Hornet Ball 4.5"	I am - Modex / Aircraft type / Meatball is accuired / Fuel state Add 'AUTO' if using Auto-Throttle	Pilot
	LSO may direct you to disengage ATC with GO MANOAL	Human Lov
'Roger Ball'	LSO clears aircraft to continue approach - GFADING START	0
'You're high'	Aircraft is above glideslope	
'POWEN'	Aircraft is be ow clideslope - ADD POWER	V
'Right for lineup'	Bank right to centerline	ALICIN
'Come left'	Bank left to centerline	
'Easy with it'	Your power corrections are excessive	
'in Close'	Aircraft at the ramp - GRACING STOP	- Comment
'You're fast / slow'	Aircraft AOA is incorrect	
'BURNERI'	SELECT AFTERBURNER	
'WAVE-OFF!'	EXECUTE WAVEOFF	
'Bolter'	Aircraft missed all the Arrestor Wires	

GENERAL ELECTRIC **F110**-GE-400 ENGINE

The F-14A entered service with the United States Navy in 1973 powered by Pratt & Whitney TF30s. By the end of the decade, following numerous problems with the original engine (and similar problems with the Pratt & Whitney F100 on the F-15 and F-16), the DoD began procuring the upgraded TF30-P-414As. While these engines solved the serviceability problems, the fuel consumption and thrust was comparable to the initial model– considerably less than what the F-14 had been designed for. In 1979, a derivative of the GE F101 turbofan called the F101-X was selected to power the F-14 and was later designated the F110-GE-400.

The F-14B Tomcat was fitted with these improved engines: two General Electric F110-GE-400 afterburning turbofan engines, which were able to provide 23,400 lbf (104 kN) of thrust with afterburner at sea level, which rose to 30,200 lbf (134 kN) at Mach 0.9. This provided a significant increase over the F-14A's TF30's maximum thrust of 20,900 lbf (93 kN). While the early TF30s required afterburners on takeoff, the increase in thrust with the F110s was so significant that takeoff with afterburners was prohibited; catapult launches with F110 afterburners were considered too dangerous because the yaw moment would be too great if one of the burners failed during or after launch. That's how powerful they were!

The Augmenter Fan Temperature Controller/Main Engine Control (**AFTC/MEC**) provides limiting functions to prevent engine damage and reduce risk of compressor stalls. Engine RPM, EGT (Exhaust Gas Temperature), and acceleration/deceleration scheduling are all limited by the AFTC to ensure safe engine operation. In civil aviation terms, the AFTC/MEC basically accomplishes the functions of a FADEC (Full Authority Digital Engine Controller), sort of the controller/brain of the engine.

There is also an **APC** (Approach Power Compensator) system that works basically like an auto-throttle system during approaches.





F-14B



THROTTLE CONTROL

There are three main throttle operation modes:

- The **Manual** mode is a mechanical mode in which the engines are controlled by mechanical linkages directly from the throttles to the engines. The manual mode is designed as a backup mode and may be inexact because of the mechanical nature of the controls.
- **Boost** mode is the normal mode of operation in which electrical paths control actuators moving the same engine controls as the mechanical linkages but more exactly and with lesser force required.
- The third mode is the **approach power compensator** mode or the **Auto Throttle** mode which is a system which allows for automatic throttle control for optimal angle-of-attack during approaches. We will further explain auto-throttle in the AUTOPILOT section.





Throttle Detents (Reference: Heatblur F-14B Wiki)

FUEL SYSTEM OVERVIEW

The main fuel storage in the F-14 consists of two feed systems, one for each engine. The right engine feed system consists of the right wing and right box cells and the front fuselage cells while the left engine feed system consists of the left wing and left box cells in addition to the aft fuselage cells. This fact needs to be kept in mind when reading the fuel gauges.

The total useable fuel quantity is roughly 20,000 pounds distributed as in the table below.

Tank group	Fuel Quantity (lbs)	
Forward Fuselage	4,700	
Aft Fuselage	4,400	
Right Feed Group	1,600	
Left Feed Group	1,500	
Internal Wings	4,000	
External Tanks	3,600	



1 - Refueling Probe, 2 - Ground refueling Port (Right Side), 3 - Forward Fuselage Tank, 4 - Left External Drop Tank, 5 - Left Box Beam Tank, 6 - Left Wing Tank, 7 - Vent Tank, 8 - Fuel Dump Mast, 9 - Aft Fuselage Tank, 10 - Right Box Beam Tank, 11 - Right Wing Tank, 12 - Right External Drop Tank.

Fuel System Overview (Reference: Heatblur F-14B Wiki)

F-14B

FUEL SYSTEM OVERVIEW

The fuel quantity indicator on the pilot right knee panel displays internal and external fuel carried.

- The TOTAL indicator displays total carried fuel.
- The L and R indicator normally shows fuel carried in left and right fuel feeds respectively. A rocker switch on the fuel management panel enables selection of the wing internal tanks (WING) or external fuel tanks (EXT) for display but is springloaded to return to showing the feed tanks (FEED) automatically. When displaying wing internal tanks or external fuel tanks, the left wing or left external tank is shown on the L counter and the right wing or right external tank on the R counter.
- The FUS & FEED tapes (fuselage and feed) shows the AFT & L (aft fuselage and left feed) and FWD & R (forward fuselage and right feed) in thousands of pounds.

Additionally the RIO has a total fuel quantity display on the right instrument panel. This display counter can only show total fuel quantity.





Switch selecting what the fuel quantity tapes on the fuel quantity display shows.

- FEED Shows respective feed and fuselage tank fuel quantity.
- WING Shows respective wing tank fuel quantity.
- EXT Shows respective external fuel tank quantity.

RIO Total Fuel Quantity Indicator (lbs)



Fuel Dump Switch



Bingo Fuel

The FEED switch allows the pilot to correct fuel imbalances caused by single engine operation or feed failures by selecting both engines to feed from either the FWD (forward and right tanks) or AFT (aft and left tanks) instead of from one feed system each as normal NORM. The switch guard locks the switch to the NORM position when down.

The WING/EXT TRANS switch controls fuel transfer from the wing and external tanks into the fuselage feed systems. The normal AUTO position enables this transfer as soon the landing gear is retracted.

The ORIDE position enables this transfer regardless of landing gear position, enabling transfer when on the ground or during a malfunction in the electrical system inhibiting landing gear retraction detection. Additionally the OFF position disables this transfer but can be overridden automatically to AUTO when the INST test is performed on the MTS panel, the refuel probe is set to ALL EXTD or when dumping fuel.

The **DUMP** switch enables fuel dump through the beaver tail fuel dump mast, it also enables all fuel transfer systems, enabling dump of fuel in wings and external tanks in addition to the fuselage. If there's weight on the wheels or the speed brake is not fully retracted the fuel dump is inhibited.

Reference: Heatblur F-14B Wiki



Wing/External Transfer Switch

- ORIDE Override.
- AUTO Normal position.
- **OFF** Turns off fuel feed from the wing and external tanks.

Fuel Dump Switch

Allows fuel dump when speed brakes are retracted, afterburner off and weight off wheels.



F-14B

ENGINE RELIGHT PROCEDURE

Cross-Bleed Airstart

A cross-bleed airstart can be attempted with one engine running if the spooldown airstart was not successfull or the engine is already at or near windmill rpm.

Cross-Bleed Airstart Checklist

1. Non-running engine throttle	OFF		
2. FUEL SHUT OFF handle	Check handle in in position		
3. Running engine throttle	Minimum 80% RPM		
4. BACK UP IGNITION switch	ON		
5. ENG CRANK switch	Set to non-running engine		
6. Non-running engine throttle	IDLE immediately after ENG CRANK on		
If no start occurs:			
7. Non-running engine throttle	OFF then IDLE		
if still no start:			
8. ENG MODE select switch	SEC		
9. Non-running engine throttle	OFF then IDLE		
After successfull airstart:			
10. BACK UP ignition switch	OFF		
11. ENG MODE SELECT switch	PRI if possible		

Windmill Airstart 🗞

The windmill airstart uses aircraft airspeed to turn the engine turbines using wind speed. Required airspeed is at or above 450 knots indicated airspeed and should only be attempted if airspeed and altitude allows it.

Windmill Airstart Checklist

1. Airspeed	At or above 450 KIAS			
2. Throttle	IDLE or above			
3. BACK UP IGNITION switch	ON			
If no relight occurs:				
4. Throttle	OFF then IDLE			
If still no relight:				
5. ENG MODE SELECT switch	SEC			
6. Throttle	If no start after mode switch, OFF then IDLE			
After successful airstart:				
7. BACK UP IGNITION switch	OFF			
8. ENG MODE SELECT switch	PRI if possible			

Reference: Heatblur F-14B Wiki

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ENGINE RELIGHT PROCEDURE



AFCS: Automatic Flight Control System

The flight control system on the F-14 Tomcat is driven by the two main hydraulic circuits, powered by pumps connected to each engine.

For longitudinal (pitch) control both tail stabilizers are deflected in unison, acting in the same way as traditional elevators. Lateral (roll) control is produced by both the tail stabilizers (tailerons) and the spoilers working in unison. To produce roll the stabilizers are deflected opposite each other to act as ailerons in combination with the spoilers on the side to which roll is commanded. The rudders on the F-14 is a standard rudder configuration albeit in a two tail, two rudder configuration.

The AFCS or Automatic Flight Control System provides additional aircraft stability (SAS or Stability Augmentation System) via automatic control surface commands generated from AFCS sensors. The AFCS is controlled by switches on the AFCS Control Panel and pitch, roll and yaw can each be set individually. The pitch and roll switches are springloaded to off but normally held to on by solenoids meaning that if the system is turned off or inoperable the switches return to off. The yaw switch is purely mechanical. Roll SAS should not be used for situations involving flight at AOA above 15 units and should therefore be set to off for combat maneuvers.

If the Autopilot Emergency Disengage Paddle on the control stick is held down the pitch and roll channels will be set to off.





Disengage Paddle

CADC & Variable Wing Sweep

The wing-sweep system controls the geometry of the F-14's wings, allowing the wings to move from a 20° to a 68° position in the air. While on the deck an oversweep of 75° is also possible reducing the F-14's wing span to 33 feet (about 10 meters). The wings are moved by hydromechanical screwjack actuators which are interconnected mechanically, making sure they're synchronized. As long as both main hydraulic systems are functioning the maximum wing-sweep change rate is about 15°/s. This can be affected negatively by negative g or large amounts of positive g.

AUTO, BOMB & MANUAL MODES

In normal operation the CADC, Central Air Data Computer, controls the wing position as a function of current Mach via the wing-sweep program, this is known as the **AUTO** mode. You can also set a specific wing sweep position **manually** using the thumb switch AFT/FWD on the throttle.

The pilot can also select a wing position aft of the wing-sweep program manually or choose the **BOMB** mode that sets the wings to 55° or further aft depending on the program.

Simply put, the CADC wing-sweep program determines the max forward position of the wings. All this is done electrically via two independent channels (for redundancy) to the wing-sweep actuators. Currently commanded wing position, CADC program wing position and actual wing position can be seen on the wing-sweep indicator next to the ACM panel

NH NH	Wing Sweep Thumb Switch	
Wing Sweep Auto Mode		
	Wing Sweep Mode Selec	cted Indicator
		SWEEP
Wing Sweep AFT	Wing Sweep FWD	
	and the second second	40
et et al		
Wing Sweep Bomb Mode	Wing Sweep Angle Indicator	(deg) 241 PULL FIRE EXT S
	Wing Sweep AFT Wing Sweep Bomb Mode	Wing Sweep Auto Mode Wing Sweep Auto Mode Wing Sweep Mode Select Wing Sweep AFT Wing Sweep Bomb Mode Wing Sweep Angle Indicator

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F-14B



CADC & Variable Wing Sweep





Wing Sweep 68 deg



Wing Sweep Mode Selected Indicator **AUTO:** Automatically set by CADC (Central Air Data Computer) MAN: Manually set by Wing-sweep switch **BOMB:** Sets wing-sweep to 55° if forwards of that. When the CADC

position is aft of 55° it will follow that setting instead **EMER**: Wings set with the emergency wing-sweep handle (75°)

Wing Sweep Angle Indicator (deg)







CADC & Variable Wing Sweep

EMERGENCY MODE

While the normal mode controls the wing-sweep electrically, to supplement this it's also possible to control the wing-sweep mechanically via the emergency mode. This is done via the emergency wing-sweep handle on the right side of the throttle. That handle is connected mechanically to the hydraulic valves in the wing-sweep system, providing a physical back-up control.

To return to the normal mode of operation, the handle should be pushed into the desired position and pressed down and the guard closed. The **MASTER RESET** button should then be depressed and the wing-sweep system set to the same position as the handle. The servo will then drive to the commanded position and re-engage the handle to the spider detent, resuming normal operation.

WING OVERSWEEP MODE

The emergency wing-sweep handle is also used to select the oversweep position of the wings. The oversweep is only used while on the ground to reduce the wing span to make it easier to spot the aircraft on the carrier deck. As the wing will sweep over the stabilizers on the tail the horizontal tail authority system is enabled to prevent the wings and stabilizers from damaging each other by restricting movement of the stabilizer.

Reference: Heatblur F-14B Wiki





SPOILERS & DLC (DIRECT LIFT CONTROL)

<u>SPOILERS</u>

Reference: Heatblur F-14B Wiki

The spoilers are only used forwards of 62° wing-sweep as further aft these conflict with the fuselage. This means that at higher speeds, the wing sweep system in AUTO mode sweeps back the wings and roll control is managed by the tail stabilizers only. When wing sweep is 62° or less, both spoilers and tail stabilizers will function to produce roll motion.

Spoilers are also used for braking when the throttle is set to IDLE, wheels are on the ground and **ANTI-SKID SPOILER BK** switch is set to either SPOILER BK or BOTH. OFF disables the system, BOTH enables antiskid and the spoiler brake system and SPOILER BK enables only the spoiler brake system. Keep in mind that for carrier operations, anti-skid and spoiler brakes must be disabled.

DLC – DIRECT LIFT CONTROL

The DLC or Direct Lift Control is used to control vertical glideslope position without pitch control inputs or engine throttle commands. The DLC uses the two inboard spoiler sections in conjunction with small corrections on the tail stabilizers to control lift.

The DLC is engaged by depression of the DLC switch on the control stick with flaps and gear down. This causes the inboard spoilers to extend to half and enables the DLC & maneuver flap command thumbwheel on the control stick to control them.

Rotation of the thumbwheel forwards extends the spoilers towards the max up position, decreasing lift and adjusting glideslope position downward. Rotation of the thumbwheel aft retracts the spoilers towards the flush position, increasing lift and adjusting glideslope position upward.

Another depression of the DLC switch disengages the system.

DLC (Direct Lift Control) Thumbwheel Controls maneuvering flaps extension/retraction. Forward rotation extends spoilers and aft rotation retracts spoilers.

Anti-Skid Spoiler Brakes switch

- **BOTH** Enables both anti-skid and spoiler brake function with weight on wheels.
- **OFF** Turns off both systems.
- **SPOILER BK** Spoiler brake, enables spoiler brake function with weight on wheels.







SPOILERS & DLC (DIRECT LIFT CONTROL)

DLC (Direct Lift Control) Thumbwheel Controls maneuvering flaps extension/retraction. Forward rotation extends spoilers and aft rotation retracts spoilers.

DLC Active Spoilers Deployed (Thumbwheel Forward) Aircraft Pitch is maintained, but descent rate increases since more drag is generated

DLC Active Spoilers Retracted (Thumbwheel Aft) Aircraft Pitch is maintained, but descent rate decreases since less drag is generated

DLC (Direct Lift Control) Engage Button



AERODYNAMICS

The Tomcat does not have any fancy FBW (Fly-By-Wire) system. This means that you have much more control on how you fly the plane. As with all inputs in the F-14, you have to know about them before doing them, and then perform them smoothly and precisely. Erratic stick and rudder movements are a recipe for disaster. As an example, one should not try an all-rudder constant slow roll turn all the way through a barrel roll; use the rudder to turn in increments with controlled inputs instead.

When flying a low angle of attack (AoA) high-speed roll, you should roll the aircraft with the stick and progressively add rudder. The higher your angle of attack, the more your rudders should replace your lateral stick inputs, especially when turning in BFM (Basic Fighter Maneuvers). If you find yourself in a nose up high AoA near stall, gently release pressure from the stick, nudge some left or right rudder into the turn and the Tomcat's nose will glide back down, then you can feed throttle back in during the recovery.

The Tomcat has many aerodynamic peculiarities and the majority of them are deadly (I'm looking at you, roll reversal!). Proverse yaw can be quite dangerous if you don't pay attention to it. Combining roll and rudder input while pulling on the stick is the last thing I would recommend. It's a bit like the "Good-Fast-Cheap" quality triangle, but with control input. Out of roll, yaw, and pitch input...you should try to only pick two at once at any time in a high AoA fight. Above 16 "AoA units" (nope, the AoA is not calculated in degrees in the Tomcat but in its own arbitrary units), forget about using roll – use rudder instead.

Manoeuvering and Flight Characteristics Video by Jabbers: <u>https://youtu.be/b5opjCygZug</u>





1 – Sensors Overview

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- 1.1 Introduction to Sensors
- 1.2 My Sensors Control Setup (HCU)
- 1.3 My Sensors Control Setup (LANTIRN)
- 2 AN/AWG-9 WCS (Weapon Control System) Radar
 - 2.1 Radar Interface & Controls
 - 2.2 Radar Main Modes
 - 2.3 Radar Pulse Mode
 - 2.3.1 Pulse Search Sub-Mode
 - 2.3.2 Pulse STT Lock Sub-Mode
 - 2.4 Radar Pulse Doppler Modes
 - 2.4.1 Pulse-Doppler (PD) Search Sub-Mode
 - 2.4.2 RWS Sub-Mode
 - 2.4.3 TWS Sub-Mode
 - 2.4.3.1 TWS Basics
 - 2.4.3.2 TWS Manual Mode
 - 2.4.3.3 TWS Auto Mode
 - 2.4.3.4 TWS Additional Functions
 - 2.4.4 Pulse Doppler STT Lock Sub-Mode
 - 2.5 Radar ACM Modes
 - 2.5.1 PLM Sub-Mode
 - 2.5.2 VSL Sub-Mode
 - 2.5.3 PAL Sub-Mode
 - 2.5.4 MRL Sub-Mode
 - 2.6 JESTER

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- 2.7 Radar Lingo and Terminology
- 2.8 RIO BRA Call

- 3 TCS/ALQ-100 (Television Camera Set)
- 4 LANTIRN Targeting Pod
 - 4.1 Introduction
 - 4.2 Display & Symbology
 - 4.3 Controls
 - 4.4 Start-Up & Lasing Procedure
 - 4.5 Pointing Methods
 - 4.5.1 Overview
 - 4.5.2 Point & Area Track
 - 4.5.3 QADL/QHUD (Cue to ADL/HUD)
 - 4.5.4 QSNO (Cue Snowplow)
 - 4.5.5 QDES (Cue to Designation)
 - 4.5.6 QWP (Cue to Waypoint)
 - 4.6 LANTIRN Pod Limitations
 - 4.7 Air-to-Air Operation
 - 4.8 JESTER AI Interface
 - 4.8.1 JESTER LANTIRN Overview
 - 4.8.2 JESTER Target Designation
 - 4.8.2.1 QMAP (Cue to F10 Map Marker)
 - 4.8.2.2 Target Search via Pilot (QEYEBALLS)
 - 4.8.2.3 Target Search via JESTER
 - 4.8.2.4 Pilot Head Control of LANTIRN Pod
 - 4.8.3 JESTER Laser Setup

1.1 – INTRODUCTION TO SENSORS

Here is an overview of how the Tomcat can "see" the outside world. All of these tools are controlled by the RIO (Radar Intercept Officer).

- AN/AWG-9 Weapon Control System (WCS) / Radar: Integrated system containing the F-14's main sensors and computer providing detection, tracking and engagement of targets in the air-to-air and air-to-ground roles.
 - Modes currently available are PD Search (Pulse Doppler), Pulse, TWS (Track While Scan), RWS (Range While Search), STT (Single Target Track) and ACM (Air Combat Maneuvering).
- LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) Targeting Pod: Targeting system developed to provide precision strike capability. Target designation is achieved by using a laser designator/range finder or an infrared laser marker, which can be created by the pod itself. It is also capable of displaying a FLIR (Forward-Looking Infrared) thermal imagery.
- TCS/ALQ-100 (Television Camera Set) : Contains an aircraft stabilized high resolution closed circuit television camera. The TCS is capable of independent contrast lock or being slaved to the AN/AWG-9 radar.



F-14B TOMCAT

1.1 – INTRODUCTION TO SENSORS

PILOT SEAT

HSD (Horizontal Situation Indicator) used as a TID (Tactical Information Display) Repeater in the front cockpit.





HSD (Horizontal Situation Display) Mode: • **TID** (Tactical Information Display): Display repeating the

RIO TID information. If RIO has TID set to TV the screen will be blank







1.1 – INTRODUCTION TO SENSORS

RIO SEAT

WCS (Weapon Control System) / Radar Control Panel Allows you to control radar (WCS) mode, IFF interrogation and consult the DDD (Detail Data Display) AUTO RANGE OFF FAST IR GAIN PO THRLD PULSE VIDEO + BRIGHT DDD (Detailed Data Display) Radar Display Main AWG-9 radar display. NORM-DISPLAY ACM * ASPECT JAM/JET WCS MODE PULSE GAIN CCM MODES Õ TWS AUTO 11111 $\mathbf{1}$ N



1.1 – INTRODUCTION TO SENSORS

RIO SEAT



HCU (Hand Control Unit) Main Radar & TCS (Television Camera Set) Control Stick

HCU (Hand Control Unit) Mode Selector Buttons

- *IR/TV Mode* Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.
- **RADAR Mode** Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.
- **DDD Mode** Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.
- **TID Mode** Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.


1.1 – INTRODUCTION TO SENSORS

RIO SEAT

Sensor Control Panel

Control panel for AWG-9 scan settings, the TCS and the airborne video tape recorder.

Liquid Cooling Switch

Controls the liquid cooling system for the AWG-9 and AIM-54. The AWG-9 circuit can be enabled independently of the AIM-54. This switch need to be enabled for the respective system before AWG-9 operation or AIM-54 missile preparation.



CAP (Computer Address Panel)

The CAP is used to enter data into the WCS. The MESSAGE indicator drum and buttons works similarly to the buttons on MFDs on newer aircraft. The TGT DATA (Target Data) CAP Category contains message button functionality used to modify hooked track symbols.





1.1 – INTRODUCTION TO SENSORS

RIO SEAT



1.1 – INTRODUCTION TO SENSORS





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1.2 – MY SENSORS CONTROL SETUP **PILOT STICK**



Target Designate UP / VSL HI ➔ Target Designate Forward / PAL ✤ Target Designate DOWN / VSL LO



1.2 – MY SENSORS CONTROL SETUP HCU STICK (RIO)



Left Toe Brake (mapped on pedals): ICS Foot Button Right Toe Brake (mapped on pedals): Microphone Foot Button

1.2 – MY SENSORS CONTROL SETUP HCU STICK AXES (RIO)

X axis of the stick is mapped to the HCU left/right axis. Y axis of the stick is mapped ot the HCU up/down axis.

SYSTEM	CONTROLS	GAMEPLAY	4	1ISC.	A	UDIO		SPECIAL	VR
F-14B RIO A	xis Commands	*	Reset category	to default	Clear cat	tegory	Sa	ave profile as	Load profile
Action			Category	Keyboar	d	Throttle - HOT	'AS W	Joystick - HOTAS Wa	. Saitek Pro Flight Co.
HCU left/right								JOY_X	
HCU up/down								JOY_Y	
HCU vernier thumbwheel									
HCU vernier thumbwheel re	lative adjustment								
Head Tracker : Forward/Bac	kward								
Head Tracker : Pitch									
Head Tracker : Right/Left									
Head Tracker : Roll									
Head Tracker : Up/Down									
Head Tracker : Yaw									
Horizontal View									
Horizontal View (Mouse)									
ICS Button ICS (Intercom) P1	IT (axis threshold)								JOY_X
ICS Button ICS (Intercom) P1	rr (axis threshold) - SRS Only / No	Menu							
ICS Button MIC (UHF) PTT (a	axis threshold)								JOY_Y
ICS Button MIC (UHF) PTT (a	axis threshold) - SRS Only / No Me								
LANTIRN S3 HAT X Axis (WP	P-, WP+)								
LANTIRN S3 HAT Y Axis (ARI	EA, POINT)								
LANTIRN S4 HAT X Axis (QD	ES)								
LANTIRN S4 HAT Y Axis (QSI	NO, QHUD)								
LANTIRN Slew X									
LANTIRN Slew Y									
LANTIRN Trigger Axis (Latch	ied, Lase, Designate)								
Radar azimuth control									

1.3 – MY SENSORS CONTROL SETUP LANTIRN STICK (RIO)



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1.3 – MY SENSORS CONTROL SETUP LANTIRN STICK AXES (RIO)



page uses the "Paddle Lever" modifier.

2.1 – AWG-9 RADAR RADAR INTERFACE & CONTROLS

The AWG-9 radar was one of the most revolutionary technological advances back in the days of the Tomcat. While most of you may be familiar with the way the radar display works in a single-seat fighter, a two-seat fighter requires tasks to be separated.

The pilot is mainly responsible for weapons launch, flying the aircraft, finding targets visually or using information forwarded by the RIO. The pilot's situational awareness extends from what he sees to what the TID repeater mode of the HSD can tell him. The pilot can operate in a very limited fashion certain radar close-range ACM (Air Combat Maneuver) modes, but he cannot control the radar by himself.

This is where the RIO comes in. He controls the radar (scanning pattern, azimuth/elevation, mode, etc.) and locks targets for the pilot, which can then be engaged by the pilot once a lock is acquired.







2.1 - AWG-9 RADARRADAR INTERFACE & CONTROLS

How to power up the radar?

Note: these steps are typically performed while on the ground.

- 1. Verify that electrical power is available (ground power or engine generators)
- 2. Communicate with the pilot to know when engines are started and engine bleed air is available. Why? The WCS requires cooling air from the ECS (Environment Control System), which in turn means:
 - a) Both engines need to be running (started by the pilot)
 - b) The AIR SOURCE selector needs to be set to BOTH ENG in the pilot's cockpit.
 - c) The LIQUID COOLING switch needs to be set to FWD in the RIO's cockpit
- 3. Set WCS (Weapon Control System) Switch STBY.
- 4. Wait approx. 40 seconds for the TID (Tactical Awareness Display) and DDD (Detail Data Display) to power on
- 5. Set Liquid Cooling Switch ON (FWD). This will start the AWG-9 radar cooling process.
- 6. Once the three-minute warm-up period for the radar is done, set WCS (Weapon Control System) Switch – WCS XMT (Transmit)









2.1 – AWG-9 RADAR RADAR INTERFACE & CONTROLS

PILOT SEAT

HSD (Horizontal Situation Indicator) used as a TID (Tactical Information Display) Repeater in the front cockpit.

This repeater shows the pilot the TID, but the TID itself is controlled by the RIO. If RIO has TID set to TV the screen will be blank while HSD is in "TID" mode.



HSD (Horizontal Situation Display) Mode:

- **NAV**: Navigational display, shows steering information depending on selected steering command source
- **TID** (Tactical Information Display): Display repeating the RIO TID information. If RIO has TID set to TV the screen will be blank

Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.



Target Designator (Radar Lock Indicator) on HUD (Heads-Up Display)

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PLM Button Button used to command pilot lockon mode of AWG-9. Also used to disengage autopilot whil@@ACL.



2.1 – AWG-9 RADAR RADAR INTERFACE & CONTROLS

The F-14's radar has a range of 200 nautical miles, a horizontal arc of 130 degrees and a variable vertical arc. You can control the radar scan pattern (1, 2, 4 or 8 bars), which will give you a narrower or wider scanning area.



4 Bar Search

2 Bar Search

1 Bar Search







RIO SEAT RDROT Radar Track Indicator Light Indicates the target is within the range or rate gate and being tracked.

OFF

ECT

-40

ANT TRK Radar Track Indicator Light Indicates the radar is tracking the target's angle.

TGTS MLC AGC

PULSE VIDEO Knob Controls video strength of pulse video on the DDD. No effect on pulse doppler video.



ASPECT Switch

Used to control the rate region covered by the doppler filters in pulse doppler modes and if to use edge or centroid tracking in pulse mode. These settings correspond to expected target aspect.

PULSE GAIN Knob

Used to control the gain of the AWG-9 in pulse mode, normally left in detent unless needed because of clutter or jamming. **Selected Radar Range Indicator (nm)** *Blank if no range scale is used on the DDD.*

Radar Range Selector Buttons 5/10/20/50/100/200 nm

JAT Radar Track Indicator Light Indicates the radar is tracking a jamming source's track angle.

IROT Radar Track Indicator Light *TCS angle tracking, called IROT as this was originally used for the IRST in the early F-14-A.*

XMTR MSL CHAN CHAN

DDD BRIGHT (Brightness) Knob

DDD (Detailed Data Display) Radar Display *Main AWG-9 radar display.*

V_c Switch

Switch used to select different closing velocity scales on the DDD in PD (Pulse Doppler) modes.

ERASE Knob

Used to control the intensity of the ERASE beam on the DDD, controlling how quick the image on the DDD fades.



PART 9 – RADAR & SENSORS

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F-14B





2.1 – AWG-9 RADAR RADAR INTERFACE & CONTROLS

RIO SEAT

The F-14's radar displays contact data on the **"DDD" (Detail Data Display).** While modern radars often display information in a top-down view, the DDD will display information differently based on what radar mode is selected.

If using a **"Pulse Doppler" operation mode (RWS, TWS, PD Search), DDD information will be displayed in terms of contact closure speed**, not in terms of range. Pulse Doppler modes have two blind spots: the "Zero Doppler Filter Line" (small speed differential between the target and you) and the "Notch Filter Line" (target is flanking or notching you, which is flying perpendicular to you).





Zero Doppler Filter Line

This imaginary line is a blind spot (+/- 100 kts around your own speed moving away from you). Targets that are matching your speed will not be displayed.



If using a "Pulse" operation mode (with no Doppler filter applied), DDD information will be displayed in terms of contact range.



2.1 - AWG-9 RADARRADAR INTERFACE & CONTROLS

RIO SEAT

The Sensor Control Panel allows you to control radar elevation scan bars and azimuth. Keep in mind using more bars and a greater azimuth range means a better coverage, but also a much longer scanning refresh time.

Radar VSL (Vertical Scan Lockon) Switch HI / OFF / LOW



Radar Azimuth Scan Selector • +/-10 deg

- +/-20 deg
- +/-40 deg • +/-65 deg

Radar Elevation Scan Bars Selector 1/2/4/8

FAST

OFF

EL

Radar Antenna EL (Elevation) Indicator

Meter with indicator needles indicating sensor elevation. Left indicator shows current actual radar antenna elevation. The right indicates commanded radar elevation while RDR is selected on HCU and TCS elevation while IR/TV is selected.



Effect of elevation bars on scanning time (timings are hypothetical and not based on actual measured timings). Reference: <u>https://youtu.be/r4-Dd4ss2Rc</u> (Jabbers)

*1.5 seconds is for the sake of discussion



RADAR INTERFACE & CONTROLS TOMCAT UHF **RIO SEAT** 0 0 features (map). . SENSORS ø AR RAD 5 4 0

2.1 - AWG-9 RADAR



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2.1 - AWG-9 RADARRADAR INTERFACE & CONTROLS

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2.1 – AWG-9 RADAR RADAR INTERFACE & CONTROLS

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TID (Tactical Information Display) Display Selector Buttons UPPER ROW:

- RID DISABLE: Not simulated.
- **ALT NUM**: Altitude numerals, enables display of track altitudes on the left side of track symbols. Shows a single digit representing tenthousands of feet
- **SYM ELEM**: Symbology elements, enables display of all supplementary symbology of tracks and waypoints.
- DATA LINK: Enables display of data link tracks.
- JAM STROBE: Enables display of jam strobes on the TID.
- **NON-ATTK**: Non-attack, enables or disables display of targets which aren't possible to engage, friendly targets being an example.

LOWER ROW:

- LAUNCH ZONE: Enables display of weapon launch zones depending on selected missile type. These replace the velocity vectors on relevant targets. This function is automatically enabled by the WCS 60 seconds prior to a target entering maximum launch range.
- **VEL VECTOR**: Velocity vector, enables display of velocity vectors on tracks.

TID (Tactical Information Display) Mode Selector

- **GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.
- **A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.
- **ATTAK**: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.
- **TV**: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.

TID Range Selector (nm) 25 / 50 / 100 / 200 /400





2.1 - AWG-9 RADAR**RADAR INTERFACE & CONTROLS**

RIO SEAT

Button selecting the ACM Manual Rapid Lockon (MRL) mode. Overrides all operational modes except PLM and VSL.

MRL Button

PWR RESET Indicator Light *Light indicating one or more inoperative* secondary power supplies.

DISPI

WCS Indicator Light

Indicates selection of STBY or XMT with the radar not yet timed out or selection of XMT with radar transmission remaining off.



2.2 – AWG-9 RADAR RADAR MAIN MODES

Radar Operation Mode (Red: Pilot-Controlled / Green: RIO-Controlled)			Function	Weapons capability	Detection-range
	Dulco	Pulse Search	Medium range search and detection, secondary air-to-ground.	Boresight missiles.	60 nm
BVR (Beyond Visual Range) (more than 10 nm)	Puise	Pulse STT (Single Target Track)	Short to medium range single target track and missile launch.	Gun and missiles, AIM-7 in CW and AIM-54 in active launch.	50 nm
	Pulse Doppler	Pulse Doppler Search Long range search and detection.		Porosight missiles	110 nm
		RWS (Range While Search)	Long range search, detection and ranging.	Boresignt missiles.	90 nm
		TWS (Track While Search)	Long range search, detection, multiple target track and missile guidance.	AIM-54, multiple target capability.	90 nm
		Pulse Doppler STT (Single Target Track)	Long range single target track and missile guidance.	Gun and all missiles. AIM-7 in PD and CW and AIM-54 in PD and active.	90 nm
WVR (Within Visual Range) (less than 10 nm)	ACM (Air Combat Mode)	PLM (Pilot Lockon Mode)	Short range search and detection.	Gun and all missiles	5 nm
		VSL High/Low (Vertical Scan Lockon)	Short range search and detection.	Gun and all missiles. VSL High or VSL Low mode is set by the RIO, but lock is performed by the pilot.	5 nm
		PAL (Pilot Automatic Lockon)	Short range search and detection.	Gun and all missiles	15 nm
		MRL (Manual Rapid Lockon)	Short range search and detection.	Gun and all missiles. Rarely used since difficult to relate what you are seeing on the DDD to what is actually outside the canopy.	5 nm

2.2 – AWG-9 RADAR RADAR MAIN MODES

The radar has the following main modes: **BVR** (Beyond Visual Range, used for long-distance engagements) which includes **Pulse-Doppler** and **Pulse** Operation Modes, and **ACM** (Air Combat Maneuvering, used for close air engagements).

Pulse modes:

- In the pulse mode of operation the AN/AWG-9 does not use pulse doppler filtering which means that it can be used to detect targets at all aspects and also be used for
 rudimentary ground mapping. On the pro side this means that the radar in this mode cannot be notched as it does not need to have a relative speed to register the target.
 The downside however is that the radar does not have an easy way of differentiate between unwanted ground reflections and real targets meaning that aircraft can hide in
 the ground clutter near the ground. Because of this and the increased difficulty from trying to differentiate real targets from the general background noise without doppler
 filtering means that the range in the pulse modes are less than in the pulse doppler modes.
- The radar has two pulse modes, pulse search and pulse single target track (P STT).
- Pulse mode does not show anything on the TID, only on the DDD. TID only shows datalink contacts and waypoints.

Pulse Doppler modes:

- In pulse doppler mode the AN/AWG-9 uses doppler filters to filter out unwanted returns, enhancing target detection and thus increasing detection range. The pros of this
 mode being that, as said, targets can be detected at greater ranges, ground returns mostly eliminated and missile guidance commands be sent to AIM-7 and AIM-54
 missiles. The AIM-54 both in TWS and STT and the AIM-7 in STT only. The biggest con of this mode being that it is susceptible to notching as a target returning zero relative
 speed will be filtered out.
- The pulse doppler modes of the AN/AWG-9 are pulse doppler search, range while scan, track while scan and pulse doppler STT. The three search modes have a common
 DDD display, the main difference being that pulse doppler search has a slightly better range as the other two modes need to process FM-ranging to enable range indication
 of tracked targets.

ACM modes:

- The AN/AWG-9 has three distinct ACM acquisition modes. Pilot lockon mode (PLM), vertical scan lockon (VSL) and manual rapid lockon (MRL).
- The ACM modes are listed in priority order, the different modes overriding other modes lower in the prioritization. This means that PLM always overrides VSL and lower modes and VSL overrides PAL and lower modes but not PLM and so on.
- All of the modes can be exited by the RIO selecting half-action and release on the HCU except PLM which will be in effect until the pilot releases the PLM button.



2.3.1 – AWG-9 RADAR PULSE MODE – PULSE SEARCH

In the pulse mode of operation, the AN/AWG-9 does not use pulse doppler filtering which means that it can be used to detect targets at all aspects and also be used for rudimentary ground mapping. On the pro side this means that the radar in this mode cannot be notched as it does not need to have a relative speed to register the target.

The downside however is that the radar does not have an easy way of differentiate between unwanted ground reflections and real targets meaning that aircraft can hide in the ground clutter near the ground. Because of this and the increased difficulty from trying to differentiate real targets from the general background noise without doppler filtering means that the range in the pulse modes are less than in the pulse doppler modes.

In the pulse search mode, the display shows only radar returns and a visual representation of the radar sweep and erase sweep. The screen shows range vs azimuth in this mode. This mode cannot guide the AIM-54 (limited to 20 nm). It also does not show information on TID. Pulse can be useful if the target is notching us and we want to keep track of it.



Set Azimuth Scan Range (deg) and Elevation Bars



2.3.2 – AWG-9 RADAR PULSE MODE – PULSE STT LOCK

Pulse STT is used to track a single target, like pulse search mode it is not susceptible to notching but it is to ground clutter. The fact that the STT modes use gates to track the target, in this case range gates, means that it is less susceptible to ground clutter but a target close enough to the ground that the ground return enters the range gates would be likely to shake the lock.

To get a radar lock from Pulse Mode to Pulse STT:

- 1. Make sure you are in Pulse Search Mode
- Select RDR HCU Mode 2.

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- 3. Press and hold the first HCU trigger (Half-Action). The radar cursor will appear on the DDD
- 4. Use the HCU stick to slew the cursor over the desired target.
- 5. Once cursor is over desired contact, press the second HCU trigger (Full-Action) to lock the target.
- 6. Once contact is locked, DDD will go in Pulse STT mode automatically.
- 7. To unlock target, press the first HCU trigger (Half-Action).
- A successful track is indicated by the ANT TRK and RDROT indicator lights on the DDD, meaning that the antenna is tracking the target and that the target is within the range gates.
- The target the display shows, in addition to the return from the target, the tracking gates (either range or range rate gate), a closing rate indication on the right side and the attack symbology if in air-to-air mode and a missile is selected. is displayed at the correct azimuth and range



Radar Cursor

Radar Contact

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2.4.1 – AWG-9 RADAR PULSE DOPPLER – PD SEARCH MODE

Adjust antenna elevation with HCU thumbwheel



The pulse doppler search mode is used mainly as a kind of early warning mode. It is the search mode with the greatest detection range but it can display no range to the RIO, only closure rate. For this reason the TID can display no track information. The scale displays contact azimuth and closure speed only.

The scale shown on the DDD (what rate region is shown) can be set by the Vc switch on the DDD panel. X-4 sets the scale to 800 knots opening to 4 000 knots closing, NORM sets the scale to 200 knots opening to 1 000 knots closing and VID sets the scale to 50 knots opening to 250 knots closing. The operating range of the doppler filters can also be configured by the ASPECT switch on the same panel, NOSE sets 600 knots opening to 1 800 knots closing, BEAM sets 1200 knots closing to 1200 knots opening and TAIL sets 1 800 knots opening to 600 knots closing. This allows the RIO to optimize the doppler filters for a known target closing speed and this affects the whole radar processing unlike the Vc switch which only affects the DDD.



PART 9 – RADAR & SENSORS

F-14B

2.4.1 - AWG-9 RADARPULSE DOPPLER – PD SEARCH MODE

The DDD in the pulse doppler search modes displays returns at azimuth versus rate (closing speed) meaning that by reading only the DDD the RIO can only discern target closing speed and azimuth. The display shows closure rate vs the ground (as if own aircraft was stationary) as opposed to relative closure rate. At the bottom edge of the DDD the AGC-trace is displayed indicating radar return intensity enabling the RIO to discern jamming targets by their return strength. The jamming targets are shown as jamming strobes on the TID if they exceed the set jamming threshold (set by the JAM/JET knob on the DDD).

Because of the way the radar operates the doppler filters it will have two blind ranges:

The mainlobe clutter (MLC) region which contains most of the ground returns, those returning with zero groundspeed is one of them and is 266 knots wide, centered around own aircraft groundspeed (133 knots slower and 133 knots faster). This is the reason that the radar can be notched as a target with the same relative groundspeed as the ground will also be filtered out.

The second filter, and second blind spot, of the radar is the zero doppler filter. This blind area is centered around a closure rate of negative own groundspeed, meaning a target moving away from own aircraft at the same speed as own aircraft. This blind area is a hardware limitation as it is a doppler radar mode it cannot detect targets without a doppler shift. The resulting blind area is 200 knots wide, meaning that a chased target moving at a speed of within 100 knots (+/-) of own groundspeed will be invisible to the radar. This means that when chasing a fleeing target it may very well be necessary to use the pulse modes instead.

Your own airspeed relative to target varies with aspect. Relative airspeed from a target at 45° will be less than a target at 0° as own speed vector will be pointing away from it slightly. This is the reason for the mainlobe clutter trace presenting a curve on the DDD as the observed speed of the returning ground returns will vary with azimuth.



SEARCH (±40° SCAN)



2.4.1 – AWG-9 RADAR PULSE DOPPLER – PD SEARCH MODE



Target ground speed 900 knots, own airspeed 1200 knots. See table for details, line of sight rate is the sum of target and own aircraft relative rate.

	Look Angle (deg)	Line of Sight Rate	Target Heading
1	45° left	1490	180°
2	60° left	1500	120°
3	30° left	1428	100°
4	0°	1200	90°
5	30° right	672	80°
6	60° right	-300	60°
7	45° right	210	0°





2.4.2 – AWG-9 RADAR PULSE DOPPLER – RWS (RANGE WHILE SEARCH) MODE

In Range While Search (RWS), a frequency measuring ranging mode is added (FM ranging) to allow the radar to measure range of tracked targets in addition to closure rate. This additional processing does however mean that the effective range of the radar is somewhat lesser. This mode is used to get a good air picture before switching to TWS (Track While Scan).

- The display on the DDD is the same as in pulse doppler search.
- The TID also shows tracks in this mode showing the targets as tracks momentarily as they're scanned and displaying their position and altitude.





LE 55°44'9

Contact: range approx. 50 nm

LN 25°56'7

0----

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DEST

Set TID Range Selector (nm)

25 / 50 / 100 / 200 /400

MAN



2.4.3.1 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE BASICS

The Track While Scan (TWS) mode uses the same FM ranging as RWS with the same reduction in range compared to pulse doppler search and the DDD display is also the same. The main difference that the computer establishes track files and tracks up to 24 targets concurrently of which 18 can be shown on the TID at any given time.







2.4.3.1 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE BASICS

What differs between the TWS Auto and Manual mode is that in TWS auto the computer takes control of used scan volume and scan pattern azimuth and elevation as soon as target tracks are present.

The TWS mode is also the only mode enabling guidance of the AIM-54 at multiple targets (up to six), and as soon as engageable targets are detected the computer starts assigning them a missile priority number according to optimal missile firing sequence.



TID (Tactical Information Display) Mode Selector

- **GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.
- **A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.
- **ATTAK**: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.
- **TV**: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.





TID (Tactical Information Display) Display Selector Buttons UPPER ROW:

- RID DISABLE: Not simulated.
- **ALT NUM**: Altitude numerals, enables display of track altitudes on the left side of track symbols. Shows a single digit representing ten-thousands of feet
- **SYM ELEM**: Symbology elements, enables display of all supplementary symbology of tracks and waypoints.
- DATA LINK: Enables display of data link tracks.
- JAM STROBE: Enables display of jam strobes on the TID.
- **NON-ATTK**: Non-attack, enables or disables display of targets which aren't possible to engage, friendly targets being an example.

LOWER ROW:

- LAUNCH ZONE: Enables display of weapon launch zones depending on selected missile type. These replace the velocity vectors on relevant targets. This function is automatically enabled by the WCS 60 seconds prior to a target entering maximum launch range. 286
- VEL VECTOR: Velocity vector, enables display of velocity vectors on tracks.

SENSORS F-14B TOMCAT

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2.4.3.2 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) MANUAL MODE

If you want to gather more information from a target without doing a proper radar lock, you can hook a target with the TID cursor only. You can think of it as a "soft lock" that simply gives you ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information.

- Select TWS MAN Mode 1.
- Select "TID CURSOR" TID Mode 2.
- Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display). 3.
- Use the HCU stick to slew the TID cursor over the desired target. 4.
- 5. Once the cursor is over desired contact, press the second HCU trigger (Full-Action) to select the target.







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SENSORS F-14B TOMCAT

2.4.3.2 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) MANUAL MODE

- 6. Once target is selected, ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information will be displayed on the TID. Keep in mind that this is NOT a radar lock and you will not be able to use weapons with this function.
- 7. If you want to lock the target with the radar (hard lock), you can press the PD STT or the Pulse STT button.
- 8. To deselect target, press the first HCU trigger (Half-Action).








2.4.3.3 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

Introduction

TWS AUTO mode works almost just like TWS MAN. The difference is that a number of radar parameters are automatized like scan cone azimuth and elevation angle. Steering cues are also computed to help guide the pilot for the best firing solution. Radar target selection (soft lock) and STT lock (hard lock) is obtained in the same manner as in TWS MAN.

Simply put, TWS-Auto attempts to keep the TWS pattern pointing where it is most useful in azimuth and elevation, while also controlling the optimum scan volume.

The azimuth and elevation angles are determined by a computed <u>weighted centroid (geometric center)</u> of targets in the scan volume. Target weights are a function of a number of parameters we will explore later in this section. This is the <u>steering centroid symbol</u>, which is visible on the RIO's Tactical Information Display. Think of this as a "X symbol that shows where should my radar be looking".



TWS-Auto Tutorial by Jabbers <u>https://youtu.be/k0rwtapUmmY</u>





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2.4.3.3 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

Pilot Steering Cues

TWS-Auto computes steering cues available for the pilot. These will direct the pilot horizontally only, based on the steering centroid computed.

The steering cues are only visible if:

- A-A (Air-to-Air) HUD Mode is selected
- Master Arm is ON (UP)
- Phoenix (AIM-54) or Sparrow (AIM-7) missile is selected
- TWS-Auto is selected from the RIO seat ٠

Phoenix Missile Selected

WCS MODE

AUMO







2.4.3.3 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

RIO Steering Cues & Centroids

TWS-Auto computes steering cues available for the RIO as well on the DDD (Detail Data Display) and TID (Tactical Information Display).

Two separate centroids are calculated as part of the TWS-Auto update procedure: a steering centroid, and an illumination centroid.

- The steering centroid facilitates steering cues (on HUD, VDI, TID, DDD) to help the pilot maintain optimum target coverage, and also displays a small X on the TID indicating the steering centroid. position. The radar gimbal limits (maximum extents, basically ±65° in both azimuth and elevation) are considered when computing this centroid.
- The illumination centroid (not visible) controls the azimuth and elevation of the scan pattern center by using the angles from the aircraft to the computed illumination centroid. The current scan volume limits are considered (i.e. either 2-bar ±40° or 4-bar ±20°) when computing this centroid.
- The velocities (change in position over time) of both steering and illumination centroids are also calculated, used to calculate steering cues for a short period when all targets are lost (in an attempt to re-acquire them at their expected positions).







2.4.3.3 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

Target Weights

CAP Message Selector Buttons *are used by the RIO to modify the status of a target* 3

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MESSAGE

RIEND

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TGT DATA

- Mandatory Attack (MAND ATTK)
- Do Not Attack (DO NOT ATTK)

The <u>steering centroid</u> is determined by a weighted centroid of targets in the scan volume. Some targets contribute more to the steering centroid than others, depending on their respective "weight". The position of each target is multiplied by its weight factor divided by the total weight of all targets, and these weighted positions are added together to give a centroid. Only sensor targets (i.e. own radar) are considered, not datalink targets.

The weight of a target impacts the emplacement of the steering centroid, and is a function of many parameters, the most important being:

- Presence of a launch zone (targets marked as friendly by RIO will never get a launch zone)
- Whether a missile is already underway to a target
- RIO selections on targets such as DO NOT ATTK (Do Not Attack) and MAND ATTK (Mandatory Attack), which can be set from the CAP (Computer Address Panel) buttons of the TGT DATA (Target Data) menu.

CAP Category Selector Switch

• **TGT DATA**: Target Data, contains message button functionality used to modify hooked track symbols.





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2.4.3.3 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

Operation

- TWS-Auto is engaged by pressing the TWS AUTO Mode selector button.
- When TWS-Auto is first engaged, there is a period of 8 seconds where the manual controls for azimuth, elevation and the scan volume pattern are still in effect and can still be controlled by the RIO.
- After this period, the TWS-Auto computer takes over.
- The scan volume pattern (2-bar vs 4-bar) is re-evaluated every 4 seconds, while the steering centroid and illumination centroid are re-evaluated multiple times per second. The weights are updated at the end of each 2 second scan frame.
- The scan volume algorithm considers the future positions of all targets, and selects between which of the two options would give a greater total illumination weight. If they are equal, 4-bar $\pm 20^{\circ}$ is selected.

Take note that firing an AIM-54 Phoenix while in TWS-Manual will result in automatic selection of TWS-Auto. When any AIM-54 missiles are deemed to still be in flight (up to 16 seconds beyond their expected time to impact), TWS-Manual mode cannot be entered. Target tracks that have a missile launched at them will also behave as if Track Hold (the button to the left of the TID fishbowl, see next page) has been selected. In other words, these tracks will continue to be extrapolated for up to 2 minutes if their radar contact is lost.







2.4.3.4 – AWG-9 RADAR PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE ADDITIONAL FUNCTIONS

Track Hold & Collision Steering

The TRACK HOLD button enables the TWS Track Hold function. Normally, targets on the TID in TWS mode are retained for 14 seconds after the last observation. When enabled, the Track Hold function extends this to 2 minutes for all tracks. This is useful if you want to keep an eye on some radar contacts that may slip out of your view momentarily.

Collision Steering Light

(Pilot Seat)

• The <u>CLSN button</u> enables collision steering to currently tracked target (or steering centroid if in TWS). This selection overrides the current steering information presented to the pilot with the collision steering, only exception being if the pilot selects the ACM (Air Combat Manoeuver) mode. LD CLSN (Lead Collision Steering) presents azimuth steering information only, while CLSN (Collision Steering) presents both azimuth and elevation steering information.







2.4.4 – AWG-9 RADAR PULSE DOPPLER – PULSE DOPPLER STT LOCK

The pulse doppler STT (Single Target Track) works and looks much like the pulse STT mode. It does however have the same advantages and disadvantages compared to pulse STT as the other pulse doppler modes compared to the pulse modes. This means that while much better at tracking a target close to the ground it is however vulnerable to notching.

To get a radar lock from Pulse Doppler Mode to Pulse Doppler STT:

- 1. Make sure you are in a Pulse Doppler Mode (PD Search, TWS, RWS)
- 2. Select RDR HCU Mode
- 3. Press and hold the first HCU trigger (Half-Action), the radar cursor will appear on the DDD
- 4. Use the HCU stick to slew the cursor over the desired target.
- 5. Once cursor is over desired contact, press the second HCU trigger (Full-Action) to lock the target.
- Once contact is locked, DDD and TID will go in Pulse Doppler (PD) STT mode automatically. Ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information will be displayed on the TID.
- 7. To unlock target, press the first HCU trigger (Half-Action).
- A successful track is indicated by the ANT TRK and RDROT indicator lights on the DDD, meaning that the antenna is tracking the target and that the target is within the range gates.
- The target the display shows, in addition to the return from the target, the tracking gates (either range or range rate gate), a closing rate indication on the right side and the attack symbology if in air-to-air mode and a missile is selected. The target return and antenna azimuth display is moved to the left side of the screen and a generated synthetic target marker is displayed at the correct azimuth. This is so that the targets range can be displayed by the synthetic target unlike the other pulse doppler modes which only shows closure rate.



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SINGLE TARGET TRACK

2.5.1 – AWG-9 RADAR ACM – PLM MODE

The PLM (Pilot Lockon Mode) is the ACM mode with the highest priority, it always overrides any other radar mode and is enabled when the pilot presses the PLM button on the front of the right throttle. Depression of that button commands the antenna to the armament datum line (ADL) and causes it to lock onto the first target seen out to 5 NM.

The procedure to use PLM is for the pilot to fly the ADL marker on the HUD over the target and then press and hold the PLM button until lockon occurs. The PLM continues until a target is detected and transition to pulse STT occurs or the PLM button is released making the radar transition to pulse search instead.





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2.5.2 – AWG-9 RADAR ACM – VSL MODE

The VSL (Vertical Scan Lockon) mode is enabled by the pilot or the RIO and is used to acquire a target at own aircrafts current heading from an elevation of -15° to +55°. The RIO can use the VSL switch on the sensor control panel in the RIO cockpit.

Two submodes are available by placing the switch into either VSL HI (high) or VSL LO (low) and releasing it back to center. The pilot can enable VSL HI or LO by selecting UP or DN respectively on the target designate switch when not in A/G mode.

This commands the antenna to start a volume 5° wide in a circular fashion. If VSL HI is commanded the vertical area covered is from +15° to +55° and if VSL LO is commanded the area covered is from -15° to +25°. VSL is indicated on the HUD by the diamond moving with antenna line of sight indicating its current position.

When a target is detected within 5 NM the radar transitions into pulse STT, otherwise it continues in VSL until another mode is selected.



Pilot's Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.



ADL (Armament Datum Line)





2.5.3 – AWG-9 RADAR ACM – PAL MODE

The PAL (Pilot Automatic Lockon) mode is enabled by the pilot selecting DES (pressing switch forward) on the target designate switch when not in A/G mode.

PAL commands the antenna to a 8-bar +/- 20° scan pattern locking onto the first target detected out to 15 NM. This mode is indicated by the diamond on the HUD following current antenna line of sight.

Pilot's Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.







2.5.4 – AWG-9 RADAR ACM – MRL MODE

The manual rapid lockon (MRL) mode allows the RIO to quickly acquire a target within the antenna limits out to 5 NM. When the MRL button on the right side of the HCU stick is depressed it commands the radar to start a one-bar supersearch pattern out to 5 NM.

The HCU stick controls the supersearch pattern in azimuth and elevation (left/right controlling azimuth and up/down controlling elevation). The DDD displays a normal supersearch pattern in 5 NM scale and additionally two tick marks are shown at the edge of the scan pattern indicating current elevation. When the target is visible the RIO commands full-action to acquire the target and transfer to pulse STT.

If only half-action is commanded after entering into MRL and then released the radar transfers back to pulse search.







MRL Button

Button selecting the ACM Manual Rapid Lockon (MRL) mode. Overrides all operational modes except PLM and VSL.

2.6 - AWG-9 RADARJESTER

You can ask JESTER to choose what radar mode to use, what scanning parameters to use and who to lock. Simply press "A" and select either the "Beyond Visual Range Radar" menu or the "Within Visual Range Radar" menu.

JESTER will dynamically tell you what contacts he found, where they are and what is their identification and direction in relationship to you.











300

50 NM RADAR

100 NM

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2.7 – AWG-9 RADAR RADAR LINGO & TERMINOLOGY

- BANDIT: Identified Enemy Aircraft
- BOGEY: Unidentified Aircraft
- SPIKE: Air-to-Air radar is locked on you
- BUDDY SPIKE: Friendly radar is locked on you
- NAILS: RWR contact, which emits radar waves but does not have a radar lock on you
- FOX 1: semi-active radar missile (27R/ER + AIM-7)
- FOX 2: heat-seeking infrared missile (27T/ET + AIM-9 + R-73/60)
- FOX 3: active radar missile, meaning the missile tracks to an aircraft's radar up to a certain distance, then its internal radar activates (pitbull) (AIM-54/R-77)
- RIFLE: AGM-65 Air-to-Ground missile
- RAYGUN: When locking a target with your radar, it is good practice to say "RAYGUN" so your teammates are aware that you are locking someone. It is often used to identify a contact as friend or foe. If a person yells "BUDDY SPIKE!", it's very likely that you are locking a friendly contact.
- IFF: meaning "Is he friendly or bandit (enemy)?"
- PITBULL: Any FOX 3 (active radar) missile that starts using its onboard radar for tracking





2.8 - AWG-9 RADAR**RIO BRA CALL**

Target Altitude:

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6523 ft

It is important for the RIO to communicate to the pilot what he sees on radar. In order to do it efficiently, the RIO can perform a "BRA" call (Bearing-Range-Altitude) for friendly, unknown or hostile targets spotted on the radar.

If the RIO hooks up a target on the TID, Target Data readouts will cycle between AL (Altitude), MC (Magnetic Course), RA (Range) and BR (Bearing) information.

Range: 34 nm



302

2.8 – AWG-9 RADAR RIO BRA CALL

The BR (Bearing) given by the radar is actually a bearing <u>relative to the aircraft's nose</u> (0 / 360 bearing). As an example, BR 348 means that the target has a bearing of 348 relative to the aircraft's nose. In simpler terms, the target is 12 degrees off to your left. To get the Target Absolute Bearing, take your absolute heading (308) and add or substract the offset off your nose (12 deg). In our case, target absolute bearing is at 308 - 12 = 296.

A **BRA** (Target Bearing Range Altitude) call from the RIO to the pilot would sound something like:

• "-Bandit, BRA, 296, 34 miles, angels 6.5."

You could also refer to a target in relationship to the aircraft nose (Bandit, 12 degrees left).

A **BRA(A)** (Bearing Range Altitude Aspect) includes the target aspect (Hot if target goes towards you, Cold if target goes away from you. Can be deduced from Target Magnetic Course). A BRA(A) call would sound something like:

• "-Bandit, BRA(A), 296, 34 miles, angels 6.5, hot."









50th Anniversary

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The TCS is located underneath and behind the radar radome, just in front of the nose gear well. It contains an aircraft stabilized high resolution (for it's time) closed circuit television camera mainly used for reconnaissance and visual identification of an aircraft.

The sensor has two fields of view (FOV), narrow (NFOV) which is 0.44° or 10X magnification and wide (WFOV) which is 1.42° or 4X magnification. The gimbal limits are +/- 15° except upwards which is limited to +11° and the TCS is capable of independent contrast lock or being slaved to the AN/AWG-9 radar.

Therefore, an easy way to use the TCS is to set the IR/TV Power switch ON (allow 2 minutes of warm-up time at STBY), lock a target using the radar, then set the TID Mode selector to TV.



TID (Tactical Information Display) Mode Selector

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- **GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.
- **A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.
- **ATTAK**: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.
- **TV**: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD.



3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

HCU (Hand Control Unit) Main Radar & TCS (Television Camera Set) Control Stick

IR/TV Overtemperature Indicator Light *Light indicating the presence of an overtemperature condition in the TCS.*

IR/TV Switch Switch controlling TCS power. Enables selection of OFF/STBY and ON.

HCU (Hand Control Unit) Mode Selector Buttons

- *IR/TV Mode* Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.
- **RADAR Mode** Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.
- **DDD Mode** Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.
- **TID Mode** Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.

3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

The FLIR sensor itself has three different zoom levels or fields of view (FoV): wide, narrow and Expanded. Limits and maximum slew rates are listed in the Heatblur F-14 wiki.



RACH (AWG-9 radar Line-of-

Sight relative to TCS LOS)

TCS Track Window

3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

When the LANTIRN targeting pod is installed, the LANTIRN VIDEO Switch allows the RIO to toggle between the LANTIRN targeting pod feed and the TCS feed.

The pilot can consult the TCS feed by setting the VDI (Vertical Display Indicator) Mode to TV.

When the A/A (Air-to-Air) HUD Mode is selected, the JESTER AI will select the TCS feed by default.





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3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

In cases where the A/G (Air-to-Ground) HUD Mode is selected, the JESTER AI will select the LANTIRN feed by default.

However, it is possible for JESTER to display TCS feed while in A/G HUD Mode. To do so:

- 1. From the JESTER Main Menu, select "Air-to-Ground Weapons"
- 2. Select "Use TCS Utility"
- 3. JESTER will switch the LANTIRN Video Switch to the TCS feed instead.





TCS Feed on VDI

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4.1 – LANTIRN TARGETING POD INTRODUCTION

The LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) Targeting Pod is a targeting system developed to provide precision strike capability. Target designation is achieved by using a laser designator/range finder or an infrared laser marker, which can be created by the pod itself. It is also capable of displaying a FLIR (Forward-Looking Infrared) thermal imagery. The LANTIRN does not have all the modern capabilities or resolution of the newer LITENING or ATFLIR targeting pods of the F/A-18C Hornet, but the LANTIRN was very advanced hardware for the time.

The LANTIRN began life as combined targeting and navigation pods designed for the F-15E and F-16. When the US Navy became interested in using the F-14 Tomcat in the air-to-ground role, Martin Marietta (now Lockheed Martin) began its own program to show that the LANTIRN could quickly be adapted for F-14 use. As the pod was adapted for the F-14, the secondary navigational pod was deleted, keeping only the targeting pod. The pod was wired up to its own control panel as the F-14 didn't have the required 1553-bus for complete integration. The control panel was patched into the TCS (Television Camera Set) -> TID (Tactical Information Display) video feed allowing it to select either the TCS or the LANTIRN for display on the TID and VDI (Vertical Display Indicator). While the pod can read waypoints and selected weapon from the WCS, the pod has its own GPS receiver and is otherwise self-contained and controlled only via its own control panel. Additionally it also has its own weapons release guidance removing the need to boresight the pod to the aircraft, a time-consuming task.



4.2 – LANTIRN TARGETING POD **DISPLAY & SYMBOLOGY**

The primary display of the targeting pod is the TID (Tactical Information Display), located in the RIO seat. To view the LANTIRN feed:

- 1. Power up the Targeting Pod using the LANTIRN Power Switch
- Press the LANTIRN VIDEO switch to select FLIR (Forward-Looking Infrared) feed 2.
- 3. Set the TID Mode Selector to TV.

LANTIRN Targeting Pod Power Switch

- **OFF** disables power to the system
- **IMU** (Inertial Measurement Unit) powering only the LANTIRN IMU
- **POD** powers the whole system

LANTIRN VIDEO Switch

Controls what video is fed to the TID and VDI, FLIR selecting LANTIRN FLIR video and TCS selecting TCS video.

TID (Tactical Information Display) Mode Selector

• GND STAB: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.

12

- A/C STAB: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.
- ATTAK: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.
- TV: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.



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4.2 – LANTIRN TARGETING POD **DISPLAY & SYMBOLOGY**



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4.2 – LANTIRN TARGETING POD DISPLAY & SYMBOLOGY

The Targeting Pod View Relative Direction symbol on the FLIR display can give you a good idea of where the pod is pointing in relationship to your aircraft. This view direction is represented in a top-down view.

Situational Awareness Cue (Targeting Pod View Relative Direction)





4.2 – LANTIRN TARGETING POD DISPLAY & SYMBOLOGY

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The pilot can also monitor the LANTIRN feed by setting the VDI (Vertical Display Indicator) Mode switch to TV.

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VDI (Vertical Display Indicator) Mode:

- **TV**: Displays video from TCS or LANTIRN on VDI
- NORMAL: Displays normal VDI display

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PART 9 - RADAR & SENSORS

F-14B TOMCAT

4.3 – LANTIRN TARGETING POD CONTROLS

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Here is a simplified overview of the LANTIRN controls. The majority of controls are available on the Control Stick in the RIO seat.

- <u>Center Slew Hat Switch</u>: Used to slew (LEFT/RIGHT/UP/DOWN) the sensor line-of-sight itself and DEPRESSION of this hat switch toggles between white hot (WHOT) and black hot (BHOT) sensor modes.
- Left Four-Way Hat (S3) Switch: Selection of QWp- and QWp+ (Cue-to-Waypoint) (LEFT/RIGHT) in addition to Point Track (UP) and Area Track (DOWN) modes.
- **<u>Right Four-Way (S4) Hat Switch</u>**: Functions of this switch change based on the Two-Way Slider position.
 - Allows for selection of QADL/QHUD (UP), QDES (RIGHT) and QSNO (DOWN) in addition to declutter level which is cycled by MOMENTARY DEPRESSION of the hat.
 - **QADL** = Cue to Armament Datum Line
 - **QHUD** = Cue to Heads-Up Display
 - **QDES** = Cue to Designate
 - **QSNO** = Cue to Snowplow.
- <u>Two-Way Slider (Front)</u>: Changes function of Right Four-Way (S4) Hat Switch. Slider is springloaded to return to center position.
 - Setting slider forwards allows for selection of manual gain while releasing and sliding it forwards again reselects automatic gain. Change of the manual gain with manual gain already selected can be done by sliding the switch forwards and holding it for 2 seconds.
 - S4 Right Hat Function: With manual gain mode active, UP/DOWN on the S4 Right Hat increases and decreases the gain while LEFT/RIGHT on the S4 Right Hat decreases and increases level.
 - Setting slider aft momentarily allows selection of used laser code, while sliding it aft and holding allows for focus control.
 - S4 Right Hat function when set to laser code change: the S4 Right Hat selects digit to change with LEFT/RIGHT and increases and decreases the selected digit with UP/DOWN.
 - S4 Right Hat function when set to focus control: the S4 Right Hat increases and decreases focus with UP/DOWN.
- IR Sensor FOV Toggle Button: Cycles between FOV (Field-of-View) levels of the infrared sensor.
- <u>LANTIRN Operation Mode Selector</u>: Toggles Air-to-Air and Air-to-Ground operation modes. FWD selects A/G (Air-to-Ground), AFT selects A/A (Air-to-Air), and the selector DEPRESSED undesignates a target.
- <u>Laser-Fire Button</u>: Fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent. A renewed press on the laser latch button resets the latched laser fire timer to 60 seconds, beginning a new 60 second countdown.
- **LANTIRN Two-Stage Trigger**: First trigger detent is used to manually lase the target. Second detent is used to fire the laser and designate QDES at the current sensor position.





4.3 – LANTIRN TARGETING POD CONTROLS

LANTIRN Power-up is done with the LANTIRN Control Panel.

LANTIRN Targeting Pod Control Stick

LANTIRN Targeting Pod Power

Laser Armed Light

LANTIRN Laser Switch

OFF disables power to the system **IMU** (Inertial Measurement Unit) powering only the LANTIRN IMU **POD** powers the whole system

Switch

ARM/SAFE

LANTIRN IBIT (Initiated Built-In Test) Button

LANTIRN VIDEO Switch

Controls what video is fed to the TID and VDI, FLIR selecting LANTIRN FLIR video and TCS selecting TCS video.

LANTIRN Mode Switch (OPER/STANDBY)

LANTIRN Failure Indicator Lights

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4.3 – LANTIRN TARGETING POD CONTROLS

An excellent LANTIRN pod tutorial by Redkite is available on youtube. Feel free to consult the video below.

Link: https://youtu.be/R9-8UCj66Ds



DCS F-14b Tomcat LANTIRN Pod and Laser guided Bombs Tutorial

RedKite Published on 12 Mar 2019

47,971 views

A detailed guide to get you dropping laser guided bombs and using all the features of the LANTIRN targeting pod Support the creation of more contentl: https://www.patreon.com/RedKite

Time codes: 1:31 Setup (Pilot + Rio) 4:05 Display information (Pilot + Rio) 9:22 Controls (Rio) 15:01 Attack preparation (Rio) 16:21 Finding the target (Pilot + Rio) 19:31 Attacking the target (Pilot + Rio) SHARE ≡+ SAVE



LANTIRN Slider Laser/Focus LANTRIN Area Track LANTRIN Toggle FOV LANTRIN QWP+ ANTRIN OWP-LANTRIN S4 HAT Down (QSNO/Code -/Gain-) ANTRIN S4 HAT Right (QDES/Digit Right/Level+) ANTRIN S4 HAT Up (QADL/QHUD/Code +/Gain+)

LANTIRN Mode Toggie LANTIRN Slider AGC/MGC

319





4.4 – LANTIRN TARGETING POD START-UP & LASING PROCEDURE

From the RIO Seat:

- 1. When on the ground, set Targeting Pod Power Switch to POD.
- Set VIDEO switch to FLIR to select LANTIRN video feed in lieu of TCS feed for the TID. 2.
- 3. Set TID Mode to TV to display LANTIRN feed.
- LANTIRN pod will warm up during 8 minutes. 4.
- 5. When warm-up is complete, the LANTIRN Mode switch will automatically switch to STANDBY mode.
- 6. Press LANTIRN Mode switch to set it to OPERATE. STANDBY caution will flash for 30 seconds, then will switch to OPER.
- 7. Set Laser Arm switch to ARM. LASER ARMED indication will illuminate.













4.4 – LANTIRN TARGETING POD **START-UP & LASING PROCEDURE**

From the RIO Seat:

- 8. Set LANTIRN laser code setting to the laser code set by the ground crew (in our case, 1688). To modify LANTIRN laser code option:
 - a) Press the LANTIRN Slider laser/focus
 - b) Modify the laser code using the Right Four-Way Hat (S4) switch Left/Right switch to select what digit to edit and the **Right S4 Hat Up/Down** switch to increment/decrement a digit.
 - c) Depress the Right Four-Way Hat (S4) switch to cycle between Auto and Manual mode. We will select manual mode since the RIO will manually lase the target.
 - d) Press the LANTIRN Slider laser/focus button again to deselect laser code.
- 9. Press the LANTIRN Slider AGC/MGC to set Automatic or Manual Gain Control. We will set Automatic.
- 10. Press the LANTIRN Mode Toggle to select between A/A (Air-to-Air) and A/G (Air-to-Ground) Mode. We will select A/G Mode.





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4.4 – LANTIRN TARGETING POD START-UP & LASING PROCEDURE

From the RIO Seat:

- 11. If a waypoint is close to the target, you can slew the LANTIRN pod to this waypoint by using the Left Four-Way Hat switch Right (QWP+) to select the desired waypoint. This will use an existing waypoint as a cue for the targeting pod.
- 12. If no waypoint is available, you can use the **Right S4 Down switch** to use QSNO (Cue-Snowplow) Mode. This will slew the pod to the direction the aircraft nose is pointing. You can coordinate with the pilot to point the aircraft in an approximate location of the target and let you slew the pod manually from there.
- 13. Use the LANTIRN Toggle FOV button to zoom in or out as required.







4.4 – LANTIRN TARGETING POD START-UP & LASING PROCEDURE

From the RIO Seat:

- 14. Slew the LANTIRN using the **Center Slew Hat Switch** to move the cursor manually on the target.
- 15. If desired, toggle between Black Hot (BHOT) and White Hot (WHOT) by depressing the Center Slew Hat Switch
- 16. Once cursor is on the target, press the Left Four-Way Hat switch Up (Area Track) to stop the cursor from drifting.
- 17. If desired, press the Left Four Way Hat switch Down (Point Track) to track an object like a high-contrast vehicle.





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4.4 – LANTIRN TARGETING POD **START-UP & LASING PROCEDURE**

From the RIO Seat:

- 18. Press the LANTIRN Trigger Full-Action (second Detent) to designate the target. Once designated, the TTG (Time-to-Go) value and slant range values will be calculated properly.
 - When TREL (time to release) counter reaches 0, press and hold the LANTIRN ٠ Trigger Full-Action (second Detent) to lase the target. The « L » will blink as the laser is being fired. If the autolase mode is activated, the laser will begin firing at 10 seconds TIMP (Time-to-Impact) until TIMP zero +4 seconds.
- 19. You can also use the **Laser Latched** button to fire the laser. Selecting it fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent.
- 20. To undesignate a target, depress the LANTIRN Mode Toggle selector (LANTIRN Undesignate control).





4.5.1 – LANTIRN TARGETING POD POINTING METHODS – OVERVIEW

There are a few methods to point a target with the targeting pod.

- **QADL (Cue Armament Datum Line)** mode has the FLIR slaved to the Armament Datum Line (ADL) on the Heads-Up Display in A/A Mode.
- QHUD (Cue Heads-Up Display) mode has the FLIR slaved to the aircraft wings symbol on the Heads-Up Display in A/G Mode.
- **QSNO (Cue Snowplow)** mode is a mode when no Target designation exists and the targeting pod points in front of the aircraft.
- QWP (Cue Waypoint Slaving) mode snaps the FLIR to a selected navigation waypoint.
- QDES (Cue Designation) mode designates the current sensor position (FLIR line-of-sight) as the designation cue (QDES).
- Area Track is used to keep track of a specific area. This is best used for buildings of fixed targets. Area Track can be set from any other pointing method with Left Four-Way Hat Switch UP.
- **Point Track** is used to keep track of a specific moving point. This is best used for moving targets. Point Track can be set from any other pointing method with Left Four-Way Hat Switch DOWN.



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Center Slew Hat

• UP: QADL (A/A) or QHUD (A/G)

Right Four-Way Hat (S4) Switch

LEFT: QWP-

RIGHT: QWP+

• RIGHT: QDES

• DOWN: **QSNO**

LANTIRN Two-Stage Trigger

Left Four-Way Hat UP: Area Track

DOWN: Point Track

LANTIRN Operation Mode Selector

- AFT: A/A Mode
- FWD: A/G Mode
- DEPRESSED: LANTIRN Undesignate

Area Track Reticle

Point Track Reticle



4.5.2 – LANTIRN TARGETING POD POINTING METHODS – POINT & AREA TRACK

"Point Track" tracks a high contrast moving object (like a vehicle), while "Area Track" tracks a static high contrast area (like buildings).

- To enter **Area Track**, make sure you are in A/G (Air-to-Ground) Mode first, then slew the targeting pod using the Center Slew Hat Switch to move the cursor, then press the **Left Four-Way Hat Switch UP**.
- To enter **Point Track**, first enter Area Track as shown before, then press the **Left Four-Way Hat Switch DOWN**.
- RATES mode means the targeting pod is not tracking any high-contrast point or area on the ground.

LANTRIN Trigger Full Action LANTRIN Trigger Half Action LANTRIN Laser Latched LANTRIN Point Track LANTRIN QWP+ LANTRIN QWP-LANTRIN S4 HAT Down (QSN0/Code -/Gain-) LANTRIN S4 HAT Left (Digit Left/Level-) LANTRIN S4 HAT Press (Declutter/Lase Auto-Man/MGC LANTRIN S4 HAT Right (QDES/Digit Right/Level+)

LANTIRN A/A or A/G Toggle

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PART 9 - RADAR & SENSORS





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Center Slew Hat

Left Four-Way Hat

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4.5.3 – LANTIRN TARGETING POD POINTING METHODS – QADL/QHUD (Cue to ADL/HUD)

Use the Right Four-Way Hat (S4) Switch UP to select either the QADL (Cue Armament Datum Line) or the QHUD (Cue Heads-Up Display) mode. The selection of the QADL or QHUD mode is based on what Operation Mode is selected;

- A/A selects QADL, which slaves the FLIR sensor line-of-sight to the Armament Datum Line of the Heads-Up Display.
- A/G selects QHUD, which slaves the FLIR sensor to the aircraft wing symbol of the Heads-Up Display.

To select QADL:

- 1. Select A/A Operation Mode by using the LANTIRN A/A-A/G Toggle Switch.
- 2. Press the Right Four-Way Hat (S4) Switch UP.
- 3. QADL mode will be selected. Targeting pod points to the Armament Datum Line of the HUD (provided the HUD is set to the A/A mode by the pilot). This mode is useful for air targets.



A/A HUD Mode





4.5.3 – LANTIRN TARGETING POD POINTING METHODS – QADL/QHUD (Cue to ADL/HUD)

To select QHUD:

- 1. Select A/G Operation Mode by using the LANTIRN A/A-A/G Toggle Switch.
- 2. Press the Right Four-Way Hat (S4) Switch UP.
- 3. QHUD mode will be selected. Targeting pod points to the Aircraft Wing Symbol of the HUD (provided the HUD is set to the A/G mode by the pilot). This mode is useful for ground targets.







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4.5.4 – LANTIRN TARGETING POD POINTING METHODS – QSNO (Cue to Snowplow)

Use the Right Four-Way Hat (S4) switch DOWN to use QSNO (Cue-Snowplow) Mode. QSNO slaves the sensor to the ground 15 nm directly in front of the aircraft along your own aircraft heading. You can coordinate with the pilot to point the aircraft in an approximate location of the target and let you slew the pod manually from there.







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4.5.5 – LANTIRN TARGETING POD POINTING METHODS – QDES (Cue to Designation)

QDES (Cue Designation) mode designates the current sensor position (FLIR line-of-sight) as the designation cue (QDES). By selecting the second detent on the LANTIRN trigger, the current sensor track or location is lased and a new location stored using that data. This is called the QDES and is used to designate targets for engagement as well as allowing the RIO to select a new location for navigational reference on the fly.

The QDES cannot be automatically transferred to the WCS (Weapon Control System), but the RIO can enter it manually using the target location information in the pod video feed. The lower right datablock is enabled for the location Qs only, but will remain even when the pod is slewed away in area or point track modes. As soon as another Q is selected however, it will update to that location instead or be removed if a directional Q is selected. As an example:

- 1. Select A/G Operation Mode by using the LANTIRN A/A-A/G Toggle Switch.
- 2. Slew Targeting Pod with Center Slew Hat
- 3. Press LANTIRN Two-Stage Trigger second detent to designate QDES. This will save the LANTIRN reticle's position as QDES.
- 4. Press **Right Four-Way Hat (S4) switch RIGHT** to slave the FLIR to the QDES (designation cue) we just saved. This targeting pod's line-of-sight will snap to the last saved QDES position. This is useful to re-acquire targets.



4 Right Four-Way Hat (S4) Switch • RIGHT: QDES LANTIRN Two-Stage Trigger 3 LANTIRN A/A or

A/G Toggle

Center Slew Hat

2

Reticle Slaved to QDES Position



4.5.6 – LANTIRN TARGETING POD POINTING METHODS – QWP (Cue to Waypoint)

You can slave the targeting pod to an existing waypoint in your database. Use the **Left Four-Way Hat switch Right (QWP+) or Left (QWP-) to select the desired waypoint.** This will use an existing waypoint as a cue for the targeting pod.





4.6 – LANTIRN TARGETING POD LANTIRN POD LIMITATIONS

Airframe Masking Guide (Limits of the camera before it will be masked by the aircraft fuselage)

The LANTIRN targeting pod has a few limitations when compared to more modern pods like the LITENING or the ATFLIR:

- The LANTIRN cannot search, spot or track a laser from another laser designator (like a wingman or a JTAC). You can only ٠ self-designate a target.
- The LANTIRN cannot be slaved to a target locked by the radar. However, the LANTIRN can perform a point track acquisition for air-to-air targets.
- The LANTIRN line-of-sight can be masked by the aircraft's airframe, which is indicated by a contour line on the targeting ٠ pod feed.
- The FLIR sensor itself has three different zoom levels or fields of view (FoV). The Wide FoV limits are 5.9° and allows a ٠ maximum slew rate of 8.5°/s. The Narrow FoV limits are 1.7° and allows a maximum slew rate of 1.8°/s. The last mode, the Expanded FoV is a digital zoom of the Narrow FoV, meaning that the resolution will be worse in this mode. The FoV limits for the Expanded FoV are 0.8° with a max slew rate of 0.7°/s.



TOMCAT

F-14B

122

SENSORS TOMCAT F-14B

4.7 – LANTIRN TARGETING POD AIR-TO-AIR OPERATION

The LANTIRN can also be use to track air targets like helicopters:

- 1. Select A/A Operation Mode by using the LANTIRN A/A-A/G Toggle Switch.
- 2. Press the Right Four-Way Hat (S4) Switch UP.
- 3. QADL mode will be selected. Targeting pod points to the Armament Datum Line of the HUD. The pilot can fly the aircraft to line up the ADL with the air target.
- 4. Use the center slew hat of the LANTIRN stick to move the reticle near the air target (a Hind helicopter in this example).
- 5. To enter **Point Track**, first press the **Left Four-Way Hat Switch DOWN**. The LANTIRN will then track the helicopter.





PART 9 – RADAR & SENSORS

4.8.1 – LANTIRN TARGETING POD JESTER LANTIRN OVERVIEW

By default, the JESTER AI will select the LANTIRN feed when the pilot selects the A/G (Air-to-Ground) HUD Mode.

JESTER can control the targeting pod for you to acquire and designate targets. See next page for an overview of the JESTER LANTIRN functions available.

Redkite has done a great video that sums up the implementation of JESTER for LANTIRN use: <u>https://youtu.be/tk45yiXvqjk</u>



Use the Jester Contextual Menu by selecting the A/G HUD Mode and pressing "A", which allows you to select one of the following menu and sub-menus:

JESTER LANTIRN FUNCTIONS (MENU #1)

- Head Control Utility: Allows the pilot to tell JESTER where to point the targeting pod.
 - **QEYEBALLS Utility**: creates a red reticle on your screen, allowing you to look outside the cockpit and look directly at a target. JESTER will then slew the targeting pod on the target you are looking at.
 - **Direct Head Control Utility**: creates a red reticle on your screen, allowing you to look on the targeting pod feed on the VDI (Vertical Display Indicator) and to slew the targeting pod using head movements. JESTER will then slew the targeting pod based on your head movements.
- Set Q Mode Utility:
 - **QHUD Utility**: JESTER slaves the targeting pod to the aircraft wing symbol on the Heads-Up Display.
 - **QSNO Utility**: JESTER sets targeting pod in Snowplow pointing mode.
 - **QWP Utility**: JESTER slaves the targeting pod to an existing waypoint cue.
 - **QDES Utility:** JESTER slaves the targeting pod to a previously designated target cue (QDES). This is useful to re-acquire previous targets for damage assessment.
 - **QMAP Marker Utility**: JESTER slaves the targeting pod to a player-made map marker created via the F10 Map.

A/I

A/G HUD Mode

- Ground Stabilize Area Utility: JESTER stabilizes the targeting pod at its current position and performs an area track.
- Search for Targets Utility: JESTER searches for targets.
- Next Page Utility: selects the second set of LANTIRN menus and sub-menus.

JESTER LANTIRN FUNCTIONS (MENU #2)

- Laser Always On Utility: JESTER manually turns on the laser when the target is designated (useful when "buddy lasing").
- Set Laser Code Utility: JESTER sets the targeting pod laser code.
- **Designate Utility**: JESTER designates the selected target with the targeting pod, creating a designation cue (QDES).
- **Disable Auto-Designate Utility**: JESTER can point the targeting pod to a target but not necessarily create/update the QDES (designation cue) using the second-stage trigger.
- Set BHOT/WHOT Utility: Toggles between White Hot and Black Hot pod polarities.
- Reset Utility: Resets all targeting pod functions.





TOMCAT

F-14B

4.8.2 – LANTIRN TARGETING POD 4.8.2.1 – JESTER TARGET DESIGNATION – QMAP (Cue to F10 Map Marker)

JESTER allows you to slave the targeting pod to a pre-determined point on the F10 map. To do so, create a Map Marker from the F10 map first, then ask JESTER to slave the LANTIRN to its location by using the QMAP utility.

- 1. Press F10 to display the map, then select the MARK LABEL button
- 2. Click where you want to create a point, then type in a short but recognizable name for your target (i.e. "Chuck's Target"). Make sure to give it a name that makes sense since people in multiplayer will also be able to see it.
- 3. Now that your Marker is created, JESTER will now magically know the coordinates of that marker (DCS: it's a magical place!).
- 4. Select the A/G HUD Mode and VDI TV Mode.

VDI (Vertical Display Indicator) Mode:

TV: Displays video from TCS or LANTIRN on VDI
NORMAL: Displays normal VDI display





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F-14B





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4.8.2 – LANTIRN TARGETING POD 4.8.2.1 – JESTER TARGET DESIGNATION – QMAP (Cue to F10 Map Marker) 10. Press "A" to access the LANTIRN contextual menu.

- 11. Access the "NEXT PAGE" menu.
- 12. Select "DESIGNATE UTILITY".
- 13. JESTER will then designate the target by pressing the two-stage trigger of the LANTIRN stick. Weapon release symbology and steering cues will become visible on the HUD.
- 14. JESTER will give you steering commands vocally to line up the target.







4.8.2 – LANTIRN TARGETING POD 4.8.2.2 – JESTER TARGET DESIGNATION – Target Search via Pilot (QEYEBALLS)

JESTER can slave the targeting pod to where the pilot is looking by using the QEYEBALLS function. QEYEBALLS creates a red reticle on your screen, allowing you to look outside the cockpit and look directly at a target. JESTER will then slew the targeting pod on the target you are looking at.

3

GROUND STABILIZE AREA UTILITY

SET & MODE

3

SEARCH FOR TARGETS

PRESS 👩

PRESS

- 1. Select the A/G HUD Mode and VDI TV Mode.
- Press "A" to access the LANTIRN contextual menu. 2.

HEAD CONTROL

PRESS

CONTEXTUAL MENL

- Access the "HEAD CONTROL UTILITY" menu. 3.
- Select "QEYEBALLS UTILITY". 4.

AIR TO GROUND

2

NEXT PAGE



A/G HUD Mode

VDI (Vertical Display Indicator) Mode:

TO

• **NORMAL**: Displays normal VDI display

• TV: Displays video from TCS or LANTIRN on VDI

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4.8.2 – LANTIRN TARGETING POD 4.8.2.2 – JESTER TARGET DESIGNATION – Target Search via Pilot (QEYEBALLS)

- 5. A red circle will appear on your screen. Move your head to set the red circle on the target you want to designate.
- 6. Press "A" to select the target.
- 7. JESTER will slew the targeting pod and perform an Area Track on the location you pointed at.







4.8.2 – LANTIRN TARGETING POD 4.8.2.2 – JESTER TARGET DESIGNATION – Target Search via Pilot (QEYEBALLS)

- 8. Press "A" to access the LANTIRN contextual menu.
- 9. Access the "NEXT PAGE" menu.
- 10. Select "DESIGNATE UTILITY".
- 11. JESTER will then designate the target by pressing the two-stage trigger of the LANTIRN stick. Weapon release symbology and steering cues will become visible on the HUD.
- 12. JESTER will give you steering commands vocally to line up the target.







4.8.2 – LANTIRN TARGETING POD 4.8.2.3 – JESTER TARGET DESIGNATION – Target Search via JESTER

JESTER can search for targets by himself using the targeting pod. Here is an overview of how to use this functionality.

- 1. Select the A/G HUD Mode and VDI TV Mode.
- 2. Press "A" to access the LANTIRN contextual menu.
- 3. Access the "SEARCH FOR TARGETS" menu.
- 4. Select desired search command.
 - Note: "active" refers to normal enemy units placed in a mission. "All" refers to both normal enemy units placed in a mission and static objects as well.
- 5. JESTER will then slew the targeting pod and look for targets based on the search command you selected. JESTER will perform an Area Track on the first target he spots.





VDI (Vertical Display Indicator) Mode:

- TV: Displays video from TCS or LANTIRN on VDI
- NORMAL: Displays normal VDI display





4.8.2 – LANTIRN TARGETING POD 4.8.2.3 – JESTER TARGET DESIGNATION – Target Search via JESTER

- 6. Press "A" to access the LANTIRN contextual menu.
- 7. Access the "NEXT PAGE" menu.
- 8. Select "DESIGNATE UTILITY".
- 9. JESTER will then designate the target by pressing the two-stage trigger of the LANTIRN stick. Weapon release symbology and steering cues will become visible on the HUD.
- 10. JESTER will give you steering commands vocally to line up the target.
- 11. If multiple targets are spotted, you can cycle between targets by using the "NEXT TARGET UTILITY".









ART 9 – RADAR & SENSORS

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TOMCAT

F-14B

4.8.2 – LANTIRN TARGETING POD

4.8.2.4 – JESTER TARGET DESIGNATION – Pilot Head Control of LANTIRN Pod

VDI (Vertical Display Indicator) Mode:

A/G HUD Mode

- TV: Displays video from TCS or LANTIRN on VDI
- NORMAL: Displays normal VDI display

JESTER can slew the targeting pod based on the pilot head movements. Selecting "Pilot Head Control" creates a red reticle on your screen, allowing you to look on the targeting pod feed on the VDI (Vertical Display Indicator) and to slew the targeting pod using head movements. JESTER will then slew the targeting pod based on your head movements. Here is an overview of how to use this functionality.

- 1. Select the A/G HUD Mode and VDI TV Mode.
- 2. Press "A" to access the LANTIRN contextual menu.
- 3. Access the "SET Q MODE UTILITY" menu.

TOMCAT

F-14B

- 4. Select either the "QSNO UTILITY" menu to select Snowplow Mode or "QHUD UTILITY" to select HUD Cueing.
 - Note: you could also select any other targeting pod mode, such as QWP (or even the QEYEBALLS function).
- 5. JESTER will select the desired LANTIRN Mode.



4.8.2 - LANTIRN TARGETING POD 4.8.2.4 – JESTER TARGET DESIGNATION – Pilot Head Control of LANTIRN Pod

- 6. Press "A" to access the LANTIRN contextual menu.
- 7. When the LANTIRN reticle is over an area of interest, select "GROUND STABILIZE AREA UTILITY". JESTER will perform an Area Track on the targeting pod reticle.
- 8. Press "A" to access the LANTIRN contextual menu.
- 9. Access the "HEAD CONTROL UTILITY" menu.
- 10. Select "DIRECT HEAD CONTROL UTILITY".





4.8.2 – LANTIRN TARGETING POD 4.8.2.4 – JESTER TARGET DESIGNATION – Pilot Head Control of LANTIRN Pod

- 11. A red dot and a small red circle will appear on your screen. Move your head to set the red dot on the center of the red circle.
- 12. When red dot is positioned correctly, the small circle will become a big circle.
- 13. Move your head in the direction that you want JESTER to slew the targeting pod. As an example, if the red dot is to the upper left side of the big red circle center, JESTER will slew the targeting pod up and left. The distance between the red dot and the center of the big red circle is proportional to the slewing rate of the targeting pod.
- 14. When targeting pod reticle is over the desired target, press "A" to tell JESTER to perform an Area Track.



TOMCAT SENSORS **Small Red Circle** Š RADAR 5 ART 0

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18. JESTER will then designate the target by pressing the two-stage trigger of the LANTIRN stick.

Weapon release symbology and steering cues will become visible on the HUD.

19. JESTER will give you steering commands vocally to line up the target.

15. Press "A" to access the LANTIRN contextual menu.

Access the "NEXT PAGE" menu.
Select "DESIGNATE UTILITY".

4.8.2 – LANTIRN TARGETING POD

4.8.2.4 – JESTER TARGET DESIGNATION – Pilot Head Control of LANTIRN Pod





4.8.3 – LANTIRN TARGETING POD JESTER LASER SETUP

JESTER can set the targeting pod's laser code to match the laser code of laser-guided bombs installed on your aircraft.

- 1. Press "A" to access the LANTIRN contextual menu.
- 2. Access the "NEXT PAGE" menu.
- 3. Select "SET LASER CODE UTILITY".
- 4. Select laser code.
- 5. JESTER will then enter the laser code manually.
- 6. From the LANTIRN contextual menu, you can also select the "LASER ALWAYS ON" option to force JESTER to keep the laser ON. This is useful in cases where you want to lase a target for someone else.



	GROUND SETTINGS	
LASER CODE :	1	
	6	RSHIFT-RALT-1
	8	RSHIFT-RALT-2
	8	RSHIFT-RALT-3
M-61 BURST :	BURST 200	RSHIFT-RALT-4
KY-28 KEY :	1	RSHIFT-RALT- +/-









SECTION STRUCTURE

- 1 Introduction
 - 1.1 Introduction to Weapons
 - 1.2 My Weapons Control Setup
 - 1.3 Armament Stations
 - 1.4 Weapons Setup
 - 1.5 Bomb Delivery Modes

2 – Air-to-Ground Weapons

- 2.1 Unguided Bomb (MK-82 Computer Pilot/CCIP)
- 2.2 Unguided Bomb (MK-82 Computer Target/CCRP)
- 2.3 ZUNI Rockets
- 2.4 M61 Gun (Air-to-Ground)
- 2.5 Using TCS (Television Camera Set)
- 2.6 GBU-12 Paveway II (Laser-Guided)
 - 2.6.1 Laser Code Setup
 - 2.6.2 With Human RIO
 - 2.6.3 With JESTER AI
- 2.7 TALD Decoys

• 3 – Air-to-Air Weapons

- 3.1 M61 Gun (Manual/No Radar Tracking)
- 3.2 M61 Gun (RTGS/No Radar Tracking)
- 3.3 M61 Gun (RTGS/Radar Tracking)
- 3.4 AIM-9M Sidewinder (No Radar)
- 3.5 AIM-9M Sidewinder (Radar)
- 3.6 AIM-7M Sparrow (Radar)
- 3.7 AIM-54 Phoenix (Single Target)
- 3.8 AIM-54 Phoenix (RIO Six Shooter)
- 4 Selective Ordnance Jettison
- 5 Videos

		1 1 INITO		1					
	§ L	1.1 - 111 F	CODUCTION			BOMBS			
14B MCA		WEAPON	ТҮРЕ			WEAPON	TYF	ΡE	
F-1		MK-81	250 lbs low-drag u Fuze: Nose	inguided bomb		MK-82AIR MK-82SE (Snake Eyes)	500 Fuze	lbs high-drag unguided bomb : Nose for free-fall drop, Nose/Tail for re	tarded drop
Ŀ		MK-82	500 lbs low-drag u Fuze: Nose	ag unguided bomb		GBU-10/12/16/24 PAVEWAY II	2000 Fuze	2000/500/1000/2000 lbs laser-guided bomb unit (G Fuze: Nose	
MEN'		MK-83	1000 lbs low-drag Fuze: Nose	unguided bomb)	MK-20 Rockeye	Ung Fuze	uided cluster bomb :: Nose	
RMAI		MK-84	2000 lbs low-drag Fuze: Nose	unguided bomb		BDU-33	25 lb Fuze	os unguided training bomb :: Nose	
& AI			GUN POD			AI	R-TO-	-AIR MISSILES	
SN		WEAPON	ТҮРЕ		WEAPO	N		ТҮРЕ	
APO		M61	Six-barrel 20 mm Gat	Six-barrel 20 mm Gatling-		AIM-9L/M Sidewinder		Infrared guided air-to-air missile	
WE	Vulcan type rotary cannon (878		AIM-7M Sparrow			Semi-active radar-guided air-to-air mis	sile		
CE:			ROCKETS		AIM-54A Mk 60 Phoenix		Active radar homing air-to-air missile. range than AIM-54C.	Higher speed and	
FFEN		ZUNI MK-71	130 mm (5 inches) ung	'E nm (5 inches) unguided rockets		AIM-54C Phoenix		Active radar homing air-to-air missile. Smokeless and equipped with better, digital electronics than AIM-54A.	
0			Fuze: Nose						
10	/ L				SPEC	CIALIZED MUNITION	S		
IRT	N	'EAPON		ТҮРЕ					
d d	AD	M-141 TALD		Air-to-Ground	tactical air-lau	nched decoy (TALD)			351
<i>N</i>									



1.2 - MY WEAPONS CONTROLS SETUP PILOT STICK



1.2 - MY WEAPONS CONTROL SETUP HCU STICK (RIO)



Left Toe Brake (mapped on pedals): ICS Foot Button Right Toe Brake (mapped on pedals): Microphone Foot Button

1.2 - MY WEAPONS CONTROL SETUP LANTIRN STICK (RIO)



1.3 - ARMAMENT STATIONS

To see your weapon loadout, press "RSHIFT+K" and use "[" and "]" to cycle through pages until you reach the INITIAL LOADOUT page. This allows you to see what weapon you have mounted on what station.



	INITIAL LOADOUT	
1A: 1	AIM-9M	CMS
1B: 2	{PHXBRU3242_2*MK82 LS}	L10: F
		L20: F
3:4	{MAK79_MK82 4}	R10: C
4:3	{MAK79_MK82 3L}	R20: F
5:3	{MAK79_MK82 3R}	LAU-138
6:4	{MAK79_MK82 4}	
8B: 2	{PHXBRU3242_2*MK82 RS}	
8A: 1	AIM-9M	

V

1.4 - WEAPONS SETUP

The M-61 Vulcan is a six-barreled hydraulically driven 20 mm automatic cannon capable of firing over 6,000 rpm (rounds per minute), or 100 rounds per second. This crazy firing rate means that you can go through your 676 rounds in roughly 6 seconds. An ingenious way to help pilots conserve ammunition was to ask the ground crews to space rounds in the ammunition belt to force the gun to fire in bursts. Bursts can be set in the mission editor to 200 rounds per trigger squeeze, 100 rounds, or 50 rounds. This way, pilots do not have to worry about holding the trigger for too long. A "manual" option is also available for those who want to have full authority over the burst length of their gun.

To see your gun burst setting, press "RSHIFT+K" while on the ground. Use "[" and "]" to cycle through pages until you reach the GROUND SETTINGS page. You can also change the burst length by pressing "RSHIFT+RALT+4".

түре		F-14B ~						
SKILI		Player						
PILO	т	Pilot #00)1					
TAIL		010	~	СОММ	COMM 124			
CALL	SIGN	Enfield		1	1			
	HIDDEN O	n map						
	HIDDEN O	N PLANNI	ER					
	LATE ACTI	VATION						
A	ម	κ Σ		0	₽¢	(p)		
M-61	M-61 Burst Mode Burst 200							
AN/AI	LE-39 Load	Burst 200						
Fill L4	Fill LAU-138 With Chaff Burst 100							
INS R	eference A	lianment	Burst 50					
TACA	N Channel	Presel (0 :	= Auto)					
TACAN Band								
IISC	hannel Pres	\sim 1						
KY-29	B Encountion							
1.20	r Codo 1et							
Laser		Digit						
Laser								
Laser	r Code 3rd I	Digit	<> 8					
Laser	r Code 4th I	< > 8						

		GROUND SET	TINGS
M-61 BURST	:	BURST 200	RSHIFT-RALT-4
KY-28 KEY	:	1	RSHIFT-RALT- +/-
LAT LONG ELEV MSL	:	N 26°09'9 94FT	E 56°14'2
MAG VAR	:	+1.8°	



1.5 - BOMB DELIVERY MODES CCIP & CCRP

There are 2 ways to deliver a bomb: CCRP or CCIP modes.

CCIP mode is the traditional dive bombing approach: you dive on target and the reticle will tell you where the bomb will impact. In the Tomcat, **CCIP** mode is referred as "**Computer Pilot**" mode.

However, dive bombing is a risky business, especially if anti-air defences are surrounding your target. The lower you go, the more vulnerable you are. This is why CCRP release mode was invented. In the Tomcat, **CCRP** mode is referred as **"Computer Target**" mode.

CCRP mode allows you to fly straight and level without having to dive down. The HUD will tell you when to release your bomb for the target you have designated with your radar. It is a much safer way to release a bomb, but as you may have guessed already, it is less precise.



CCIP: Continuously Computed Impact Point



CCRP: Continuously Computed Release Point

2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

From the RIO Seat (or using JESTER):

- 1. Select MK-82 Bombs WPN TYPE
- 2. Select Computer Pilot Attack Mode
- 3. Select desired Delivery Mode (we will use STP and PRS, Step and Pairs).
 - STP (Step) releases a single bomb per bomb release button press.
 - RPL (Ripple) releases multiple bombs per bomb release button press.
 - SGL (Single) releases a single bomb per release button press.
 - PRS (Pairs) releases a pair of bombs per bomb release button press.
- 4. Select Mechanical Fuze to NOSE
- 5. Select Electronic Fuze to INST (Instantaneous)
- 6. Select Delivery options (we will use Interval 010 msec and Quantity 01)
- 7. Arm Stations that you want to use (press "RSHIFT+K" and use "[" and "]" to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3 and 6.



8A: 1 AIM-9M





A/G GUN

NOSE

3

FMU

3

2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

If using JESTER, use the same procedure but with the JESTER menus.





2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

From the Pilot Seat:

- 1. Master Arm switch ON (UP)
- 2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
- 3. HUD Display Mode A/G
- 4. Verify that stations 3 and 6 are selected
- Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.





5



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2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

From the Pilot Seat:

- 6. Perform a 40-deg dive to the target. You can set throttle to IDLE and deploy speed brake for better controllability
- 7. Align the impact point pipper on the HUD over the target. It will appear from the bottom when you are sufficiently low.
- 8. Press the STORE RELEASE (RALT+SPACE) button on the stick to release bombs, then throttle up and pull up.



A 1301/1/1/1





From the RIO Seat (or using JESTER):

- 1. Select MK-82 Bombs WPN TYPE
- 2. Select Computer Target Attack Mode
- 3. Select desired Delivery Mode (we will use STP and PRS, Step and Pairs).
 - STP (Step) releases a single bomb per bomb release button press.
 - RPL (Ripple) releases multiple bombs per bomb release button press.
 - SGL (Single) releases a single bomb per bomb release button press.
 - PRS (Pairs) releases a pair of bombs per bomb release button press.
- 4. Select Mechanical Fuze to NOSE
- 5. Select Electronic Fuze to INST (Instantaneous)
- 6. Select Delivery options (we will use Interval 010 msec and Quantity 01)
- 7. Arm Stations that you want to use (press "RSHIFT+K" and use "[" and "]" to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3 and 6.



8B: 2 {PHXBRU3242_2*MK82 RS} 8A: 1 AIM-9M







If using JESTER, use the same procedure but with the JESTER menus.





From the Pilot Seat:

- 1. Master Arm switch ON (UP)
- 2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
- 3. HUD Display Mode A/G
- 4. Verify that stations 3 and 6 are selected
- Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.





5





From the Pilot Seat:

- 6. Press the TD (Target Designate) switch UP (VSL HI) or DOWN (VSL LO) to slew the Designator Diamond over the desired impact point.
- 7. Once Designator Diamond is over impact point, press the TD (Target Designate) PAL mode (Forward) to lock the Designator Diamond.
- 8. Fly straight and level towards the target and align velocity vector with the Bomb Fall Line

Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position. 6b

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.







From the Pilot Seat:

SK &

- 9. Wait until the Lower Solution Cue appears from the top of the Bomb Fall Line, then press and hold the STORE RELEASE (RALT+SPACE) button.
- 10. When the Upper Solution Cue appears from the top of the Bomb Fall Line and meets the velocity vector, bombs will automatically drop. You can now release the STORE RELEASE button.





Tive

Upper Solution Cue (bombs are dropped when STORE RELEASE button is held and Upper Solution Cue meets the velocity vector)

Lower Solution Cue



2.3 – ZUNI ROCKETS

From the RIO Seat (or using JESTER):

- 1. Select LAU-10 (Zuni Rocket) WPN TYPE
- 2. Select Computer Pilot Attack Mode

TOMCAT

ARMAMENT

Q

WEAPONS

OFFENCE:

9

PART

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- 3. Select desired Delivery Mode (we will use RPL and SGL, Ripple and Single).
 - STP (Step) releases a single rocket per trigger press.
 - RPL (Ripple) releases multiple rockets per trigger press.
 - SGL (Single) releases a single rocket per trigger press.
 - PRS (Pairs) releases a pair of bombs per trigger press.
- 4. Select Mechanical Fuze to NOSE
- 5. Select Electronic Fuze to INST (Instantaneous)
- 6. Select Delivery options (we will use Interval 050 msec and Quantity 04)
- Arm Stations that you want to use (press "RSHIFT+K" and use "[" and "]" to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3, 6, 1B and 8B.







V

2.3 – ZUNI ROCKETS

If using JESTER, use the same procedure but with the JESTER menus.





2.3 – ZUNI ROCKETS

From the Pilot Seat:

- 1. Master Arm switch ON (UP)
- 2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
- HUD Display Mode A/G 3.
- 4. Verify that stations 3, 6, 1B and 8B are selected
- 5. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.







WEAPONS & ARMAMENT F-14B TOMCAT

OFFENCE: WEAPONS

9

PART

2.3 – ZUNI ROCKETS

From the Pilot Seat:

- 6. Perform a 20-30-deg dive to the target. You can set throttle to IDLE and deploy speed brake for better controllability
- 7. Align the impact point pipper on the HUD over the target. When you are too far, the impact point is a diamond. When you are close/low enough, the diamond turns into a cross.
- 8. Press the TRIGGER SECOND STAGE (SPACE) on the stick to launch rockets, then throttle up and pull up.



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Rocket Impact Point (Cross = Close Enough)

ARMAMENT F-14B TOMCAT Š WEAPONS **OFFENCE:** 9 PART



OFFENCE:

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PART

2.4 – M61 GUN (AIR-TO-GROUND)

From the Pilot Seat:

- 1. Master Arm switch ON (UP)
- 2. HUD Display Mode A/G
- 3. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.
- 4. Select Gun Rate (LOW/HIGH) as required. For ground strikes, I recommend LOW rate of fire.
- 5. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
- 6. Confirm that Air Source Selector is set to BOTH ENG. The gun requires bleed air pressure in order to operate.











From the Pilot Seat:

- 7. Perform a 20-30-deg dive to the target. You can set throttle to IDLE and deploy speed brake for better controllability
- 8. Align the impact point pipper on the HUD over the target. When you are too far, the impact point is a diamond. When you are close/low enough, the diamond turns into a cross.
- 9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire guns, then throttle up and pull up.









Take note that air-to-ground strikes can use the TCS (Television Camera System) feed to see better. The RIO can also set TCS settings like Narrow or Wide field-of-view.





2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN) 2.6.1 – Laser Code Setup

(Code 1655, tracking laser code 1688)

The GBU-12 Paveway II is the laser-guided version of the Mk-82 unguided, general purpose bomb. The seeker head on each laser guided bomb is set to track only a specific laser pulse rate frequency (PRF) code. These are manually set by the weapons load crew during ground operations and may not be set from the cockpit during flight.

The laser code of the GBU-12 must be the same as the laser code of the laser designator, which can either be the LANTIRN targeting pod's laser designator or a ground unit equipped with a laser designator (JTAC). The default laser code is "1688".

If you are flying in multiplayer and do not know your GBU-12 code, you can open the INITIAL LOADOUT Kneeboard page by pressing "RSHIFT+K". This will show you the laser code set on your GBU-12 laserguided bomb.



Targeting pod Las

(code 1688)

Icode 1655, tracking laser code 1688

Targeting Pod Laser





;				
	FUEL GUN AMMO AMMO TYPE FLARE CHAFF SELECT LOADOUT: SELECT LIVERY	20mm HEI		100% 100% 60 150
TOTAL WEIGHT 69814/74349	01 - VF-102 Diamondback 113 BOAF MAXIMUM WEIGHT	s 1996 RD NUMBER	ок	
SU-12 ission payload FMU-139 4 s Function Delay 1688 USAF v	~ 0 ~ s	OK	CANCEL	×



From the RIO Seat:

- 1. When on the ground, set Targeting Pod Power Switch to POD.
- 2. LANTIRN pod will warm up during 8 minutes.
- 3. While we wait, check if your laser code is set to the desired code (1688 by default). Press "RSHIFT+K" to open kneeboard. See section 2.6.1 to request the ground crew to change GBU-12 laser codes if required.
- 4. When warm-up is complete, the LANTIRN Mode switch will automatically switch to STANDBY mode.
- 5. Press LANTIRN Mode switch to set it to OPERATE. STANDBY caution will flash for 30 seconds, then will switch to OPER.
- 6. Set Laser Arm switch to ARM. LASER ARMED indication will illuminate.
- 7. Set VIDEO switch to FLIR to select LANTIRN video feed in lieu of TCS feed for the TID.
- 8. Set TID Mode to TV to display LANTIRN feed.











From the RIO Seat:

- 9. Set LANTIRN laser code setting to the laser code set by the ground crew (in our case, 1688). To modify LANTIRN laser code option:
 - a) Press the LANTIRN Slider laser/focus
 - b) Modify the laser code using the **Right S4 Left/Right** switch to select **what digit to edit** and the **Right S4 Hat Up/Down** switch to **increment/decrement a digit**.
 - c) Press the **Right S4 Press** switch to switch between **Auto and Manual mode**. We will select manual mode since the RIO will manually lase the target.
 - d) Press the LANTIRN Slider laser/focus button again to deselect laser code.
 - e) Press the LANTIRN Slider AGC/MGC to set Automatic or Manual Gain Control. We will set Automatic.
 - f) Press the LANTIRN **Mode Toggle** to select between A/A (Air-to-Air) and A/G (Air-to-Ground) Mode. We will select A/G Mode.







TOMCAT

F-14B

From the RIO Seat (or using JESTER):

10. Select GBU-12 WPN TYPE

TOMCAT

F-14B

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WEAPONS

OFFENCE:

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- 11. Select Manual Attack Mode
- 12. Select desired Delivery Mode (we will use STP and SGL, Step and Single).
 - STP (Step) releases a single bomb per bomb release button press.
 - RPL (Ripple) releases multiple bombs per bomb release button press.
 - SGL (Single) releases a single bomb per bomb release button press.
 - PRS (Pairs) releases a pair of bombs per bomb release button press.
- 13. Select Mechanical Fuze to NOSE
- 14. Select Electronic Fuze to INST (Instantaneous)
- 15. Select Delivery options if necessary (we will not use any since we use STP-SGL)
- 16. Arm Stations that you want to use (press "RSHIFT+K" and use "[" and "]" to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3, 4, 5 and 6.



INITIAL LOADOUT



TOMCAT F-14B ARMAMENT Š WEAPONS **OFFENCE:** 9 PART

2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN) 2.6.2 – With Human RIO

If using JESTER, use the same procedure but with the JESTER menus.







From the RIO Seat:

- 17. If a waypoint is close to the target, you can slew the LANTIRN pod to this waypoint by using the Left Four-Way Hat switch Right (QWP+) to select the desired waypoint. This will use an existing waypoint as a cue for the targeting pod.
- 18. If no waypoint is available, you can use the **Right S4 Down switch** to use QSNO (Cue-Snowplow) Mode. This will slew the pod to the direction the aircraft nose is pointing. You can coordinate with the pilot to point the aircraft in an approximate location of the target and let you slew the pod manually from there.
- 19. Use the LANTIRN Toggle FOV button to zoom in or out as required.







From the RIO Seat:

- 20. Move the LANTIRN stick lever to move the cursor manually on the target.
- 21. Once cursor is on the target, press the Left Four-Way Hat switch Up (Area Track) to stop the cursor from drifting.
- 22. If desired, press the Left Four Way Hat switch Down (Point Track) to track an object like a high-contrast vehicle.

Note: Keep in mind that you can undesignate using the LANTIRN Undesignate button.











Wing Sweep Bomb Mode

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From the Pilot Seat:

- 31. Once the Time to Release reaches 0 and the Bomb Release Cue crosses the two lines, press the STORE RELEASE button to drop the bomb.
- 32. As the pilot, take extreme care to fly in a gentle right-hand turn over the target to provide the least disturbance to the camera limits, maintaining the targeting pod laser tracking. If the targeting pod gets masked by the aircraft fuselage, the laser link will be broken and the guided bombs will go dumb and miss their mark.







From the RIO Seat:

33. To undesignate the target, **depress** the LANTIRN **Mode Toggle selector** (LANTIRN Undesignate control).







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CMP/TGT WEAPONS

JESTER

CMP/PLT WEAPONS

CMP/IP WEAPONS

5b

4b

GBU-12

XZ



NOSE

JESTER

7b

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From the Pilot Seat:

- 10. JESTER will warm up the targeting pod by himself.
- 11. On the ground, you can ask the ground crew to modify the laser code of the guided bombs. See section 2.6.1.
- 12. Consult kneeboard (RSHIFT+K) to find the INITIAL LOADOUT page, which will list the laser code set by the ground crew for the guided bombs. In our case, the laser code is 1688.
- 13. Press "A" to access the LANTIRN contextual menu.
- 14. Access the "NEXT PAGE" menu.
- 15. Select "SET LASER CODE UTILITY".
- 16. Select laser code.
- 17. JESTER will change the LANTIRN laser code.





17





F-14B

MAMENT F-14B TOMCAT ARMAMENT Š WEAPONS **OFFENCE:** 9 PART

2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN) 2.6.3 – With JESTER AI

From the Pilot Seat:

- 18. Master Arm switch ON (UP)
- 19. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
- 20. Verify that required stations are selected
- 21. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.







From the Pilot Seat:

- 22. Press "A" to access the LANTIRN contextual menu, then access the "HEAD CONTROL UTILITY" menu and select "QEYEBALLS UTILITY".
- 23. A red circle will appear on your screen. Move your head to set the red circle on the target you want to designate, then press "A" to select the target.
- 24. JESTER will slew the targeting pod and perform an Area Track on the location you pointed at.
- 25. Press "A" to access the LANTIRN contextual menu, then access the "SEARCH FOR TARGETS" menu.
- 26. Select desired search command.
 - Note: "active" refers to normal enemy units placed in a mission. "All" refers to both normal enemy units placed in a mission and static objects as well.
- 27. JESTER will then slew the targeting pod and look for targets based on the search command you selected. JESTER will perform an Area Track on the first target he spots.
- 28. When a target has been acquired by JESTER, press "A" to access the LANTIRN contextual menu. Then, access the "NEXT PAGE" menu and select "DESIGNATE UTILITY".
- 29. JESTER will then designate the target by pressing the two-stage trigger of the LANTIRN stick. Weapon release symbology and steering cues will become visible on the HUD.











From the Pilot Seat:

30. JESTER will give you steering commands vocally to line up the target (i.e. "Steer Left, 1 Degree").



From the Pilot Seat:

F-14B

- 31. JESTER will arm the laser and call out « 10 seconds » to bomb drop, then « 5 seconds » to bomb drop.
- 32. Once the Time to Release reaches 0 and the Bomb Release Cue crosses the two lines, JESTER calls « Pickle ». Press the STORE RELEASE button to drop the bomb.
- 33. The TIMP indication shows the Time-To-Impact in seconds.
- 34. 10 seconds before impact, JESTER will lase the target, guiding the GBU-12 in the process on the target. The « L » indication will flash while laser is firing.







From the Pilot Seat:

35. As the pilot, take extreme care to fly in a gentle right-hand turn over the target to provide the least disturbance to the camera limits, maintaining the targeting pod laser tracking. If the targeting pod gets masked by the aircraft fuselage, the laser link will be broken and the guided bombs will go dumb and miss their mark.







From the Pilot Seat:

36. If you want to undesignate the target, press "A" to access the LANTIRN contextual menu[^], then access the "NEXT PAGE" menu, then select UNDESIGNATE UTILITY and RESET UTILITY. JESTER will then reset the targeting pod settings and undesignate the target.



2.7 – TALD DECOYS

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F-14B

Suppression of Enemy Air Defenses (SEAD, also known in the United States as "Wild Weasel" and (initially) "Iron Hand" operations, are military actions to suppress enemy surface-based air defenses, including not only surface-to-air missiles (SAMs) and anti-aircraft artillery (AAA) but also interrelated systems such as early-warning radar and command, control and communication (C3) functions, while also marking other targets to be destroyed by an air strike. Suppression can be accomplished both by physically destroying the systems or by disrupting and deceiving them through electronic warfare.

The ADM-141A TALD (Tactical Air-Launched Decoy) was intended to confuse and saturate enemy air defenses, as part of an overall SEAD strategy, thus allowing attacking aircraft and weapons a higher probability of penetrating to the target. The TALD was an expendable glide vehicle with a square fuselage, flip-out wings, and three tail control surfaces. A digital flight control system could be programmed to conduct various speed or manoeuvering changes during flight. The missile could be launched from 12,200 metres (40,000 ft), at which height it had a range of up to 126 kilometres (78 mi); a low-altitude range reduced this to 26 kilometres (16 mi).





395

2.7 – TALD DECOYS

From the RIO Seat (or using JESTER):

1. Select TALD Bombs WPN TYPE

TOMCAT

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WEAPONS

OFFENCE:

9

PART

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F-14B

- 2. Select desired Delivery Mode (we will use STP and SGL, Step and Single).
 - STP (Step) releases a single TALD per bomb release button press.
 - RPL (Ripple) releases multiple TALDs per bomb release button press.
 - SGL (Single) releases a single TALD per bomb release button press.
 - PRS (Pairs) releases a pair of TALD per bomb release button press.
 - Select Delivery options if required (we will not use them for Step-Single).
- 4. Arm Stations that you want to use (press "RSHIFT+K" and use "[" and "]" to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3, 4, 5 and 6.



11	3:	2	{PHXBRU3242_2*MK82SE	LS}L10:	F
2	:	1	FUEL TANK 300 GAL	L20:	F
3	:	1	{BRU3242_ADM141}	R10:	a
4	:	1	{BRU3242_ADM141}	R20:	F
5	:	1	{BRU3242_ADM141}	LAU-1	138
6	:	1	{BRU3242_ADM141}		
7	:	1	FUEL TANK 300 GAL		
91	2.	2	TOURDELLAND ON THE OPENING	Del	

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8A: 1 AIM-9M




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2.7 – TALD DECOYS

If using JESTER, use the same procedure but with the JESTER menus.







2.7 – TALD DECOYS

From the Pilot Seat:

ARMAMENT F-14B TOMCAT

8

OFFENCE: WEAPONS

9

PART

- 1. Master Arm switch ON (UP)
- 2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
- 3. HUD Display Mode A/G
- 4. HSD Display Mode TID. If a datalink host is available (AWACS), tune in to its frequency and you may have more information on your TID.
- 5. Verify that stations 3, 4, 5 and 6 are selected
- 6. Fly at a cruising altitude and speed (more altitude and speed means more range for the TALD)
- 7. Consult your RWR (Radar Warning Receiver) to know where to find radar emitters. Align the aircraft nose with the direction of these emitters.
- 8. When ready, press and hold the STORE RELEASE (RALT+SPACE) button to launch the TALD.









2.7 – TALD DECOYS

Once launched, the TALD will deploy its wings and glide for as long as it can. Radar emitters should start launching ground-to-air missiles at the decoy once they detect it.







3.1 – M61 GUN (MANUAL/NO RADAR TRACKING)

- 1. Master Arm switch ON (UP)
- 2. HUD Display Mode A/A
- 3. Select Gun Rate (LOW/HIGH) as required. For air-toair, I recommend HIGH rate of fire.

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- 4. Set Gunsight Elevation Lead As Required (we will use 53 mils, which is roughly 3 degrees above the ADL, Armament Datum Line).
- 5. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
- 6. Confirm that Air Source Selector is set to BOTH ENG. The gun requires bleed air pressure in order to operate.
- 7. Press the CAGE/SEAM button on the throttle to go in Manual Air-to-Air Gun Mode.
- 8. Place Pipper on target. Keep in mind that in Manual Mode, you have no ranging or target lead information.













3.1 – M61 GUN (MANUAL/NO RADAR TRACKING)

9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire.



Gun Ammunition Counter

3.2 – M61 GUN (RTGS/NO RADAR TRACKING)

- 1. Master Arm switch ON (UP)
- 2. HUD Display Mode A/A
- 3. Select Gun Rate (LOW/HIGH) as required. For air-toair, I recommend HIGH rate of fire.
- 4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
- 5. The RTGS (Real-Time Gunsight Mode) will automatically be activated.
- 6. Confirm that Air Source Selector is set to BOTH ENG. The gun requires bleed air pressure in order to operate.
- 7. Place either the Diamond (ranged for 2000 ft) or the Pipper (ranged for 1000 ft) on target. Keep in mind that in RTGS Mode, you have no ranging information but lead computing information.
- 8. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire.













3.3 – M61 GUN (RTGS/RADAR TRACKING)

- 1. Master Arm switch ON (UP)
- 2. HUD Display Mode A/A
- 3. Select Gun Rate (LOW/HIGH) as required. For air-to-air, recommend HIGH rate of fire.
- 4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
- 5. The RTGS (Real-Time Gunsight Mode) will automatically be activated.
- 6. Confirm that Air Source Selector is set to BOTH ENG. The gun requires bleed air pressure in order to operate.
- 7. Press the Target Designate Switch Forward, which will engage the PAL (Pilot Automatic Lockon Mode) to radar lock the target. Alternatively, you could also have any other kind of radar STT (Single Target Track) lock. The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.





Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.

F-14B



3.3 – M61 GUN (RTGS/RADAR TRACKING)

- 8. Place the pipper on the target diamond. If you have a good radar lock, you will have ranging, closure rate and lead information.
- 9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire.



OFFENCE: WEAPONS & ARMAMENT F-14B TOMCAT

9

PART

Gun Ammuni Counter







3.4 – AIM-9M SIDEWINDER (NO RADAR TRACKING)

- 1. Master Arm switch ON (UP)
- 2. HUD Display Mode A/A
- 3. Set the SW COOL switch to ON. This commands cooling of the Sidewinder missiles seeker head. The missile will immediately show ready but full seeker head performance will take at least 60 seconds. The corresponding missile status windows turns white to indicate a ready missile.
- 4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SW.
- 5. Select **NORM** (Sidewinder expanded acquisition mode (SEAM) allows the missile seeker head to be uncaged to track a target within the seeker limits, 40° from ADL) or **BRSIT** (Boresight, seeker head remains slaved to ADL (2.5° field of view) Mode.





3.4 – AIM-9M SIDEWINDER (NO RADAR TRACKING)

F-14B TOMCAT

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OFFENCE: WEAPONS

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6. Line up target with ADL (within 20 deg) to acquire heat signature

- a) If using NORM mode, press the CAGE/SEAM button on the throttle. This illuminates the SEAM LOCK light on the ACM panel and uncages the seeker for 4.5 seconds and allows it to track a target present in the seeker field of view. If no IR sources is found the missile is again caged and the SEAM LOCK light is deactivated. If lock-on is successful, the aural tone will remain and the SEAM LOCK light stays illuminated A low-pitch growling tone indicates the seeker is searching. A high-pitch screeching sound will indicate the seeker is looking at an IR-source.
- b) If using Boresight mode, low-pitch growling tone increases slightly in intensity when the seeker is looking at an IR-source.
- 7. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire missile once seeker is tracking a good infrared source.









3.5 – AIM-9M SIDEWINDER (RADAR TRACKING)

- Master Arm switch ON (UP) 1.
- 2. HUD Display Mode – A/A
- 3. Set the SW COOL switch to ON. This commands cooling of the Sidewinder missiles seeker head. The missile will immediately show ready but full seeker head performance will take at least 60 seconds. The corresponding missile status windows turns white to indicate a ready missile.
- 4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SW.
- 5. Select NORM (Sidewinder expanded acquisition mode (SEAM) allows the missile seeker head to be uncaged to track a target within the seeker limits, 40° from ADL) or BRSIT (Boresight, seeker head remains slaved to ADL (2.5° field of view) Mode.
- 6. Press the Target Designate Switch Forward, which will engage the PAL (Pilot Automatic Lockon Mode) to radar lock the target. Alternatively, you could also have any other kind of radar STT (Single Target Track) or ACM lock. The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.



Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.







3.5 – AIM-9M SIDEWINDER (RADAR TRACKING)

- 7. Line up target with ADL (within 20 deg) to acquire heat signature
 - a) If using NORM mode, press the CAGE/SEAM button on the throttle. This illuminates the SEAM LOCK light on the ACM panel and uncages the seeker for 4.5 seconds and allows it to track a target present in the seeker field of view. If no IR sources is found the missile is again caged and the SEAM LOCK light is deactivated. If lock-on is successful, the aural tone will remain and the SEAM LOCK light stays illuminated A low-pitch growling tone indicates the seeker is searching. A high-pitch screeching sound will indicate the seeker is looking at an IR-source.
- 8. Steer the aircraft to line up the T-shaped steering cue with the center of the black circle (ASE, or Allowable Steering Error circle) on the HSD to maximize probability of kill.
- 9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire missile once seeker is tracking a good infrared source.







3.6 – AIM-7M SPARROW (RADAR TRACKING)

- 1. Master Arm switch ON (UP)
- 2. HUD Display Mode A/A
- 3. Set the MSL PREP switch ON. This commands the WCS to start missile preparation for the AIM-7 and AIM-54. When the individual missiles are tuned and ready the corresponding missile status windows turns white to indicate a ready missile. This should take approx. 2 minutes.
- 4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SP/PH.
- 5. Select **NORM** (used to engage a target tracked in STT; WCS is capable of using both CW and pulse doppler for guidance) or **BRSIT** (Boresight, tracks the strongest target return within the boresighted flood area) Mode. We will chose NORM mode.
- 6. You need a radar STT (Single Target Track) lock to the target. This can be done through JESTER, through the RIO cockpit or through one of the pilot ACM modes with the Target Designate Switch (Forward engages the PAL (Pilot Automatic Lockon Mode, Up/Down engages VSL HI/LO). The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.







3.6 – AIM-7M SPARROW (RADAR TRACKING)

- 7. Line up target with ADL (within 20 deg)
- 8. Steer the aircraft to line up the T-shaped steering cue with the center of the black circle (ASE, or Allowable Steering Error circle) on the HSD to maximize probability of kill.
- 9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire missile when ready.
- 10. Keep tracking the target to maintain radar lock until missile impact.







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3.6 – AIM-7M SPARROW (RADAR TRACKING)





3.6 – AIM-7M SPARROW (RADAR TRACKING)

Missile Next Launch Button

Button used by RIO to select a

hooked target as the next target

to launch at in TWS.

Note: you can also fire AIM-7 missiles from the RIO seat. Pilot needs to set Master Arm ON, set MSL PREP ON and select Sparrows first. However, I would advise against using Sparrows as the RIO for the following reasons:

- The AIM-7 requires a constant radar lock, which must be maintained by steering the aircraft (that's the pilot's job).
- The RIO A/A Launch mode is useful in BVR (Beyond Visual Range) engagements, but the effective range of the AIM-7 makes it more suited for WVR (Within Visual Range) engagements, which are better managed by the pilot.



Missile Speed Gate Selector Switch

Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier

- WIDE: Not Simulated
- NARROW : Not Simulated
- NOSE : Not Simulated
- **NOSE QTR**: In DCS, this position is used for standard missile operation
- TAIL QTR : Not Simulated
- TAIL : Not Simulated

Missile Options Switch

- SP PD: AIM-7 Sparrow Pulse Doppler Launch Mode
- NORM: Normal
- **PH ACT**: AIM-54 Phoenix Active Launch Mode



3.7 – AIM-54 PHOENIX (SINGLE TARGET)

1. Master Arm switch – ON (UP)

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WEAPONS

OFFENCE:

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PART

F-14B

- 2. HUD Display Mode A/A. Also set HSD Display Mode to TID.
- 3. In the RIO cockpit, verify that the Liquid Cooling Switch has been set to ON (FWD). This controls the liquid cooling system for the AWG-9 and AIM-54 missile.
- 4. Set the MSL PREP switch ON. This commands the WCS to start missile preparation for the AIM-7 and AIM-54. When the individual missiles are tuned and ready the corresponding missile status windows turns white to indicate a ready missile. This should take approx. 2 minutes.
- 5. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SP/PH.
- 6. Press the WEAPON SELECTOR button again to toggle between Sparrows (SP) and Phoenixes (PH).
- 7. Select NORM (used to engage a target tracked in STT; WCS is capable of using both CW and pulse doppler for guidance) or **BRSIT** (Boresight, tracks the strongest target return within the boresighted flood area) Mode. We will chose NORM mode.
- 8. You need a radar STT (Single Target Track) lock to the target. This can be done through JESTER, through the RIO cockpit or through one of the pilot ACM modes with the Target Designate Switch (Forward engages the PAL (Pilot Automatic Lockon Mode, Up/Down engages VSL HI/LO). The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.













3.7 – AIM-54 PHOENIX (SINGLE TARGET)

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Missile Options Switch

- **NORM**: Normal (Missile goes active after a certain delay)
- **PH ACT**: AIM-54 Phoenix Active Launch Mode, missile goes active immediately after launch.

Note: When you first fire a Phoenix missile, the missile is initially guided by your own radar. However, an « active radar homing missile » also has his own radar inside the seeker head. The moment the missile goes « active » (meaning it will start self-homing/tracking targets on his own instead of using your aircraft's radar) is called « Pitbull ». When the missile goes « Pitbull », the missile truly becomes fire-and-forget. NATO brevity word "Pitbull" would be called out on the radio to inform other pilots, just as "Fox Three" would be called out upon launch.



3.7 – AIM-54 PHOENIX (SINGLE TARGET)

Note: you can also fire AIM-54 missiles from the RIO seat.

- 1. Make sure pilot has set Master Arm ON, set MSL PREP ON and selected Phoenix missiles with the stick.
- 2. Radar STT lock a target (see SENSORS section).
- 3. Set Missile Speed Gate to NOSE QTR.

Missile Next Launch Button

Button used by RIO to select a

hooked target as the next target

to launch at in TWS.

- 4. Set Missile Option as required (NORM or PH ACT if you want the Phoenix to go active immediately after launch)
- 5. When ready, fire the Phoenix using the A/A Launch Button (keep pressed for 3-4 seconds).



Missile Speed Gate Selector Switch

Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier

- WIDE: Not Simulated
- NARROW : Not Simulated
- NOSE : Not Simulated
- **NOSE QTR**: In DCS, this position is used for standard missile operation
- TAIL QTR : Not Simulated
- TAIL : Not Simulated

Missile Options Switch

- **SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode
- NORM: Normal
- PH ACT: AIM-54 Phoenix Active Launch Mode



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3.7 – AIM-54 PHOENIX (SINGLE TARGET)

6. On the TID, a timer in seconds (TTI, Time to Impact in seconds) will appear next to the selected target.



	Attack Display Symbols				
Artificial Horizon	\mathbf{i}	Artificial horizon on TID representing aircraft roll and pitch. Angle of the line represents roll and vertical deflection on display represents pitch.			
Steering Guidance Symbol		Symbol representing steering error from optimal missile launch direction. Should be placed by the pilot as near as possible to the center of the ASE circle and at launch should be inside of that same circle.			
Allowable Steering Error Circle	\bigcirc	ASE circle used to indicate the allowable steering error for missile launch. Size varies with attack geometry, mode and selected missile.			
Breakaway Indication	\times	Large cross appearing in the center of the TID when target range is less than minimum missile launch range.			



TUMR (Time Until Minimum Range), TUOR (Time Until Optimum Range) and TUIR (Time Until In-Range/Maximum Range)

The launch zone vectors are activated manually by the RIO or when time to maximum launch range is less than 60 seconds and replaces the normal track velocity vectors.

Launch Zone Vectors The track symbol vector length in this mode represents the timeuntil-Rmin, with a maximum limit of 180 seconds (shown as a 1.5" long vector). When the time-until-Rmin becomes less than 180 seconds, the vector will start to shorten and move towards the center dot on the target (which represents Rmin). If the vector becomes zero length, you are at AIM-54 Rmin.

Along this vector line is also a second dot, with the distance from end of the vector to that dot representing time-until-Rmax (a.k.a. timeuntil-in-range). That is, when the vector shortens to this dot (end of the vector reaches the dot), it indicates you are at Rmax (maximum range to target). The dot disappears when you are closer than Rmax to the target (i.e. time-until-Rmax, a.k.a. time-until-in-range is now essentially negative).

The intensified bar (box) along the launch zone vector represents the optimum missile launch range. When the vector end reaches the bar 418 the time until in optimal range is 8 seconds.

3.7 – AIM-54 PHOENIX (SINGLE TARGET)



3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

In the RIO cockpit:

1. Verify that the Liquid Cooling Switch has been set to ON (FWD). This controls the liquid cooling system for the AWG-9 and AIM-54 missile

In the Pilot cockpit:

- 2. Set Master Arm switch ON (UP)
- 3. Set the MSL PREP switch ON. This commands the WCS to start missile preparation for the AIM-7 and AIM-54. When the individual missiles are tuned and ready the corresponding missile status windows turns white to indicate a ready missile. This should take approx. 2 minutes.
- 4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SP/PH.
- 5. Press the WEAPON SELECTOR button again to toggle between Sparrows (SP) and Phoenixes (PH).
- 6. Select **NORM** Missile Mode







F-14B

3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

In the **RIO cockpit**:

- 7. Set Missile Speed Gate to NOSE QTR.
- 8. Set Missile Option as required (NORM or PH ACT if you want the Phoenix to go active immediately after launch)
- 9. Set Radar WCS Mode to TWS AUTO (Track While Scan)
- 10. As targets are scanned they will automatically be numbered in terms of priority (1 = highest priority).
- **11. You do not need to radar lock a target**; you just have to launch weapons and the TWS mode will automatically pick which target is the highest priority for you and launch a Phoenix at it.
- 12. When ready, fire the Phoenix using the A/A Launch Button (keep pressed for 3-4 seconds). Missile will track by itself the target with the highest priority (1). TWS priority numbers are to the right of contact symbols, while target altitude is displayed to the left in tens of thousands of feet.



• 1 for 5000 to 14999 ft





to launch at in TWS.

2 for 15000 to 24999 ft) A/A (Air-to-Air) Launch Button

Button used for RIO launch of AIM-7 or AIM-54, hot trigger is indicated by button illumination

Missile Speed Gate Selector Switch

Configures the missiles acquisition gate, allowing the RIO to finetune the missile to find the correct target easier

- WIDE: Not Simulated
- **NARROW**: Not Simulated
- **NOSE** : Not Simulated
- **NOSE QTR**: In DCS, this position is used for standard missile operation
- TAIL QTR : Not Simulated
- TAIL : Not Simulated

Missile Options Switch

• **SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode

NORM: Normal

• **PH ACT**: AIM-54 Phoenix Active Launch Mode

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3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

- 13. On the TID, a timer in seconds (TTI, Time to Impact in seconds) will appear next to the selected target.
- 14. If you use the A/A Launch Button again, TWS will automatically switch to the target with the next highest priority (2). And fire the missile on this target. Keep using the A/A Launch Button until all missiles are launched.
- 15. And that's it! You have now performed a "Six Shooter" (engaged six targets almost simultaneously).







3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

4 – SELECTIVE ORDNANCE JETTISON

METHOD #1: Emergency Jettison

Pilot Seat:

• Use the Emergency Stores Jettison Button to jettison all stores except sidewinder missiles.

METHOD #2: ACM Jettison

RIO Seat:

1. Select desired stations using the SELECT switches (UP).

Pilot Seat:

2. Flip the ACM Jettison cover UP, then press the white button under it to jettison your selected stations.

ACM (Air Combat Maneuver) Switch/Cover

- Lifting the ACM cover activates the ACM mode and allows access to the ACM jettison button.
- Button under the ACM cover that enables jettison of stores selected on the RIO's ARMAMENT panel. Will not jettison Sidewinders regardless if selected.

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in line











5 – VIDEOS

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ARMAMENT

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- 2 Air-to-Ground Weapons
 - 2.1 Unguided Bomb (MK-82 Computer Pilot/CCIP) <u>https://youtu.be/Is3AtOX-abw</u>
 - 2.2 Unguided Bomb (MK-82 Computer Target/CCRP) <u>https://youtu.be/Is3AtOX-abw</u>
 - 2.3 ZUNI Rockets <u>https://youtu.be/wftck0C3fJ8</u>
 - 2.4 M61 Guns (Air-to-Ground) <u>https://youtu.be/EEeyH-MUVf8</u>
 - 2.5 Using TCS (Television Camera Set) <u>https://youtu.be/gYEAdqKTN_M</u>
 - 2.6 GBU-12 Paveway II (Laser-Guided) <u>https://youtu.be/R9-8UCj66Ds</u>
 - 2.7 TALD Decoys https://youtu.be/Ub8xtfmJHYg

- 3 Air-to-Air Weapons
 - 3.1 M61 Guns (Manual/No Radar Tracking) <u>https://youtu.be/B-qsw06hBco</u>
 - 3.2 M61 Guns (RTGS/No Radar Tracking) <u>https://youtu.be/B-qsw06hBco</u>
 - 3.3 M61 Guns (RTGS/Radar Tracking) <u>https://youtu.be/B-qsw06hBco</u>
 - 3.4 AIM-9M Sidewinder (No Radar) https://youtu.be/4m-Q02gxFEA
 - 3.5 AIM-9M Sidewinder (Radar) <u>https://youtu.be/4m-Q02gxFEA</u>
 - 3.6 AIM-7M Sparrow (Radar) https://youtu.be/BIJO8HduYak
 - 3.7 AIM-54 Phoenix
 <u>https://youtu.be/4groy-_Bxfk</u>
- 4 Selective Ordnance Jettison <u>https://youtu.be/VQ7ufmx2pVI</u>

INTRODUCTION

Countermeasures are very simple to use. You have three countermeasure types at your disposal: flares, chaff and an ECM (Electronic Countermeasure) jammer. We will explore together what is used against what, and how.

Missiles can generally track you using 2 things: radar signature (radar waves are sent on you and you reflect them, which is called a "radar signature") and heat signature (like the exhaust of your engines). Countermeasures will only be effective against the kind of weapon it was meant to counter; a heat-seeking missile will not care if you deploy electronic countermeasures against it since it tracks heat, not radar signatures. This is why it is important to know what is attacking you in order to counter it properly. This is what the **<u>RWR</u>** (Radar Warning Receiver) is for: to help you know what is firing at you so you can take the adequate action to counter it.

Flares are used against missiles that track heat (infrared or IR) signatures. Instead of going for the heat signature generated by your engines, a missile will go for a hotter heat source like flares.

<u>Chaff</u> is a form of "passive" jamming. Passive (reflected) jamming is when a deceptive object or device reflects radar waves. Chaff is simply a bundle of small pieces of metal foil with reflective coating, which creates clusters of radar signatures that prevent a radar to get a solid lock on the aircraft itself.

The <u>AN/ALQ-126 Deception Jammer</u> is the onboard Defensive Electronic Countermeasure (<u>DECM</u>) system. It is a form of "continuous" jamming, also called "active" or "transmitted" jamming. This device transmits its own synchronized radar waves back at your enemy's radar receiver to simulate erroneous radar wave returns. Simply put, active jamming will try to drown a radar in white noise.

In order to use these three forms of countermeasures, you can use "countermeasure programs", routines that will deploy a number of flares/chaff for a number of cycles at a given interval.



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COUNTERMEASURES CONTROL SETUP (PILOT)







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COUNTERMEASURES CONTROL SETUP (RIO)



AN/ALR-67 RWR (RADAR WARNING RECEIVER)

The RWR (Radar Warning Receiver) will tell if you are being searched or locked by radar. The annunciator threat lights will tell you which type of threat is locking you. CW is for continuous wave emissions, AI is for Air Intercept, SAM is for surface-to-air-missiles, and AAA is for anti-aircraft artillery radar.

The **RWR** will locate the radar emitters' heading but not their range. Instead, their spacing from the center of the RWR circle refers to the lethality of the threat. The outer band (critical) is generally missiles in flight. The middle band (lethal) is for radars actively tracking you. The inner band is classified as non-lethal since these are radars searching for you, not actively tracking you. Keep in mind that the definition of these bands has changed throughout the life of the Tomcat. Some versions may have the Critical and Non-Lethal bands reversed depending on the software version of RWR installed on the plane.

If a **Threat Advisory Indication** is illuminated, it means the radar emitter has a solid lock on you. Tones also indicate what's happening (new contact, radar lock warning, missile launch, etc.) The faster the tone frequency, the greater the danger.



Pilot ECM (Electronic Countermeasures) / ALR-67 RWR Warning Lights / Threat Advisory Indicator

- **SAM**: steady illumination when detecting lock on from a SAM tracking radar. Flashes when missile launch is detected.
- **AAA**: steady illumination when detecting lock on from an Anti-Aircraft Artillery tracking radar. Flashes when AAA firing is detected.
- **AI**: steady illumination when detecting lock on from an Airborne Interceptor radar.

IFF

RCV

XMIT



Threat Advisory Indicator (RIO Panel)
IFF: Received mode 4 interrogation without own system generating reply
RCV: ALQ-126 is receiving a threat identification signal
XMIT: ALQ-126 is transmitting
SAM : Warning light, steady illumination when detecting lockon from a SAM tracking radar. Flashes when missile launch is detected.
AAA : Warning light, steady illumination when detecting lockon from a AAA tracking radar. Flashes when AAA engagement is detected.
CW: Detection of a continuous wave (CW) emitter
AI: Warning light, steady illumination when detecting lockon from an airborne interceptor radar.



AN/ALR-67 RWR (RADAR WARNING RECEIVER)

The RIO has a RWR control panel, which allows him to choose what display mode to use.

RWR Mode Selector

Switch springloaded to center (OFF) position. Can be held to OFST (offset) and LMT (limit) position to enable respective function while held.

- If too many contacts start overlapping each other, you can use the "OFFSET" function, which will spread out enemy contacts. It is indicated by an O in the status ring on the display
- You can also use the "LIMIT" function, which is indicated by an L in the status ring on the display and limits the display to only show the threat symbols of the six highest prioritized threats.

RWR Test Switch

Switch springloaded to center. Momentary selection of BIT indicates BIT in ALR-67. Selection of SPL (special) while BIT page 1 is displayed shows the special BIT status page while held and then for 3 seconds when released.





AN/ALR-67 RWR (Radar Warning Receiver) Power Switch FWD: ON / AFT: OFF

RWR Volume Control Knob



AN/ALR-67 RWR (Radar Warning Receiver) Display Mode Selector

Selector switch controlling what type of threats to prioritize and display.

- NORM (Normal)
- AI (Airborne Interceptor)
- AAA (Anti-Aircraft Artillery)
- UNK (Unknown)
- FRIEND

	Threat symbol	Platform/Sensor	Special Tone	Threat symbol	Platform/Sensor	Special Tone
	Ships (Symbology enhanced	by being enclosed by an enlarged U symbol.)		M2	Mirage 2000-C and 2000-5	Yes
$\Delta NI / \Delta I R_{-}67 R M / R$	AB	Arleigh Burke		\$3	S-3B	
	AK	Admiral Kuznetsov		SH	SH-60B	
	GR	Grisha 5 (Albatros)		Air Defense		
LEGEND	GZ	DDG-168 Guangzhou		2	S-75 TR SNR (Fan Song)	
	HP	Oliver Hazard Perry		3	S-125 TR SNR-125 (SA-3/Low	
	HU	DDG-171 Haikou			Blow)	
	КК	Krivak 3 (Rezky)		6	Kub SA-6	
	KV	Kirov (Pyotr Velikiy)		8	OSA (SA-8)	
	N			10	S-300PS 30N6 TR (SA-10)	
		Ships only carrying a navigational		11	Buk (SA-11)	
		radar		12	S-300V	
		(civilian ships, submarines)		15	Tor 9A331 (SA-15)	
201KV131				19	Tunguska 2C6M (SA-19)	Yes
2300001	NE	Neustrashimy		A	Gepard, M-163 Vulcan and ZSU-	
	NZ	Nimitz (Vinson, Stennis)			23-4 Shilka	
	SV	Slava (Moscow)		BB	S-300PS 64H6E SR (SA-10/Big	
- $(F) (F) (F)$	TC	Ticonderoga			Bird)	
	TT	Tarantul 3 (Molniya)		CS	S-300PS 5N66M SR (SA-10/Clam	
	TW	Tarawa			Shell)	
	YI	FFG-538 Yantai		DE	Sborka (Dog Ear)	
	Aircraft	•		FF	S-125 P-19 SR (SA-3/Flat Face)	
	13	C-130		GR	Roland SR	
	17	C-17A		HA	Hawk SR	
	37	AJS-37		НК	Hawk TR	
INT	50	A-50		PT	Patriot	
	52	B-52		RO	Roland	
	14	F-14A/B	Yes	S	1L13 and 55G6 EWR	
	15	F-15C/E	Yes	SD	Buk TR (SA-11/Snow Drift)	
	16	F-16C	Yes	SN	PRW-11 (Side Net)	
	18	F/A-18C	Yes	Missiles		
	19	Mig-19		M	MICA-EM, R-37, R-77, AIM-54	
	21	Mig-21bis			and AIM-120	
	23	Mig-23MLD		ATC (Air Traffic Control)		
	24	Su-24M/MR		Т	Airport ATC Radar	
	25	Mig-25PD				
	29	Su-27, Su-33, Mig-29A/G/S and J-	Yes			
		11A				
	30	Su-30	Yes			
	31	Mig-31		Referen	ce: Grim Reaners E-14 RWR Vid	den
	34	Su-34	Yes			
	39	Su-25TM (Su-39)	Yes	https://	<u>youtu.be/-G-9tZ9i0lc</u>	
	AN	AN-26B and AN-30M				
	AP	AH-64D				
	B1	B-1B				
	BE	Tu-95 and 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 and IL -78M				122
	KC	KC-135				432
	KL	KC-155				
	NJ I	KJ-2000				

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<u>1 - COUNTERMEASURE PROGRAM</u>

Your AN/ALE-39 Loadout is set from the mission editor. You can equip an optional LAU-138 with additional Chaff, which is quite useful in SAM-alley kind of environments.

From the RIO seat, the Countermeasures Program panel allows you to create countermeasures release programs. Rotate the blue thumbwheels to set Chaff parameters, yellow thumbwheels to set Flare parameters, white thumbwheels for Jammer parameters. Parameters include quantity and intervals in seconds.

Flare Program - Quantity Thumbwheel Sets quantity of flares to be released in a program.



Chaff Program Thumbwheels

- **B QTY**: Quantity, sets quantity of chaff to release in one program salvo, can also be set to C (continuous) or R (random).
- B INTV: Interval (sec), sets interval between chaff burst to release in one program salvo, can also be set to R (random).
- **S QTY**: Quantity, selects number of salvoes to release in a program.
- **S INTV**: Interval (sec), selects interval between salvoes in a program.

AN/ALE-39 Countermeasures Program Panel

Jammer Program Thumbwheels

Quantity / Interval Hundreds (sec) / Interval Tens (sec) / Interval Units (sec)

			-	_	~				
\sim	Q	æ	Σ		0	e e	(P)	***	
					Additi	onal pro	perties	for airc	raft
M-61	Burst M	ode			Burst	200			
AN/AL	.E-39 Lo	badout			30 Fla	ares / 30) Chaff		
Fill LA	U-138 \	With Ch	aff		~		R		
INS R	eferenc	e Align:	ment Si	tored					
TACA	N Chan	nel Pres	el (0 =	Auto)	< > 0				
TACA	N Band				Х				
ILS Cł	nannel I	Presel			< > 1				
KY-28	Encryp	tion Ke	y		< > 1				
Laser	Code 1	lst Digit			< > 1				
Laser	Code 2	nd Digi	t		< > 6	;			
Laser	Code 3	Brd Digit			< > 8	;			
Laser	Code 4	lth Digit			< > 8				

AN/ALE-37 Programmer Reset Switch

LOAD Control Thumbwheels

Thumbwheels inputting into AN/ALE-39 what is loaded into each launcher subsection.

- **L10** Sets loaded countermeasure in Left 10 subsection.
- **L20** Sets loaded countermeasure in Left 20 subsection.
- **R10** Sets loaded countermeasure in Right 10 subsection.
- **R20** Sets loaded countermeasure in Right 20 subsection.

Flare Program - Interval Thumbwheel Sets interval between flare releases in a program (sec)



2 - COUNTERMEASURE CONTROL PANEL

Once your program has been created, the RIO can then set the PWR/MODE switch as desired and use the Chaff Release, Flare Release and Jammer Release switches to dispense countermeasures as necessary, using either a Single dispense (switch AFT) or a Program dispense (switch FWD).





<u>3 - COUNTERMEASURE DISPENSE (RIO)</u>

For quick countermeasure dispensing, there are two mirrored Chaff/Flare Dispense Hat switches. I haven't mapped them since I am a lazy bastard, but you can still map them to four-way switches or bindings if you want.

Personally, I simply use bindings linked to the Flare Release, Chaff Release and Jammer Release switches.

Chaff/Flare Dispense Hat Switch

- DOWN: Initiates set chaff release program.
- UP: Initiates a single chaff release.
- LEFT (Outboard): Initiates set flare release program.
- RIGHT (Inboard): Initiates set jammer release program.

Chaff/Flare Dispense Hat Switch

→ AN/ALE-39 Chaff SGL
 ↓
 ← AN/ALE-39 Flare SGL

- DOWN: Initiates set chaff release program.
- UP: Initiates a single chaff release.
- LEFT (Inboard): Initiates set jammer release program.
- RIGHT (Outboard): Initiates set flare release program.



CONTROL OPTIONS

My Setup

F-14B RIO Countermeasures	Reset category to d
Action	Category
AN/ALE-39 Left Data Dispenser Switch Down - (Chaff Program Countermeasures
AN/ALE-39 Left Data Dispenser Switch Left - Fla	re Program Countermeasures
AN/ALE-39 Left Data Dispenser Switch Right - Ja	mmer Program Countermeasures
AN/ALE-39 Left Data Dispenser Switch Up - Cha	ff Single Countermeasures
AN/ALE-39 Right Data Dispenser Switch Down -	Chaff Program Countermeasures
AN/ALE-39 Right Data Dispenser Switch Left - Ja	mmer Program Countermeasures
AN/ALE-39 Right Data Dispenser Switch Right -	Flare Program Countermeasures
AN/ALE-39 Right Data Dispenser Switch Up - Ch	aff Single Countermeasures

Chaff Release Switch Program / Standby / Single



Flare Release Switch Program / Standby / Single



Jammer Release Switch Program / Standby / Single





<u>4 - COUNTERMEASURE DISPENSE (PILOT)</u>

The pilot can also dispense countermeasures. **If the flaps lever is in the UP position**, the DLC Engage button will dispense countermeasures.

The Flare Mode switch in the RIO cockpit allows a "PILOT" setting, which enables the pilot to manually release flares with the pilot stick DLC Engage Button. If the Flare Mode switch is set to MULT or NORM, the DLC Engage button will release chaff instead.





Flare Mode Switch

- MULT Multiple, each flare ejection command will eject one flare from each launcher subsection loaded with flares. Affects both manual and programmed releases.
- **NORM** Normal, each flare ejection command will eject one flare in total. Affects both manual and programmed releases.
- **PILOT** Enables the pilot to manually release flares with the pilot stick DLC button, the other positions releases chaff with DLC button depression.



TOMCAT F-14B **COUNTERMEASURES** Š RWR **DEFENCE:** 7 PART

COUNTERMEASURES - CHAFF & FLARES AN/ALE-39 CMDS (COUNTERMEASURES DISPENSER SYSTEM)

5 – JESTER MANAGEMENT





AN/ALQ-126 DECEPTION JAMMER (DECM)

The AN/ALQ-126 deception jammer is designed to detect radar threats, analyze them, select the optimum countermeasure technique available and apply it.

In DCS, the DECM (Defensive Electronic Countermeasures) system is modelled as a simple noise jammer due to engine limitations but controlled by the DECM logic as to when it's on or off.

The two indication lights on the threat advisory are **RCV** (receive) and **XMIT** (transmit). RCV illuminates up when the system detects and analyzes a threat while the XMIT illuminates up when it's actively jamming a threat.

Operate the Jammer using the Jammer Mode Selector.

AN/ALQ-126 DECM (Defensive Electronic Countermeasures) Jammer Mode Selector

- **OFF** Turns off power to AN/ALQ-126.
- **STBY** Standby, applies power to warmup system.
- **TEST/HOLD 3 SEC** Should be held in this position for 3 seconds to prepare for system test.
- **TEST/ACT** Starts AN/ALQ-126 BIT, used after 3 seconds in TEST/HOLD 3 SEC position.
- **REC** Receive, enables AN/ALQ-126 to receive and analyze threat signal. Detected missile launch may force the system into repeat mode.
- **RPT** Repeat, enables AN/ALQ-126 to use programmed responses to received threat signals.

DECM Standby Light

Amber light indicating warmup when system is placed in STBY. Goes out after complete warmup. Indication during test or operation indicates a fault has occurred.

Threat Advisory Indicator (RIO Panel)

- IFF: Received mode 4 interrogation without own system generating reply
- RCV: ALQ-126 is receiving a threat identification signal
 - XMIT: ALQ-126 is transmitting

IFF

RCV

XMIT

SAM: Warning light, steady illumination when detecting lockon from a SAM tracking radar. Flashes when missile launch is detected.

AAA: Warning light, steady illumination when detecting lockon from a AAA tracking radar. Flashes when AAA engagement is detected.

CW: Detection of a continuous wave (CW) emitter

Al: Warning light, steady illumination when detecting lockon from an airborne interceptor radar.

DECM AN/ALQ-126 Volume Control Knob

DATALINK & IFF INTRODUCTION

One of the biggest challenges of integrated modern warfare is the identification of contacts. As various information donors like friendly fighters, ground radar stations, AWACS (Airborne Warning and Control System, like an E-3 Sentry or an E-2 Hawkeye), and ships interrogate unknown contacts with IFF (Identify-Friend-or-Foe) systems, this information needs to be relayed to everyone within a given Network. This is where Datalink comes in; the Tomcat can gather information from both LINK 4A and LINK 4C networks.

Link 4A TADIL C is one of several Tactical Data Links now in operation in the United States Armed Services and forces of the North Atlantic Treaty Organization (NATO). Link-4A plays an important role by providing digital surface-to-air, air-to-surface, and air-to-air tactical communications. Originally designated Link-4, this link was designed to replace voice communications for the control of tactical aircraft. The use of Link-4 has since been expanded to include communication of digital data between surface and airborne platforms. First installed in the late 1950s, Link-4A has achieved a reputation for being reliable. But Link-4A's transmissions are not secure, nor are they jam-resistant. However, Link-4A is easy to operate and maintain without serious or long-term connectivity problems.

Link 4C is a fighter-to-fighter data link which is intended to complement Link 4A although the two links do not communicate directly with each other. Link 4C uses F-series messages and provides some measure of ECM resistance. Link 4C is fitted to the F-14 only and the F-14 cannot communicate on Link 4A and 4C simultaneously. Up to 4 fighters may participate in a single Link 4C net.



TOMCAT

SENSORS INTEGRATED VIEW

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DATALINK

12

PART

These are the main displays that you will consult when gathering information on a target.



TID HAFU SYMBOLOGY

Hostile, Ambiguous, Friendly or Unknown (HAFU) is a symbology system used by the F/A-18 to represent contact identification. A similar concept is used on the F-14.

Here are three main HAFU symbols:

Staple: Unknown

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ART

F-14B

- Triangle: Hostile
- Half-Circle: Friendly

Upper Part: This is what you have identified.

This symbol shows an Unknown Target that has not been interrogated by either yourself or any other information donor (i.e. AWACS).

Contact Azimuth

Upper Part: This is what you have identified.

This symbol shows a hostile Target that has been interrogated by you and identified as hostile. However, you do not have information from any other information donor (i.e. AWACS).

Upper Part: This is what you have identified.

This symbol shows a Friendly Target that has been interrogated by you and identified as friendly. However, you do not have information from any other information donor (i.e. AWACS).

Lower Part: This is what information donors have identified.

This symbol shows a Hostile Target that has been interrogated by you and confirmed hostile. It has also been interrogated and confirmed hostile by another information donor (i.e. AWACS).

Lower Part: This is what information donors have identified.

This symbol shows a Friendly Target that has not been interrogated by you, which is unknown. However, it has also been interrogated and confirmed friendly by another information donor (i.e. AWACS).

Toggle the TID Data Link button to remove or show information that comes from Datalink if the TID becomes too cluttered.

Lower Part: This is what information donors have identified.

This symbol shows an Unknown Target that you have not interrogated yet, but that has been interrogated and confirmed hostile by another information donor (i.e. AWACS).



TID HAFU SYMBOLOGY

The CAP (Computer Address Panel) selected in the TGT DATA (Target Data) menu allows you to designate the status of a selected target (Friendly, Hostile, Unknown).

	Onboard S	ensor Targets
Unknown		Unknown sensor track in RWS, TWS and STT modes.
Hostile	\wedge	Track in TWS and STT modes designated as hostile by RIO.
Friend		Track in TWS and STT modes designated as friendly by RIC
Angle- Tracked Radar Target	$\langle \cdot$	Radar target tracked only in angle (jamming target).
Angle- Tracked Radar Target with Altitude Difference Ranging	\odot	Radar target being tracked in angle only and range being computed by altitude difference ranging.
TCS-Angle Tracked Target	$\dot{>}$	Target being tracked in angle by TCS.
TCS-Angle Tracked Target with Altitude Difference Ranging	\odot	Target being tracked in angle by TCS and range being computed by angle difference ranging.
	Data Link	Targets
Unknown	•	Data link track identified as unknown by source.
Hostile	\checkmark	Data link track identified as hostile by source.
F : 1		Data link track identified as friendly by source





TID HAFU SYMBOLOGY



The CAP (Comp you to modify t and DO NOT AT	outer Address Panel) selected in the TGT DATA (Target Data) n he status of a selected target (Mandatory Attack, Do Not Atta TK do affect the TWS (Track While Scan) Centroid in TWS AUT	menu also allows ack). MAND ATTK TO mode. Mandatory Attack Do Not Attack
	Position Symbol Modifiers	 CAP Message Selector Buttons are used by the RIO to modify the status of a target Mandatory Attack (MAND ATTK) Do Not Attack (DO NOT ATTK)
Mandatory Attack	Additional symbology on a TWS track (horizontal bac center dot) selected as mandatory attack by the RIC target can be designated thusly and always receives engagment priority number.	Ar through D. Only one s an MESSAGE MAND ATTK FRIEND
Data link Destroy	Additional symbology on a data link track (horizonta through center dot) designated to be destroyed by a source. Does not affect target prioritization in WCS	al bar data link 5.
Do Not Attack	Additional symbology on a TWS or data link track (we through center dot) designated as do not attack (by disengage (via data link). If set by RIO removes target WCS target prioritization.	Vertical bar RIO) or et from DATA MULT TRANS TGT
Multiple Targets	Additional symbology on a TWS or data link track (h bar on left side of symbol) indicating that the track of multiple targets. Can be set manually by RIO or reci- data link.	norizontal represents ieved via
Data Link Challenge	Additional symbology on a data link track (small V w center dot) representing data link command to visua target.	vith apex at ally identify CAP Category Selector Switch
Track Extrapolated	Additional symbology on TWS or STT track (small X center at center dot) indicating that no update to ta occured within 8 seconds. Track will be deleted after seconds or 2 minutes if track hold function is enabled	• TGT DATA: Target Data, contains message button functionality used to modify hooked track symbols.

MANUAL IFF EXAMPLE

- 1. Set IFF Mode 4 Power Switch ON (FWD)
- 2. Select TWS AUTO radar mode
- Select a DDD range as desired (100 nm). 3.
- 4. Press and hold the IFF Interrogate button for a few seconds.
- While the IFF Interrogate button is pressed, the DDD will 5. momentarily switch from the Pulse Doppler Closure Velocity scale to a Range scale.
- Friendly contacts are identified with a bar above and a 6. bar below them.
- 7. Hostile contacts are identified as single bars.
- Release the IFF Interrogate button. The DDD scale will go 8. back in the Pulse Doppler Closure Velocity scale.



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MANUAL IFF EXAMPLE

Now that we have identified our targets in the DDD, we need to mark them as friendly, hostile or unknown on the TID. This has to be done manually.

- 9. Select "TID CURSOR" TID Mode
- 10. The TID cursor will appear on the TID
- 11. Press and hold the first HCU trigger (Half-Action), then use the HCU stick to slew the TID cursor over the desired target.
- 12. Once the cursor is over desired contact, press the second HCU trigger (Full-Action) to select the target.
- 13. Once target is selected, ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information will be displayed on the TID and symbol will brighten. Keep in mind that this is NOT a radar lock and you will not be able to use weapons with this function.
- 14. Set CAP (Computer Address Panel) Category Selector switch to TGT DATA (Target Data)
- 15. The green arrow next to UNK message button means that the target is currently set as UNKNOWN on the TID.
- 16. Press the CAP Message button next to FRIEND to set contact as FRIENDLY on the TID.
- 17. Contact will go from a Staple (Unknown HAFU) to a Half-Circle (Friendly HAFU)
- 18. To deselect target, press the first HCU trigger (Half-Action).
- 19. Repeat the process (steps 10 through 18) for other contacts on the TID and assign them HOST (Hostile) HAFU if they are not marked as friendly on the DDD during IFF interrogation.

TOMCAT







LINK 4A (TAC) VS LINK 4C (FIGHTER-TO-FIGHTER)

- The Link-4A system is a fully automatic, high-speed data transmission system used for aircraft control. The system provides controlling information to the aircraft, using radio transmission between the controlling ship and the controlled aircraft. The Carrier Aircraft Inertial Navigation System (CAINS) is also a part of the Link-4A system.
- Link 4C, on the other hand, is a fighter-to-fighter data link which is intended to complement Link 4A although the two links do not communicate directly with each other.



SETTING UP TAC (LINK4A) DATALINK (HUMAN RIO)

You can set up Datalink Mode and Host with JESTER, or a human RIO can also do this for you. Here is how to do it with a human RIO.

- 1. Open up your kneeboard using "RSHIFT+K". This will bring you to the GROUND SETTINGS page.
- 2. Cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
- 3. Set Datalink Power Switch ON (FWD). Datalink Forward position sets datalink in LINK 4A (Tactical) Mode.
- Set Datalink Mode to TAC (CAINS/WPT is used for INS alignment on the carrier). 4.
- Set Datalink Reply Switch to NORM to allow the aircraft to both receive and transmit information. 5.
- Set Datalink Frequency to the desired network (in our case the E-2C AWACS). Our desired frequency is listed on the 6. kneeboard TACTICAL DATALINK SYSTEMS as 316.60 MHz. Rotate the Datalink Frequency Select wheels to 16.6 as shown (the 3 is preset and cannot be modified).
- 7. Close your kneeboard using "RSHIFT+K".







빌 8 TALINK 4 2 ART

SETTING UP TAC (LINK4A) DATALINK (HUMAN RIO)

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7. And that's it! You will now receive and transmit information to the E-2C AWACS on this network. Data on targets identified by the E-2C Hawkeye will automatically be displayed on your TID (provided the TID DATA LINK button is pressed in).



SETTING UP AUX (LINK4C) DATALINK (HUMAN RIO)

You can set up Datalink Mode and Host with JESTER, or a human RIO can also do this for you. Here is how to do it with a human RIO.

- 1. Open up your kneeboard using "RSHIFT+K". This will bring you to the GROUND SETTINGS page.
- 2. Cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
- 3. Set Datalink Power Switch AUXILIARY (AFT). Datalink Aft position sets datalink in AUXILIARY LINK 4C (Fighter-to-Fighter) Mode.
- 4. Set Datalink Mode to TAC (CAINS/WPT is used for INS alignment on the carrier).
- 5. Set Datalink Reply Switch to NORM to allow the aircraft to both receive and transmit information.
- 6. If flying on multiplayer, coordinate with other players to find a **common Datalink Frequency**. However, **each player must have his own unique Datalink Address** in order for the datalink to know who sends what and to whom it sends the information. In our case, we will use 320.60 with an address of 05. Another player could use 320.60 as well, but with his own address (like 02 for example).
- 7. Set Datalink Frequency to the desired network. Our desired frequency is 320.60 MHz. Rotate the Datalink Frequency Select wheels to 20.6 as shown (the 3 is preset and cannot be modified).
- 8. Set Datalink Address to the desired address. Our desired address is 05. Rotate the Datalink Address thumbwheels to 05 as shown.





• ART 12 – DATALINK & IFF

F-14B TOMCAT

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8. And that's it! You will now transmit and receive information to all fighters on this datalink network (Frequency 320.60 Address 05). Data on targets identified by friendly fighters will automatically be displayed on your TID (provided the TID DATA LINK button is pressed in).





SETTING UP DATALINK (JESTER)

You can set up Datalink Mode and Host with JESTER, or a human RIO can also do this for you. Here is how to do it with JESTER:

- 1. Set Datalink Mode to the Tactical Datalink System. Use the JESTER Contextual Menu by pressing "A" twice and selecting "DATA LINK RADIO" (LCTRL+7). Then, select "SET MODE" (LCTRL+1) and select "TACTICAL DATALINK SYSTEM" (LCTRL+1) for LINK4A Mode (AWACS, Carrier). You can also select "FIGHTER-TO-FIGHTER" for LINK4C Mode (datalink between a flight of four fighters on the same network).
- 2. Set Datalink Frequency to the desired network. Use the JESTER Contextual Menu by pressing "A" twice and selecting "DATA LINK RADIO" (LCTRL+7). Then, select "SET HOST" (LCTRL+1) and select desired datalink host (E-2C AWACS, CVN74 Stennis Carrier, etc.).





빌 3 **ATALINK** 12 ART

TOMCAT

NOTES ON LINK4 DATALINK

- 1. At the moment, LINK-4 Datalink is not compatible with the more modern LINK-16 datalink used in the F/A-18C Hornet. This means that information can only be transferred between LINK-4-compatible assets like the F-14 and the E-2 Hawkeye or E-3 Sentry AWACS.
- 2. Datalink must also be set to the correct frequency for Automatic Carrier Landings and Carrier INS Alignment.
- 3. When set to TAC the data link will then receive the 8 target tracks with the highest priority from the TDS controller.
- 4. In Link 4C (AUX), up to four aircraft can participate within a flight and all four aircraft should have different addresses set.





RADIOS - INTRODUCTION

The Tomcat comes equipped with two radio sets: the AN/ARC-159 UHF 1 Radio (controlled by the pilot) and the AN/ARC-182 V/UHF 2 Radio (controlled by the RIO). Interestingly, while the pilot used a standard push-to-talk button on his throttle, the RIO had to press his foot on push-to-talk pedals to communicate.

While the pilot can communicate on the radio on his own, the role of managing communications was typically handled mainly by the RIO. The RIO's radio also had a greater range of available frequencies, which means the RIO could also have additional responsibilities such as acting as a FAC(A), which is a Forward Air Controller (Airborne).





F-14B

AN/ARC-159 UHF 1 RADIO (PILOT)

OPTIONS

SYSTEM	CONTROLS	GAMEPLAY	MISC.	A
F-14B Pilot - All			Reset category to default	Clear cat
Action		Cate	egory Ke	yboard
Mic Button ICS		Rad	io RS	5hift + ∖
Mic Button ICS - SRS Only / No M	1enu	Rad	io	
Mic Button UHF1 (ARC-159)		Rad	io R/	Alt + \
Mic Button UHF1 (ARC-159) - SF	RS Only / No Menu	Rad	io	
Mic Button UHF2 (ARC-182)		Rad	io R(Ctrl + \
Mic Button UHF2 (ARC-182) - SF	S Only / No Menu	Rad	io	



AN/ARC-159 UHF 1 Radio Remote **Channel/Frequency Indicator**

AN/ARC-182 V/UHF 2 Radio Remote **Channel/Frequency Indicator**



Pilot ICS Push-to-Talk (PTT) Switch

Switch allowing pilot to key one or both radios and intercommunication to RIO.

- ICS Keys intercommunication to RIO.
- BOTH Keys both UHF 1 and V/UHF 2 for transmission (not simulated).
- UHF1 Keys UHF 1 for transmission.
- UHF2 Keys V/UHF 2 for transmission.

Amplifier Selector

- **B/U** Backup amplifier.
- NORM Normal amplifier.
- EMER Emergency amplifier

ICS (Intercommunication

System) Volume Control

ICS (Intercommunication System) Switch

- **RADIO OVERRIDE** Makes ICS audio override radio audio.
- HOT MIC Allows talking to the RIO without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.
- **COLD MIC** Allows talking to the RIO only while the PTT is pressed.

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IAME	New Airplane	Gro	up #001		?
CONDITION					> 100
COUNTRY	USA				
ASK	Intercept				
JNIT	< > 1		OF < > 1		
YPE	F-14B				
KILL	Client				
ILOT	Pilot #002				
AIL #	119	~	СОММ	124	
ALLSIGN	Enfield		1	1	
HIDDEN O	N MAP				
HIDDEN O	N PLANNER				
LATE ACTIV	ATION				

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F/UHF AN/ARC-182		
annel 1	< > 124	MHz
annel 2	< > 258	MHz
annel 3	< > 260	MHz
annel 4	< > 270	MHz
annel 5	< > 255	MHz
annel 6	< > 259	MHz
annel 7	< > 262	MHz
annel 8	< > 257	MHz
annel 9	< > 253	MHz
annel 10	< > 263	MHz
annel 11	< > 267	MHz
annel 12	< > 254	MHz
annel 13	< > 264	MHz
annel 14	< > 266	MHz
annel 15	< > 265	MHz
annel 16	< > 252	MHz
annel 17	< > 268	MHz
annel 18	< > 269	MHz
annel 19	< > 268	MHz
annel 20	< > 269	MHz
annel 21	< > 225	MHz
annel 22	< > 258	MHz
annel 23	< > 260	MHz
annel 24	< > 270	MHz
annel 25	<> 255	MHz
annel 26	<> 259	MHz
annel 27	< > 262	MHz
annel 28	<> 257	MHz
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AN/ARC-182 V/UHF 2 RADIO (RIO)



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- RADIOS F-14B TOMCAT

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You can open up your kneeboard using "RSHIFT+K" Cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the ARC-159 and ARC-182 Channels pages. This is helpful to know what frequencies the preset channels are set to.

	AN/ARC-15	9 CHANNE	IS		AN/ARC-182	CHANNE	IS
Ch01	225.000MHz	Ch11	267.000MHz	Ch01	225.000MHz	Ch16	252.000ME
Ch02	258.000MHz	Ch12	254.000MHz	Ch02	258.000MHz	Ch17	268.000MH
Ch03	260.000MHz	Ch13	264.000MHz	ChO3	260.000MHz	Ch18	269.000MH
ChO4	270.000MHz	Ch14	266.000MHz	ChO4	270.000MHz	Ch19	268.000MH
Ch05	255.000MHz	Ch15	265.000MHz	Ch05	255.000MHz	Ch20	269.000MH
Ch06	259.000MHz	Ch16	252.000MHz	Ch06	259.000MHz	Ch21	225.000MH
Ch07	262.000MHz	Ch17	268.000MHz	Ch07	262.000MHz	Ch22	258.000MH
Ch08	257.000MHz	Ch18	269.000MHz	Ch08	257.000MHz	Ch23	260.000MH
Ch09	253.000MHz	Ch19	268.000MHz	Ch09	253.000MHz	Ch24	270.000MH
Ch10	263.000MHz	Ch20	269.000MHz	Ch10	263.000MHz	Ch25	255.000ME
				Ch11	267.000MHz	Ch26	259.000MF
				Ch12	254.000MHz	Ch27	262.000MH
				Ch13	264.000MHz	Ch28	257.000MH
				Ch14	266.000MHz	Ch29	253.000MH
				Ch15	265.000MHz	Ch30	263.000MH

458

PRACTICAL CONSIDERATIONS

F-14B

RADIOS

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As the pilot, you can also use JESTER by pressing "A" twice to ask him to set ARC-182 (V/UHF2) radio frequencies. You can choose between preset frequencies, manual frequencies, tactical frequencies (aircraft carriers, AWACS, tankers, etc.) or ATC (Air Traffic Controllers) frequencies.



AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

The Tomcat has a number of autopilot "relief modes" that assist the pilot in flying the aircraft. You can combine multiple autopilot modes together, in conjunction with the APC (Approach Power Compensator), which is basically an ATC (Automatic Throttle Controller).

Apart from stability augmentation the AFCS is also used to provide autopilot functionality. To use the autopilot all three stabilisation channels must be enabled.

Autopilot modes can also be combined together (i.e. setting a Heading Hold mode in conjunction with an Altitude Hold Mode is possible).

Note: All the autopilot modes can be overriden by enough force on the control stick or by depression of the autopilot emergency disengagement paddle, automatically resetting all autopilot switches to off.



AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

AUTOPILOT MODES

- ATTITUDE HOLD: Attitude Hold. Aircraft will maintain the existing pitch and roll. Limited to within 30° pitch and 60° roll angles and the aircraft will be automatically moved within this range. Current attitude can be changed with the control stick and will be held when the stick is released.
 - a) Ensure Autopilot Altitude Hold Mode switch, VEC/PCD/ACL Autopilot Selector, and Autopilot Heading Mode switch are all set to OFF
 - b) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
 - c) Set Autopilot Switch to ENGAGE (FWD)
- ALTITUDE HOLD: Barometric Altitude Hold. When engaged, aircraft will maintain current heading and barometric altitude.
 - a) Ensure aircraft vertical velocity is approximately within +/- 200 ft/min or the autopilot cannot be engaged. Try to fly level and aim for a vertical velocity of 0 ft/min.
 - b) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
 - c) Set Autopilot Switch to ENGAGE (FWD)
 - d) Set Autopilot Altitude Hold Mode switch to ALT (FWD)
 - e) Wait for the A/P REF warning light on the left side of the Vertical Display Indicator (VDI) to illuminate
 - f) Press the Autopilot Reference/Nosewheel Steering button on the control stick to set the current altitude as the reference altitude.
- <u>HEADING HOLD</u>: Aircraft will maintain your current magnetic heading. Maneuver the aircraft to desired heading and with a bank angle of less than 5° to set heading.
 - a) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
 - b) Set Autopilot Switch to ENGAGE (FWD)
 - c) Set Autopilot Heading Mode switch to HDG (FWD)
- **<u>GROUND TRACK</u>**: Ground track mode sets the autopilot to follow a ground track by compensating for aircraft wind drift (similar to heading hold). This mode uses INS (Inertial Navigation System) data instead of the magnetic compass heading.
 - a) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
 - b) Set Autopilot Switch to ENGAGE (FWD)
 - c) Set Autopilot Heading Mode switch to GT (AFT)
 - d) Wait for the A/P REF warning light on the left side of the Vertical Display Indicator (VDI) to illuminate
 - e) Press the Autopilot Reference/Nosewheel Steering button on the control stick to engage autopilot in Ground Track Mode.
- <u>VECTOR/PCD</u>: Datalink Vector / Precision Course Direction. Used to allow a Link 4 controller to remotely control the aircraft. This is not modelled in DCS.
- ACL: Automatic Carrier Landing. See ACLS section for more information.



AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

AUTOPILOT MODES

VEC/PCD/ACL Autopilot Selector

- **VEC/PCD**: Vector/PCD mode. Roll and pitch axis is controlled by data link. Engaged by NWS button on pilot stick.
- OFF
- **ACL**: Automatic carrier landing mode. Engaged by NWS button on pilot stick.

Autopilot Altitude Hold Mode AFT: OFF / FWD: ON

Autopilot Heading Mode

- AFT: **GT** Ground track mode, engaged by NWS button on pilot stick.
- MIDDLE: OFF
- FWD: **HDG** Heading Hold Mode

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Autopilot Engage Switch AFT: OFF / FWD: ON

Or.

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Autopilot Reference / Nosewheel Steering Button



Roll SAS (Stability Augmentation System) Switch FWD: ON / AFT: OFF

Yaw SAS (Stability Augmentation System) Switch FWD: ON / AFT: OFF

> Autopilot Emergency Disengage Paddle





AUTOPILOT MODES





PLM Button

Button used to command pilot lockon mode of AWG-9. Also used to disengage autopilot while in ACL (Automatic Carrier Landing).

- LANDING CHK: carrier has a channel ready for ACL and that the crew should prepare for carrier
- ACL READY: CATCC (Carrier Air Traffic Control Center) has acquired aircraft and is transmitting
- **CMD CONTROL**: aircraft is under data link control for landing
- 10 SECONDS: indicates that carrier motion is added to data link info and commands during • landing. Indicates 10 seconds to arrival at the next point in approach pattern in other modes.
- TILT: no data link command received for the last 2 seconds during ACL (Automatic Carrier Landing)
- VOICE: CATCC not ready for ACL, switch to standard voice procedures ٠
- AUTO THRO: Auto throttle system is disengaged by other means than the throttle mode switch. ٠
- **A/P REF**: autopilot selected but not engaged. Exception altitude and heading hold. •

APC (APPROACH POWER COMPENSATOR) / AUTOTHROTTLE

The Approach Power Compensator (APC) mode or the auto throttle mode is a system that allows for automatic throttle control for optimal angle-of-attack during approaches. Basically, the autothrottle will adjust power to maintain an ON SPEED AoA.

The auto throttle mode is solenoid held and will revert to boost mode if the criteria for automatic controls are not met.

To allow selection of APC AUTO mode (set Throttle Mode switch to AUTO/FWD) :

- Throttles need to be between 75 to 90% rpm
- Landing gear handle needs to be down
- No weight on the wheels (in flight)

If these criteria are no longer met, the throttles are manually overriden with force on the throttles or the Cage/SEAM button on the left throttle is depressed. When disengaging APC, the solenoid releases the switch and throttle mode reverts to Boost.

For additional auto-throttle tune the gain of the system can be set on the inlet ramps/throttle control panel. The settings are hot, normal or cold with hot increasing the throttle gain (and effective thrust) and cold decreasing it. These settings correspond to cold or hot external temperatures but should be set according to observed throttle control.

Throttle Mode Switch AUTO: Automatic BOOST: Boosted MAN: Manual



Throttle TEMP (Computer Gain) Switch Hot / Normal / Cold

Cage/SEAM Button

Throttle will move by itself

once ApC is engaged

ICEMAN PILOT AI

If you are in Single Player and occupy the RIO seat, you can give the AI Pilot "ICEMAN" some basic commands to set heading, speed and altitude (angels). Take note that ICEMAN will not be able to takeoff, land or fight while you are in the RIO seat.



NAVIGATION SUMMARY

Navigation in the F-14 is a two-man job. The pilot can steer the aircraft towards a waypoint selected by the RIO, but it is the RIO's thankless task to input coordinates manually. This navigation section will be divided in sub-sections.

1. Introduction

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NAVIGATION

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- 2. Reference Point Types
- How to Enter Waypoints (JESTER) 3.
- How to Enter Waypoints (RIO) 4.
- Waypoint Navigation (JESTER) 5.
- 6. Waypoint Navigation (RIO)
- 7. TACAN Navigation
- VOR & ADF Navigation 8.
- 9. Bullseye & NAVGRID
 - 9.1 Introduction
 - 9.2 Grid
 - 9.3 Grid Display Modes
 - 9.4 Voice Codes ٠
 - 9.5 Grid View Offset
 - 9.6 Grid Setup (RIO) ٠
 - 9.7 Grid Setup (JESTER)
 - 9.8 Using NAVGRID

10. ACLS Landing / Case III Recovery

11. AN/ASN-92 INS (Inertial Navigation System)

- 11.1 INS Introduction •
- 11.2 INS Drift
- 11.3 Coordinate Correction Fixes Overview
- 11.4 Overfly Visual Fix Tutorial
- 11.5 TACAN Fix Tutorial .
- 11.6 Radar Fix Tutorial ٠





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1 - INTRODUCTION

PILOT Cockpit





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1 - INTRODUCTION

<u>RIO Cockpit</u>

TID (Tactical Information Display)

The TID is the main data display for the WCS (Weapon Control System). It displays a tactical picture to the RIO which is used to identify and select targets for the long range weapons on the F-14 Tomcat. Think of it as a top down map showing the relative coordinates of all presented tracks and symbols, but without a representation of the ground/surface features (map). It is also used in secondary roles as a display for entering data into the WCS, for navigation, for INS alignment and for the on board checkout, OBC.

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BDHI (Bearing Distance Heading Indicator) *Displays indicating azimuth and bearing information (including TACAN)*

468



ECMD (Electronic Countermeasure Display) Display used for navigational information. Has d

Display used for navigational information. Has a brightness control knob, test button and a BIT indicator showing status of display (solid black when operational, showing white flags when indicating a fail condition).

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Called ECMD as the F-14A and later PMDIG (Programmable Multi-Display Indicator Group) F-14B used this display for RWR presentation as well.
1 - INTRODUCTION

RIO Cockpit

CAP (Computer Address Panel)

The CAP is used to enter data into the WCS. The MESSAGE indicator drum and buttons works similarly to the buttons on MFDs on newer aircraft.

CAP Keyboard CLEAR Button

CAP Message Selector Buttons

TNG (NBR) Button *Not Simulated.*

> **PRGM RESTRT Button** Button used to restart the

Button used to restart the program running in the WCS.

CAP Keyboard ENTER Button

CAP Numeric Keypad

CAP Message Indicator Drum *Changes with position of CATEGORY SELECTOR switch*

CAP Message Selector Buttons

CAP Category Selector Switch

- BIT: Built-In Test
- **SPL**: Special, contains message button functions for display and entry of the heading for the data files representing the four catapults on the aircraft carrier.
- **NAV**: Navigation, contains message button functions used for navigational fixes and updating data used by for INS operation and alignment
- **TAC DATA**: Tactical Data, contains message button functionality allowing for hook/selection of the different waypoints available in the WCS navigational system.
- **D/L**: Datalink, contains message button functionality for RIO data link responses to data link controller commands.
- **TGT DATA**: Target Data, contains message button functionality used to modify hooked track symbols. 469

TOMCAT

F-14B

2 – REFERENCE POINT TYPES

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NAVIGATION

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F-14B

The F-14 has the ability to store three waypoints, a fixed point (FP), an initial point (IP), a surface target (ST), a home base (HB), a defended point and a hostile area. Waypoints are dedicated for navigation purposes, but the other reference point types are used for other purposes. The coordinates of these points can be entered in the Mission Editor, or by JESTER or by the RIO manually.

- **Navigation Waypoints**: Used for navigation. A maximum of three waypoints can be stored at once.
- Fixed Point (FP): Used as an arbitrary point in space used to establish current position calculated by referring to external references
- Initial Point (IP): Often used as a starting reference point for a bombing run to a target
- Surface Target (ST): Used as coordinates for a ground target (i.e. an enemy bunker)
- Defended Point (DP) / MAN (Manual): Used as an area to protect (i.e. friendly troops on the ground)
- Hostile Area (HA): Used as coordinates for an area with known hostiles on the ground or in the air.
- Home Base (HB): Airfield or carrier that will be used to land.





470

2 – REFERENCE POINT TYPES

All these different points can be monitored on the TID.



Manually Entered Reference Points						
Home base		Waypoint representing home base, carrier or airfield.				
Waypoint	· ·	WCS navigational waypoint, sup- planted by number indicating way- point 1, 2 or 3.				
Defended Point	\bigcirc	Waypoint used to show area to pro- tect.				
Fix Point		Generic fix-point waypoint.				
Hostile Area	\bigcirc	Waypoint indicating a hostile area.				
Surface Target	\bigcirc	Waypoint indicating a surface tar- get.				
IP		Waypoint used for air-to-ground engagement, see Computer Initial Point.				

3 - WAYPOINT ENTRY - JESTER

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If you are flying with JESTER, you can easily create "Markers" on the F10 map and then ask JESTER to add them from the CAP (Computer Address Panel).

- 1. Press F10 to display the map, then select the MARK LABEL button
- 2. Click where you want to create a point, then type in a short but recognizable name for your waypoint (i.e. "Chuck WP1" for a navigation waypoint or "Chuck ST" for a Surface Target). Make sure to give it a name that makes sense since people in multiplayer will also be able to see it.



3 - WAYPOINT ENTRY - JESTER

- 3. Now that your Marker is created, JESTER will now magically know the coordinates of that marker (DCS: it's a magical place!).
- 4. Press "A" twice and access the NAVIGATION menu.
- 5. Access the "STEER POINT FROM MAP UTILITY" menu.
- 6. Select the waypoint type that you want to modify (i.e. WPT 2 for Navigation Waypoint 2).
- 7. Select the desired marker that you want to set as your new waypoint/fixed point/surface target/etc.
- 8. And that's it! JESTER will then do the boring exciting task of entering waypoint coordinates in the CAP (Computer Address Panel).





Remember when I told you about that RIO waypoint coordinates entry during the aircraft's start-up procedure? Well, there we are! Each time you spawn in a cold & dark F-14, you will have to enter the Waypoint, Fix Point, Surface Target, Initial Point and other point coordinates manually through the CAP (Computer Address Panel).

If the mission creator decided to make your life easier, he will have already pre-placed all these points for you. You can open up your kneeboard using "RSHIFT+K", then cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the **REFERENCE POINTS page.**

On the other hand, if the mission creator is evil or a lazy bastard, these points will not have been set and you will have to go through the F10 map to find your coordinates and convert them from a Degree, Minutes, Seconds (DMS) format to a Degrees, Minutes, Tenths of a Minute format.

As an example:

42°04'33" North 42°20'31" East on the F10 map would be entered in the Tomcat CAP as 42°04'5 North 42°20'5 East You can convert seconds into tenths of a minute by simply dividing the number of seconds by 60.

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42°04'33"N 42°20'31"E, 636 ft

LN 42°04'5 LE 42°20'S

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		REFE	REN	CE POINT	5	
		LAT		LON	ALT	MAG VAR
RAMP:	N	41°55'6	E	41°51'0	65	+6.1
WP1:	N	41° 58' 7	E	42.09.2	536	+6.1
WP2:	N	42.04.8	E	42'13'1	650	+6.1
WP3:	N	42.08.8	E	42.02.5	35	+6.1
FP:	N	42°03'7	E	42.06.5	1137	+6.1
IP:	N	42°04'7	E	42°10'5	716	+6.1
ST:	N	42°05'9	E	42°07'5	95	+6.1
HB:	N	41°55'9	E	41.52.6	59	+6.1
DP:						
HA:						
WP4:						
WP5:						
WP6:						
WP7:						
WP8:						
WP9:						
WP10:						

4 - WAYPOINT ENTRY - RIO

- 42°04'33"N 42°20'31"E, 636 ft
- 1. Set CAP (Computer Address Panel) CATEGORY selector to TAC DATA (Tactical Data)
- 2. Press the CAP Message selector button next to the waypoint/surface target/fixed point/etc. that you want to modify.

MAP

- From the F10 map, our coordinates for waypoint 2 are: 42°04'33" North 42°20'31" East in deg, min, seconds.
- 4. Convert these coordinates in Degrees, Minutes, Tenths of a Minute. Converted coordinates to input in the CAP: 42°04'5 North 42°20'5 East
- 5. On the CAP keyboard, press the CLEAR button.
- 6. On the CAP keyboard, press the « 1 » (LAT for Latitude) button.
- 7. On the CAP keyboard, press « N+E » to select North coordinates, then type « 42045 »
- 8. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.
- 9. On the CAP keyboard, press the « 6 » (LONG for Longitude) button.
- 10. On the CAP keyboard, press « N+E » to select East coordinates, then type « 42205 »
- 11. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.



LN 42°04'5 LN 42°04'8 LE 42°13'1	
^{7c} LN 42°04'5 LE 42°13'1	
LE 042°20'5 LN 42°04'5 LE 42°13'1	
LN 42°04'S LE 42°20'S	10c



LANDING F-14B TOMCAT Ĵ CLS 4 Š **NAVIGATION** 19 ART ۵.



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4 - WAYPOINT ENTRY - RIO





5 - WAYPOINT NAVIGATION - JESTER

- 1. Press "A" twice and access the NAVIGATION menu.
- 2. Access the "SELECT DESTINATION STEER POINT UTILITY" menu.
- 3. Select the waypoint that you want to track (i.e. WPT 1 for Navigation Waypoint 1).
- 4. JESTER will then select your desired waypoint provided the coordinates are already entered in the CAP.
- 5. From the pilot's seat, select the DEST (Destination) Navigation Steer Command switch.
- 6. Set VDI Mode to NORM
- 7. Set HSD Mode to NAV

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Navigation Steer Command Selectors:

- TACAN: Selects TACAN as steering command source
- **DESTINATION**: Selects RIO set waypoint as steering command source
- **AWL/PCD**: AWL (All-Weather Landing)/PCD (Precision Course Direction), selects glideslope guidance (ILS/ACLS) for landing or PCD for air-to-ground engagement directions as steering command source
- **VECTOR**: selects data link deviation steering as steering command source
- MANUAL: selects manually selected course and heading as steering command source



WPT 2

PRESS

FIXED POINT

477

WPT 3

PRESS

PRESS 4



F-14B

8. You can track the waypoint using the VDI (Vertical Display Indicator) and the HSD (Horizontal Situation Display).



6 - WAYPOINT NAVIGATION - RIO

- 1. Set CAP (Computer Address Panel) CATEGORY selector to TAC DATA (Tactical Data)
- 2. Press the CAP Message selector button next to the waypoint/surface target/fixed point/etc. that you want to select. We will use Waypoint 2. This will ensure the data displayed on the TID is from the correct waypoint.
- 3. Set the Navigation DEST Mode selector to "2" to track Waypoint 2. This will ensure the steering cues sent to the pilot on the HSD come from Waypoint 2.
- 4. Check the TID and ECMD to monitor waypoint range (RA) and magnetic bearing (MB).





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F-14B

Steering Indicator

Indicates current navigation steering

6 - WAYPOINT NAVIGATION - RIO





- 1. Set TACAN Mode selector to T/R. Allow a warm-up period of 2 minutes.
- 2. Set TACAN Frequency using the X/Y selector and the Ones and Tens dials. We will set TACAN frequency to 67X.
- 3. Set TACAN CMD (TACAN Command) to PLT if you are the pilot or to NFO if you are the RIO.

TACAN CMD Indicator

Indicates current crewmember in command of the TACAN.

- **PLT**: Pilot
- NFO: Naval Flight Officer (RIO)



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7 – TACAN NAVIGATION

- 4. From the pilot's seat, select the TACAN Navigation Steer Command switch.
- 5. Set HSD Mode to NAV
- 6. On the HSD, set desired COURSE to TACAN (we will set it to 070)
- 7. Consult the BDHI and HSD to track TACAN





BDHI (Bearing Distance Heading Indicator)

- Displays indicating azimuth and bearing information.
- No. 2 bearing pointer (thick) indicates magnetic course to tuned TACAN station.
- No. 1 bearing pointer (thin) indicates bearing to tuned UHF/ADF station
- BDHI also indicates distance; counter indicates slant range • to tuned TACAN station in nm

Current Heading

482

Range to TACAN (nm)







Note: You can use RSHIFT+K and the [or] keys to cycle through kneeboard pages to the TACAN LIST page. This will give you information about the nearest TACAN beacons available.



F-14B TOMCAT

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Note: if you want to have TACAN deviation on your VDI and HUD, set the HUD Display Mode to LDG (Landing) and your VDI Mode to NORM. We will touch this functionality in the ACLS landing tutorial.



TACAN Bearing Line Full : TO TACAN Dashed: FROM TACAN **TACAN Bearing Line** GREEN/RED : TO TACAN BLACK: FROM TACAN 485

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Note 2: For some complex navigation or radial interception cases that require a precise flight path, you can use the HSD Selected Heading Knob which will set a heading bug on your HSD.



F-14B TOMCAT



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8 – VOR & ADF NAVIGATION

The UHF Automatic Direction Finder is used with the ARC-182 radio, which is controlled by the RIO. Take note that the ADF system for the ARC-159 radio in the pilot's seat is not functional. ADF provides relative bearings to transmitting ground stations or other aircraft. It can receive signals on any 1 of 30 preset channels or on any manually set frequency in the 108 to 399.975 MHz range. The system has a line-of-sight range, varying with altitude. The system requires a 5-minute warmup period. During the warmup time, failure indications should be disregarded. Bearing to transmitting stations is displayed on the pilot/RIO BDHI (No. 1 needle), pilot HSD, and RIO multiple display indicator. The ADF signal is interrupted during voice UHF transmissions. The only information you will have from ADF is azimuth, not range. Since the Tomcat isn't equipped with DME (Distance Measuring Equipment), we can only have azimuth information as well and no range.



F-14B

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VOR frequencies can be found in the mission editor or in the F10 map. For ADF, you will very likely have to place a unit in the mission editor that broadcasts on a valid frequency (i.e. 320 MHz FM).



8 – VOR & ADF NAVIGATION

Here is a demonstration with a VOR from the RIO Seat.

- 1. Set V/UHF 2 Radio Mode Selector to T/R for at least 5 minutes to warm-up.
- 2. Set V/UHF 2 Frequency Mode Selector to MAN

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F-14B

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- 3. Set V/UHF 2 Frequency to VOR frequency (113.400 MHz) using Select switches.
- 4. Set V/UHF 2 UHF Switch to AM or FM band based on the frequency you are tracking. Since our VOR frequency is 113.40 MHz, it is in the AM band. Confirm that you hear the correct morse code of the tracked VOR.
- 5. Set V/UHF 2 Radio Mode Selector to DF (Directional Finding).





V/UHF 2 frequencies range from:

- VHF 30-88 MHz FM close air support
- VHF 108-118 MHz AM navigation, receive only
- VHF 118-156 MHz AM air traffic control
- VHF 156-174 MHz FM maritime
- UHF 225-400 MHz AM/FM military/NATO



8 – VOR & ADF NAVIGATION

6. Consult No. 1 Bearing Pointer (thin needle) on the BDHI (Bearing Distance Heading Indicator) to find bearing to VOR. You can also consult the ECMD (rear cockpit) or the HSD (front cockpit).





F-14B TOMCAT



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9 - BULLSEYE & NAVGRID

This section will be divided in sub-sections.

- 9.1 Introduction
- 9.2 Grid
- 9.3 Grid Display Modes
- 9.4 Voice Codes
- 9.5 Grid View Offsets
- 9.6 Grid Setup (RIO)
- 9.7 Grid Setup (JESTER)
- 9.8 Using NAVGRID



9.1 - BULLSEYE & NAVGRID - Introduction

A "Bullseye" is a fictional point in space used as a reference to locate yourself, friendly contacts and enemy contacts. If you know where the bullseye is and the enemy doesn't, it gives you a way to communicate positions without the enemy knowing where to look from. Your wingmen and AWACS will often refer to "bulls" or "bullseye" on the radio. A bullseye call, used to communicate your position, is done in the following format:

- Bearing from bullseye
- Range from bullseye
- Altitude

Bullseye Explanation by JediLinks: https://youtu.be/vgcXcfeGb2M



Allied Flight (411): 411, engaging bandit at bullseye 180 for 17, at 7000 Allied Flight (421): 421, engaging bandit at bullseye 199 for 26, at 7000



F-14B

9.1 - BULLSEYE & NAVGRID - Introduction

Ever heard of the game "Battleship"? It is played on ruled grids on which each player's fleet of ships (including battleships) are marked. The locations of the fleets are concealed from the other player. Players alternate turns calling "shots" at the other player's ships, and the objective of the game is to destroy the opposing player's fleet.

Now, where am I going with this analogy? In real life, the Tomcat's main role was Fleet Air Defense (FAD). The aircraft was meant to protect a Carrier Battle Group (CVBG). Navigating at sea is different from navigating on land since you have no landmarks to use as a reference. This is why carrier groups needed to use a grid reference system to vector aircraft on CAP (Combat Air Patrol) interception missions.

This grid reference system is what we call NAVGRID (Navigation Command and Control Grid), which works similarly to the Bullseye. The main use of NAVGRID is for several Tomcat pilots flying together in multiplayer and to use the same NAVGRID system, which will allow them to transmit target information quickly and efficiently.



F-14B

9.1 - BULLSEYE & NAVGRID - Introduction

NAVGRID is a grid system that can be customized at will (number of sectors, orientation, coverage, and reference point), but it is generally oriented to the boat, or a point on the boat's path of travel across a given time period. The US Navy developed for defending carrier battle groups against Soviet air attacks a doctrine called "vector logic." It established a circular grid, not necessarily centered on the carrier, within which fighters could be moved like chess pieces. Vector Logic defined the threat sector (airspace an opposing air force could pass through in an attempt to detect or attack the fleet), which would then be communicated to interceptors. The grid is all about getting to where you need to be to protect the fleet.



9.2 - BULLSEYE & NAVGRID - Grid

Here is a comparison between what the NAVGRID looks like and what it would look like on a map. In this case, the NAVGRID parameters are:

- **Reference Point YY**: Coordinates set on Bullseye
- Threat Axis (defines orientation of grid's bisector): Uses Bearing 304, which coincides with a projection from Bullseye to Waypoint 3

Waypoint 2

ctor 2

S. Fujairah Intl

Enemy Contact

Number of Sectors: 4

Waypoint 3

Tunb KochTunb Is

bu Musa Island Airport

Grid Coverage Angle: 50 deg

nd AFB

Sharjah Intl

Chen 99

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HEADING

25°02'03"N 57°31'23"E

Sector 7

New Airplane Grou

Threat Axis (Bisector)



NAVGRID Reference Point YY

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NAVGRID grid range is indicated by the large (100 nm interval) and small markings (50 nm interval) on the grid lines.



The grid lines are only displayed if the TID Mode Selector is set to Ground Stabilized (GND STAB), which shows a top-down view with true north pointing up. If TID Mode Selector is set to Aircraft Stabilized (A/C STAB), a Voice Code will be displayed next to your own aircraft, showing your position from the NAVGRID Reference Point YY. This is useful to give your own position to your wingmen in relationship to the Bullseye (YY).

TID (Tactical Information Display) Mode – A/C STAB

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• **A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.



TID (Tactical Information Display) Mode – GND STAB

• **GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.



LANDING F-14B TOMCAT CLS 4 8 NAVIGATION 5 ART Δ

9.4 - BULLSEYE & NAVGRID - Voice Codes

If you want to gather more information from a target without doing a proper radar lock, you can hook a target with the TID cursor. If the NAVGRID system is activated, a "Voice Code" indication will display information on its magnetic bearing and approximate distance from the Reference Point YY. Here is how you can get a Voice Code:

- 1. Select TWS MAN Mode
- 2. Select "TID CURSOR" TID Mode
- 3. Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display).
- 4. Use the HCU stick to slew the TID cursor over the desired target.
- 5. Once the cursor is over desired contact, press the second HCU trigger (Full-Action) to select the target.
- 6. Selected target will display a Voice Code (i.e. 31B) and alternate with the target's altitude in thousands of feet.





DISPLAY

TWS MAN

WCS MODE

1

TWS MAN Mode



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Tunb KochTunb Island AFB

u Musa Island Airport

Sharjah Int

AMinhad AB

HEADING

25°02'03"N 57°31'23"E

9.4 - BULLSEYE & NAVGRID - Voice Codes

Voice Codes are displayed for current hook alternating with the altitude readout on the TID if ALT NUM is selected for display.

A voice code indicates bearing from Reference Point YY in tens (31 reading as 310 as an example) followed by a letter indicating range. A would indicate 0-50 nm while B indicates 50-100nm and so on for consecutive letters.

Voice codes are only indicated on hooked targets if the TID GND STAB is selected and NAVGRID system is defined and activated.

Traditional Bullseye Call: Dodge 1-1, engaging bandit at bullseye 314 for 68, at 7000.

Voice Code Call Equivalent: Dodge 1-1, engaging bandit at 31 Bravo, 7000.

Target is at a bearing of 314 from bullseye/YY, 68 nautical miles from bullseye/YY, altitude of 7000 ft.



9.5 - BULLSEYE & NAVGRID – Grid View Offset

If you are in a situation where the aircraft symbol is not visible on the grid, it is possible to use the "HCU Offset" function to offset the aircraft symbol's location and navgrid on the TID cursor's location:

1. Select "TID CURSOR" TID Mode

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- 2. Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display).
- 3. Use the HCU (Hand Control Unit) stick to slew the TID cursor over the desired location of the aircraft symbol on the TID.
- 4. Once the cursor is over desired emplacement offset of the aircraft symbol, press the second HCU trigger (Full-Action). The TID Cursor will become highlighted.
- 5. Press the HCU Offset button on the HCU stick.
- 6. The aircraft symbol and navgrid will be offset as shown.
- 7. To reset the offset, set the TID Mode Selector to A/C STAB, then back to GND STAB.





The NAVGRID setup (if done by the RIO) requires four things:

- A Reference Point YY (usually the coordinates of Bullseye, but it can be set anywhere you want depending on the mission requirements)
- A Sector Count (1 to 6)
- A Coverage Angle (from 30 to 180 deg)
- A Threat Axis Heading

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In this example, we will create a NAVGRID with the following parameters:

- Reference Point YY Latitude/Longitude Coordinates (set on Bullseye):
 - 24°45'17" North 57°43'37" East (Deg, Min, Sec, using F10 Map)
 - 24°45'3 North 57°43'6 East (Deg, Min, Tenth of a Minute, Computer Address Coordinates Format)
 - Note 1: convert them from a Degree, Minutes, Seconds (DMS) format to a Degrees, Minutes, Tenths of a Minute format.
 - Note 2: conversion of seconds into tenths of a minute is done by dividing the number of seconds by 60
- Sector Count: 6
- Coverage Angle: 90 deg
- Threat Axis (Bisector) Heading: 315

24°45'17"N 57°43'37"E, 0 ft

Bullseye Coordinates (used

for Reference Point YY)





- 1. Set CAP (Computer Address Panel) CATEGORY selector to D/L (Datalink)
- 2. Press the CAP Message selector button next to NAV GRID. A green arrow indicates NAVGRID is activated.
- Select "TID CURSOR" TID Mode 3.

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- Press and hold the first HCU trigger (Half-Action); the TID cursor will appear 4. on the TID (Tactical Information Display).
- 5. Use the HCU (Hand Control Unit) stick to slew the TID cursor anywhere on the TID page, then release HCU trigger (Half-Action). This will ensure that no waypoint is hooked and prevent you from unknowingly modifying existing selected waypoint coordinates.
- 6. Set TID Mode Selector to GND STAB.





KEYBOARD





- *Reference Point YY Latitude/Longitude Coordinates (set on Bullseye):*
 - 24°45'17" North 57°43'37" East (Deg, Min, Sec, using F10 Map)
 - 24°45'3 North 57°43'6 East (Deg, Min, Tenth of a Minute, Computer Address Coordinates Format)

CREATE GRID REFERENCE POINT YY (BULLSEYE)

- 7. Verify that no waypoint/surface target/fixed point/etc. is selected or hooked on the TID
- 8. On the CAP keyboard, press the CLEAR button.

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- 9. On the CAP keyboard, press the « 1 » (LAT for Latitude) button.
- 10. On the CAP keyboard, press « N+E » to select North coordinates, then type « 24453 »
- 11. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.
- 12. On the CAP keyboard, press the CLEAR button.
- 13. On the CAP keyboard, press the « 6 » (LONG for Longitude) button.
- 14. On the CAP keyboard, press « N+E » to select East coordinates, then type « 57436 »
- 15. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.





MAP

for Reference Point YY)



- Coverage Angle: 90 deg
- Sector Count: 6
- Threat Axis (Bisector) Heading: 315

SET GRID SECTOR COUNT, COVERAGE ANGLE AND THREAT AXIS HEADING

- 16. On the CAP keyboard, press the CLEAR button.
- 17. On the CAP keyboard, press the « 4 » (ALT) button to select Coverage Angle.
- 18. On the CAP keyboard, type « 90 » to enter a coverage angle of 90 degrees.
- 19. Look at the top of the TID and confirm that the coverage angle is correct, then press "ENTER" to enter grid coverage angle.
- 20. On the CAP keyboard, press the CLEAR button.
- 21. On the CAP keyboard, press the « 2 » (NBR) button to select Sector Count (number of grid sectors).
- 22. On the CAP keyboard, type « 6 » to enter a Sector Count of 6 sectors.
- 23. Look at the top of the TID and confirm that the sector count is correct, then press "ENTER" to enter grid sector count.
- 24. On the CAP keyboard, press the CLEAR button.
- 25. On the CAP keyboard, press the « 8 » (HDG) button to select Threat Axis (Bisector) Heading.
- 26. On the CAP keyboard, type « **315** » to enter a Threat Axis heading of 315.
- 27. Look at the top of the TID and confirm that the heading is correct, then press "ENTER" to enter grid threat axis heading. Your grid will be oriented according to this heading.






9.6 - BULLSEYE & NAVGRID - Grid Setup (RIO)

And that's it, we have a NAVGRID set up properly!

NAVGRID PARAMETERS

- Reference Point YY Latitude/Longitude Coordinates (set on Bullseye):
 - 24°45'3 North 57°43'6 East (Deg, Min, Tenth of a Minute, Computer Address Coordinates Format)
- Coverage Angle: 90 deg
- Sector Count: 6
- Threat Axis (Bisector) Heading: 315





9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

JESTER can turn on the NAVGRID when requested by the pilot.

- 1. Press "A" twice and access the NAVIGATION menu.
- 2. Access the "NAVIGATION GRID UTILITY" menu.
- 3. Select the "ENABLE NAVGRID UTILITY".
- 4. JESTER will then enable the NAVGRID.



9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

By default, JESTER will create a NAVGRID that uses the Bullseye as a Reference Point YY. He will then set the Threat Axis heading from the Bullseye to the Hostile Area (HA) Waypoint coordinates if already available in the CAP (Computer Address Panel). If No HA coordinates are available, JESTER will then use the Defended Point (DP) as a Threat Axis reference. If no DP is available, he will then use a Surface Target (and so on and so forth, using the Waypoint Order priority table). You can have a quick look at your waypoint coordinates by using "RSHIFT+K" and the [or] keys to cycle through kneeboard pages to the REFERENCE POINTS page. Then, by default JESTER will set a grid coverage angle of 50 degrees with 4 sectors.

- **Reference Point YY**: Coordinates set on Bullseye
- Threat Axis (defines orientation of grid's bisector): Uses Bearing 304, which coincides with a projection from Bullseye to Hostile Area (or any waypoint available from the Waypoint Order table).
- Number of Sectors: 4

WP3

Islar d AFB

Airport

had AB

DP

Grid Coverage Angle: 50 deg

WP2



	REFERENCE POINTS					
		LAT	1	LON	ALT	MAG VA
MP:	N	24°51'6	E 57	0'95.1	74	+1.7
VP1:	N	26°10'2	E 56	5°52'2	0	+2.0
VP2:	N	26° 30' 6	E 56	5°17'7	0	+2.1
VP3:	N	26°07'0	E 55	5° 34' 9	0	+2.1
FP:	N	26°47'5	E 56	5'37'5	0	+2.1
IP:						
ST:	N	26° 35' 1	E 56	5°57'2	0	+2.1
HB:	N	24°51'6	E 57	0'95.1	0	+1.7
DP:	N	25' 52' 1	E 56	5.11,3	2538	+2.0
HA:	N	26°02'7	E 56	5° 30' 9	0	+2.0

	Waypoint Order		
1	HA (Hostile Area)		
2	DP (Defended Point)		
3	ST (Surface Target)		
4	FP (Fix Point)		
5	WP3 (Waypoint 3)		
6	WP2 (Waypoint 2)		
7	WP1 (waypoint 1)		
8	HB (Home Base)		
9	Aircraft Start Location		

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9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

From the pilot's seat, if you want to be able to consult the NAVGRID as well you will have to perform a few simple tasks.

- 1. By default, JESTER uses the A/C STABILIZE radar mode, which does not display the NAVGRID since it is centered on the aircraft. We need to ask him to use GROUND STABILIZE instead.
- 2. Press "A" twice and access the JESTER main menu.
- 3. Access the "BEYOND VISUAL RANGE RADAR" menu.
- 4. Select the "GROUND STABILIZE RADAR".

LANDING F-14B TOMCAT

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- 5. Select INDEFINITE RADAR (or a specific time duration if you want to revert to A/C STABILIZE afterwards) to tell JESTER to set the radar to Ground Stabilize Mode (which is the only radar mode that will display the NAVGRID).
- 6. Set HSD Mode to TID to display the Tactical Information Display Repeater on the Horizontal Situation Display.
- 7. NAVGRID will now be visible from the pilot's seat.



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NDEFINITE

30 S

120 S

ED S RADAR





Now, now that we have learned how to create a grid... how do we use it? Well, here are two examples of NAVGRID applications.

EXAMPLE 1: GROUND-CONTROLLED INTERCEPTION (GCI)

If a ground controller is online, he can determine with the team his own NAVGRID and vector aircraft to specific sectors.

If all four Tomcats use the same NAVGRID reference, Threat Axis, Coverage Angle and Number of sectors, a GCI can plan an interception mission like a game of chess. For instance, the GCI could communicate to the four Tomcat pilots the location of a radar contact with a specific sector or Voice Code:

• « All flights, Hostile Backfire located in Sector 4 Bravo at 6000 ft. »

• « All flights, Hostile Backfire located at 34 Bravo at 6000 ft. » Just with that information, all pilots will know where the target is just by looking at their NAVGRID.

If the GCI is smart, he can also vector different flights for a BARCAP (Barrier Combat Air Patrol) mission by assigning each flight a sector to cover from a specific direction. He could assign you to cover Sector 4-A, while he could task Tomcat #3 with Sector 3-A, Tomcat #2 with Sector 2-A and Tomcat #1 with Sector 1-A.



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9.8 - BULLSEYE & NAVGRID - Using NAVGRID

EXAMPLE 2: COMMUNICATING RADAR CONTACT LOCATION USING NAVGRID

If you (Tomcat #1) are flying with a wingman (Tomcat #2) and you want to transmit to your wingman the location of a target quickly, you can either communicate the Voice Code of the hooked radar contact or you could give him a general sector location to look.

As an example, you could tell your wingman:

« Unknown contact, 31 Bravo at 5000 ft. » This will tell him to expect a target at a bearing of 310 from the NAVGRID Reference Point YY (Bullseye) from a distance between 51 and 100 nm.

You could also say something more general but just as effective: « Unknown contact, Sector 2 Bravo, at 5000 ft. » This will give your wingman a grid to work with.





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10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

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Case III recovery is used for all night operations, as well as during the day when the weather is below Case II minimums (less than 1,000-3). In other words, a Case III recovery is used for bad weather with low visibility conditions. The ACLS (Automatic Carrier Landing System) will act sort of like an ILS (Instrumented Landing System) but for a carrier (d'uh).





The landing looks complicated, but it's not that bad once you figure out what you need to do. Don't worry, we'll go through it together.

- You will generally start a Case III recovery in the Marshal Zone. It's an airspace 25 nautical miles from the carrier where aircraft wait for landing clearances. We will use the carrier's TACAN beacon to orient ourselves and approach the carrier from a certain direction in reference to the beacon, which is what we call a radial. The Marshal Radial is usually 15 to 30 degrees off the Final Bearing. In our case, the final bearing is 360 deg, so the Marshal Radial is 030.
- We will follow the Marshal Radial (030) and descend from 10,000 ft to 5,000 ft at 250 kts with a descent rate of 4000 ft/min
- Once we are 15 nm from the carrier on the Marshal Radial, we will turn 90 degrees right (030 + 90 degrees = 120 degrees) and maintain a 12 nm separation with the carrier.
- We will follow the "arc" until we reach the Final Bearing radial (360/000) approximately 10 nm from the carrier. We will then drop our gear down, set our flaps to full and set our angle of attack to ON SPEED AOA.
- Once we have turned to 360/000 and captured the carrier's localizer (indicates lateral deviation with runway centerline), we will then capture the glide slope (indicates vertical deviation with optimal path) using the ICLS (Instrumented Carrier Landing System).
- Once we are 3/4 nm from the aircraft, we will track the meatball and use it as a reference to land.
- The TACAN is mostly used to help you track your radials and distance from the carrier during your approach. The ICLS, on the other hand, is used to give you a reference on where you should be during the final landing phase.





Here is a brief overview of what we'll do.





- 1. Contact Carrier on the carrier's frequency to turn on the lights.
 - a. Set either ARC-182 V/UHF 2 or ARC-159 UHF 1 radio frequency to the carrier's radio frequency. This can be done with:
 - JESTER i.

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- From the pilot's seat with UHF 1 (if carrier frequency is within UHF1 range). ii. Frequencies range from 225.000 MHz to 399.975 MHz.
- iii. From the RIO's seat with V/UHF 2. Frequencies range from:
 - VHF 30-88 MHz FM close air support
 - VHF 108-118 MHz AM navigation, receive only
 - VHF 118-156 MHz AM air traffic control
 - VHF 156-174 MHz FM maritime
 - UHF 225-400 MHz AM/FM military/NATO
- b. Press the MIC BUTTON UHF 2 (RCTRL+\) switch or the MIC BUTTON UHF 1 (RALT+\) switch on your throttle to contact the carrier. If the RIO is in charge of the radio, use the pedal in the appropriate ICS mode to communicate.
- c. Go in F5 AT5 menu, then to the CVN-74 menu, then to the F1 Inbound menu.
- d. The carrier will give you a QFE (Barometric Pressure Setting), a pattern altitude and other relevant information.
- e. And that's it, the carrier is now illuminated.
- 2. Set Barometric Pressure (QFE) stated by the carrier controller (i.e. 29.93 in Hg)





F3. Dubai Intl... F4. Sirri Island... F5. Al Maktoum Intl... F6. Al Minhad AB...

VHF/UHF ARC-182 3. Main. ATC. CVN-74 John C. F1. Inbound F2. Request Azimuth F11. Previous Menu

F12. Exit

Enfield 1-1, fly heading 039 for 23, QFE 29.93, runway 35, to pattern altitude

RIO AN/ARC-182 V/UHF 2 Radio Control Panel





- 3. Adjust your interior cockpit lights as required.
- 4. If desired, pull the HUD Filter Handle to set a red filter on the HUD (Heads-Up Display)
- 5. If desired, click in the middle of the VDI (Vertical Display Indicator) screen to set a red filter on the VDI
- 6. Set navigation lights as required

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Click in the middle of the VDI to toggle between red and green VDI filters





When pushed, leaves HUD in the day

- 7. Set ARA-63 ICLS (Instrument Carrier Landing System) Power Switch ON (FWD)
- 8. Set ARA-63 ICLS Channel Selector to ICLS frequency of the carrier (11 in our case, should be listed in mission briefing)
- 9. Use "RSHIFT+K" and the [or] keys to cycle through kneeboard pages to the TACAN LIST page. The TACAN frequency of the carrier should be listed there (74X).
- 10. Set TACAN Mode selector to T/R. Allow a warm-up period of 2 minutes.
- 11. Set TACAN Frequency using the X/Y selector and the Ones and Tens dials. We will set TACAN frequency to 74X.
- 12. Set TACAN CMD to PLT if you are the pilot or to NFO if you are the RIO.
- 13. Set VDI Mode to NORM
- 14. Set HSD Mode to NAV

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- 15. Set Navigation Steer Command to TACAN.
- 16. Set HUD Mode to LDG (Landing). You could also set it to CRUISE, but LDG mode has the advantage of showing TACAN steering cues on the VDI and Heads-Up Display.
- 17. Set HUD AWL (All-Weather Landing System) Mode to ACL (Automatic Carrier Landing)
- 18. Set VDI AWL Mode to ACL









- 19. Use "RSHIFT+K" and the [or] keys to cycle through kneeboard pages to the TACTICAL DATALINK SYSTEMS page. The datalink frequency of the carrier (Stennis) should be listed there (309.70 MHz).
- 20. Set Datalink Power Switch ON (FWD)
- 21. Set Datalink Mode Switch TAC (AFT)
- 22. Set Datalink Frequency to the desired network. Our desired frequency is 309.70 MHz. Rotate the Datalink Frequency Select wheels to 09.7 as shown (the 3 is preset and cannot be modified).
- 23. Set Radar Beacon Power Switch to PWR (FWD)
- 24. Set Radar Beacon Selector Switch to SINGLE.
- 25. If the carrier's datalink frequency is set up properly, the ACLS Push-to-Test switch should illuminate. Then, you know that you are good to go.







F-14B

Alternatively, you can use JESTER to set up the Datalink frequency for you.

- 19. [J] Set Datalink Mode and frequency with JESTER. Use the JESTER Contextual Menu by pressing "A" twice and selecting "DATA LINK RADIO" (LCTRL+7). Then, select "SET MODE" (LCTRL+1) and select "TACTICAL DATALINK SYSTEM" (LCTRL+1).
- 20. [J] Then, you can set Datalink Frequency to the desired network. Use the JESTER Contextual Menu by pressing "A" twice and selecting "DATA LINK RADIO" (LCTRL+7). Then, select "SET HOST" (LCTRL+1) and select desired datalink host (CVN74 Stennis Carrier).



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10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

26. Set ANTI-SKID SPOILER BK switch OFF (MIDDLE) 27. Set HOOK BYPASS switch to CARRIER (AFT) 28. Set Hook Lever DOWN 29. Set Wing Sweep Mode to AUTO 30. Set Speed Brake OUT (Deployed)











10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

31. Turn the CRS (Course Set) knob to set desired course for TACAN approach (030 for the Marshal Radial).

TACAN Range (nm)





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32. When you are 25 nm from carrier, follow the Marshal Radial (030) and descend from 10,000 ft to 5,000 ft at 250 kts.







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- 34. Steer 90 deg right to a heading of 120 and set TACAN course to the Carrier Runway Heading (000/360).
- 35. When crossing the carrier's runway heading radial of 360, steer aircraft to 360 for Final Approach.





- 36. Once lined up on the final segment (10 nm out), select AWL/PCD (All-Weather System/Precision Course Direction) Navigation Steer Command.
- 37. When reaching 8 nm from carrier, set landing gear down, full flaps, settle aircraft attitude at On Speed AoA. Double-check that Anti-Skid Switch is OFF, Hook Lever is DOWN, Hook Bypass Switch is set to CARRIER.
- 38. When flaps are down, press the DLC Toggle button. Confirm DLC (Direct Lift Control) is on by checking if the Maneuvering Flaps/Spoilers are deployed
- 39. Set VEC/PCD/ACL Autopilot selector to ACL (Automatic Carrier Landing) (AFT)
- 40. Set Autopilot Switch to ENGAGE (FWD)

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- 41. A/P REF will indicate that autopilot selected but not engaged
- 42. Remove your hand from the throttle, then set Throttle Mode switch to AUTO (FWD). This will engage Auto-Throttle, which will automatically adjust thrust to maintain an ON SPEED AoA (Angle of Attack).







- 45. As you are 6 nm from the carrier, the LANDING CHK caution will illuminate. This means the carrier has a channel ready for ACL and that the crew should prepare for carrier landing.
- 46. As you are 4 nm from the carrier, the ACL READY caution will illuminate. This means the CATCC (Carrier Air Traffic Control Center) has acquired the aircraft and is transmitting glidepath information to the aircraft. The AP/CPLR caution will indicate the CATCC is ready to control the aircraft.
- 47. Ensure Localizer and Glide Slope needles are centered or the ACLS (Automatic Carrier Landing System) will not be able to engage properly.
- 48. Press the Autopilot Reference / Nosewheel Steering Button to engage the automatic carrier landing system.
- 49. Once engaged, the CMD CONTROL caution will indicate that the aircraft is under datalink control for landing.
- 50. Once you are 10 seconds to arrival, the 10 SECONDS caution will illuminate.



LANDING CHK

ACL READY

A/P CPLR

CMD CONTROL

10 SECONDS

50







LANDING F-14B TOMCAT

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51. The ACLS will then automatically land the aircraft for you on the carrier. If the ACLS disconnects or the aircraft autopilot or autothrottle fails, be ready at any second to take back the controls and throttle up to go around.





10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

One last piece of advice for ACLS is that you must remember that the PLM (Pilot Lockon Mode) button on the throttle can be used to disengage the autopilot while in ACL (Automatic Carrier Landing) mode at any time.



PLM Button

Button used to command pilot lockon mode of AWG-9. Also used to disengage autopilot while in ACL.





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11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.1 - INS Introduction

Reference: Heatblur F-14 DCS World Forums https://forum.dcs.world/topic/175786-dcs-f-14-update-all-about-inertia

The F-14 predated the era of modern GPS (Global Positioning System) and it needed a system to guide the aircraft on a route to a mission objective hundred or thousand miles-long, and then back to the home base. Being a naval aircraft designed to operate over the ocean far away from any ground-based TACAN (Tactical Air Navigation) station or visual references, having a reliable navigation system is all the more critical for the Tomcat.

The solution to this problem took the form of an INS (Inertial Navigation System). An INS measures and integrates sensed inertia forces (acceleration) and rotational velocities to calculate aircraft position and linear velocity. The INS used on the F-14 is a multi-unit Carrier Aircraft Inertial Navigation System (CAINS) designated as AN/ASN-92. The INS requires coordinates of its initial position, which means that it must be aligned either on the ground or on the aircraft carrier itself (see Start-Up Procedure section).

The AN/ASN-92 provides the crew and the other aircraft systems with:

- Current latitude and longitude
- Attitude
- Heading true and magnetic
- Own ground speed and ground track
- Ability to store and display three waypoints, a fixed point (FP), an initial point (IP), a surface target (ST), a home base (HB), a defended point and a hostile area
- Range, bearing, command course, command heading and time-to-go to a selected destination point
- Calculated wind speed and direction
- Calculated magnetic variation
- Continuous monitoring of the status of the unit, and in case of failure inform the crew with advisory lights and appropriate acronyms displayed on the TID (Tactical Information Display)
- Backup navigation modes in case of partial system failure

A fully aligned AN/ASN-92 INS, in accordance with the requirements of the navy specification, for the latitude of 45 degrees North, should provide the following performance:

- 3 arc minutes for heading,
- 2.5 arc minutes for pitch and roll
- Position error rate of 0.75 nm per hour (CEP, Circular Error Probable)
- Velocity error of 3 feet per second.

All values stand for standard deviation and assume a normal distribution of the error. The RIO can decide to finish the alignment and switch to the INS navigation mode at any point after coarse alignment criteria have been met. However, a premature selection of the navigation mode will significantly degrade the navigation quality. In-flight alignment of the F-14 INS is impossible. In case of an in-flight INS failure or a takeoff without proper INS alignment, two additional backup navigation modes are available. They provide dead-reckoning navigation using attitude information from the IMU or the AHRS (Attitude and Heading Reference Set), airspeed from the CADC (Central Air Data Computer), stored wind data and magnetic variation.

11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.1 - INS Introduction

Reference: Heatblur F-14 DCS World Forums https://forum.dcs.world/topic/175786-dcs-f-14-update-all-about-inertia

Although from the crew member's point of view, the INS is used mostly for navigation, it is also essential for proper operations of other aircraft equipment. For example, the attitude is necessary for the radar. The attitude and the own position are required for some weapon delivery modes, particularly for long shots. Even more distressing to the crew, a complete failure of the INS renders weapons such as the AIM-7 inoperable.

The same information is used for data-link operations - when using erroneous INS data, own tracks and targets received from cooperating aircraft will not match and result in false contacts being displayed on the TID. These are only a few examples, and the INS data is used whenever aircraft position or attitude is required.

AN/ASN-92 is built from multiple components, but there are two particular components which constitute the core of the system: the inertial measurement unit (IMU) and the navigation computer.

The IMU is a three-axis, four-gimbal, all-attitude unit containing two gyros and three accelerometers. The gyros and the accelerometers are mounted to a platform that is free to rotate respect to the base (aircraft). The four-gimbal system provides gimbal-lock free rotation and uses torquer motors to correct platform attitude errors. The gyros sense angular rotation about their sensitive axes and are the source of information about the aircraft attitude. They also stabilize the whole platform and keep the constant orientation of the accelerometers respect to the ground. Two accelerometers are used to measure acceleration in the horizontal plane; the third accelerometer measures vertical acceleration. The sensitive axes of the accelerometers are orthogonal. The sensed acceleration signal is integrated in the computer and used to calculate aircraft velocity and displacement from the initial position. The attitude of the platform is also corrected continuously to account for the effects associated with the Earth's rotation and device inaccuracies.

11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.2 - INS Drift

The INS suffers drift due to measurement errors that accumulate with time. due to imprecise sensors (gyroscopes and accelerometers) and due to the limitations of calculation methods. A cumulative error in coordinate calculations can be up to a few nautical miles after 1 hour of flight. Errors in coordinate calculations will affect flight path and determination of target locations, especially if the pilot uses waypoints to navigate. To compensate for these errors, they need to be corrected. You will start noticing inertial drift once the coordinates of your waypoints do not seem to match what you see outside the cockpit.

In order to update/re-align the INS position in-flight, a pilot uses reference points such as known landmark, TACAN station or something easy to spot visually. These reference points are called **fixed points (or "fix")**, Fixed points, which are similar in nature to waypoints (basically, a set of coordinates for a navigation point), are used to re-align your INS. Typically, you want to have these fixed points set up before entering a combat zone.

Notes:

- If the INS drift is minimal (high accuracy), overflying the expected position of this waypoint should result in a small distance reading, meaning that the geographic coordinates match the INS coordinates.
- If the INS drift is high (low accuracy), overflying the expected position of this waypoint should result in a significantly greater distance reading, meaning that the geographic coordinates do not match the INS coordinates.



11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.2 - INS Drift

Here is an example to illustrate the effect of accumulated position error.





11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.2 - INS Drift

How do you know when to re-align, though? Well, one quick way is to select an existing waypoint as a navigation fix point; its coordinates should set on a visual landmark. When overflying this landmark, you can use the Waypoint Range displayed on:

- **Pilot Seat**: the HSD (Horizontal Situation Display)
- **RIO Seat**: the TID (Tactical Information Display) or ECMD (Electronic Countermeasures Display) to see the INS-computed distance between the aircraft and selected waypoint.

Waypoint Range (nm)





11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.3 - Coordinate Correction – Fixes Overview

There are three primary methods of performing a navigation fix:

- **Overfly Visual Fix**: this method consists of flying over a known reference point that matches a waypoint stored in the INS. Once flying over this point, perform the fix to measure the position error and correct it.
- **TACAN Fix**: this method consists of selecting a TACAN station that matches a waypoint stored in the INS. Perform the fix to measure the position error between the waypoint and the TACAN station and correct it.
- **Radar Fix**: this method consists of using the radar and finding a known reference point that matches a waypoint stored in the INS. Using the radar, perform the fix to measure the position error and correct it.

Redkite has great tutorials for INS Fixes: <u>https://youtu.be/YqQz9YrEi6A</u>





11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.4 - Overfly Visual Fix Tutorial

For fixed points, it is recommended to use locations that stand out in the terrain – buildings, towers, bridges, road crossings, and river merge points that are easily located along the route. In this example, our Fix Point coordinates are already entered in Waypoint 2, which is set over a visual landmark (football field).






From the Pilot Seat:

- 5. Fly directly over the fixed point's geographic position (football field). Call out your position to the RIO using a countdown to make things easier.
 - Note: Disregard the waypoint's position on the VDI (Vertical Display Indicator) and the HSD (Horizontal Situation Display) since we assume the accumulated INS position error is significant.





- 6. Set CAP (Computer Address Panel) CATEGORY selector to NAV (Navigation)
- 7. Once the pilot is over the fixed point, press the VIS FIX (Visual Fix) Button.
- 8. Once VIS FIX button is pressed:
 - a) The VIS FIX button is illuminated with a green arrow.
 - b) The TID Data Display will show the difference in latitude and longitude between the aircraft's position at the time the fix procedure was triggered and the waypoint position computed by the aircraft's Inertial Navigation System.







From the RIO Seat:

- 9. Based on the value of the accumulated error, you can decide to either accept or reject the update. If the accumulated error is reasonable, accept the update by pressing the FIX ENABLE button.
- 10. If the accumulated error does not make sense, then reject the update by pressing the VIS FIX button again. The green arrow will then extinguish.
- 11. That's it, you have corrected the INS drift!

Important Note:

• A blind validation can screw up your whole INS position easily since it will modify the whole INS waypoint database and aircraft position. It will also affect INS bias calculations, which will degrade the quality of the INS over multiple flights. INS bias calculations are used to tune the INS, improving its precision... that is until the INS bias values are zeroed when pressing the FIX ENABLE button.



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LS 0°03.9

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9a – FIX ENABLE Not Pressed

INS Correction not performed yet







For fixed points using a TACAN fix, we have to use a ground-based TACAN station as a reference and a waypoint set on the very same position of the TACAN station. In this example, our Fix Point coordinates are already entered in Waypoint 2, which is set over TACAN Station 67X in Kobuleti.





From the Pilot Seat:

1. The pilot should set TACAN CMD (TACAN Command) to NFO since in this tutorial the RIO is setting up the TACAN channel.

From the RIO Seat:

- 2. Set TACAN Mode selector to T/R. Allow a warm-up period of 2 minutes.
- 3. Set TACAN Frequency using the X/Y selector and the Ones and Tens dials. We will set TACAN frequency to 67X, which is the station we want to use as a reference for the fix.
- 4. Consult the BDHI and ensure TACAN station signal is tracked.

BDHI (Bearing Distance Heading Indicator)

- Displays indicating azimuth and bearing information.
- No. 2 bearing pointer (thick) indicates magnetic course to tuned TACAN station.
- No. 1 bearing pointer (thin) indicates bearing to tuned UHF/ADF station
- BDHI also indicates distance; counter indicates slant range to tuned TACAN station in nm

No.2 Bearing Pointer Magnetic Course to tuned TACAN Station

TACAN Frequency Readout TACAN Frequency Ones Dial 1 **TACAN Frequency Tens Dial TACAN X/Y Selector**







From the RIO Seat:

- 9. Set CAP (Computer Address Panel) CATEGORY selector to NAV (Navigation).
- 10. Press the TACAN FIX button.
- 11. Once the TACAN FIX button is pressed:
 - a) The TACAN FIX button is illuminated with a green arrow.
 - b) The TID Data Display will show the difference in latitude and longitude between the TACAN's position at the time the fix procedure was triggered and the position of the reference waypoint No. 2 computed by the aircraft's Inertial Navigation System.



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TACAN FIX Pressed Latitude & Longitude Error

LW 0°00.6'

BRIGHT

445

548

STEERING

DEST

TID



From the RIO Seat:

- 12. Based on the value of the accumulated error, you can decide to either accept or reject the update. If the accumulated error is reasonable, accept the update by pressing the FIX ENABLE button.
 - Generally, a TACAN fix is deemed to be quite reliable since it relies on a fixed station and does not require a specific timing like the Overfly Visual Fix method.
- 13. If the accumulated error does not make sense, then reject the update by pressing the TACAN FIX button again. The green arrow will then extinguish.
- 14. That's it, you have corrected the INS drift!

Important Note:

 A blind validation can screw up your whole INS position easily since it will modify the whole INS waypoint database and aircraft position. It will also affect INS bias calculations, which will degrade the quality of the INS over multiple flights. INS bias calculations are used to tune the INS, improving its precision... that is until the INS bias values are zeroed when pressing the FIX ENABLE button.





ANT TRK

ASPECT

TAIL

PULSE VIDEO

BEAM

PULSE

RDROT

11 - AN/ASN-92 INS (INERTIAL NAVIGATION SYSTEM) 11.6 - Radar Fix Tutorial

For radar fixed points, it is recommended to use geographical features such as islands, mountains or distinct coastlines since the radar Pulse Search mode only gives a very approximate picture. In this example, our Fix Point coordinates are already entered in Waypoint 2, which is set over a peninsula off the coast of Syria. This method requires the RIO to "designate" on the DDD (Detailed Data Display) Radar Display the area where the selected waypoint (Waypoint No. 2 in this case) is expected to be.

Keep in mind that using a radar fix is the least precise method and it is easy to mistake some radar returns / clutter for terrain features.

BRIGHT

NORM

ERASE

E

Vc x4

VID

RANGE

DDD (Detailed Data Display) Radar Returns in Pulse Search Mode

DISPLAY

TWS



Radar in Pulse Search Mode



- 1. Set CAP (Computer Address Panel) CATEGORY selector to TAC DATA (Tactical Data)
- 2. Press the CAP Message selector button next to the waypoint/surface target/fixed point/etc. that you want to select as the "fixed point". We will use Waypoint 2.
- 3. Set the Navigation DEST Mode selector to "2" to track Waypoint 2. This will ensure the steering cues sent to the pilot on the HSD come from Waypoint 2.
- 4. Check the TID (Tactical Information Display) to monitor waypoint range (RA) and magnetic bearing (MB).







- 5. Select Radar Pulse Search Mode
- 6. Set DDD RDR Display Mode
- 7. Select RDR HCU Mode
- 8. Set desired DDD Max Range As Desired. We will select 50 nm.
- 9. Set Azimuth Scan Range and Elevation Bars As Desired
- 10. Adjust PULSE GAIN knob As Desired to obtain good clarity on DDD.
- 11. Adjust ERASE Knob to control how quickly the image on the DDD fades.
- 12. Adjust radar antenna elevation in order to obtain radar returns on the DDD.







- 13. Set CAP (Computer Address Panel) CATEGORY selector to NAV (Navigation).
- 14. Press the RDR FIX button.
- 15. Once the RDR FIX button is pressed, the RDR FIX button is illuminated with a green arrow.
- 16. Press and hold the first HCU (Hand Control Unit) trigger (Half-Action). The radar cursor will appear on the DDD.
- 17. Use the HCU stick to slew the cursor over the expected location of Waypoint 2 (selected Fix Point).
- 18. Once cursor is over the expected location of Waypoint 2 (selected Fix Point), press the second HCU trigger (Full-Action) to designate this point.









From the RIO Seat:

- 19. The TID Data Display will show the difference in latitude and longitude between the radar's designated point at the time the fix procedure was triggered and the position of the reference waypoint No. 2 computed by the aircraft's Inertial Navigation System.
- 20. Based on the value of the accumulated error, you can decide to either accept or reject the update. If the accumulated error is reasonable, accept the update by pressing the FIX ENABLE button.
- 21. If the accumulated error does not make sense, then reject the update by pressing the RDR FIX button again. The green arrow will then extinguish.
- 22. That's it, you have corrected the INS drift!

Important Note:

 A blind validation can screw up your whole INS position easily since it will modify the whole INS waypoint database and aircraft position. It will also affect INS bias calculations, which will degrade the quality of the INS over multiple flights. INS bias calculations are used to tune the INS, improving its precision... that is until the INS bias values are zeroed when pressing the FIX ENABLE button.



19 – FIX ENABLE not Pressed Latitude & Longitude Error

CONTRAST

+00.9

409

STEERIN

()

LW 0°05.2

20a – FIX ENABLE Not Pressed

INS Correction not performed yet

0°15.2



INTRODUCTION

AIR-TO-AIR REFUELING - WHY WE ALL HATE IT

Air-to-air refueling is one of the hardest, most hated, and most frustrating tasks in DCS. Ever. Of all time.

Why? Well, one of the main reasons for the difficulty behind refueling is the skill required to do formation flying. Flying in formation with another aircraft requires much more practice than you would initially think. Another reason is pure physics: there is this thing called "wake turbulence". An aircraft flies through a fluid: air. Just like with any fluid, if you have something that displaces itself through it at a certain speed, the fluid will become disrupted (turbulence). Wingtip vortices and jetwash are both effects of this simple concept. Wake turbulence is the reason why airliners need to wait a minimum time between takeoffs: flying through disrupted air will destabilize the aircraft and it is unsafe, especially during critical phases of flight like takeoff and landing.

Unfortunately, wake turbulence is something a pilot <u>has</u> to deal with during airto-air refueling. This is why the aircraft will fly just fine when approaching the tanker, but start wobbling around when flying in close proximity of the refueling basket/drogue and tanker engines.







TYPES OF AIR-TO-AIR REFUELING

There are four main air-to-air refueling techniques used in military aviation:

- Probe-and-drogue (refueling probe must be inserted in the tanker's drogue basket)
- Flying Refueling Boom (guided by boom operator aboard the tanker)
- Buddy Refueling (two fighters can refuel one another independently without a tanker)
- Nose-Probe refueling



INTRODUCTION

TYPES OF AIR-TO-AIR REFUELING

The refueling aircraft available in DCS are:

F-14B TOMCAT

REFUELING

AIR

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AIR-TO

16

ART

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- The Ilyushin II-78M "Midas", a russian probe-and-drogue tanker, which was developed from the II-76.
- The Boeing KC-135 "Stratotanker", a US Air Force flying boom tanker, which was developed from the Boeing 367-80.
- The KC-135 MPRS (Multi-point Refueling Systems), a US Air Force KC-135 tanker modified to add refueling pods to the KC-135's wings, making it useable as a **probe-and-drogue** tanker.
- The Lockheed S-3B "Viking", a US Navy probe-and-drogue tanker.
- The Lockheed KC-130 "Hercules", a USMC probe-and-drogue tanker, which was developed from the C-130. ٠

The F-14 is equipped with a Probe-and-Drogue system, so air-to-air refueling will only be performed from either an II-78M, a KC-130, a KC-135 MPRS or a S-3B tanker.





AIR-TO-AIR REFUELING DEMO

3

5a

- 1. Consult mission briefing to know on which radio frequency you need to contact the tanker. In our case, we will use the frequency 225.000 AM from the VHF/UHF radio.
- 2. Set HUD Display Mode to CRUISE and Navigation Steer Command to TACAN
- Find tanker using TACAN frequency (33Y) as shown in the NAVIGATION TACAN section. 3.
- Communicate with TEXACO (tanker callsign) using the MIC UHF2 Button (RCTRL+\). 4.
- Select Tanker Texaco (F6) communication menu, and then select "Intent to Refuel" 5.

VHF/UHF ARC-182

Fl. Intent to refuel 🧹

5b

6. TEXACO should give you a pre-contact altitude (in our case 20,000 ft).

Note: Some tankers like the KC-130 are equipped with a TACAN beacon, which can give you a direction to find it easily. Just make sure you have the correct TACAN frequency set in the A/A (Air-to-Air) Mode. Set TACAN using the NAVIGATION TACAN tutorial.



		D T	UH EST + 25 VHF TEST	F DIM	
TKR	33Y	Теха	TACAN .co 1-1	LIST KC-130	RSHIFT+K
BCE	75X	N 37	* 41' 3	W112'18'2	8919ft
BLD	114X	N 35	5° 59' 7	W114°51'8	3567ft
BTY	94X	N 36	°48'0	W116°44'8	2944ft
CDC	120X	N 37	*47'2	W113°04'1	5485ft
DAG	79X	N 34	° 57' 7	W116'34'7	1789ft
EED	99X	N 34	°46'0	W114°28'4	674ft
GFS	91X	N 35	5°07'9	W115°10'6	4042ft
C	2	o. CRUISE	OFF NE	ACL UDI AWL ULS ACL ACL ECM MODE ONDE OFF	



F-14B



AIR-TO-AIR REFUELING DEMO

- 7. Set Master Arm Switch OFF (DOWN)
- 8. Tell the RIO to set the WCS Switch STBY
- 9. Set Refuel Probe switch to either ALL EXTD or FUS EXTD
- 10. Set Fuel Dump switch OFF
- 11. Set Air Source L ENG (will avoid fuel fumes going through air conditioning system)
- 12. Set Wing Sweep Thumb Switch DOWN (BOMB). A constant wing sweep of 55 deg will help stabilize the flight of the aircraft.















Procedures on Joining:



F-14B TOMCAT

IG F-14B F-14B TOMCAT

AIR-TO-AIR REFUELING DEMO

- 13. Make sure refueling probe has deployed correctly. Keep in mind that you may not exceed 350 kts with an extended refuel probe.
- 14. When you are less than 0.1 nm away from tanker, position yourself as shown on picture.
- 15. When in position, use your radio menu to select "Ready Pre-Contact" (F1).
- 16. The tanker's pilot should answer you with "Cleared Contact" and should deploy his drogue basket and start to accelerate to cruising speed.
- 17. Fly formation with the tanker and approach the drogue basket very slowly (make sure you remain about 2-3 kts faster than the tanker) with very gentle inputs. Use stick for big corrections, but keep trimming constantly for small corrections.
- 18. Keep the aircraft **trimmed at ALL TIMES**. Approaching untrimmed is living hell. Be careful with the throttle since it has a very fast response time. Use airbrake if you need to slow down quickly while maintaining altitude.
- 19. When adjusting power, make very small power adjustments since the engine response time is very fast and the F110 engines are very powerful, even in IDLE regimes.



Probe Extended





REFUELING -AIR **AIR-TO** 10 ART Δ

AIR-TO-AIR REFUELING DEMO

- 20. Insert your probe into the drogue basket by using your reference point. Align the left-most refueling pod of the tanker with the middle upper section of the canopy frame, **both vertically and laterally.**
- 21. Additional drag should be generated by the drogue once you have contact with the drogue: your aircraft will slightly decelerate. Throttle up a little to keep the probe in. Once the probe is taking fuel, the tanker pilot should tell you "You're taking fuel" and a green light should illuminate on the tanker's engine.
- 22. Keep formation with the tanker until your refueling is complete. Don't look at the basket, look at the tanker's refueling pod.
- 23. Detach your probe from the basket by throttling down and set Refuel Probe switch to RETRACT.





F-14B



AIR-TO-AIR REFUELING DEMO

Note: While the pilot is busy refueling, the RIO can monitor the fuel refueling progress and keep the pilot updated. The JESTER AI will also give you corrections and advice (while cracking some jokes in the process).







AIR-TO-AIR REFUELING DEMO

Of course, all of this seems much easier said than done. You will very likely do following mistakes:

- Approach too fast and miss the basket ٠
- Oscillate vertically without being able to line up with the basket ٠
- Keep going either too fast or too slow
- Drift left or right ٠
- Overcompensate control inputs ٠
- Forget the airbrake on

Here is a great demo of air-to-air refueling by 104th_Maverick.

https://youtu.be/mINT28ZFKbA

The next slide will give you a couple of tips to help you catch that basket and slurp that delicious jet fuel like a crack addict.







- Remaining CALM is key for a successful refueling. If you lose your cool, take a break and try again once you are relaxed. Silk hands and a clear head are needed for that part.
- If you overshoot (or are about to fly past) the tanker, you can bleed speed very fast by deploying your airbrakes. You can go from 400 kts to 300 kts in a matter of seconds.
- Avoid combining roll, pitch and yaw movements at the same time when you are tracking the basket. Failing to do so will make you drift vertically and horizontally, which doesn't help at all and may induce PIO (Pilot induced oscillations). Try to stay in the same horizontal plane as much as possible.
- It is easier if you try to "break down" your control inputs in separate movements. I try to avoid gunning my throttle, pitching up/down, rolling and using my rudder at the same time. I generally avoid using the rudder and instead focus on using small pitch and roll inputs only in order to make the aircraft's response predictable. Combining different control inputs can make the aircraft react in a way that makes it all very difficult for your brain to predict and process. I tend to make sure my plane is straight and level at first and that I am more or less lined up with the basket.
- Once I have a satisfying attitude and that the basket is placed as per the reference points (left-most refueling pod of the tanker aligned with the middle upper section of the canopy frame, **both vertically and laterally**), I gradually throttle up and increase speed to match the tanker's speed. Make sure that you keep a constant speed as much as possible.
- Avoid big throttle movements as the F-14B's engines respond very quickly and are very powerful.
- Once my speed matches the tanker's, I can gradually accelerate to a speed that is 2-3 kts faster, approaching the basket very slowly. At that part, the ONLY two things I am watching are my AIRSPEED and the REFERENCE POINT (REFUELING **POD + CANOPY FRAME). DO NOT LOOK AT THE BASKET**. Nothing else matters.
- Once I am approaching the basket, I make sure to avoid inducing yawing motion with the rudder pedals. I displace myself with roll and pitch (vertical) stick input only.
- Trim, trim, trim! Trimming is the name of the game. The better trimmed you are, the easier the approach will be.





F-14B



Heatblur F-14 Wiki http://www.heatblur.se/F-14Manual/

Used for Part 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Home of M.A.T.S.

http://www.anft.net/f-14/ Used for Part 3, 8, 13

Jabbers F-14 Tutorials (Youtube)

https://www.youtube.com/watch?v=wl9l9MDRxXk&list=PLbEi2nhCxrDVOAgxR59UgR0TnmC4qHkAi Used for Part 2, 3, 4, 5, 6, 8, 9, 10, 12

Redkite F-14 Tutorials (Youtube)

https://www.youtube.com/watch?v=R9-8UCj66Ds&list=PLml_c09ciucs3Q2SsJ2HDHBGpTbfkDwE4 Used for Part 3, 6, 9, 10, 15

104th_Maverick F-14 Case I Carrier Landing Tutorial (Youtube)

https://www.youtube.com/watch?v=NMDuXrtHWno Used for Part 6, 15

104th_Maverick DCS F-14 Tomcat Air to Air Refueling Tutorial (Youtube)

https://youtu.be/mINT28ZFKbA Used for Part 16

OverKill DCS F-14 Tutorials (Youtube)

https://www.youtube.com/watch?v=1AfENikz58g&list=PLjjb3OaSRCPNfHzcEu41AJAw1IoOBERcj Used for Part 3, 5, 6, 9, 10

Spudknocker F-14 Tutorials (Youtube)

https://www.youtube.com/watch?v=I4Dnl8ECJhc&list=PLZ8X4p18pdbmUs_ujgpyRSMXg8vzGR46Z Used for Part 6, 10

Crash Laobi 1-Minute DCS F-14 Tutorials (Youtube)

https://www.youtube.com/watch?v=zJqnkMDYUPU&list=PL-uF4jhpky8VD6mKjxfNFG-TJSZq4fmEh Used for Part 4, 5, 6, 15

Matt Wagner DCS: F/A-18C Hornet – Episode 16: CASE III Introduction

https://youtu.be/DvIMHnLjbDQ

Used for Part 15

PART 1 – INTRODUCTION & JESTER AI PART 2 - CONTROLS SETUP PART 3 – COCKPIT & EQUIPMENT PART 4 – START-UP PROCEDURE PART 5 – TAKEOFF PART 6 – LANDING PART 7 – ENGINE MANAGEMENT PART 8 – FLIGHT & AERODYNAMICS PART 9 – RADAR & SENSORS PART 10 – OFFENCE: WEAPONS & ARMAMENT PART 11 – DEFENCE: RWR AND COUNTERMEASURES PART 12 – DATALINK & IFF PART 13 – RADIOS PART 14 – AUTOPILOT PART 15 – NAVIGATION & ACLS LANDING PART 16 – AIR-TO-AIR REFUELING PART 17 – REFERENCE MATERIAL

|--|

ACRONYMS

ACL	Automatic Carrier Landing
ACLS	Automatic Carrier Landing System
ACM	Air Combat Maneuver
ACQ	Aquisition
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADL	Armament Datum Line
AFCS	Automatic Flight Control System
AFTC	Augmenter Fan Temperature Control
AHRS	Attitude Heading Reference System
AICS	Air Inlet Control System
AOA	Angle of Attack
APC	Approach Power Compensator
ASH	Automatic Stored Heading
ATC	Active Transfer Command
ATLS	Automatic Thrust Limiting System
ATTK	Attack
AVTR	Airborne Video Tape Recorder
AWL	All-Weather Landing
BATR	Bullet at Target Range
BDHI	Bearing-Distance-Heading Indicator
BIT	Built-in Test
BRC	Base Recovery Course
BRST	Boresight
BRU	Bomb Rack Unit

CAINSCarrier Aircraft Inertial Navigation SystemCANTCOCan't ComplyCAPComputer Address PanelCCIPContinuously Computed Impact PointCICUComputer Integrated Converter UnitCLSNCollisionCMContinuous MonitorCRSCourseCRTCathode Ray TubeCSAContinuous Semi-ActiveCSDCComputer Signal Data ConverterCTVSCockpit Television SensorCVAircraft CarrierCWContinuous-WaveDDIDigital Data IndicatorDEF PTDefensive Electronic CountermeasuresDESDesignate	CADC	Central Air Data Computer			
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CTVSCockpit Television SensorCVAircraft CarrierCWContinuous-WaveDDDDetail Data DisplayDDIDigital Data IndicatorDECMDefensive Electronic CountermeasuresDEF PTDefended PointDESDesignate	CSDC	Computer Signal Data Converter			
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CWContinuous-WaveDDDDetail Data DisplayDDIDigital Data IndicatorDECMDefensive Electronic CountermeasuresDEF PTDefended PointDESDesignate	CV	Aircraft Carrier			
DDDDetail Data DisplayDDIDigital Data IndicatorDECMDefensive Electronic CountermeasuresDEF PTDefended PointDESDesignate	CW	Continuous-Wave			
DDIDigital Data IndicatorDECMDefensive Electronic CountermeasuresDEF PTDefended PointDESDesignate	DDD	Detail Data Display			
DECM Defensive Electronic Countermeasures DEF PT Defended Point DES Designate	DDI	Digital Data Indicator			
DEF PT Defended Point DES Designate	DECM	Defensive Electronic Countermeasures			
DES Designate	DEF PT	Defended Point			
	DES	Designate			

Destination
Direction Finder
Data Link
Direct Lift Control
Distance Measuring Equipment
Doppler
Expanded Chaff Adapter
Electronic Countermeasures
Electronic Counter-Countermeasures
Electronic Countermeasures Display
Environmental Control System
Exhaust Gas Temperature
Exhaust Gas Temperature Electronic Instrument Group
Exhaust Gas Temperature Electronic Instrument Group Estimated Time of Arrival
Exhaust Gas Temperature Electronic Instrument Group Estimated Time of Arrival Expand
Exhaust Gas Temperature Electronic Instrument Group Estimated Time of Arrival Expand False Alarm Rate
Exhaust Gas Temperature Electronic Instrument Group Estimated Time of Arrival Expand False Alarm Rate Field Carrier Landing Practice
Exhaust Gas TemperatureElectronic Instrument GroupEstimated Time of ArrivalExpandFalse Alarm RateField Carrier Landing PracticeFatigue Engine Monitoring System
Exhaust Gas Temperature Electronic Instrument Group Estimated Time of Arrival Expand False Alarm Rate Field Carrier Landing Practice Fatigue Engine Monitoring System Fuel Flow

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– кегекеNCE MATERIAL & ACRONYMS F-14В томсат

17

PART

FMR	Frequency Ranging	IAS	Indicated Airspeed	LCD	
FOV	Field of View	ICLS	Instrument Carrier Landing System	LCOS	
FRL	Fuselage Reference Line	ICS	Intercommunications	LOS	Γ
FSK	Frequency-Shift-Keyed	IFF	Identification Friend or Foe	LPRF	Γ
FWD	Forward	IFR	Instrument Flight Rules	LSO	Γ
GACH	Gimbal Angle Crosshair	IFT	In-Flight Training	LTE	Γ
GCI	Ground Controlled Intercept	ILS	Instrument Landing System (ICLS)	М	Γ
GCS	Gun Control System	IMN	Indicated Mach Number	MA	Γ
GM	Ground Map	IMU	Inertial Measurement Unit	MAD	Γ
GPS	Global Positioning System	INS	Inertial Navigation System	MAG VAR	Γ
GSS	Gun Scoring System	IP	Initial Point	MAN	Γ
GT	Ground Track	IR	Infrared	MAND	Γ
НВ	Homebase	IRAT	IR Angle Tracking	MDIG	
HCU	Hand Control Unit	ITER	Improved Triple Ejector Rack	MEC	
HDG	Heading	ITS	Integrated Trim System	MIL	
НОЈ	Home-on-Jam	JAM	Jamming	ML	
HOST	Hostile	JAT	Jam Angle Track	MLC	
HPRF	High Pulse Repetition Frequency	KCAS	Knots Calibrated Airspeed	MLG	
HSD	Horizontal Situation Display	KTS	Knots	MOAT	
HSI	Horizontal Situation Indicator	LAR	Launch Acceptable Region	MMGS	
HUD	Heads-up Display			MRL	

Lead Computing Optical Sight Line of Sight Low Pulse Repetition Frequency Landing Signal Officer or "Paddles" Launch-to-Eject Mach Missile Alert Magnetic Azimuth Detector Magnetic Variation Manual Mandatory Multipurpose Display Indicator Group Main Engine Control Military Missile Launch Mainlobe Clutter Main Landing Gear Missile on Aircraft Test Multiple Mode Gun Sight Manual Rapid Lockon

Liquid Crystal Display

568

PART 17 – REFERENCE MA	

ACRONYMS

MSL	Mean Sea Level	PRI	Primary	SAM	Surface to Air Missile
NAV GRID	Navigation Command and Control Grid	PRSL	Pulse Radar Slaved	SAS	Stability Augmentation System
NBR	Number	PS	Pulse Search	SAT	Simultaneous Alignment and Test
NFO	Naval Flight Officer	PSTT	Pulse Single Target Track	SCP	Sensor Control Panel
NFOV	Narrow Field of View	РТ	Point	SD/A	Sample Data/Active
NM	Nautical Miles	QADL	Cue-to-ADL	SEAM	Sidewinder Expanded Acquisition Mode
NOZ	Nozzle	QDES	Cue-to-Designate	SINS	Ship Inertial Navigation System
NTDS	Naval Tactical Data System	QHUD	Cue-to-HUD	SP	AIM-7 Sparrow Missile
OBC	On-Board Check	QSNO	Cue-to-snowplow	ST	Surface Target
Paddles	See LSO	QWP	Cue-to-waypoint	STAB	Stabilization
PAL	Pilot Automatic Lockon	RACH	Radar Angle Crosshair	STAB AUG	Stability Augmentation
PCD	Precision Course Direction	RDR	Radar	STBY	Standby
PD	Pulse Doppler	RDROT	Radar on Target	STC	Sensitivity Time Control
PDCP	Pilot Display Control Panel	RECON	Reconnaissance	STT	Single Target Track
PDRSL	Pulse Doppler Radar Slaved	RIO	Radar Intercept Officer	SW	AIM-9 Sidewinder Missile
PDS	Pulse Doppler Search	RNG	Range	TACAN	Tactical Air Navigation
PDSTT	Pulse Doppler Single Target Track	RNGRT	Range Rate	TARPS	Tactical Air Reconnaissance Pod System
РН	AIM-54 Phoenix Missile	ROT	Range on Target	TAS	True Airspeed
PLM	Pilot Lockon Mode	RTGS	Real-Time Gun Sight	TCS	Television Camera Set
PRF	Pulse Repetition Frequency	RWS	Range While Search	TDS	Tactical Data System

569

F-14B TOMCAT	
PART 17 – REFERENCE MATERIAL & ACRONYMS	

<u>ACRONYMS</u>

TER	Triple Ejector Rack		VID	Visual Identification
TGT	Target]	vM	Manual MAG VAR
THRLD	Threshold]	VMCU	Voltage Monitor Control Unit
TID	Tactical Information Display]	VSL	Vertical Scan Lockon
ТІТ	Turbine Inlet Temperature]	VTR	Video Tape Recorder
TTG	Time-to-Go]	WCS	Weapon Control System
TUIR	Time Until in Range	1	WFOV	Wide Field of View
TUMR	Time Until Maximum Range	1	WILCO	Will Comply
TUOR	Time Until Optimum Range	1	WOD	Wind over the Deck
TWS	Track While Scan]	wow	Weight on/off Wheels
TWSA	Track While Scan Automatic]	YY	Geographic Reference Point for NAV
TWSM	Track While Scan Manual	ון		GRID
UHF	Ultra High Frequency]		
UTC	Coordinated Universal Time]		
Vc	Closing Velocity Rate]		
vC	Computed MAG VAR]		
VDI	Vertical Display Indicator]		
VDIG	Vertical Display Indicator Group (HUD & VDI)			
VEC	Vector	1		
VFR	Visual Flight Rules	1		

THANK YOU TO ALL MY PATRONS

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- James K.
- <u>Hoggit</u>
- <u>Whoops</u>



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Chuck_Owl

[→



INSTANT ACTION CREATE FAST MISSION MISSION CAMPAIGN MULTIPLAYER

LOGBOOK ENCYCLOPEDIA TRAINING REPLAY

MISSION EDITOR CAMPAIGN BUILDEF

EXI



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