

Top Mach Studios, LLC



T-7A Red Hawk for Microsoft Flight Simulator 2020 / 2024

User Manual

For Software Release V1.1



Disclaimer – Although the digital aircraft model for which this manual is written resembles its real-world counterpart, neither the model nor this manual can or should be used as a source of real-world information about the operation or maintenance of the corresponding aircraft and is a work of fiction. Additionally, this package is not endorsed by or supported by the Boeing Corporation or Saab Aerospace or their affiliates, or by the United States Air Force, the United States Department of Defense, or the Government of the United States of America.



TOP MACH STUDIOS, LLC

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THE T-7A RED HAWK TRAINING AIRCRAFT

Brought to you by Top Mach Studios, LLC

The T-7A Red Hawk presented an interesting and fun challenge for Top Mach Studios. The aircraft is still in the early stages of engineering and manufacturing development led by the United States Air Force and the Boeing Corporation, partnered with SAAB Aerospace. There is a significant amount of general information available about the program and the aircraft, but there is a lot of information about the aircraft and its systems that is still not public information. As such we've used a wide array of photographs, videos of simulator and live aircraft footage, simulator footage captured from a Boeing ground simulator, articles, statements from the USAF and the lead contractors, and expert estimates of aircraft specifications. The current simulation is at best an accurate replica of the T-7A, but not a full-up simulation of the real aircraft. That will have to wait until more information becomes available in the public domain. However, we've done a lot of research into comparable aircraft and systems and believe we've developed an exciting and enjoyable simulation that should represent what flying in the T-7A might be like.

ABOUT THE T-7A

The T-7A Red Hawk is an all new two-seat, single engine, supersonic advanced training aircraft developed for the United States Air Force by primary contractors Boeing and Saab Aerospace. When it enters service in the late 2020s, the T-7A will replace the venerable but aging Northrop T-38 Talon, in service with the USAF since the early 1960s. The Red Hawk will be part of an entirely new training system that includes interconnected live and ground simulator-based training to prepare pilots who will fly current and future 5th and 6th generation aircraft for the USAF.

Powered by the GE F404 afterburning turbofan engine, giving it a high thrust to weight ratio, the T-7A was specifically designed for sustained high-G, high-angle-of-attack maneuvers, and night operations. In the training environment, this allows new pilots to train to fly and fight in the vertical and exposes them to near front-line fighter level performance, a capability not present in the T-38 and other current US fast jet training aircraft. Another key program goal is a strong emphasis on ease of maintenance, to reduce long term program costs and keep operational availability at 80 percent or higher.

It incorporates fly-by-wire controls, a fully digital glass cockpit, "stadium seating" to improve backseat visibility, next-gen ACES 5 ejection seats, modular systems architecture, and maintenance friendly design to increase availability and reduce lifecycle cost. T-7A is being developed in tandem with the Ground-Based Training System simulator and courseware to

provide AETC with a seamless, comprehensive flight training program. The first of two “production ready” airframes flew from Boeing’s facility at St. Louis on Dec. 21, 2016, launching initial flight-testing with the manufacturer. Boeing delivered the first of five production-representative aircraft to Edwards on Nov. 9, 2023, launching USAF and Boeing developmental flight-testing.

The T-7A has a sophisticated avionics suite and onboard and ground support computer systems that enable many capabilities not found in any other front line training aircraft. This makes the Red Hawk a central component of the US Air Force’s Advanced Pilot Training System (APTS), a multi-disciplinary approach to front line pilot training that includes in-cockpit augmented reality training equipment, simulated aerial refueling, mixed ground simulator and live aircraft interactions, simulated sensor and threat environments, customizable / on the fly training scenarios, in cockpit simulated avionics from other front line aircraft, and other components that will greatly enhance the USAF’s training and flight currency capabilities for new and veteran pilots.

The T-X program

The Red Hawk was the end result of the T-X program, a United States Air Force development and acquisition program for a new two-seat jet trainer that began in the early 2000s. On March 20, 2015, the US Air Force released the T-X program requirements. On 30 December 2016, the US Air Force released a formal request for proposals. The request included 350+ aircraft and an initial operational capability by 2024. Several major US and European defense contractors submitted proposals and prototype airframes for testing and evaluation. On September 27, 2018, the U.S. Air Force officially selected the Boeing T-X entry as its new advanced jet trainer to replace the T-38.

Entry To Service

The T-7 is expected to enter operational service (IOC) in the late 2020s. Several significant delays have occurred during the later stages of development including problems with ejection seat certification, flight control system software, parts availability, wing rock issues at high angles of attack, and a handful of other development hurdles. However, the manufacturers have subsequently delivered five EMD (engineering and manufacturing development) airframes to the USAF for initial testing and evaluation and low-rate serial production is budgeted to begin in 2025 with at least 350 aircraft planned to enter service by the late 2030s. The T-7’s design allows for future missions to be added, such as aggressor and light attack/fighter roles and requests for proposal from USAF, the US Navy, and several foreign air forces for training, aggressor, and attack roles have been submitted. It’s estimated that over 2,000 T-7s and derivatives could be manufactured over the life of the program.

AIRCRAFT SPECIFICATIONS (T-7A EMD) STATED AND ESTIMATED



General characteristics

Crew: 2: student pilot (front seat) and instructor pilot (rear seat)

Length: 46.9 ft (14.13 m)

Wingspan: 30.6 ft (9.22 m)

Height: 13.5 ft (4.066 m)

Wing area: 310 ft sq (est.)

Empty weight: Est. 18,000 lbs (8,181 kg)

Gross Weight: Est. 22,900 lbs (10,409 kg)

Maximum Takeoff Weight: 26,675 lb (12,125 kg)

Fuel capacity: 4,500 pounds (2,045 kg)

Powerplant: 1 × General Electric F404- GE-103 afterburning turbofan, 11,000 lbf (49 kN) thrust dry, 17,200 lbf (77 kN) with afterburner

Maximum speed: Low supersonic, Mach 1.2+ (est.) at altitude

Maximum Angle of Attack: 30 degrees

G-Limits: +8.5/-3

Cruise speed: at 36,000 ft (12,000 m) altitude / Mach 0.80, est.

Range: 990nm (1,830 km)

Service ceiling: 50,000 ft (15,200 m)

Thrust/weight at GW: 0.75

NOTAMS (REALLY IMPORTANT STUFF TO READ FIRST)

MINIMUM HARDWARE RECOMMENDATIONS

This T-7A Red Hawk model is a complex, high-detail model with large textures as well as complex customized flight control and instrumentation coding that may not function correctly without sufficient computing resources. We highly recommend minimum system specifications that meet or exceed the following:

CPU: 3.2GHz quad core processor or better

GPU: at least 6GB dedicated video memory, Nvidia 1060 GTX or AMD RX 580 or better recommended

RAM: 16.0GB minimum

Hard Disk: 2.8GB minimum hard disk space required for installation

A dedicated control input device such as a joystick, yoke, or HOTAS type control device with dedicated rudder controls or alternatively an Xbox type compatible controller is strongly recommended, though keyboard flight control inputs are supported.

DISCLAIMERS ABOUT THE MODEL AND THIS MANUAL

We've done our best to replicate the T-7A, within the limits of the information available to the public and within the limitations of Microsoft Flight Simulator 2020 (MSFS) and MSFS2024, however, we make no claims, representations, or warranties about the accuracy or validity of any modeled systems or capabilities, or of any statements made about the real-world aircraft. This is not a true-to-life simulator of the T-7A, and any statements or programming choices we've made concerning performance, operations and procedures as incorporated in the model and described herein shall be considered fictional works and may not reflect real world aircraft data. This is a "scale" digital model, or replica, of the T-7A, with information used in its creation taken only from published, publicly available sources, and with its only purpose to be as a source of entertainment, exclusively for customers of the MSFS2020/MSFS2024 game environment, and is therefore not appropriate or intended for the purpose of training or simulation of real-world T-7A flight operations or systems familiarization. Additionally, this manual should only be used as a guide to using the Top Mach Studios, LLC model of the T-7A for

MSFS2020/MSFS2024 and is in no way adequate to serve as a manual or guide to the operation of the real-life T-7A and its systems, nor is it an adequate source of information for real-world operation and maintenance of any aircraft sub-systems and components. Additionally, neither the T-7A model, nor this manual are endorsed by or supported by Boeing Corporation, SAAB Aerospace, their subcontractors and/or affiliates in the development of this product, nor by the United States Air Force or the Government of the United States of America.

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PRODUCT SUPPORT AND UPDATES

Top Mach Studios will do its best to keep the product updated and resolve critical bugs as soon as possible. Updates are typically deployed as new installers/packages and will be available

through the reseller channel from which you purchased the model. Installation of updates will depend on which point of purchase you used and the nature of the updates and instructions will be provided with each such update.

Top Mach Studios provides direct customer support via its Discord server support channels, which can be found on Discord by searching Top Mach Studios, LLC

MODEL FEATURES AND CAPABILITIES

Custom Programmed Simulated Fly-By-Wire control system for virtually carefree flight control

- Nimble, quick, balanced control feel
- Incredibly fun and easy to fly at low level, in formation, and for mock dog-fighting
- Auto-trim / pitch control
- G-Limiter
- Roll rate limiter
- Yaw limiter and Yaw Damping
- Angle of Attack Limiter
- Completely controllable and docile handling to 30 degrees AoA limit (post stall)
- Highly resistant to departure from controlled flight throughout the flight envelope.
- Precision, stable high altitude flight control to 50,000 feet and above.
- Accurate take-off, approach, and landing speeds (from simulator footage)
- Realistic control response and “feel” throughout the flight envelope

Highly detailed fully custom 3D cockpit modeling and avionics suite with:

- Highly detailed modeling and texturing of cockpit, all control panels, and interior detailing developed with careful attention to real world reference photograph, simulator, and video documentation.
- Highly detailed ACES V ejection seat models
- Fully Functional touch screen (interactive) glass cockpit Large Panel Display and Up Front Control Display screens, digital engine information display, Head Up Display, and backup ADI, with 100% custom developed gauges and instrumentation suite
- Multi-mode HUD display system modeled after real world T-7 imagery
- Robust crew alerting system messages system alerting on a variety of information, caution, and warning messages and associated sound effects including b****ing Betty/Brian alerts.
- Radar and Tactical situation display emulation from the Top Mach Studios F-22A.
- FLIR (forward looking infra-red) simulation and synthetic vision display with HUD overlays for night and low visibility flying.

- Highly functional and customized Up Front Control Display module, modeled from real world information (where available) with many features and functions for flight planning, instrument flight, navigation, and communication.
- Configurable large panel display with customized screen selection options from 8 different data screen options and two different display formats.
- Canopy reflections and rain effects
- All buttons, knobs, and switches in the cockpit are animated and many are functional or emulate system functionality and drive crew alerting system messages.
- Rear seat position is fully functional – fly as the “instructor” pilot.
- Full suite of essential autopilot and navigation controls.
- Detailed side console panels modeled from real world aircraft and simulator footage
- Full cockpit lighting system including night lighting, NVG style back lighting, and individual lighting controls modeled as closely to the real aircraft as possible.
- Animated pilot figurines with optional display positions including “self” avatar view and co-pilot (instructor) that can be hidden or displayed and additional configuration options.
- Custom “Electronic Flight Bag” tablet with G3000 interface for additional navigation and flight planning (this feature is not fully MSFS2024 compatible due to Microsoft bugs).

Detailed Custom 3D Exterior Model

- Highly detailed fully custom developed 3D exterior model.
- 20 detailed liveries representing T-X prototype, T-7A EMD liveries, T-7A in service liveries, USAF Thunderbirds, and other speculative liveries based on T-38 training squadron liveries, aggressors, and more.
- Detailed custom texturing of all main surfaces, wheel bays, and other surface and interior areas of the aircraft body.
- High detail landing gear bays and assemblies
- Animation of all flight control surfaces.
- Detailed and fully animated landing gear and extension / retraction sequence.
- Custom dynamic visual effects including wing vapor effects, APU start and run effects, engine heat and smoke plumes, wheel dust and smoke effects, afterburner plume and burner flame holder, and others.
- Cold and dark visual modeling features (pilots displayed or hidden (coming soon), remove before flight tags, etc...) that are user controlled from the System Control menu.
- Detailed and realistically modeled ground equipment for optional display from the System Control menu including: maintenance platforms, ground power unit, wheel chocks, avionics bay details, boarding ladder, fire extinguisher, and more.
- Full exterior Lighting Systems include custom landing and taxi lighting, formation slime lighting, navigation lights, and beacons; all modeled after the actual aircraft, with correct lighting positions and transparencies.

Fully Customized Sound Pack from Echo19 Audio

- Highly realistic sound suite for exterior sounds based on real world F/A-18C F404 engine sounds, tuned with exacting attention to the real-world F404 engine exterior sound-scape.
- 3D Fly-By sound experience for fly-overs and exterior fly-bys. Experience the thundering sound experience of afterburning engine power.
- Highly immersive interior sounds replicating sounds for all major systems and sub-systems and customer interactions within the cockpit environment based on Boeing / McDonnell Douglas aircraft sounds
- Aural voice alerts and tones for a wide variety of Crew Alerting System alerts
- Wind and drag induced ambient and reactive sound effects for landing gear, speed brakes, high speed wind blast, high g / high alpha buffet, and others.

Realistic Engine and Performance Modeling

- Realistic / accurate engine start procedures
- Realistic weight and fuel quantities.
- Engine model tuned to GE F404 specifications for realistic thrust/weight ratio and performance across the flight envelope.
- Modeled fuel consumption in line with real world specifications at low and high altitudes. Range profile matches real world stated range estimates.
- Aerodynamics and flight performance modeled from available real-world data and like-kind jet trainers like the the KAI T-50.
- Accurate fuel consumption and maximum range at all altitudes (not based on the default game turbine model, but customized to improve accuracy of turbine fuel consumption and thrust).
- Mach 1.2+ maximum speed at altitude
- Service ceiling modeled to 50,000+ feet.

THE SIMULATED COCKPIT AND GENERAL SYSTEMS DISCUSSION

COCKPIT OVERVIEW DIAGRAM / THE “BIG PICTURE”



The diagram above shows the cockpit layout. The numbered items are the various consoles and panels that contain instruments and controls for the T-7A.

1. HUD (HEAD UP DISPLAY)
2. UFCD (Up Front Control Display)
3. Left Auxiliary Console
4. Large Area Display (LAD)
5. Backup ADI
6. Engine Instrumentation Display
7. Left Console
8. Right Console
9. Ejection Seat

What follows is a summary description of each of the displays or subpanels where functional control interactions or instruments can be found. If a subpanel lacks a description, this means that there is not a control or instrument in that subpanel that has functional importance within this model. This doesn't mean it can't be interacted with or explored as we've animated all cockpit controls and incorporated realistic behaviors where appropriate.

HEAD UP DISPLAY (HUD)



The Head Up Display or “HUD” provides a centralized view of key aircraft situational awareness data. The T-7 HUD we modeled is based on videos and photographs of the HUD employed in the pre-production T-X and early T-7A EMD designs and includes additional data points that may or

may not be present in the production aircraft. It's an information rich display with lots of information. The numbered items are described below:

1. Pitch Ladder
2. Current heading and heading tape
3. AP Heading hold indicator
4. Wind corrected bearing indicator
5. Wind direction and speed
6. Airspeed tape (10s of knots)
7. G meter tape
8. Angle of attack indicator tape (degrees AoA)
9. Altimeter Tape (thousands of feet)
10. Equivalent Air Speed (KEAS)
11. Calibrated Air Speed (KCAS)
12. Groundspeed Indicator, knots
13. Current G meter indicator
14. Waterline marker
15. Altimeter, barometric
16. Vertical velocity indicator, feet per minute
17. Radar altimeter, feet
19. Combination gear down indicator and target approach angle of attack marker
20. Flight path marker
21. Course Deviation Indicator (CDI) slaved to NAV lock with LOC1 active
22. Mach meter
23. Angle of attack meter
24. Beta or slide slip meter
25. G meter
26. Max G reached during flight
29. Bank angle scale
30. Current bank pointer and side slip indicator
31. Current waypoint
32. Distance to current waypoint
33. Bearing to current waypoint

UP FRONT CONTROL DISPLAY (UFCD)



The Up Front Control Display is a critical interface for managing communication, navigation, aircraft display data, and for configuring the model in the sim.

1. Comm 1 volume control knob
2. Comm 2 frequency adjustment knob (in .25 hertz increments, probably best to use the digital numeric pad).
3. Comm 2 frequency control knob (in .25 hertz increments, probably best to use the digital numeric pad).
4. Comm 2 volume control knob
5. Comm1 current frequency
6. HSI page button (opens HSI page)
7. Alpha digital keypad page button (opens Alpha keypad page)
8. System Control page button (opens model configuration page)
9. Comm2 current frequency
10. Currently active / entered keypad value
11. Numeric digital keypad. +/- adjusts for a positive or negative values once a numeric value is entered into the active keypad value box
12. Backspace to delete most recently entered value in active / entered keypad box
13. Clears entire entry in keypad value box
15. Mission Altitude: enter a barometric altitude to set the minimum altitude for a given mission – alert will display in CAS alert box if aircraft below this value.
16. Autopilot altitude hold status

18. Joker fuel setting in thousands of pounds (in future update will be expressed in pounds). This can be configured via the number pad.
19. Bingo fuel setting in thousands of pounds (in future update will be expressed in pounds). This can be configured via the number pad.
20. INOP
21. Current GPS waypoint – Blue colored NAV Hold status indicator if GPS hold is active. Pressing this will open Waypoints review page described below
22. Current TACAN repeater ident and Tan colored NAV Hold status indicator if TACAN hold is active
23. NAV repeater active for NAV HOLD. Depending on which repeater type is selected the respective NAV Hold status indicator will display
24. Autopilot page button (opens autopilot menu page)
25. TSD page button (opens TSD/RADAR page)
26. Current VOR repeater frequency active – Magenta colored NAV Hold status indicator if VOR/ILS hold is active.
27. Localizer hold indicator. If VOR repeater is a localizer (ILS, for example), the yellow indicator box will display. Value displayed is the bearing to the repeater facility (not the localizer path heading, which is found in the course heading displays if LOC1 is selected in NAV SET).
28. Select NAV hold on or off – will slave to whichever NAV SET value is selected.
29. HUD mode page button (opens HUD modes selection page)
30. DATA page button (opens DATA page)
31. Autopilot heading hold heading – when AP heading hold active will steer the aircraft. When AP inactive but heading mode is ON, will still show the heading indicator carat on the HUD and HSI.
32. Transponder frequency and mode select. Enter a numeric value and press this button to enter a transponder frequency. Pressing when no numeric entry is present will change mode. Mode select can also be done in the DATA page
33. Crew Alerting System (CAS) messages. When a solid circle or triangle exists, messages are present. When pressed, will open a list of currently active CAS messages.
34. Adjust HUD brightness knob
35. HUD off, night, day modes (INOP) knob
36. Adjust UFCD and backup ADI display brightness knob
37. UFCD menu selection knob (INOP) knob



UFCD MASTER WARNING AND CAUTION INDICATIONS



The UFCD alerting system will pop up a master warning or master caution indication as shown above when a warning / caution alert is triggered. UFCD interaction will be prevented until you press and acknowledge the respect alert box by clicking on it with mouse or other input device. Once cleared the pop up will disappear until either the same condition is triggered again or a new / different alert is triggered. Additionally, If the alert conditions are no longer met (example, gear is lowered when gear up alert is active), the pop up will disappear without user interaction needed.

UFCD HORIZONTAL SITUATION INDICATOR HSI PAGE



This aircraft reference top down view provides navigation data and planning information. The HSI also depicts navigation references like intersections, VORs, and airfields. Not all items are numbered as these are covered elsewhere in the UFCD documentation above or below.

1. Unused
2. Shows ETA to destination waypoint in the flight plan and the current UTC time.
3. Shows localizer or flight path heading tied to the CDI (course deviation indicator) and determined by the NAV SET selection entered (in this example, ILS localizer IMWH)
4. Groundspeed, magnetic heading, and barometric altitude reference data
5. Current wind vector (speed in knots and prevailing wind direction)
6. HSI map range selector
7. Course indication arrow tied to the CDI and NAV SET selection (in this example, ILS localizer IMWH)
8. Current True heading indicator and compass rose
9. Current active GPS / flight plan course to next waypoint (KPAE in this example)
10. Autopilot heading hold indicator
11. CDI (course deviation indicator) for localizer or flight path – color coded magenta for VOR / LOC, Tan for Tacan, and Blue for GPS courses.
12. Current flight plan line (magenta)
13. Current Latitude and Longitude position of the aircraft
14. Current map scale (240NM in this example)

15. Current vertical velocity

16. Back button (found in most UFCD pages – navigates you to previously active page).

UFCD AUTOPILOT PAGE

COMM1 128.000					CLR	3. GPS ICAO KEAT	4. BACK
N W E S	1	2	3	1. AP MASTER OFF	2. HDG LOCK OFF	5. CRS 0	6. HDG 358
ABC	4	5	6	7. NAV HOLD ON	8. NAV SET LOC1	9. APPR LOCK OFF	10. BACK COURSE OFF
SYSTEM CONTROL	7	8	9	11. ALT HOLD ON	12. ALT 1200	13. VS HOLD OFF	14. VS 0
COMM2 124.850	+/-	0	.	TCN 1X	VOR 109.500 IMWH	ILS 357	

The UFCD Autopilot page is the main autopilot control page for the aircraft. You'll note that other pages have reference A/P interface options for ease of access, but this is the main control page and the only page with the autopilot master switch control.

1. AP master engage/ disengage control button
2. Heading Lock mode control button
3. GPS active waypoint and waypoints page button
4. Back button (takes you back to prior UFCD page)
5. CRS heading (displays heading to a VOR repeater when active in the NAV radio)
6. AP Heading lock heading entry (accepts data entries)
7. NAV HOLD mode control button
8. NAV SET selects which navigation source (will determine which source for NAV HOLD to use).
9. Approach mode hold button
10. Back course mode button
11. Altitude hold mode control button
12. Altitude target for altitude hold mode button
13. Vertical speed mode control button

14. Vertical speed target for vertical speed mode control button and for altitude hold mode button.

HUD MODE PAGE



The HUD mode page allows a selection of HUD modes and display options. The four HUD modes on the left side of the screen will change the HUD mode displayed in the center screen and on the HUD glass in the front cockpit and duplicates the HUD display shown on the HUD glass.

1. A/A is the air to air HUD mode (displays a static IR missile type targeting reticle)
2. A/G is the air to ground HUD mode (no actual A/G functionality present)
3. NAV ENR is the enroute navigation HUD mode
4. NAV LDG is the landing HUD mode
5. FLIR video displays a FLIR emulation screen as an underlay on the HUD mode screen to assist with flying at night or in low visibility conditions
6. Synthetic video displays a synthetic vision view of the earth with a relative altitude reference color coding. Yellow, orange, and red indicates close to or below terrain features. Gray and green colors indicate flight at a safe altitude above terrain.
7. F-22 enables the F-22 HUD display found in our F-22 model.

Shown above is the synthetic video with the NAV LDG HUD mode displayed

DATA PAGE

1. FUEL	TOTAL 2244	JOKER 1200	BINGO 600	FUEL FLOW 0.00	TTE 00:00:00	DTE 0	BACK
2. TIMER	00:00:00	START	STOP	RESET	UTC 17:35:33	LOCAL 10:35:33	
3. TEMPS	OAT 59	ISA 55	TAT 59	> (F)/C			
4. IFF	OFF	STBY	3A	3C 7450	4	5	S
N W E S							

The Data page contains the following information and features:

1. Fuel data. Non-interactive information about total fuel on board, joker and bingo fuel settings, current fuel flow, estimated time 'til empty, and estimated distance 'til empty based on current fuel flow and current ground speed.
2. Timer (start, stop, reset control the time features) and UTC and LOCAL time displays
3. Outside air temp, International standard atmosphere temperature, and Total aircraft temperature
4. IFF / Transponder mode select (you can select mode from here, but frequency is entered on the main UFCD page).

SYSTEM CONTROL PAGE



This page is specifically for controlling display elements for the model within the simulation. The following notes apply

1. RBF tags – will display rbf tags when the aircraft is stationary, on the ground, cold and dark and the APU is off. HUD cover and seat RBFs will only display when battery is switched off
2. Wheel chocks can be displayed as long as the aircraft is on the ground and stationary
3. The boarding ladder can only be displayed when the aircraft is stationary, on the ground, cold and dark and the APU is off.
4. The maintenance platforms can only be displayed when the aircraft is stationary, on the ground, cold and dark, the ladder is NOT displayed, and the APU is off.
5. The Tow bar and ground tug can only be displayed when the aircraft is stationary, on the ground, cold and dark, and the APU is off.
6. Avionics bays are found below the cockpit on the forward fuselage. These can only be displayed when the aircraft is stationary, on the ground, cold and dark, and the APU is off.
7. The EFB button hides or displays the tablet device on which can be found the Garmin G3000 map and GTC interfaces.
8. Hides or displays the front seat pilot figurine avatar (self-view) when in interior pilot camera view. When aircraft is operating the front pilot position is always displayed from the exterior view.

9. Raise or lower the front seat pilot helmet visor
10. Hide or display the front seat pilot life preserver flotation device and the utility pouch on the torso.
11. Hides or displays the back seat pilot figurine avatar, for all interior cameras, for the co-pilot avatar (self-view) and for the exterior view.
12. Raise or lower the back seat pilot helmet visor
13. Hide or display the back seat pilot life preserver flotation device and the utility pouch on the torso.
14. Hides or displays front and/or back seat pilot figurines for both interior and exterior cameras when aircraft is cold and dark.
15. Hides or shows the front or back seat pilot head for the avatar / self-view when in the interior camera pilot or co-pilot views (display option will be dependent on which camera position is selected).

The ground power units are not controlled from this interface, but instead by interacting with the ground power switches on the left console when the aircraft is parked on a game parking spot with external power supply available.

UFCD TSD / RADAR SYSTEM



The UFCD TSD / RADAR page shows a top down view of the air space which can be configured to display flight plan path, nav aids and airport symbology, and radar contacts. The T-7 doesn't

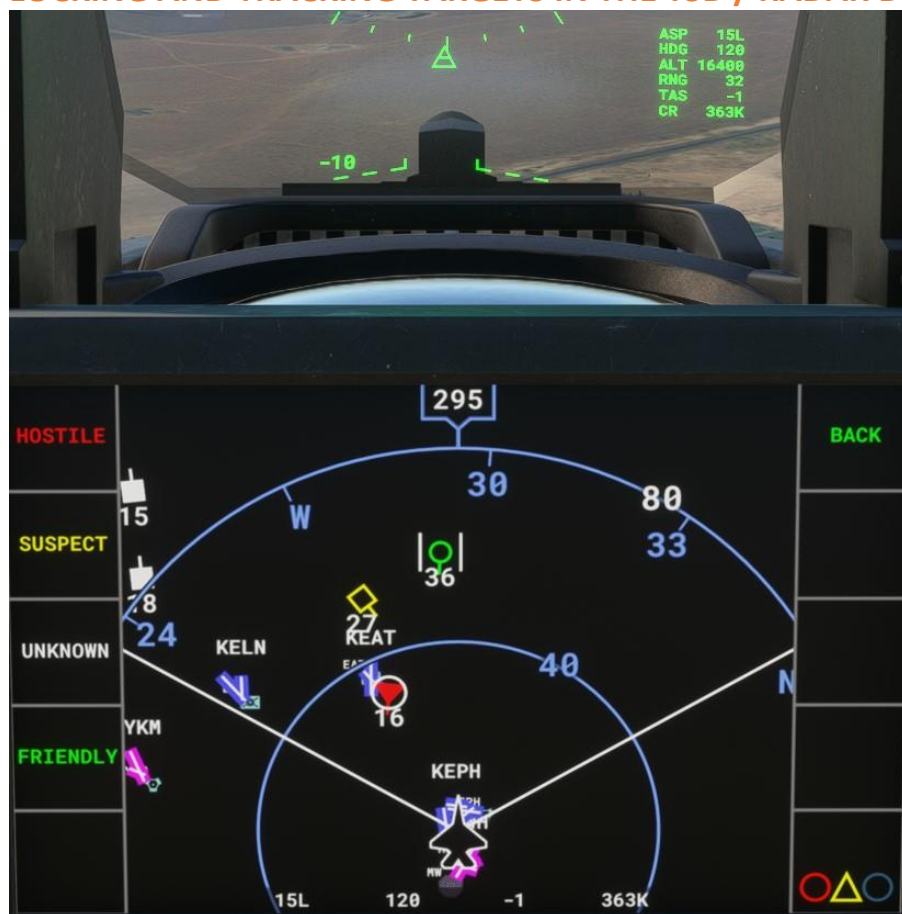
carry a radar set but instead has a radar emulation system that can be fed data via data-link and transponder returns. For our implementation we've brought elements of the F-22 radar display and TSD system into a single interface.

1. Offset will change the display from aircraft at the bottom with an ARC display of the forward aspect from the aircraft or a compass rose style display showing all 360 degrees of the area around the aircraft.
2. Flight Plan option will hide or display the current flight plan path lines
3. NAVAID option will hide or display ground objects like airports or VOR positions as well as intersections.
4. RADAR will hide or show radar contacts on the TSD. Radar contacts display as white blocks with a tick mark indicating heading and a numeral indicating present barometric altitude in thousands of feet.
5. Zoom in display range
6. Zoom out display range
7. ASSIGN opens a new page that allows you to assign a target a status of hostile, friendly, or suspect.



Using your mouse pointer, single click on a selected track / contact and then select one of the four options using the select buttons. To change a designation, click the cursor over the contact again and select the new designation.

LOCKING AND TRACKING TARGETS IN THE TSD / RADAR DISPLAY



- The radar screen displays positional information on air contacts for data from Multiplayer, real-time live traffic, or AI-traffic
- Left and Right of radar screen displays across a maximum azimuth of -60 deg to 60 deg (120 degrees total beam angle)
- The bottom of screen represents the nose of aircraft
- Top edge of the screen is the selected range (max of 160 – game data is limited to 100 nm)
- Once designated, friendly aircraft will continue to be tracked and displayed outside of the radar block zone to simulate Data Link communications (like Link16) and maintain awareness of your wingmen or friendlies as long as they are within display range (TSD is limited to 500 nm range).
- Double click on a contact to bug it, then double click again to promote it to an active track (locked and displaying telemetry).
- A locked contact will also show in the HUD with a directional helper that shows as a square box shape when the contact is within the HUD display aspect angle and a square

box with an X through it when outside the HUD aspect angle. If you fly toward the box you will center the target in the HUD.



- Telemetry data will also display in the lower right corner of the HUD and at the bottom of the TSD screen. Telemetry data includes, Aspect angle, contact heading, contact altitude, contact range from your aircraft, true airspeed, and closure rate (the relative speed between your aircraft and the contact).
- Right click a contact to demote the tracked contact. If no contacts are tracked, a right click will remove/demote all bugged aircraft.
- Tracks will persist for between 10 and 30 seconds on the radar and TSD screens even once the beam is moved away from a track. The radar system emulation has programming to predict a track's position even after the beam has stopped illuminating it.

Radar System Limitations

We employ the game's traffic data API to generate the tracks / contact data. There are some game specific limitations to the data displayed on the radar screen.

- The effective range at which tracks can be displayed is a little over 100NM. Game API limitation.
- For PC customers, the minimum distance a contact can be tracked / displayed is around 5NM or a little less (approx.. within visual range) at which point the radar screen will stop displaying track information. To reacquire the track, you'll need to increase distance to the aircraft. Game API limitation.
- For Xbox customers, AI and real-time traffic tracking can be a challenge due to low data refresh rates from the API. Tracking at longer ranges (greater than 25nm) is possible, but once you close on a contact to less than about 20-25nm, it can be difficult to impossible to maintain radar contact or lock. Also, the denser the scenery or the more resources are being used to run the game, the less likely you will be to see traffic tracks displayed on the radar / TSD screens; the game culls or removes unnecessary data to free up resources. Multiplayer traffic radar tracking has fewer limitations and performs more like you'd see for PC (see above).

- With the exception of position and altitude and a randomly generated ID, the rest of the telemetry data is calculated by our software. This is a very complex set of mathematical calculations and the game does create some limitation around these, particularly in the calculation of closure rate, which can display values as much as 10% - 15% lower than actual with the delta increasing with increased closure velocity.
- If you leave the session, pause, or minimize the game, your track designations will be lost/cleared.
- At present this system does not support sim-connect derived data and as such it will not display tracks/contacts when in, for example, VATSIM, or other third party mediated connections.

UFCD GPS WAYPOINTS PAGE

	SP(3)						BACK
	IDENT KEUG						
	BRG	198.8					
	RNG	233.7					
	LAT	44.1					
	LON	-123.2					
N W E S							  

This page presents a list of the waypoints entered into your GPS flight plan. Push the up arrow to move to the end/destination for your flight plan, down arrow to the departure / beginning of the plan.

G3000 INTERFACE / TABLET “EFB” DISPLAY



The G3000 interface and map functions just as it will for other aircraft in the game. We've included the G3000 for familiarity and for advanced flight planning and navigation. It is the only interface by which you can create and manage GPS flight plans once in a game session. The tablet can be hidden or displayed by clicking the "EFB" button in the System Control menu. The PWR button turns the device on / off. The Zoom+ increases map zoom and Zoom- decreases map zoom.

LEFT AUXILIARY CONSOLE

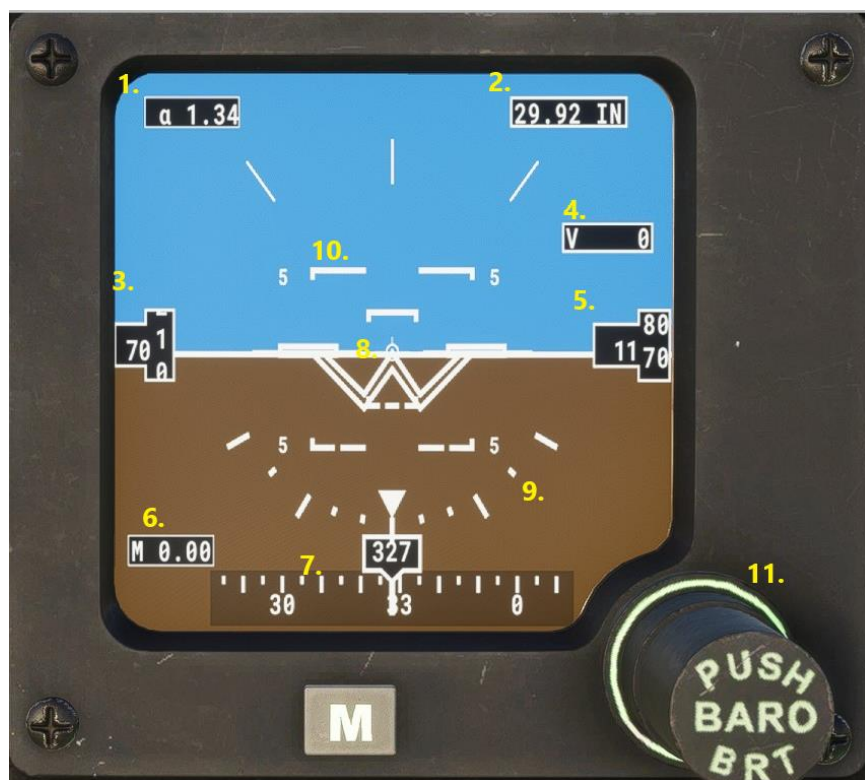


The Left Auxiliary Console contains the following controls:

1. Emergency Gear Switch
2. Landing Gear Indicator Lights
3. Landing Gear Lever
4. Down Lock Override

AUX Flaps, ENG Fire warning light, APU Fire warning light are animated, but inop in this build.

BACKUP ADI



The Backup ADI contains the following information/displays:

1. Angle of Attack
2. Kohlsman knob setting (baro pressure)
3. Airspeed
4. Vertical Velocity Indicator
5. Altimeter
6. Mach number
7. Current true heading / heading tape
8. Waterline marker and flight path marker
9. Bank angle indicator
10. Pitch ladder (horizon is at 0 degrees – brown is ground, blue is sky)
11. Kohlsman knob – adjust barometer setting (does not function for brightness control)

ENGINE INFORMATION DISPLAY



The engine information display contains information about various aspects of the aircraft power systems:

1. Engine N1 RPM
2. Engine Exhaust Gas Temperature (EGT)
3. Engine Oil Pressure PSI
4. Engine Fuel Flow PPH
5. APU status (displays when APU switch is on)
6. Engine Exhaust Nozzle and Afterburner Status
7. Hydraulic system 1 and 2 pressure
8. Battery 1 and 2 voltage
9. Total fuel quantity gauge
10. Current Joker and Bingo Fuel settings
11. Engine Information Display brightness control

LARGE AREA DISPLAY (LAD) PANEL



The Large Area Display Panel or LAD, is the primary flight display for the T-7. It provides access to a flight data information, navigation, aircraft systems, and more. For this model, we've able to gather visual public information about 7 of the available screen displays. Anything not modeled is due to lack of public data.

LAD Screen Layout Options:

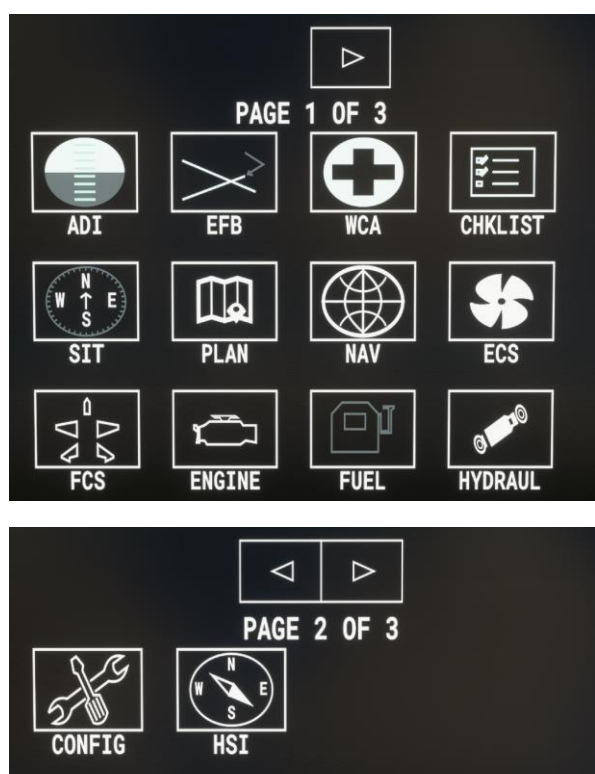


In real life the LAD has fully customizable screen position and resizing options for each screen segment in the display. We felt this was unnecessarily complex for MSFS and given the information currently publicly available for the T-7, so we've modeled two options. Layout 1 and 2 can be selected by pressing / clicking on the

Layout Button on the upper left corner of the LAD Screen. However, it is possible to select any desired combination of screens to display in each of the display windows, including duplications of screens.

LAD FMTS MENU

On each screen  this icon opens options for the respective screen including the option for the FMTS MENU. The FMTS MENU button opens the list of available screens (not all are modeled) that we know of for the T-7A.

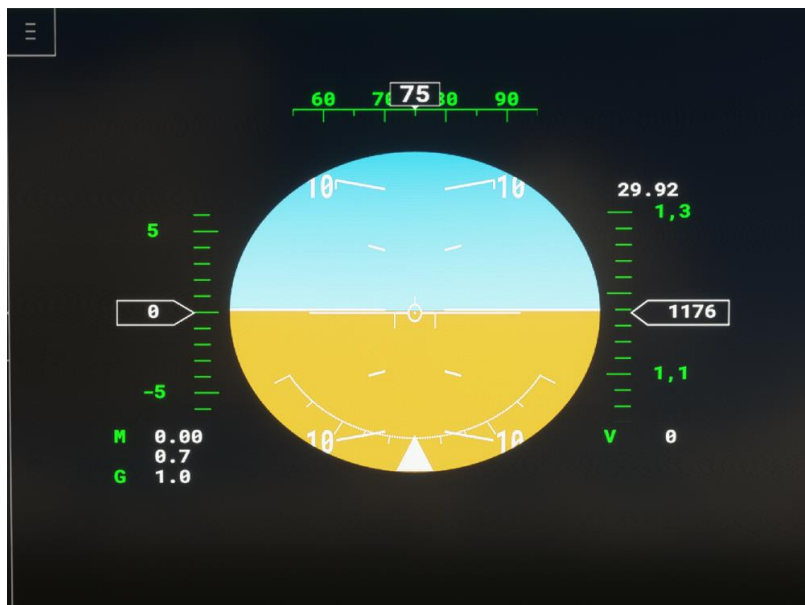


The Available functional screens are:

ADI, NAV, ECS, FCS, ENGINE, CONFIG, and HSI

A short description of each follows below.

ADI SCREEN



The ADI screen contains the same information found in the Backup ADI found above in this manual. It does have the following additional submenu items:



HIDE TAPES will hide the pitch and airspeed tapes on either side of the attitude indicator. *This will also affect the HUD display* of the pitch, airspeed, aoa, and g meter tapes to help declutter the HUD in both the HUD page of the UFC and in the HUD glass.

CAGE will lock the pitch ladder, and insert a climb dive marker on the ADI and in all HUD displays in the cockpit. The flight path marker will still be free to move as normal.

HIDE SHAPE will hide the attitude indicator color circle, leaving only the artificial horizon line and the bank indicator.

NAV MAP SCREEN



The Nav map screen is a custom developed navigation overview that contains many of the same information items as found in the UFCD HSI described above. Additionally, there are references to the AP heading, VOR course, and GPS course guidance on the upper left as well as current NAV SET selection data (VOR/LOC, GPS, or TACAN selection) on the upper right. It includes a north up or track up orientation options and compass rose displaying *magnetic heading* along with navigation symbology for navaids and airports. Additionally, you'll see an overlay of navigation guidance data and flight plan flight path overlay. The HIDE NAV option will hide the data display on the upper left and right of the compass rose to help declutter. The NORTH UP and TRACK UP options will alternate the display accordingly. Currently the NAVMAP display is not programmed with the correct aspect ratio which can result in distortions of map details and slight apparent deviation of aircraft symbol from flight plan. This does not affect the other HSI displays found in the cockpit and may be addressed in a future update.

HSI SCREEN



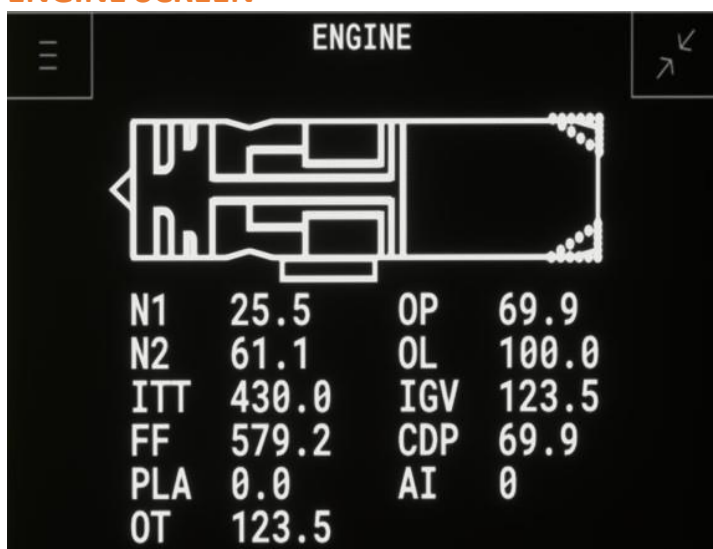
The HSI SCREEN is essentially a simplified duplicate of the UFCD HSI Screen and duplicates many of the features found on the NAVMAP display, with heading displayed, a compass rose that's aircraft (track-up) oriented and displays navigation guidance information. It also includes a color coded course deviation indicator for guidance along a designated flight path as found in the UFCD HSI screen and NAVMAP. The HIDE NAV option in the menu selector will hide the navigation data to right and left of the compass rose. The TRACK UP or NORTH UP option shown will switch between track up vs north up display.

FCS SCREEN



The FCS screen shows information about control positions and control surface status. As you move the control surfaces you'll see the values and position indicators moving. Flaps extension is noted when EXT displays. P, R, Y trims indicate trim values for pitch, roll, and yaw. When hydraulic pressure is low the colors will change to yellow and if hydraulic pressure is very low or zero, the color will be change to red.

ENGINE SCREEN



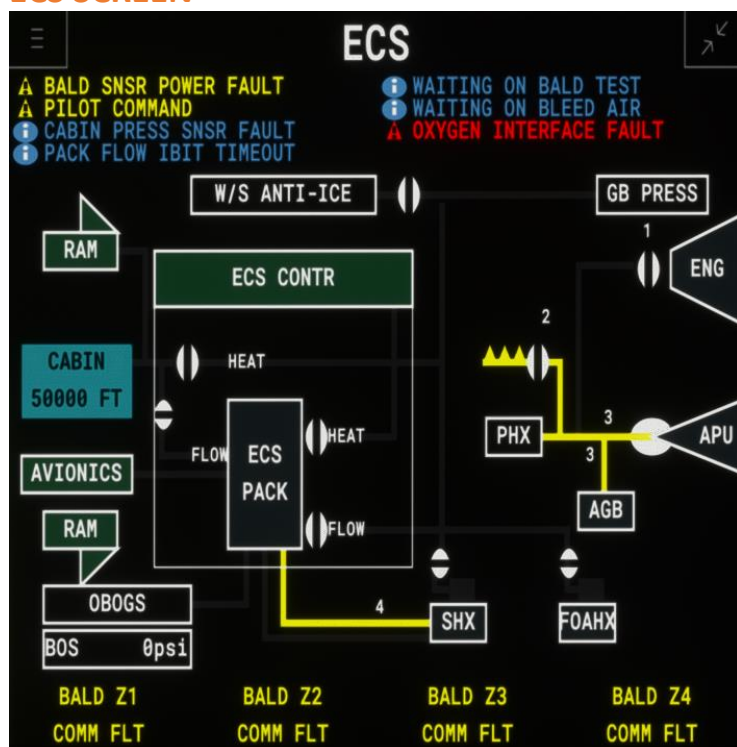
The engine screen shows key engine telemetry, some of which is already found on the Engine Information Display, but this screen contains additional telemetry.

AIRCRAFT CONFIG SCREEN

AIRCRAFT CONFIG		
TAIL NUMBER	N382TK	
MNP	1.15.3.8	
EFD FWD/AFT	0049 / 0049	
LAD FWD/AFT	0116 / 0116	
UFCD FWD/AFT	0122 /	
MS RTU	1.35	
EVA		
VMS	TXDFPR018	
AECU	0	
APECU	0	
BCU	131	
FADEC A/B	/	
FQGS	2.1 / 1.0	

Static display screen based on real world references for the Aircraft Config screen

ECS SCREEN



Static display based on real world Environmental Control Systems display screen references.



LEFT CONSOLE

The Left Console has the following controls:

1. Parking brake switch
2. Battery two control switch
3. Master battery switch
4. Main Generator Switch
5. Formation light control knob
6. Position / Nav Light control
7. INOP
8. Anti-Collision Light control switch
9. Landing and Taxi light control switch
10. APU control switch
11. Engine crank switch
12. Fuel flow cutoff / start control
13. Throttle lever
14. Canopy Open / Close Lever
15. Ground power port A (left) B (right)
16. External Power control switch



RIGHT CONSOLE

The Right Console has the following controls:

1. Flight control stick
2. Oxygen Mode Control Switch
3. Oxygen Supply Control Switch
4. Consoles Backlight Control Knob
5. Main Panel Backlight Control Knob
6. Flood Light Control Knob
7. Bleed Air Control Switch
8. Flashlight (click body to rotate, red button to select lighting option)

EJECTION SEAT



The ejection seat has an interactive component – the small lever on the left of the seat is the arm / disarm lever. Make sure this is in the armed position before takeoff.

AIRCRAFT HANDLING AND PERFORMANCE NOTES, LIMITS, AND GAME SETTINGS

ENGINE STARTUP PROCEDURES

The T-7A engine is started very much like the F/A-18 family of aircraft as it uses the same engine core and base systems. If you've started the game's Super Hornet engine, the procedure should be very similar for the T-7A:

- Check Throttle is in the OFF position (click on the FUEL CUTOFF button if not – throttle must be in idle position to trigger fuel cutoff).
- Set BATT on and make sure the MAIN GEN switch is in the on position.
- Set APU Switch to the ON position and wait until the ready light is green.
- Set the ENGINE CRANK switch to the ON position and wait until there is a small positive fuel flow for the starter (check Engine Information Display).
- Click the FUEL CUTOFF button on the throttle lever to advance throttle to idle.
- Engine should begin to spool up.
- Turn off APU once engine has stabilized above 20% N1 rpm

SPEED LIMITS

Though we don't have precise figures for the T-2A's speed limits, based on various sources we estimate the following. We've set the Mmo (maximum Mach number) to 1.4 though it's rumored the USAF may artificially limit the aircraft to subsonic speeds (M0.975) using control surface deflections. An Overspeed CAS message and voice alert will play if this speed is exceeded. VNe (Never exceed speed) is 650 Knots. A CAS caution message will display at 625 Knots. An Overspeed CAS Warning message and Overspeed Voice alert will play above 650 Knots.

G-LIMITER

The T-7A is rated for +8/-3 Gs. Our flight control system will limit G to no more than about 8.5G. The aircraft is also limited to about -3.5 G by our flight control system.

AOA LIMITER (STICK PUSHER)

Current AoA limits for the T-7A are stated as 30 degrees AoA. We've incorporated AoA limits into the model. It's possible to exceed this limit a little with full back pitch combined with roll and yaw inputs, but this is a fully recoverable maneuver in this flight model and can be used in BFM where appropriate.

FLAPS SYSTEM



The T-7A has an auto-flaps system that is active when the gear is extended. The flaps will deflect as speed increases during takeoff and as angle of attack increases, and will provide additional lift during landing and takeoffs. The flaps light will illuminate green when this system is active and will automatically extinguish when gear is retracted. The aux flaps override button can be used to engage the flaps manually when in flight with the gear retracted, but there are no speed restrictions on flaps extension so use this wisely, and again, the light will illuminate green when this system is active. The flaps system also functions as maneuvering flaps (flaperons) and will extend and retract automatically when the aircraft is maneuvering between high and low angle of attack. The aux flaps light will not illuminate when the maneuvering flaps are active.

AUTOTHROTTLE

The T-7A does not have an autothrottle system.

PITOT HEAT EQUIPMENT

The model is configured with an “always on” pitot heat system.

EXTERNAL POWER OPTION

The aircraft can be supplied AC ground power as long as the aircraft is *parked in a game designated parking spot* on an airport apron. This will avoid using the battery or APU to run electrical systems while parked. If you activate the Ground power switch and set the A or B switches to ON, you’ll get AC power to the aircraft and you’ll see the ground power equipment displayed on the side of the aircraft model.

LANDING GEAR EXTENSION AND SPEED LIMIT

The landing gear can’t be extended from the retracted position when above 260 KIAS. The maximum landing gear extended speed is 300 KIAS and a CAS warning message and voice alert will play if this speed is exceeded with gear extended. On the ground the down lock override switch can be pressed to enable the landing gear handle to be raised; a CAS warning message and voice alert will play if done. This is only for emulation purposes as it’s not possible to retract or otherwise force the landing gear to retract or collapse while on the ground, the intended purpose of this switch.

EMERGENCY PROCEDURES

While we’ve not made an attempt to model or document any detailed emergency procedures, we have provided a significant list of crew alerting system (CAS) messages to keep you busy if

you haven't followed checklists and standard procedures. There is a supplemental list of CAS messages with parameters and aural alert information below. The plane will bark at you if you're doing something wrong.

TAKEOFFS AND CLIMBS, APPROACHES AND LANDINGS

Real world data on takeoff, approach, and landing procedures is not public information. We don't know the exact recommended approach angles of attack for the real T-7A. We've observed videos and simulator footage to estimate as follows:

For full fuel load takeoffs, accelerate to 115+ Knots and then gently rotate to about 7.5 degrees nose up. The aircraft should lift off around 145 knots or so. For lower takeoff weights, same procedure, with a lower speed for lift off. Once gear up and established in climb, accelerate to 300 Knots in MIL (or MAX) thrust and then maintain pitch attitude as needed to maintain 300 knots until Mach 0.78 (if climbing to cruise altitudes), then adjust for cruise between 0.78 to 0.85M.

For approaches, we recommend pattern speeds of 160-180 knots, approach speed of about 140 to 160 knots (to hold about 5 degrees aoa). For final, with gear and flaps down, maintain approx. 10 degrees AoA. Nose pitch angle when on stable approach will be around 7.5 degrees nose high when aircraft weight is low. A flare isn't necessary, but a small flare to up to 10 degrees nose up can be helpful to smooth out the touchdown if desired.

CRUISE PROFILE AND RANGE

Estimated range for the T-7A is around 990NM. This allows for a maximum of about 2.5 hours of total flying time. If you run the gas guzzling afterburner you're going to reduce this endurance considerably. This is a training jet, not a long-haul cruiser. For most efficient cruise, climb to at least FL360 and once established at altitude maintain Mach 0.80. Best cruise is probably around FL410 and Mach 0.80 as fuel load lightens and you may possibly extend total range to as much as 1100NM if you're very careful about fuel burn and the winds are favorable.

VR FUNCTIONALITY

The model supports VR headset usage. Most everything works as expected.

CAS (CREW ALERTING SYSTEM) MESSAGES REFERENCE

We've provided a reference for all of the Crew Alerting System messages that we've included with the T-7A model. This can be found below.

CONTACT AND SUPPORT INFORMATION

For support with your purchase, download, and installation, please contact the reseller channel from which you purchased the product (Microsoft Marketplace support).

For support with model features, bugs, or other related issues, please contact us on our Discord server via the T-7A related support channel.

Top Mach Studios Online Resources:

Web Site: www.topmachstudios.com

Discord: <https://discord.gg/uqpvKjZC6t>

Facebook: <https://www.facebook.com/TopMachStudios>

Youtube: <https://www.youtube.com/channel/UCLa-LVq4xGHcuK6yQFCu1qw>

Email non-support related inquiries to:

devs@topmachstudios.com

TOP MACH STUDIOS, T-7A SPIRIT CHECKLISTS

While we don't have access to T-7A official procedures and checklists we did prepare this set of checklists to follow for key phases of flight.

INTERIOR INSPECTION (NO EXTERNAL POWER – ELECTRICAL SYSTEMS OFF) – PILOT

1. Personnel Equipment:
 - a. Seat and Rudder Pedals – Adjust as desired
 - b. Restraint harness and inertia reel – connect and check
 - c. Helmet, Visor, oxygen mask – don and check fit
 - d. Helmet communication cord and oxy hose – connect
 - e. Oxy Supply – Off
 - f. Oxy Mixture – Norm
 - g. Oxy Regulator Mode - Norm
2. Ejection seat arming handle – Disarmed until clear of hangar or other overhead obstructions
3. Throttles – Off
4. Landing Gear Lever – down
5. Down Lock Override - Norm
6. BRAKE HOLD - ON
7. Landing light switch – Off
8. Speed Brake Lever – Retracted / Closed Position
9. POS LIGHTS – FLASH

10. ANTI-COLLISION LIGHTS – OFF
11. Other exterior or interior lighting controls – Set knob / switch positions as desired
12. BLEED AIR – OFF
13. CABIN PRESS - NORM
14. DEFOG LEVER – Min
15. ANTI-ICE SWITCH – Off
16. CABIN TEMP – As Desired
17. CABIN FLOW – As Desired
18. APU – Off
19. ENGINE CRANK - Off
20. BATT Switch– Off
21. AUX PWR Switch - Off
22. MAIN GEN switch - On

INITIAL CHECK / DC POWER ON

1. Confirm crew ready for DC power on
2. BATT Switch – On
3. AUX PWR Switch – On
4. Landing Gear Down Lock Lights On (Green)
5. Parking Brakes – Verify Set

APU START

1. Verify ground crew and co-pilot ready for APU Start
2. APU – Switch to ON and wait for READY light to illuminate
3. Bleed Air - ON
4. Adjust Cockpit lighting as needed
5. Display screens brightness – set
6. Check battery voltages and electrical current in Engine Information Display
7. Check Fuel Quantity
8. Hydraulic System – Verify Quantity, Temperature
9. Test Fire warning lights (avail. In future update)
10. Canopy – Closed and locked

ENGINE START

1. Notify / confirm ground crew and any remaining ground equipment removed / clear
2. Engine Crank Switch - ON
3. At positive fuel flow, Move throttle to idle to open fuel valve.
4. Monitor fuel flow
5. Check Engine Parameters (N1, Fuel flow, Temp, Oil Pressure, Oil Temp, Oil Quantity)
6. Wait a minimum of 30 seconds after engine has reached stable idle RPM and then set APU switch off

BEFORE TAXI

1. Engine Instruments – Check

2. OXY regulator mode – test and confirm function
3. Navigation equipment – Check
4. IFF – Verify function and transponder mode select in UFCD
5. Verify flight plan / programming
6. Initial autopilot settings entered as desired
7. Altimeters – Set barometric pressure and check field elevation on HUD and ADI altimeters
8. Verify fuel quantity
9. Anti Ice – Set as needed
10. Windshield Defog Lever – As Required
11. Speed Brake - Closed
12. Position Lights – Check Flash
13. Formation Lights – As Needed
14. Verify Canopy Closed and Locked
15. Remove Wheel Chocks – Remove Headphones interconnect with ground crew
16. Signal Ground Crew with Taxi Lights – Steady to alert ground crew to clear the way for taxi, flashing the light to alert ground crew to re-establish intercoms.

TAXIING

1. Landing/Taxi Lights - TAXI
2. BRAKE HOLD – OFF
3. Brakes check – verify normal brake function and response
4. Verify FCS function – CAS messages check
5. Speed Brake switch to full open and closed
 - a. check speed brake extension and retraction
6. OXY SUPPLY switch – ON
7. Oxy regulator mode switch – NORM

BEFORE TAKEOFF

1. Anti-Collision Lights – ON
2. Position Lights - STDY
3. Landing Lights – ON
4. Helmet Visors – Lower (additional protection against bird strikes causing windshield failure during takeoff)
5. CAS messages – status check

TAKEOFF

1. Brakes - Depress and Hold
2. Heading Check
3. Annunciator and CAS – Status Check
4. Throttles – Intermediate thrust
5. Engine Data – Check
 - a. Power level
 - b. Fan RPM
 - c. Engine TBT
 - d. Core rpm

- e. Oil pressure
 - f. Oil Quantity
- 6. CAS check
- 7. Brakes Release
- 8. Throttles – Maximum Thrust
- 9. Engine Performance – Check
- 10. Acceleration – Check
- 11. Rotation Speed – Check
 - a. Rotation Speed at approx 115 Knots
 - b. Rotate to between 7-10 degrees nose up

AFTER TAKEOFF / CLIMB

1. Landing Gear – Up when aircraft clear of runway and safe climb speed reached
2. Landing Lights – Off
3. Check Landing Gear Position indicator lights illuminate red during transition and off when gear fully retracted.
4. Check landing gear knob light out when gear retracted
5. Throttles – Set for Climb
6. Fuel Quantity and Flow indicators – Check
7. Altimeters – check barometric pressure settings
8. Above FL100, Maintain 300 Knots until Mach 0.78
9. Above FL180 set altimeters to 29.92
10. Autopilot – Engage when appropriate

CRUISE CHECKS

1. Engine & Instruments – CHECK
2. Fuel Quantity – CHECK
3. Radios - TUNED and SET
4. Lights - AS REQUIRED

DESCENT

1. Hydraulic System – Check Pressure, Temp, Qty
2. Electrical Power – Check
3. Engine Instruments – Check
4. CAS – Check
5. Fuel – Check
6. Navigation and Communications – Set as required
7. Transponder – Set and Active
8. Landing Data – Computed and checked
9. Altimeters – Set barometric pressure below transition altitude
10. Anti Ice – As Needed
11. Defog Switch – As Needed
12. Helmet Visors – Lowered when below 10,000 AGL
13. Interior Lighting – Set for Landing
14. Restraint Harness – Secured

APPROACH AND LANDING

1. Altimeter – Check
2. Localizer Frequency – Check
3. Localizer Course – Check
4. Landing Gear Handle Dn – On Glideslope
 - a. Check landing gear position lights illuminate green
 - b. Check landing gear knob light illuminates
5. Landing Lights – On
6. Approach AoA – 10 degrees
7. Pattern Speed – B/W 160 and 180 kts depending on GW
8. Approach AoA – 6-8 degrees for 750 fpm descent rate on a 3 degree GS
9. Final Approach Speed – Approx. 125 to 140 knots depending on GW
10. Final Approach AoA – 10 degrees angle of attack
11. Flare as needed – Nose pitch approx. 10 degrees up at touchdown
12. Bring nose wheel down when safe
13. Speed brake full when nosewheel on ground
14. Apply wheel brakes until safe taxi speed
15. Exit runway when able

AFTER LANDING

1. Taxi Lights - ON
2. Anticollision lights – Off
3. Position lights – BRT / FLASH
4. Transponder / IFF – OFF
5. ANTI-ICE – Off
6. Speed brake switch - Retract

PARKING / SHUTDOWN

1. Parking Brake – Set / On
2. Anti-Skid Switch - Off
3. Ground crew intercom – Connect
4. Wheel Chocks – Install
5. Taxi Light – Off
6. Anti-Collision Lights – Off
7. Position Lights – Off
8. Bleed Air – Off
9. Throttles Idle
10. Engine Instruments – Check for normal Idle Operation
11. Throttle – Fuel Cutoff position
12. Ejection Seat Arming Lever – Disarm
13. BATT – Off
14. AUX PWR - Off
15. Canopy – Open

TOP MACH STUDIOS T-7A RED HAWK CREW ALERTING SYSTEM (CAS) REFERENCE

ALERTING MESSAGE TEXT	INFO	CAUTION	WARNING	SPECIFIC VOICE ALERT	NOTES
PULL UP			Below 3000 ft AGL, <-6000 fpm sink rate, speed > 180 Knots	PULL UP PULL UP	
G FORCE			Load Factor > 8.5	OVER G	
BINGO FUEL			< Bingo Fuel State	BINGO FUEL	
JOKER FUEL		<Joker Fuel State		JOKER FUEL	
AIRSPEED		Airspeed > 625 Knots			
OVERSPEED			Airspeed > 650 Knots, or Mach Number greater than 1.40		
LOW ALTITUDE		<1000 AGL, <-500 fpm sink rate, gear up			
HIGH ALTITUDE		Altitude > 50,000 feet	Altitude > 55,000 feet		
GEAR UP		Gear retracted, airspeed < 190 knots, Altitude <3000 Feet AGL			
PARKING BRAKE	Parking Brake On while on Ground	Throttle > 50% while on ground, or aircraft airborne			
GEAR UNSAFE	Gear in transit (cycling up or down)		Airspeed > 300 KIAS with gear extended	GEAR UNSAFE	
FUEL IMBALANCE		Fuel imbalance greater than 200 lbs between L/R sides of aircraft	Fuel imbalance greater than 500 lbs between L/R sides of aircraft		
SPEEDBRAKE	Speed brake open any percentage > 0				
CANOPY OPEN	Canopy is unlocked / open		Canopy unlocked / open at groundspeed > 10 knots		
ENG STARTING	Engine starter running				

ENG OUT			Groundspeed > 8 knots and N1 < 15%		
ENG ITT		Interstage Turbine Temp > 1060C	Interstage Turbine Temp >1100C		
ENG OVERSPEED			N1 > 102.5%		
ENG FIRE			Engine Fire Detected	ENGINE FIRE	
GEN OFF		MAIN GEN switch Off and Eng N1>15%			
BATT OFF		BATT Switch OFF when a/c power is on			
CAB PRESSURE LO		Cabin Pressure is less than 10000 ft. pressure alt.	Cabin Pressure less than 12,000 ft. pressure altitude		
FBW OFF			FBW module disabled		
EJECT. SEAT F		Aircraft electrical power on and front ejection seat arming lever in disarm position			
EJECT. SEAT R		Aircraft electrical power on and rear ejection seat arming lever in disarm position			
BLEED AIR		Aircraft airborne and bleed air system is off			
EXT. POWER	Ext. Power Active				Only functions when aircraft is in a parking spot that supports ground power
AVIONICS BAY OPEN	Forward avionics bays are open				
MSN ALT		Aircraft is below mission altitude setting			
APU ON	APU is on / running	APU on above 40,000 feet and/or greater than 220 Knots	KIAS greater than 280 Knots		