T-38C TALON

DESIGNED FOR PREPAR3D

MILVIZ

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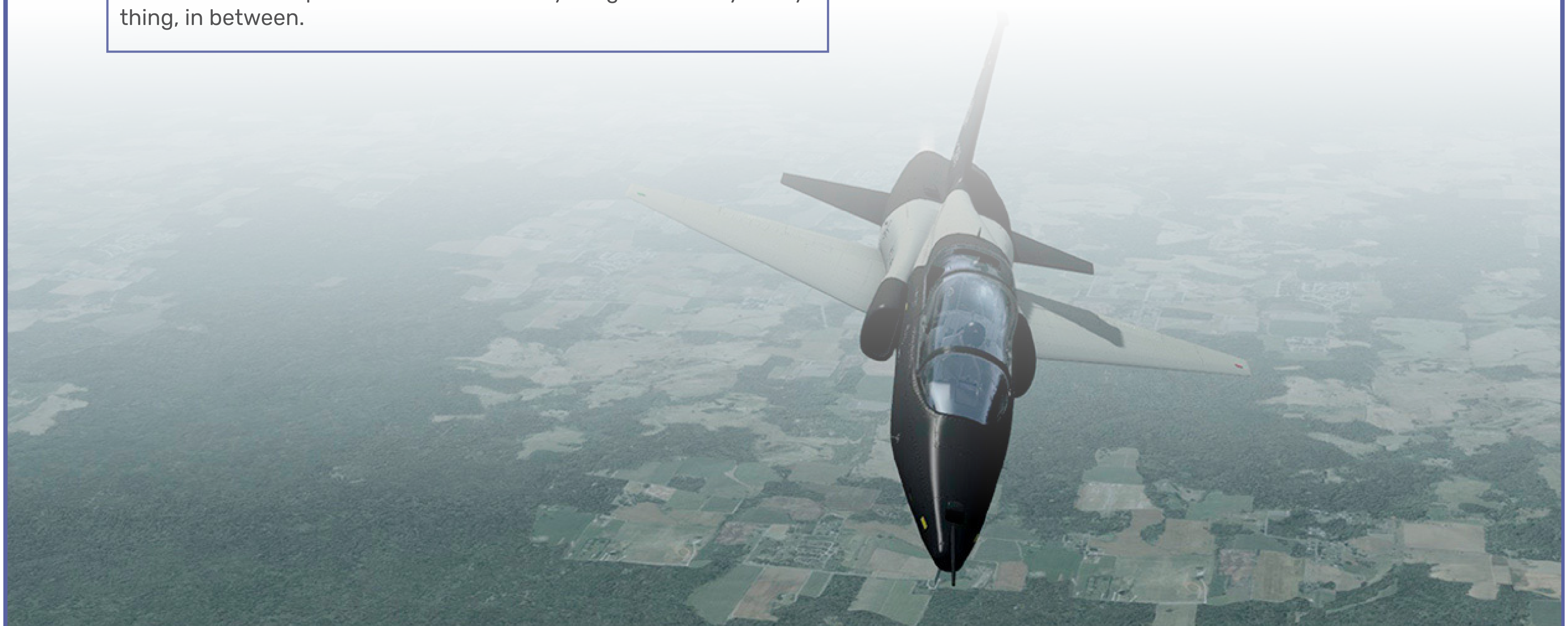
Table of Contents

Introduction to the T-38C Talon

THE ACCOLADES OF THE T-38 TALON ARE MANY and indeed, well-deserved. It can be rather difficult to believe that the svelte Talon, with it's lightweight appearance and sleek, graceful curves, has been airborne now for 60 years. During much of that time, the Talon has served as the backbone of the USAF jet training program, helping tens of thousands of pilots become the very best at their jobs.

The beginnings of the Talon makes for a rich story and is well worth sharing - enough so that a few scant pages prefacing this user guide scarcely does the aircraft justice. It seems a shame to not touch on the subject and so we shall, but not without more than a bit of reverence for a spectacular aircraft that we know holds a special place in the hearts of many pilots who have went on to fly aircraft ranging from F-104's to Space Shuttles and everything, absolutely everything, in between.



Above: Artwork depicting the Northrop N-102 Fang.
Right: Front and side views of the N-102.
(Images: Northrop)

A Precursor: The N-102 Fang

The T-38 was truly the culmination of years of research: the groundwork for what would become the first supersonic training aircraft initially started as an in-house project at Northrop Corporation.

It was here in the early 1950's that an engineering team was first formed with the assigned task of reversing the trend towards ever-increasing size and weight in fighter aircraft development.

The team was led by the vice president of engineering at Northrop, Edgar Schmued. Previously with North American Aviation, Schmued had been involved while there with the design of a few other *slightly* famous aircraft: the P-51 Mustang and the F-86 Sabre.

The late 1940's and the early 1950's marked a period of extremely rapid progress in aircraft design, especially in the areas of propulsion and aeronautics. The US Air Force was intent on achieving higher levels of performance and greater armament load in fighter aircraft, but these gains came with consequences such as higher levels of complexity, exponential increases in maintenance costs, and increases in airframe weight which in turn resulted in longer runway requirements.

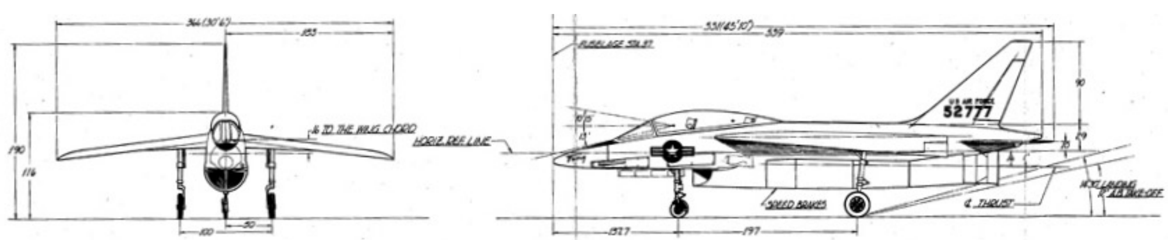
Schmued, seeing a potential opportunity, gave his team the goal of delivering a smaller aircraft with high performance, high reliability and superior maneuverability, all the while pursuing a cost advantage over other fighter aircraft of the era.

Initial studies at Northrop resulted in a prototype aircraft, the N-102 'Fang'. This compact aircraft (which bore only minor resemblance to the later developments it inspired) sported sharply angled delta wings shoulder mounted on the fuselage sides, a largely unobstructed canopy with excellent over-the-nose viewing, as well as a single engine design with a single split air intake located under the cockpit, along the ventral line of the aircraft.

Plans originally called for the N-102 to be powered by the newly developed J-79 turbojet engine, which notably went on to power a range of well known fighter aircraft such as the F-104 Starfighter and the F-4 Phantom II.

The J79, at over 17 feet long and nearly two tons, is a sizable engine; the resulting aircraft would of been much larger than originally desired.

The N-102 failed to garner enough interest from the US Air Force, who instead chose a competing design for its high altitude day fighter requirement, the sleek and speedy



TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Lockheed F-104 Starfighter. As a result, the N-102 was fated to never leave the prototype stage.

Development of the N-156

Post-WWII, the US Navy had undergone a major shift in strategies, brought about in part by the rapid development of jet aircraft. One class of ship, the escort carrier, had served an important role in WWII, but was now largely without a purpose. The smaller decks of the escort carriers weren't capable of handling the heavier and faster fighter jets being developed at the time, and the design team at Northrop took note of this fact.

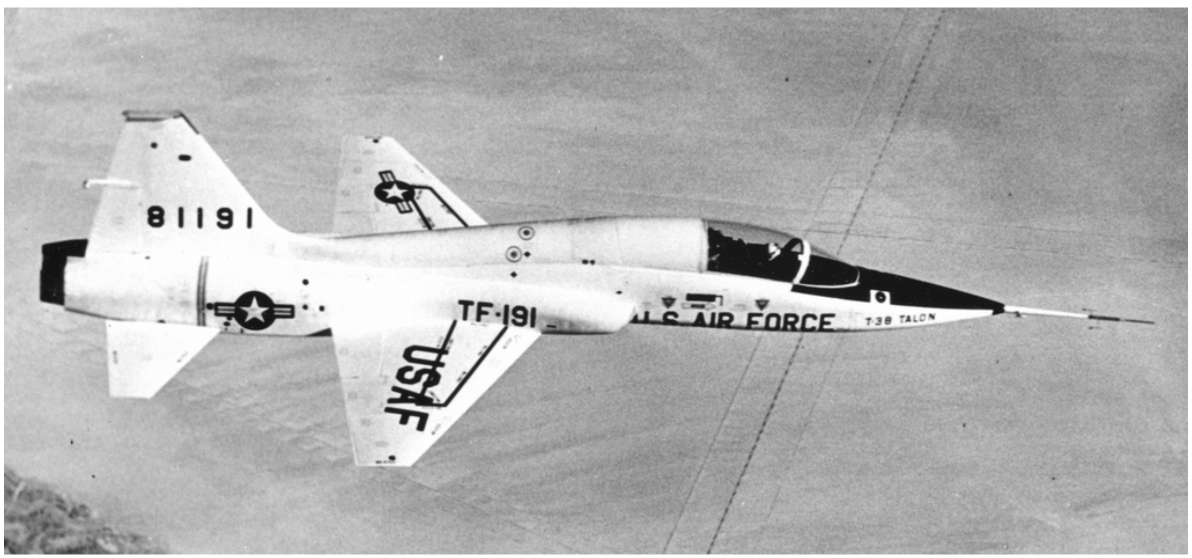
Meanwhile, continuing developments in engine design had brought forth an engine which caught the attention of the engineering group at Northrop: the compact, yet high thrust J-85 turbojet. With a thrust-to-weight ratio exceeding 6.25, this was a noteworthy thrust per pound advantage over existing engines such as the J-79, which had a thrust-to-weight ratio of 4.7.

In addition, the basic design of the J-85 was very compact, measuring about a foot and a half in diameter and approximately 4 feet long, all contained in a package that would weigh around 400 pounds installed.

This was exactly what the Northrop designers had been waiting for. Perfectly suited for their goal of a lightweight-yet-powerful fighter aircraft (a concept explored by the previous N-102 prototype) the J-85 proved to be the perfect match.

The N-156 project began in 1954, with the initial plans calling for a small, twin engine fighter capable of operating from the light

decks of the US Navy's escort carriers. This would be termed the N-156N. A ground-based fighter, the N-156F, as well as a two-seat training variant, the N-156T, rounded out the planned N-156 family.



Above: First flight of the YT-38 Talon, serial number 58-1191, 10 April, 1959. Top right: The first prototype of the N-156F with the first and second YT-38 prototypes along with their test pilots at Edwards Air Force Base. (Images: USAF)

Finding a Role

Unfortunately, it became clear early in the design phase that the US Navy was abandoning any plans to equip their aging escort carriers in such a manner. Regardless, Northrop saw merit in the aircraft design taking shape and decided to press on with the N-156 project using in-house funding.

Then in May of 1955, the US Air Force issued a General Operating Requirement for a supersonic trainer to replace the aging Lockheed T-33. Northrop decided to adapt the N-156T for this competition, ultimately edging out a favoured two-seat variant of the North American F-100 to win a contract for three prototypes: the YT-38 Talon.

The first prototype (designated the YT-38) flew in April of 1959 and was quickly adopted by the USAF, complementing the T-37 primary jet trainer already in use.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Above: USAF T-38C Talon, serial number 68-8119, assigned to 50th Flying Training Squadron, Columbus Air Force Base, 7 September 2006 . (Images: USAF)

The usefulness of the N-156 project did not stop there, however. Development of the fighter variant had continued, albeit with internal funding. In 1958, a research and development contract was given to Norair (the aircraft and missile manufacturing division of Northrop) for three fighter aircraft prototypes and one static test frame.

The first prototype of the N-156F rolled off the line in May of 1959. Despite a series of very satisfactory tests with live ordnance, it did not find a home with the US Air Force. However, in 1962 it was chosen as the winner of a competition to supply US allied nations with a low cost fighter aircraft.

Designated the F-5A Freedom Fighter, it became a success of it's own right. Between the T-38 and the F-5, it became clear that Northrop's gamble on bucking the trend had paid off.

A Supersonic Success Story

From 1961 until production was halted in 1972, over 1100 T-38A Talons were manufactured. Over 500 of those aircraft are still in use with the US Air Force, receiving airframe, engine and system component modifications and replacements as the fleet has aged.

The T-38 belongs to a very exclusive club of aircraft that have been in service with the USAF for over 50 years, joining the B-52 Stratofortress and the U-2 Dragon Lady. Such an exemplary service record is equally matched by the many other impressive traits of the T-38, which in no small measure has helped to enable the longevity of the aircraft.

Performance of the T-38 has always been outstanding. In 1962, the Talon set time-to-climb records for 3,000, 6,000, 9,000, and 12,000 meters, which had been previously set by the F-104. The new records were surpassed a month later by the F-4; however, given the size and power disparity of the F-4 in comparison to the T-38, there was certainly no loss of pride for the compact Talon.

The T-38 needs as little as 2,300 feet of runway to take off and can climb from sea level to 30,000 feet in about one minute. A propulsion modernization program has further increased thrust on modified aircraft by approximately 19 percent, reducing takeoff distance by 9 percent.

Through an avionics and propulsion upgrade program, the modernized T-38C entered service with the USAF in 2001. Improvements included the addition of a glass cockpit with integrated avionics displays, a head-up display, and an electronic training scoring system.

Over 72,000 Pilots Served

It's very safe to say that the T-38 Talon has far exceeded any expectations it's designers may have had when they first conceived the N-156 family in the 1950's. Since delivery of the first production airframes in 1961 to the US Air Force, the T-38 has served as the final stepping stone in the training of tens of thousands of military pilots - a role it continues to this very day.

The USAF Strategic Air Command used the T-38 from 1978 to 1991 as part of the Accelerated Copilot Enrichment Program, and later as proficiency aircraft for all pilots of the B-52, B-1, SR-71, U-2, KC-135 and KC-10 aircraft. Air Combat Command and Air

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Force Global Strike Command continue to use the T-38 as proficiency aircraft for U-2 and B-2 Spirit pilots.

Air Education and Training Command (AETC) uses the T-38C to train and prepare pilots for the F-15C, F-15E, F-16, B-52, B-1B, B-2, A-10, F-22 and F-35.

Advanced JSUPT (Joint Specialized Undergraduate Pilot Training) students fly the T-38C in aerobatics, formation, night, instrument and cross-country navigation training, while test pilots and flight test engineers are trained in T-38s at the U.S. Air Force Test Pilot School at Edwards Air Force Base. The T-38 is also used by Air Force Material Command to test experimental equipment such as electrical and weapon systems.

Pilots from most NATO (North Atlantic Treaty Organization) countries train in the T-38 at Sheppard AFB, Texas, through the Euro-NATO Joint Jet Pilot Training Program.

In addition, the National Aeronautics and Space Administration (NASA) currently uses T-38 aircraft as trainers for astronauts and as observers and chase planes on programs such as the space shuttle.

Retiring the T-38

As fighter aircraft evolve in order to better perform their roles, so must the equipment used to train the pilots evolve as well.

The ‘5th’ generation of fighter aircraft such as the F-35 and the F-22, along with the ever more connected battlefield environment, has placed new pressures and workloads on pilots, which aren’t often addressed by aircraft solely focused on imparting flying skills.

Requirements for a T-38 replacement were being developed as early as 2003. However, over the years the proposed replacement date has been moved both forwards and back. Budget constraints cause delays, but training requirements, along with issues such as airframe fatigue and falling availability rates highlight the importance of finding a successor to the long-lived Talon.

The list of requirements for such a replacement is long: Ideally, it would require the capability to provide a training platform for aircraft control, formation flying, instrument and navigation, advanced air-to-air, advanced air-to-ground, and advanced crew/cockpit resource management. In addition, there are also advanced training requirements to be met, such as sustained high-G operations, aerial refueling, night vision operations, air-to-air intercepts, and data-link operations.

The T-X program, outlining the need for a next generation training aircraft, originally released the list of necessary requirements in 2015, with a formal request for proposals released in late 2016. Bids for the T-X aircraft were submitted by several competitors, with some based on existing designs (the Leonardo T-100, based on the Aermacchi M-346 Master, the KAI T-50 Golden Eagle, submitted by Lockheed Martin and Korea Aerospace Industries, and a variant of the Hawk T2 submitted by Northrop Grumman, BAE and others), while other submissions were wholly new developments.

The winner for this competition was announced just this past September: The Boeing/Saab T-X. Details are still vague on when this new, single engine, twin tail, training aircraft will enter service, but with this announcement, a retirement date for the venerable T-38 Talon inevitably moves from an ‘if’ to a ‘when’; truly the end of an era.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

T-38C Features

Replicating an advanced jet engine aircraft within the confines of a desktop simulator, while retaining all of the characteristics that make the real world aircraft unique, is no small task.

We aren't exactly strangers to this 'genre' of aviation. With a successful track record of simulating some of the most complex military aircraft in the world, we've become known for exacting recreations that seek to condense the experience and convey the sense of being 'there'.

We're also quite familiar with the T-38 Talon itself, having brought multiple versions of the T-38A to the desktop over the past several years. The T-38A was also the base which first saw the introduction of our 'Advanced' series of jets: Exacting aeronautical and engine simulations made possible by our custom physics and flight dynamics engine, complete with training aids and customizable failure and damage modeling.

The T-38C is in every way a much more modern version of the original T-38, in the simulator as well as in real life. Traditional flight instruments are replaced by a large multifunctional display (MFD), controlled with an up-front control panel (UFCP) and a hands-on-throttle-and-stick (HOTAS) system. A Head Up Display (HUD) provides symbolic flight and weapon delivery information, while an Electronic Engine Display provides vital engine feedback to the pilot.

Adding to this is an enhanced performance profile that carefully imitates upgrades done to the engine inlets and injectors, taking into account the increased engine thrust available.

Our customizable failure system ensures that all types of users are catered to: whether you want to enjoy a simple flight, or have the aircraft keep you on the edge of your seat, the system can be tailored to your liking.

Special Features

- Custom physics & FDE engine
- Custom ground & structural dynamics
- Aerodynamic model based on Northrop and NASA data
- Realistic J-85-5R engine model
- Custom Flight Control System model
- Configurable forced and random failures system
- Basic 'Instructor' mode available
- Icing effects and damage modeling
- Highly advanced avionics simulation
- Includes F-16 and MIL Heads Up Displays
- Realistic navigation & flight planning capability
- Capability to define and load data externally
- Professionally mastered sound set
- Ultra-detailed modeling, inside and out
- Professional PBR texturing
- RealLight implementation
- TacPack integration for simulated combat training features

ADV RealLight TACPACK POWERED vrsimulations.com

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

System Requirements

The following requirements apply as a general minimum to successfully install, configure and operate the MilViz T-38C Talon.

Please note that your choice of scenery, location, simulator settings and 3rd party utilities may place additional demands on your simulation platform and may affect your simulator experience.

Supported Platforms:

- Lockheed Martin Prepar3D, version 4.4+

(Note: For compatibility with any future updates and hotfixes, please register for and visit our product forums. Compatibility with future versions of Prepar3D is not implied nor included.)

Supported Operating Systems:

- Windows 7
- Windows 10

Processor (CPU):

- 2.6 GHz CPU required
  (3.0 GHz, multiple core processor or better recommended.)

Video Card (GPU):

- DirectX 11 compliant video card with a minimum of 4 GB video RAM

System Memory (RAM):

- 8 GB RAM

Hard Drive:

- 2 GB or greater free hard drive space.

Gaming Controller:

- Joystick, yoke, or other gaming controller (a means of controlling the aircraft rudder, either with twist joystick function or dedicated pedals, is additionally recommended).

(Note: All MilViz products **require** a minimum of one functioning gaming device such as a joystick for proper operation and control.)

Other Software Requirements:

- The TacPack Combat System software from VRS (https://www.vrsimulations.com/tacpack.php) is required for full functionality of the below components:
  - A-A Combat Simulation: Funnel gunsight including bullet fly-out dots, along with LCOS gunsight mode. Non-TacPack users will see a static funnel or LCOS reticle.
  - A-G Combat Simulation: No-Drop-Bomb-Scoring (NBDS) systems, including CCIP, delayed CCIP, CCRP, and Manual bomb aiming displays on the HUD, along with NDBS scoring (calculated bomb impact point relative to the target) displays in the MFD. Non-TacPack users will not be able to utilize these systems.

Installing the T-38C Talon

1

Beginning Installation

As with other flight simulator add-ons, pre-installation precautions should involve closing any open applications, as well as temporarily disabling any active antivirus software.

Failure to temporarily disable antivirus software when installing may result in a non-functioning product and/or simulator!!!

After purchase, you will have been given a link or an option to download a compressed (.zip) file. This compressed file contains an executable (.exe) file, which is the installer for the MilViz T-38C Talon.

Using the Windows File Explorer or file compression utility of your choice, unzip this file to a location of your choosing.

Once unzipped, you may begin installation by right clicking on the executable (.exe) file, then selecting "Run as administrator". The installer will run, showing an initial welcome screen. Left click on the "Next" button to continue.

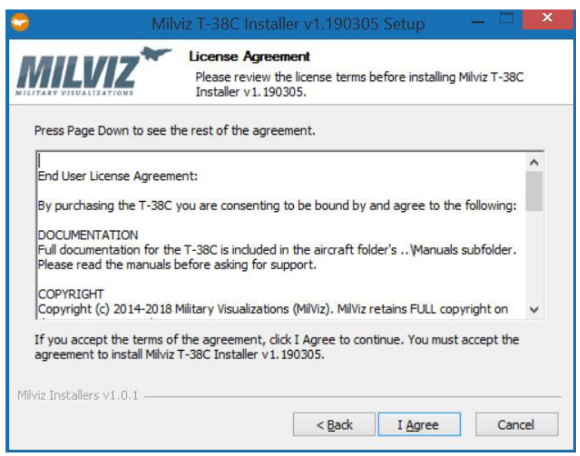
Note: *Version numbers shown in any of the following installation images may differ from the downloaded product.*

2

Licence Agreement

The screen will allow you to view the end user license agreement. Please take the time to carefully review the license agreement text.

Clicking "I Agree" at this screen will confirm your acceptance of the license agreement, and will allow you to proceed to the next step of the installation.

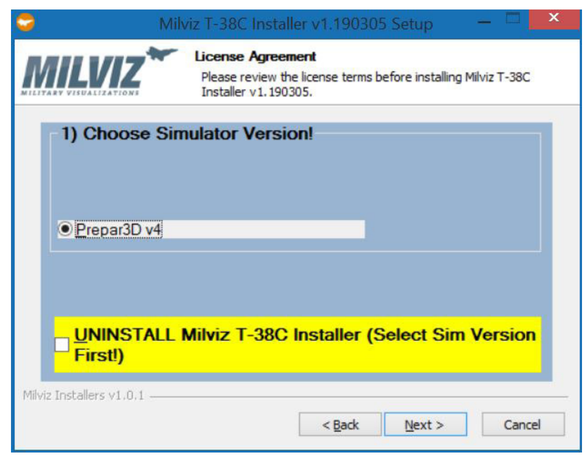


3

Choose Simulator Version

The installer should automatically find all compatible simulator platforms on your system. Only installed & compatible simulators will be displayed as options.

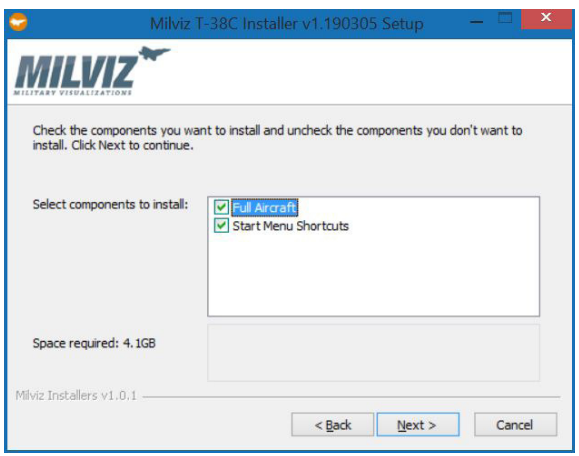
Please note that the MilViz T-38C Talon only supports Prepar3D version 4.4(+); as such, this is the only option displayed.



4

Component Selection

The various components that make up the installation may be deselected at this screen, though we really don't recommend doing so.



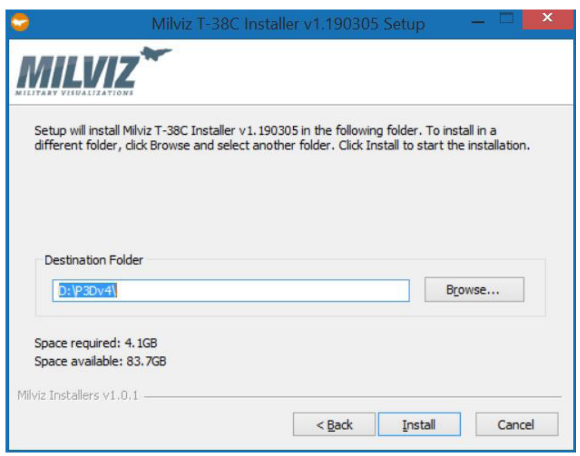
5

Install Location

The next screen shown will display the location where the MilViz T-38C Talon will be installed.

This should be pre-filled out with a folder location based on the simulator chosen in Step 2. If you wish to change the location where the Talon is to be installed, you may do so by left clicking the "Browse" button and selecting a different folder.

Clicking the 'Install' button will start the process of copying files to the correct locations.

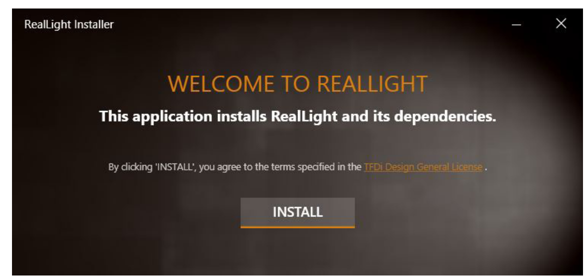


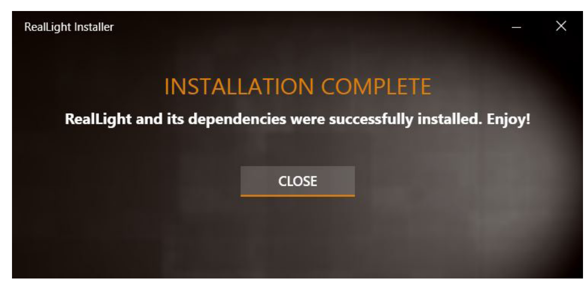
6

Component Installation

After the main bulk of the files are finished copying, the installer will automatically open the installer for the RealLight application.

Please follow the prompts to install these components.



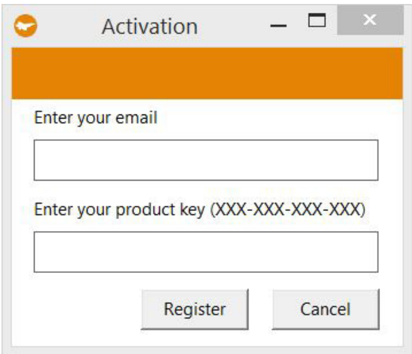


7

Product Registration

The MilViz T-38C Talon contains a DRM system which helps to ensure that only legitimately purchased copies of the T-38C Talon are in use.

This DRM system is activated the first time that the aircraft is loaded in the simulator. During this initial loading process, the following screen will appear, prompting entry of your email address, along with the product key you were given at time of purchase.



Enter the details prompted and press the 'Register' button to continue.

It should be noted that the product key you were given is registered to the email address you used when purchasing the product, requiring the entry of that same email address at this screen.

8

Post-Installation Tasks

Please be sure to revert your antivirus program settings back to their previous state. Also please make sure that your P3D directory off-limits to any automatic antivirus scanning. Failure to do this may result in a non-functioning simulator!

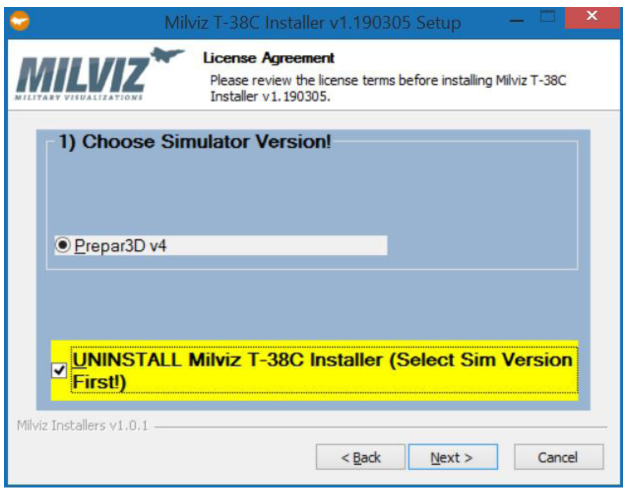
It may be worthwhile to back-up or save a copy of the downloaded installer. Please be aware that as new updates are released over time, we do not continue to offer older versions for download due to support issues. Please also note that support is intended for the latest releases of our products only.

Uninstalling the T-38C

The MilViz T-38C Talon may be uninstalled from a single simulator at a time by re-running the installer.

Once the installer opens, advance to the step where you can choose your simulator. Here you may select the simulator you wish to uninstall from, then select the checkbox which is highlighted in a nice subdued yellow color and reads "UNINSTALL". Left click on the "Next" button to proceed with uninstalling the aircraft.

Note: *Prior to uninstalling the aircraft, please be sure to back up any customized files or custom liveries you have installed if you wish to keep them.*



Product Support & Updates

To receive product support, please ensure you register for support forum access. Support forum access is available to legitimate product owners only and is granted on a per-product basis, meaning that you have to actively register for each individual product.

To register, please email **oisin@milviz.com** with your proof of purchase and your preferred (or existing, if you have already registered for other products) username and we'll get you set right up!

The T-38C Talon is updated by one of two methods, with minor update notifications delivered through the MVAMS application, and major update notification being provided by your vendor.

To check for a minor update, open the MVAMS application via the MVAMS icon which has been placed on your desktop. If you do not see it, the MVAMS application is installed to 'C:\Users\(username)\AppData\Local\MVAMS'.

If a minor update for the Talon is available, a notification will appear here. Click yes to begin the update process, which largely mirrors the install process.

Major updates are beyond the scope of the MVAMS application, however, and require a new version of the aircraft to be downloaded and installed. Be sure to uninstall the previous version first, backing up any custom files or liveries prior to doing so.

Simulator Configuration

Within the simulator, certain configuration settings are required for full and proper functionality of the MilViz T-38C.

Please be sure to refer to and follow the instructions and recommendations within this section, especially if you are experiencing unexpected behavior with the T-38C.

One area that's often a concern to many sim pilots is simulator performance. However, due to the countless combinations of computer hardware, installed scenery, background processes, etc, we find it nearly impossible to recommend any perfect settings that would satisfy all users.

A lower limit for performance, as measured by frames=per-second (FPS), doesn't really exist for the underlying custom simulation code of the MilViz T-38C. This means that there isn't a point where the simulation 'stops' being accurate in terms of physics.

However, low FPS will definitely affect general usability and enjoyment of the simulator. As such, we would recommend that users strive to maintain a smooth framerate of at least 25 FPS.

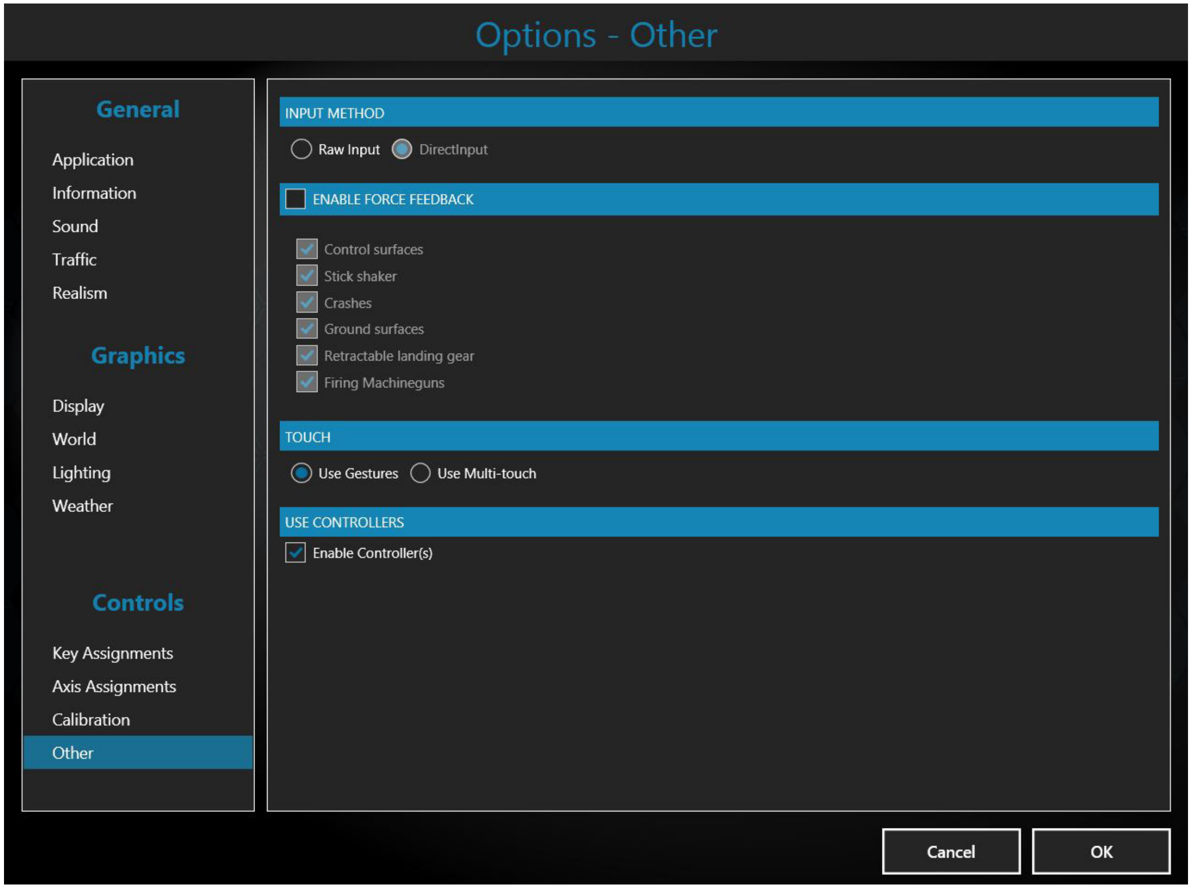
This can generally be achieved through the adjustment of the various graphics options in the Display, World, Lighting, and Weather pages.

We would leave it to the user to find their perfect balance of a smooth flight experience with graphical detail in the surrounding world.

Controller Input Method

One of the most important configuration settings that absolutely must be done within the simulator is to set the controller input method to **Direct Input**. This is a critical setting - without doing so, the T-38C simulation will not respond correctly to controller mapping set through the MVAMS application.

To set this configuration option, browse to the Prepar3D 'Options - Other' window. In the section marked 'Input Method', select the radio button marked 'Direct Input'. The result of a correctly set input method looks like the image below.



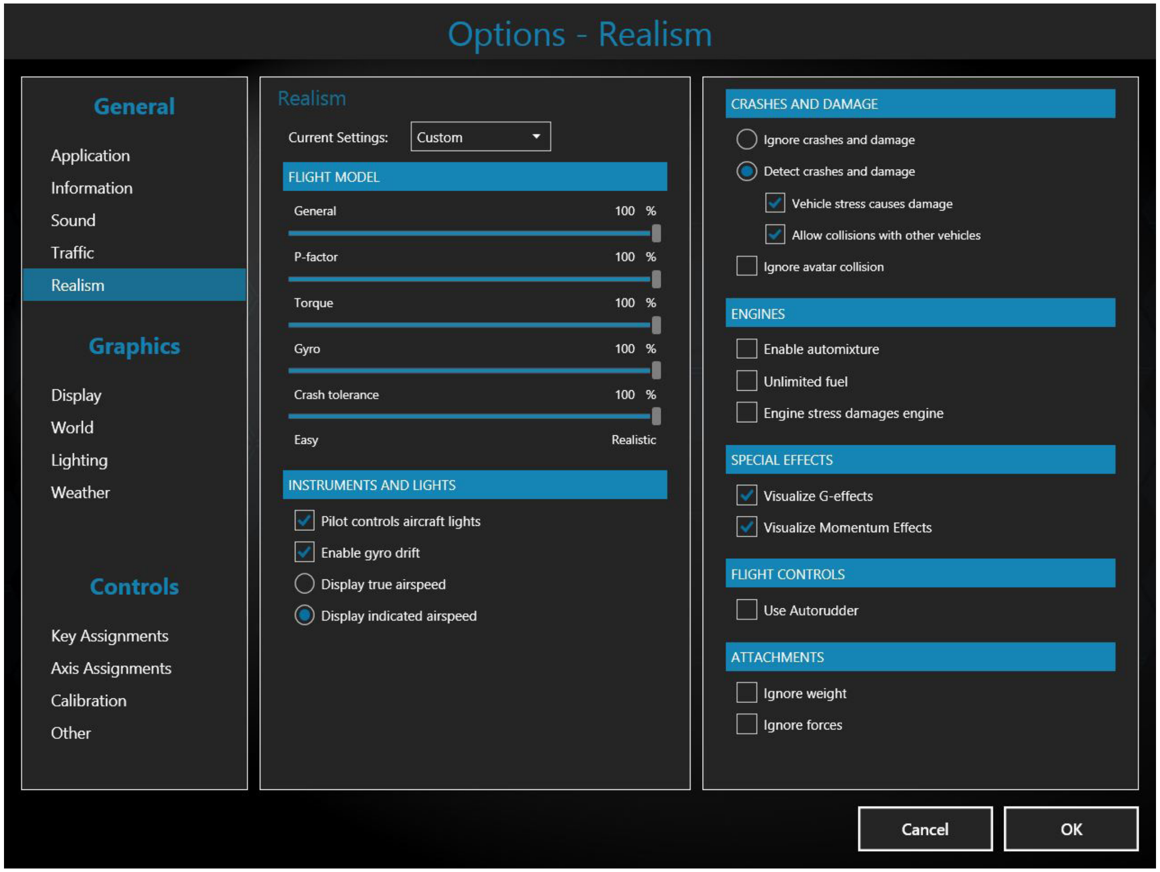
TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Realism Settings

MilViz aircraft are developed with an overall goal of replicating a realistic level of accuracy in regards to operation and flight response. To this end, development and testing are generally carried out using the highest realism settings available within the simulator.

Overall, the realism settings within Prepar3D exist in order to make simulated flying less of a chore, as well as to remove some of the tasks which are necessary in real life to ensure a safe and proper flight.

While we don't discourage the use of many of these settings, it should also be noted that the custom systems and flight model programming in the T-38C Talon do render some of the overall platform settings superfluous .



Flight Model
For correct operation, all sliders in the flight model section should be set fully to the right.

Instruments and Lights
The MilViz T-38C Talon has a sophisticated lighting system in place, so the "Pilot controls aircraft lights" should be checked. "Enable gyro drift" and "Display indicated airspeed" may be left to user preference.

Crashes and Damage
The choices in this section may be overridden by the custom failures built into this aircraft.

Engines
All three checkboxes in this section must remain unchecked for correct operation.

Special Effects
This may be left to user preference.

Flight Controls
For the most realistic flight experience, "Autorudder" should not be selected.

Attachments
These should remain unchecked.

Simulator Events for UFCP & MFD Keys

UFC (Front Cockpit)					
UL-1	0x1106D	IFF Key	0x11078	CLK Key	0x11083
UL-2	0x1106E	MRK Key	0x11079	TST Key	0x11084
UL-3	0x1106F	APP Key	0x1107A	BULL Key	0x11085
UL-4	0x11070	EGI Key	0x1107B	IDT Key	0x11086
UR-1	0x11071	WPN Key	0x1107C	RTN Key	0x11087
UR-2	0x11072	ALT Key	0x1107D	ENT Key	0x11088
UR-3	0x11073	SET Key	0x1107E	Numeric 0 - 9	0x11089 + (0 TO 9)
UR-4	0x11074	VTR Key	0x1107F		
FPL Key	0x11075	WIT Key	0x11080	Alpha A-Z	0x11093 + (0 TO 25)
DST Key	0x11076	ACK Key	0x11081		
COM Key	0x11077	HUD Key	0x11082	Space	0x110AD
MFD (Front cockpit)					
Heading Dec	0x110B0	ML-7	0x110BA	MT-3	0x110C4
Heading Inc	0x110B1	MR-1	0x110BB	MT-4	0x110C5
Course Dec	0x110B2	MR-2	0x110BC	MT-5	0x110C6
Course Inc	0x110B3	MR-3	0x110BD	MT-6	0x110C7
ML-1	0x110B4	MR-4	0x110BE	MB-1	0x110C8
ML-2	0x110B5	MR-5	0x110BF	MB-2	0x110C9
ML-3	0x110B6	MR-6	0x110C0	MB-3	0x110CA
ML-4	0x110B7	MR-7	0x110C1	MB-4	0x110CB
ML-5	0x110B8	MT-1	0x110C2	MB-5	0x110CC
ML-6	0x110B9	MT-2	0x110C3	MB-6	0x110CD

FSUIPC - Can I still use it?

FSUIPC is a commonly used third party application that provides many quality of life features for sim pilots, including per aircraft controller and keyboard settings.

The application may be used with the MilViz T-38C, but the following instruction has to observed:

1) All controls assigned within FSUIPC must be sent to the simulator as a normal axis in order for the T-38C to detect them.

Simulator Events for UFCP & MFD Keys (continued)

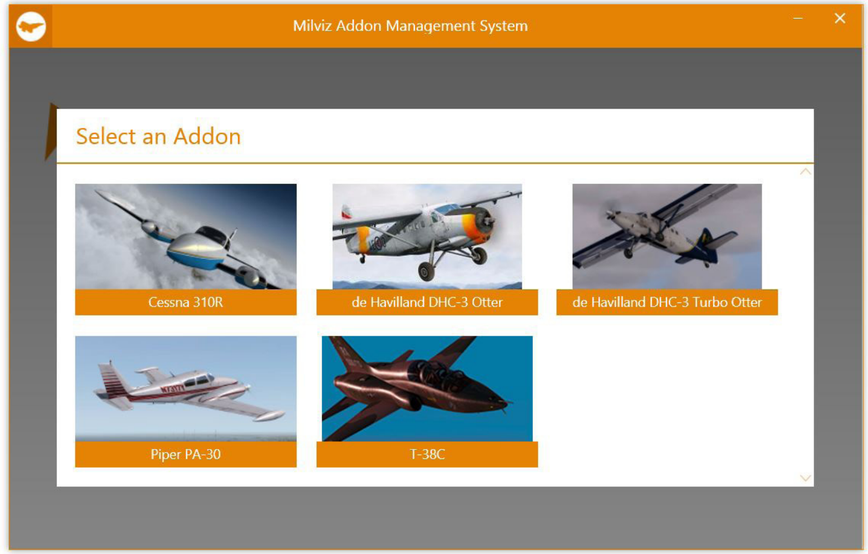
UFC (Rear Cockpit)					
UL-1	0x11114	IFF Key	0x1111F	CLK Key	0x1112A
UL-2	0x11115	MRK Key	0x11120	TST Key	0x1112B
UL-3	0x11116	APP Key	0x11121	BULL Key	0x1112C
UL-4	0x11117	EGI Key	0x11122	IDT Key	0x1112D
UR-1	0x11118	WPN Key	0x11123	RTN Key	0x1112E
UR-2	0x11119	ALT Key	0x11124	ENT Key	0x1112F
UR-3	0x1111A	SET Key	0x11125	Numeric 0 - 9	0x11130 + (0 TO 9)
UR-4	0x1111B	VTR Key	0x11126		
FPL Key	0x1111C	WIT Key	0x11127	Alpha A-Z	0x1113A + (0 TO 25)
DST Key	0x1111D	ACK Key	0x11128		
COM Key	0x1111E	HUD Key	0x11129	Space	0x11154
MFD (Rear cockpit)					
Heading Dec	0x11159	ML-7	0x11163	MT-3	0x1116D
Heading Inc	0x1115A	MR-1	0x11164	MT-4	0x1116E
Course Dec	0x1115B	MR-2	0x11165	MT-5	0x1116F
Course Inc	0x1115C	MR-3	0x11166	MT-6	0x11170
ML-1	0x1115D	MR-4	0x11167	MB-1	0x11171
ML-2	0x1115E	MR-5	0x11168	MB-2	0x11172
ML-3	0x1115F	MR-6	0x11169	MB-3	0x11173
ML-4	0x11160	MR-7	0x1116A	MB-4	0x11174
ML-5	0x11161	MT-1	0x1116B	MB-5	0x11175
ML-6	0x11162	MT-2	0x1116C	MB-6	0x11176

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

MVAMS Overview

MVAMS stands for MilViz Addon Management System. It is a stand-alone application used by many of our product releases which represents our user-friendly solution to the growing complexity of options and choices available within our aircraft. It provides a central location to manage your aircraft, as well as providing incremental update capabilities.

If not already present, the MilViz T-38C Talon installs, and fully integrates with, the MVAMS application. This allows the user access to a range of configuration utilities specific to this aircraft.

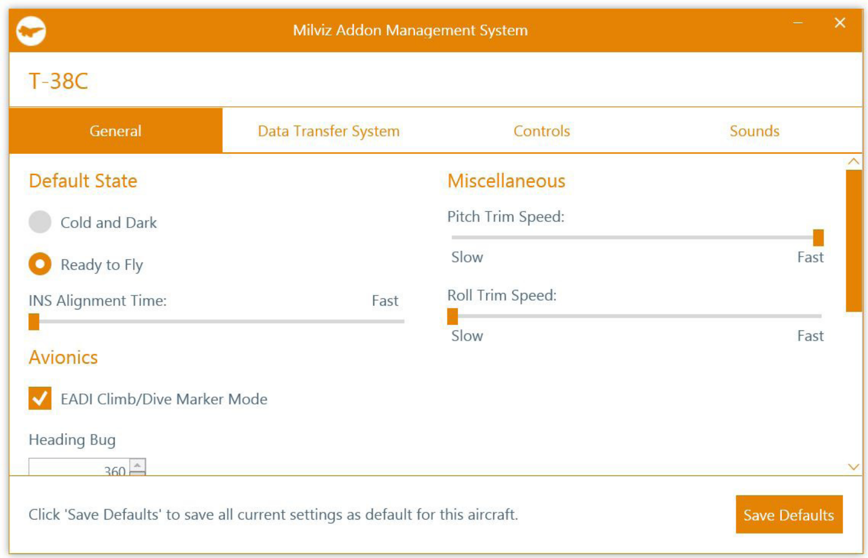


Starting MVAMS

If this is your first MilViz product that includes the MVAMS application, running the aircraft installer will place a shortcut icon on your desktop. If this is not your first MVAMS equipped MilViz product, the shortcut icon may already exist on your desktop. This icon will open the MVAMS application. In addition, the installer will open automatically run MVAMS once installation is complete.

Selecting Your Aircraft

When you open the MVAMS application, you are presented with a pictorial view of all MVAMS-compatible aircraft installed on your computer. The configuration details for any aircraft may be shown by clicking its image with the left mouse button. Your newly installed T-38C Talon will be available in this list for selection.

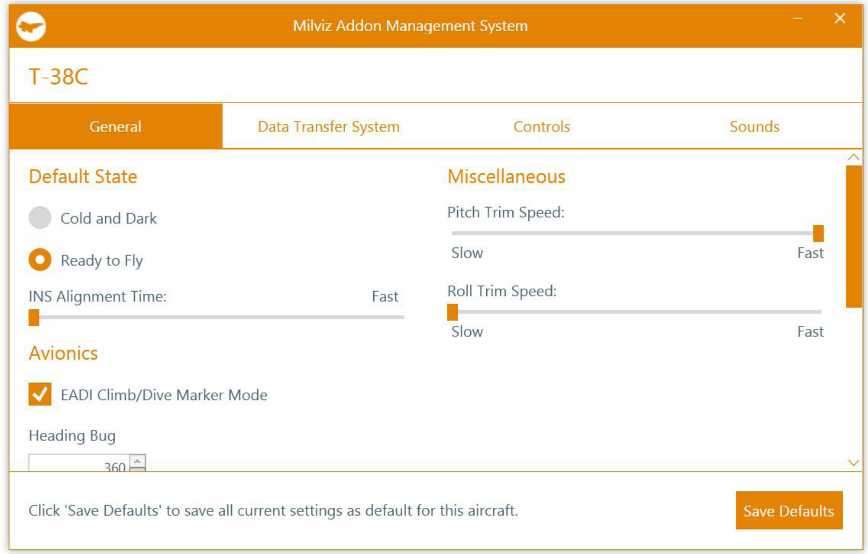


T-38C Specific Tabs

Each aircraft within the MVAMS application has configuration options organized in accordance with the complexity and amount of configuration options available. With the T-38C, these options are organized into three tabs: General, Data Transfer System (DTS), Controls, and Sounds. You may move between these tabs freely without fear of losing data; the 'Save Defaults' button is used when all desired options have been set.

MVAMS Operation - General Options

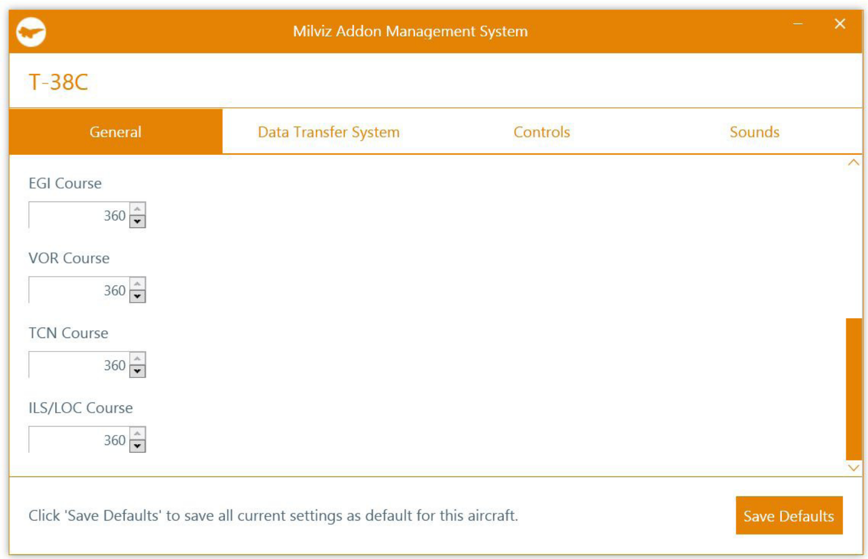
The General tab holds configuration options for the default start-up state of the aircraft, the length of time required for INS alignment, adjustment of the trim speeds, the display of the EADI (Electronic Attitude Director Indicator) marker, as well as the initial settings of various bugs and headings.



Default State

The default state that the aircraft is in when the simulator is loaded may be set here. 'Cold and Dark' allows for the experience of running through a full start-up of the engines and systems of the T-38C. 'Ready to Fly', on the other hand, provides the convenience of being able to take to the air with very little mucking about.

The 'INS Alignment Time' slider allows for another convenience: set fully to the left, it takes a greater (and more realistic) amount of time for alignment to occur (approximately 4 minutes), while when set fully to the right, the alignment time is nearly instantaneous.



Miscellaneous

Pitch and Roll trim sensitivity may be adjusted here, allowing for tailored to flying preferences and user controls. A slider set fully to the left allows for precise, but slow, trim adjustments, while movement to the right allows for more rapid adjustments. (Default settings are recommended by actual T-38 instructors as being the most realistic.)

Avionics

The EADI Climb/Dive Marker Mode checkbox allows for setting which mode the EADI is in when the aircraft is loaded, either a conventional mode or the CDM (Climb Dive Marker) mode,.

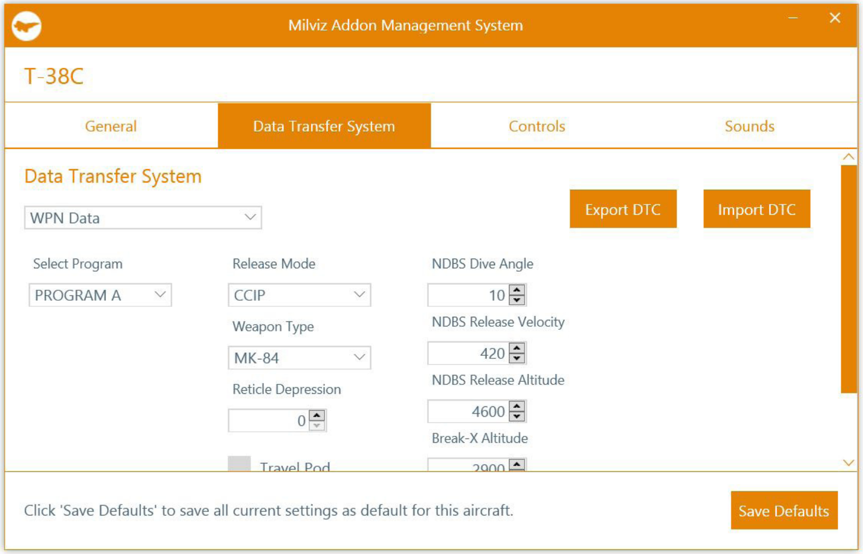
Also shown under the Avionics heading are settings for the various markers and bugs in the T-38C. These may be preset using the 0 - 360 degree selectors, so that the aircraft will reflect these settings when loaded.

MVAMS Operation - Data Transfer System

The real T-38C Talon contains a Data Transfer System that allows for a wide range of data to be uploaded to the T-38C, including weapons programs, navigation data, training & no-fly zones, flight plans and more. Using the MVAMS utility, we've allowed for the emulation of this function, mimicking the ability to upload data and flight plans to the T-38C prior to your flight. Much of this data may be entered or changed in the aircraft, but this system provides a quicker (and arguably easier) method for doing so.

In addition, we've also provided the ability to export and import a compressed file containing all of this data. This can be used as needed; whether it's to define different sets of flight plans, training zones, mission parameters, etc.

The depth of the systems that have definable parameters is rather extensive. Each area has it's own page for entering or changing data. These are accessible through the dropdown menu located on the upper left side of the Data Transfer System page (shown fully expanded on the image to the right).



WPN Data

Since the T-38C is used for advanced training, it is unique in that the weapons it carries for this purpose are purely *simulated*. This means that the DTS may be loaded with different air-to-ground profiles that are selectable in the cockpit by the pilot.

Data profiles for six different programs, plus the gun, are able to be set.

FPL Data

A flight plan in the T-38C is defined as a series of waypoints. A waypoint may be either an ICAO ID, or a DEST (Destination) index. Ten flight plans may be stored in the DTS, with numbers 0 through 9, each having an identifier that may be optionally entered.

Each flight plan has a limitation of 15 waypoints. Each waypoint, whether defined as a DEST index or as an ICAO ID, may also have a TOT (Time on Target) and a waypoint type (Flyby, Flyover, IAF, FAF, APT, Missed Approach Point) assigned.

The DEST points are referenced in the flight plan by their index number. Entered on their own page (shown in the image above as DST Data), they consist of a latitude and longitude, and optionally an altitude and a TOT.

For each waypoint in a flight plan, either a DEST index reference (entered in the box titled Waypoint DEST) or an ICAO ID (entered in the box titled Waypoint ID) may be entered, but never both at once.

(Note: Terminal Approaches & Block-10 features are not included in the consumer version of the T-38C.)

FUEL & CLOCK Data

The Bingo Fuel Level (minimum fuel level required for a safe return to base) and the Clock Delta Time may be set here.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

APP Data

This page allows for 100 different PPA (pre-programmed approaches) to be created and stored, using index numbers 500 to 599. There are two types of approaches that may be created, a VOR/ILS approach, and a SCA (Self Contained Approach).

These differ in that a VOR/ILS approach utilizes ground based navigation - a VOR/ILS frequency to provide lateral and/or vertical guidance to the runway, while a Self Contained Approach uses inputted glideslope, final approach fix, and final intercept point data to provide guidance.

This data entry method is the only way these approaches may be created; although the PPA entries may be reviewed from within the aircraft, they may not be edited.

DST Data

Briefly mentioned in the FPL Data section, the DEST (Destination) points represent the overall database of user-definable waypoints used for navigation or mission planning. The system allows for the entry of indexes 201 to 499 (indexes 400 and up are only editable within MVAMS).

Each destination entry requires a valid latitude and longitude. An altitude may be entered, as well as a TOT (Time on Target). The destination entries may be used when creating flight plans, as well as with the Bullseye function in the aircraft.

ICAO Data

The ICAO Data page allows for the review of the ICAO database, but does not allow for these entries to be modified. This database is separate and is not imported or exported along with the rest of the T-38C data.

Map Data

Two types of zones may be entered and adjusted within MVAMS: Training Zones and No-Fly Zones. The system contains space for 10 Training Zones and 10 No-Fly Zones.

Each zone is identified by it's index number and an identifier. For Training Zones, a zone may consist of up to 40 user-definable latitude and longitude points to determine the perimeter of the zone, while No-Fly Zones may consist of 10 user-definable points.

Options also exist for Training Zones to be shown or hidden on the MFD, as well as what color the zone should appear as. No-Fly Zones may also be shown or hidden, and a zone radius is definable.

COM Radio & TCAS Data

The T-38C allows for storing up to 40 VHF and UHF primary frequencies, as well as 40 UHF standby frequencies. These may be set to personal preference. The manual VHF and UHF frequencies that are tuned when the aircraft is loaded may also be set here to personal preference.

In addition, it's possible to set the default TCAS Emergency and VFR Codes as well.

DCL Data

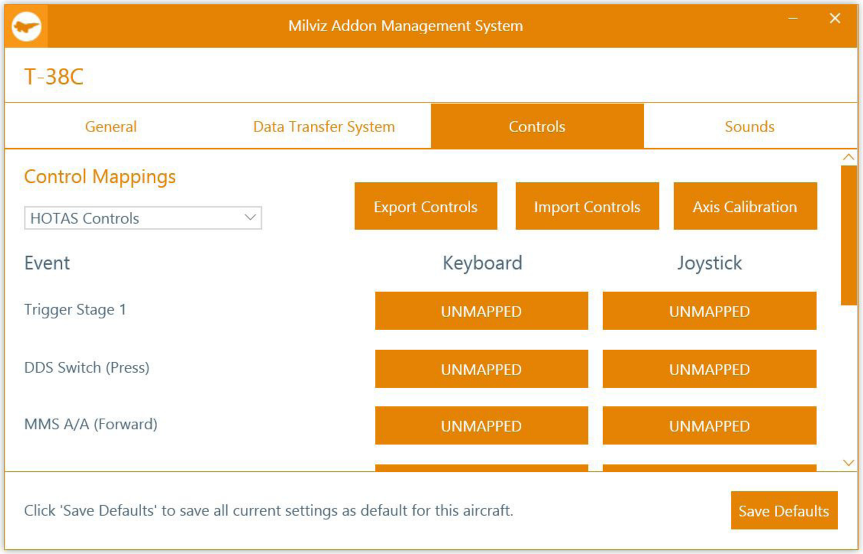
It's possible to set a very wide range of declutter options on this page for both the HUD and the MFD so as to tailor the declutter function to personal preference.

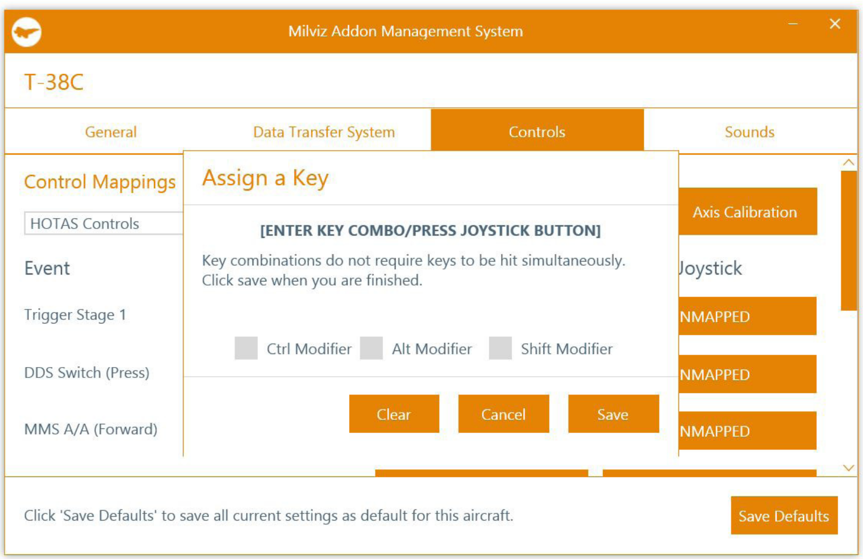
NAV Radios

The T-38C has four separate NAV radios that may be independently set and used for navigation. For ease of use, each may be set within MVAMS so that they are tuned as desired when the aircraft is loaded.

The four radio frequencies that are definable are TACAN, AAT (Air to Air TACAN), VOR, and ILS.

MVAMS Operation - Controls





The T-38C Talon provides the pilot with a HOTAS (Hands On Throttle And Stick) environment for aircraft and systems control. However, even with a HOTAS arrangement, the Talon still represents a fairly complex workspace for a pilot.

In order to lighten the configuration burden on our pilots, we've allowed for a large amount of T-38C specific controls to be assigned directly though our MVAMS utility. Common controls, such as pitch and roll, throttle, and rudder, are still assignable through the simulator.

Control mappings are organized into three overall categories: HOTAS Controls, Flight/Engine Controls, and Miscellaneous Controls. Each group is navigated via the dropdown selection box located in the upper left portion of the Control Mappings page.

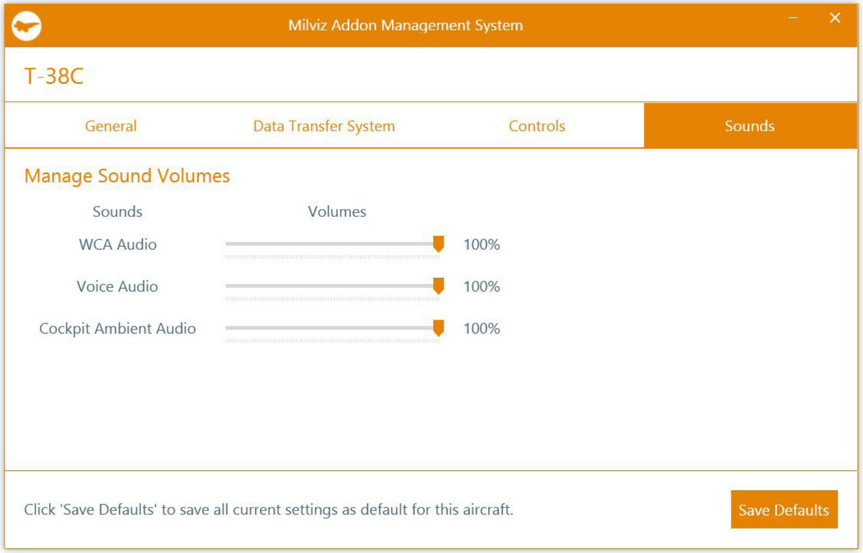
All control events are able to be mapped to either a joystick or gaming controller button, or a keyboard assignment. Keyboard assignments allow for multiple key strokes to be recorded. Joystick button assignments allow for the CTRL, ALT and Shift keys to be used as button modifiers.

To reduce or prevent conflicting control assignments, please ensure that the buttons and keyboard assignments used through the MVAMS utility do not match any that are being used or are assigned within the simulator.

MVAMS Operation - Sounds

On the last MVAMS tab, the T-38C Talon allows for adjustable sound levels in the cockpit in order to adjust individual sound volumes to user preference.

Before exiting the MVAMS utility, be sure to click on the 'Save Defaults' button in the lower right portion of the MVAMS window in order to save any changes that have been made.



TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Failures Configuration & Operation

Overview

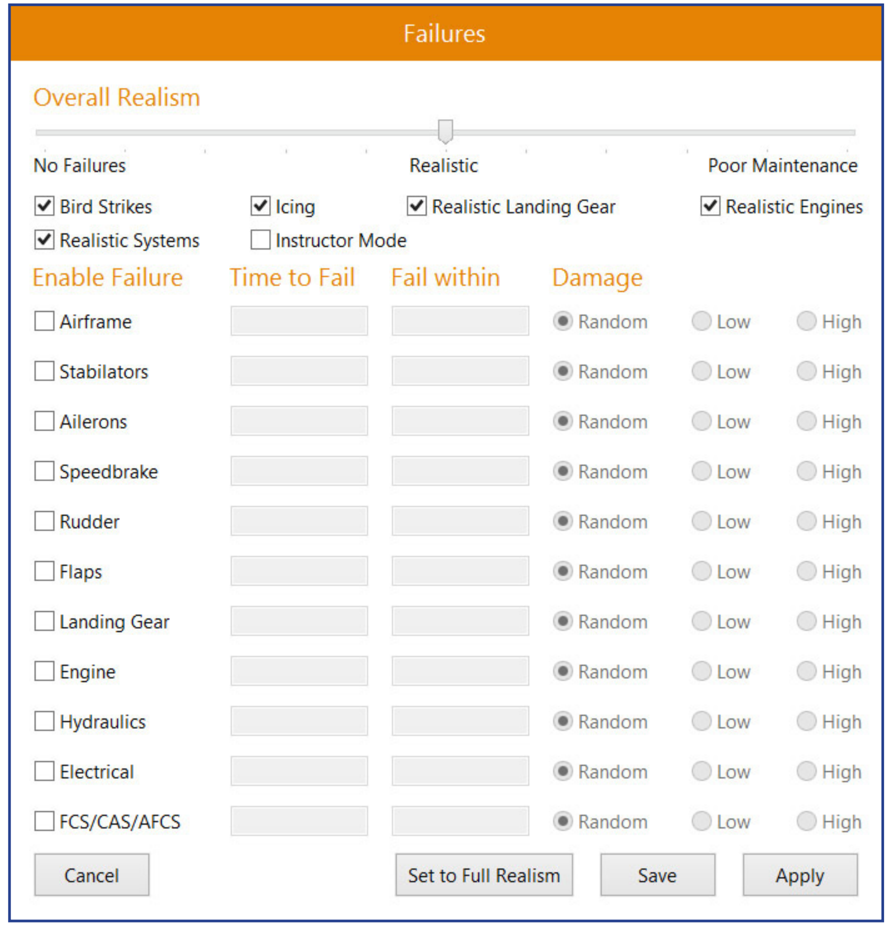
The MilViz T-38C Talon is built upon our highly successful ADV platform. This provides a completely custom-coded flight dynamics engine that operates outside of the traditional flight simulator confines.

As well, it also provides the T-38C with advanced aerodynamics, engine modelling, flight control modeling, structural modeling, realistic ground dynamics, and fully configurable failure modeling.

Much of this simply serves to make the T-38C an extremely realistic aircraft to operate and fly. Performance is as close to the real aircraft as is possible in all areas; flight dynamics, aircraft control response and engine performance are matched precisely using wind tunnel and flight test data made available by the aircraft manufacturer, NASA, and other research agencies.

The majority of the ADV underpinnings in the MilViz T-38C is invisible to the virtual pilot, with no interface to betray its presence, no settings to fiddle with or adjust. It exists to turn our simulated aircraft into a realistic experience, one that will reward the studious pilot with mastery, albeit virtual, over a complex twin-engined jet aircraft.

The only portion of our ADV simulation that allows user interaction (along with the ability to adjust and change settings to match personal preference) is the failure modeling, where the type, timing, and severity of faliures are fully configurable.



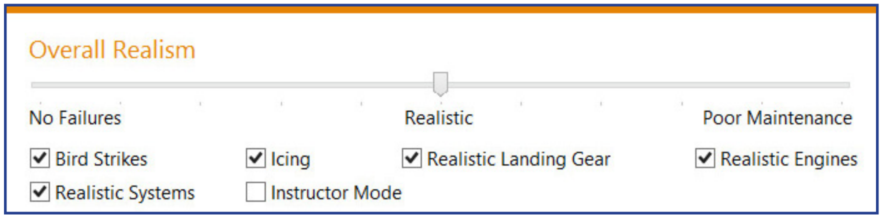
Accessing the Failures Panel

The Failures panel is where all interactive settings related to the failure modeling included in the MilViz T-38C are found. The panel is opened through the simulator's in-game menu system, with the menu item titled 'T-38C ADV Configuration Menu'. The panel will appear as shown on this page, with the same settings enabled and/or disabled by default on a freshly installed aircraft.

Closing the panel without saving any changes is accomplished by pressing the 'Cancel' button in the bottom right hand corner of the window. The 'Save' button allows changes to be saved with the panel remaining open to make further adjustments, while the 'Apply' button saves all changes and closes the panel immediately. The 'Set to Full Realism' button reverts the panel settings to a 'factory' default. This is useful to quickly undo all changes made.

It's worth noting that the default settings on the failures panel does not have any specific systems failures turned on, but still has a high level of realism engaged, with consequences awaiting a careless or unaware pilot!

Overall Realism



This section, presented above how it appears by default, covers a range of general failure options and probabilities.

The slider at the very top enables and simultaneously modifies the probability of failure for all systems on the T-38C. The default middle position, 'Realistic', sets the probability of failure to match values taken from actual T-38 fleet maintenance data (USAF source). Moving this slider to either the right or left will increase or decrease this probability in comparison to a realistic value.

If the slider is set fully to the left (No Failures), all operational and timed failures will be disabled.

The 'Bird Strikes' checkbox enables the possibility of a bird strike, both mid-air and on the ground. The probability of a strike will grow with increasing airspeed and decreasing altitude, based on data gathered by the USAF in various studies.

The effects of an impact will depend on where the impact occurs (fuselage or engines) as well as the strike energy (bird weight and relative speed). The effects will range from a minor engine or fuselage damage to a complete engine loss or severe airframe damage affecting the aircraft handling qualities.

The 'Icing' checkbox enables the possibility of detrimental icing effects. Flying in icing conditions with the engine Anti-Ice in OFF position will cause ice to accrue in the inlet guide vanes and bullet nose of the engine. This will increase the probability of engine FOD (Foreign Object Damage) due to ice detaching from these parts and being ingested by the compressor.

In addition, the T-38C is not equipped with any method of wing or leading edge de-icing or an anti-icing device. As such, flying in icing conditions will cause ice to accrue on wings, resulting in a negative impact on aircraft handling qualities and performance.

As you can imagine, the best advice when this feature is enabled is to avoid flying under potential icing conditions as much as possible!
The 'Realistic Landing Gear' checkbox enables suitable landing gear mechanical characteristics and proper limitations. With this option enabled, the maximum energy the landing gear can absorb in an impact (a touchdown) is limited to realistic values. Very high sink rates could cause a partial or total landing gear collapse.

Also, landing gear tires limitations are modeled. Exceeding the maximum ground speed (≥ 190 knots) could and will damage the nose and/or main gear wheels causing a blowout. Full braking application beyond 100 KCAS is not recommended either, as it can possibly overheat the brakes and wheels and could block the main gear wheels causing the tires to skid and a possible blowout due to excessive tire wear.

The landing gear may also be damaged by taxiing the aircraft onto unprepared terrain.

The 'Realistic Engines' checkbox enables realistic GE-J85-5R PMP (Propulsion Modernization Program) engine characteristics. Flying at high angles of attack, applying aggressive throttle inputs, or flying outside of the operational envelope will lead to engine compressor stalls or engine flameouts.

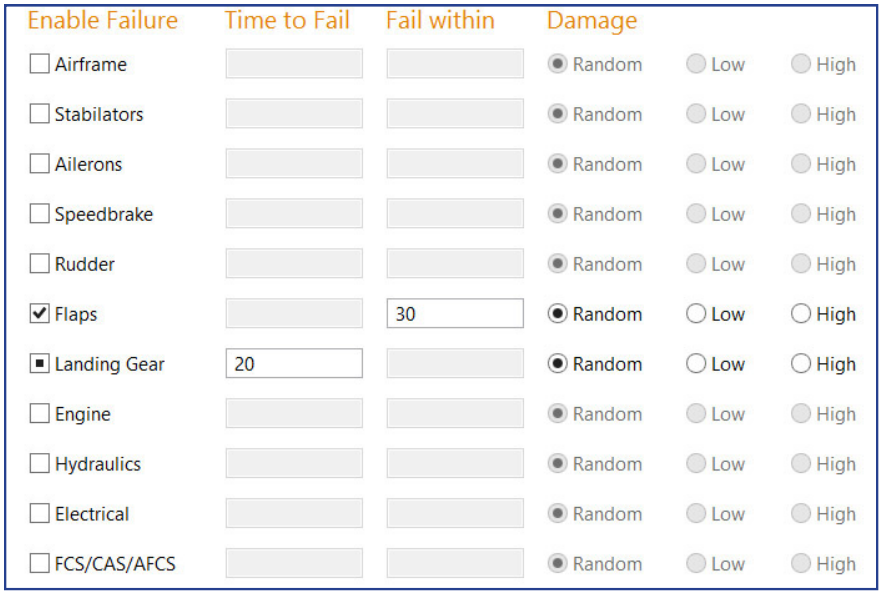
The 'Realistic Systems' checkbox enables a maximum level of realism for all aircraft systems (fuel, hydraulics, etc). If not enabled, all systems will automatically continue to work as intended regardless of abuse or misuse.

The 'Instructor Mode' checkbox enables said mode - providing tips and warnings at any phase of the flight, from engine start-up to shutdown. In this mode, you essentially have an instructor in the rear seat, providing flying hints and warnings, noting damage or failures, or listing operational limitations (and when they are exceeded).

Use of the Instructor Mode is recommended for anyone new to the aircraft. It will help reduce the learning curve and provide valuable information to the pilot, ultimately with the goal of keeping the blue side up!

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Timed System Failures



Timed failures are divided into various system groups, as shown in the image above. Each system can be enabled individually, as well as combined with any or all of the others.

Failures can be enabled to trigger in two different modes: 'Time to Fail' and 'Fail Within'. The difference between the two is that in the first case the failure will occur when the specified time has passed, while in the later the failure will occur at any time within the selected time lapse.

By default, none of the timed failures are enabled. While in this state, the text boxes and radio buttons which allow data input for each system are disabled.

Clicking on an empty checkbox of any single system will place the system in 'Fail Within' mode, show a check mark in the check box of the selected system, enabling the data entry text box in the 'Fail Within' column, as well as the Damage choices.

Clicking again on a checked checkbox for a selected system will place the system in 'Time to Fail' mode, which enables the data entry text box in the 'Time to Fail' column, and disables the data entry text box in the 'Fail Within' column. In addition, the checkbox will now have a square showing instead of a check mark. In either mode, the enabled data entry text box takes a time specified in minutes, whole numbers only.

In the image to the left, the flaps systems are enabled in a 'Fail Within' mode, with 30 minutes set. This means that at a random point prior to 30 minutes passing, a failure in the flaps systems will occur. The landing gear also is also enabled, but in the 'Time to Fail' mode, with 20 minutes set. This means that at the 20 minute mark into the flight, a failure in the landing gear will occur.

The Damage option can be set to one of three choices. When set to 'Random', the severity of the failure will be randomly set, ranging from minor or even possibly negligible damage, up to a total loss of the targeted system. The 'Low' option forces the triggered failure to be minor in scope, while the 'High' option does the opposite, forcing the failure to always be a total system loss.

Failures Summary

The following table gives a brief explanation of the causes and/or the negative effects or aircraft behavior that can be expected with each failure.

Failure Groups	Description
Airframe	Primarily caused by delamination in the wing tip, resulting in roll and/or yaw deficiencies. Depending on the level of damage a more or less pronounced aircraft roll and/or yaw tendency will be noticed.
Stabilators	Most of the horizontal tail problems are due to improper rigging. This failure could partially or totally affect the flap to horizontal tail interconnect function. In the most critical situation a horizontal tail jamming can occur. In this case, no pitch axis control from stick or trim inputs will be possible after the failure.
Ailerons	A large percentage of the aileron problems are due to improper adjustments of the rigging. In the most critical case, an aileron jamming can occur. The aircraft roll capability will be affected accordingly.
Speedbrake	The airbrakes can partially or totally fail to extend or retract (if previously extended) if an airbrakes system failure occurs.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Failures Summary (continued)

Rudder	The principal causes of rudder subsystem failures are: improper rigging, hydraulic leaks and access door screw fastenings improperly secured that project sufficiently to hinder rudder movement. In the most critical case a rudder jamming can occur. In this case, yaw axis control will be lost and a residual yaw movement will be found depending on the rudder jamming position.
Flaps	The trailing edge flaps can partially or totally fail to extend or retract (if previously extended) if a flaps system failure occurs. Aside, the flaps can result damaged if extended beyond its maximum extension speed (≈240kcas @ Flaps>46%). In this case, a single or dual flap jamming can occur. A residual roll motion could result due to flap asymmetry after the jamming.
Landing Gear	The landing gear failures range from a failure to obtain a positive indication of gear up or down to an actual landing gear leg extraction or retraction failure. In the first case, the failure is due to an improperly adjusted landing gear door and can be solved by recycling the landing gear up and down after the initial extension or retraction in order to obtain the proper indication.
Engine	This failure reflects damage occurred in the engine core (compressor/turbine), the Variable Exhaust Nozzle (VEN) actuation system or the engine power gearbox. Damage will range from effects unnoticeable by the pilot to a complete engine or power gearbox loss, depending on damage severity. If the gearbox is failed, the associated generator and hydraulic systems (FLT CTLS or UTILITY) for that engine will be lost.
Hydraulics	A failure in the hydraulic system will suppose the total loss of one or both (if a system leakage exists) of the hydraulic sub-systems; Flight Controls Hydraulic, and/or Utility Hydraulic.
Electrical	This failure reflects damage occurred in an electrical system component or group of components: generators, battery, AC crossover or DC/AC buses. In the case of a DC or AC bus loss all of the aircraft systems powered by this bus will be either lost or degraded.
FCS/CAS/AFCS	A SAS failure will involve different possibilities ranging from an erratic/oscillatory SAS behavior to a non responding system (no stability augmentation). If any undamped yaw oscillation occurs with the system on, the corresponding YSAS switch should be immediately turned OFF.

FAQ's / Tips

1. **Nose wheel steering is not working:** Nose wheel steering is toggled with the tailhook simulator command. Like in the real aircraft, nose wheel steering is automatically disabled if afterburner operation is selected. Also, once the aircraft weight is off of the wheels, the nose wheel steering is automatically disengaged and must be manually activated after each landing.

2. **Sudden loss of aircraft control after brakes application (realistic landing gear):** The T-38 is not equipped with an anti-skid braking system. This means that the faster you go and the harder the brakes are applied, the higher the heat generated in both the brakes and the wheels. In extreme cases the wheels could block resulting in a blowout following almost immediately.

3. **Blowout at high speeds (realistic landing gear):** If the ground speed limitation is exceeded (>190kts), wheel and tire damage will occur raising the possibility of a blowout.

4. **Engines make a loud 'bang' followed by flameout (realistic engine):** If engine operational limitations are not observed, it is relatively easy to enter the compressor instability zone. This can be caused by several factors: Rapid engine throttle movements at high altitude and low speed, afterburner selection outside its operational envelope, or flying at high AoA or sideslip angles. Once the instability is noticed (via loud noises) the affected engine throttle must be immediately retarded to idle so as to recover the compressor and avoid engine damage. If no corrective action is taken an engine flameout will follow.

5. **Low engine RPMs and engine not responding to throttle commands (realistic engine):** This condition is caused by a compressor stall, evidenced by a drop in RPM's. In this situation, the engine control limits the amount of fuel injected to avoid a flameout and/or engine damage. To exit this condition the throttle needs to be retarded to idle and pumped, starting from this position. Also, the airspeed needs to be increased above 300 KIAS to help restore nominal compressor airflow conditions.

6. **Oscillating engine RPMs (realistic engine):** This is a strong indication that the engine has been damaged. Not only are there different sources of damage modeled (compressor/turbine

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

blade mechanical failures, ground collisions, birds ingestion, ice ingestion, etc), but engine damage can range from mild damage (small vibrations) to a complete engine loss, occasionally accompanied by fire. Once any engine damage is noticed or suspected, emergency procedures should be immediately followed. Usually the safest option is retarding to idle or completely shutting down the affected engine. If a damaged engine continues to be operated, particularly at high RPM, it becomes increasingly likely that engine damage will become catastrophic.

7. **Engine damage occurs while flying in icing conditions (realistic engines):** The Anti-Ice system is not simply cosmetic! Flight in icing conditions will cause ice to accumulate on the inlet guide vanes and the engine bullet nose. If the resulting ice detaches (during high-g manoeuvring, for example) and is ingested by the compressor, engine FOD (Foreign Object Damage) will occur. It's worth noting, however, that the anti-icing equipment will have a realistic impact on performance and operation.

8. **Engine over-temperature (realistic engine):** EGT values well above 650°C is the best evidence that something is going wrong in the engine. High engine temperature is caused by engine damage either in its core (compressor/combustion chamber/turbine) or its VEN (Variable Exhaust Nozzle). It can be also be strong evidence of an engine fire. If a VEN failure happens (VEN not changing with RPM or Afterburner), increased EGT values will occur since exhaust flow is improperly constricted by the failed exhaust nozzle. Flying in an over-temperature condition should be always avoided.

9. **Engine under-temperature (realistic engine):** This condition will only exist when a VEN failure occurs and the exhaust area is larger than the required one. In this case, the exhaust gas is over expanded. In this case, the primary effect will be a somewhat noticeable loss of thrust in the affected engine

10. **Flaps are not operational; aircraft develops tendency to roll (realistic systems):** If the flaps are operated beyond their structural limits (280 to 350 kias depending on deflection), jamming will occur. If this happens while the flaps are in motion, an asymmetric jam (left/right flap) is very likely to occur and a residual roll tendency will result; the greater the asymmetry, the more noticeable the roll tendency will be.

11. **It seems impossible to force the aircraft into a spin:** The T-38 is a very spin resistant airframe, but it is possible with the correct technique. After repeated failed attempts during the development of the T-38, it was discovered that the pilot needed to perform a PIO-like manoeuvre in pitch at a very low speed, high pitch attitude and AoA conditions, in order to force the spin. Adding some lateral stick will help on occasion, with no rudder required. With those very unnatural pilot actions, the resulting inertial coupling in combination with reduced stability will do the rest. However, it was finally concluded that even when applying such abnormal control combinations that a spin was still very difficult to achieve. It's notable that not even a single T-38 has been lost in a spin related incident, highlighting the remarkable spin resistance of the aircraft.

12. **How to recover from a spin**: The T-38 has two spin modes. The first is a pitch and roll oscillatory mode, usually happening at the first stage of the spin development. The second mode (fully developed spin) is characterized by a flat spin with very steady yaw rotation (about 90-120 deg/s) with the nose slightly below the horizon and no roll oscillations. Once the spin confirmed, the recovery actions **must be immediately applied**: full aileron in direction of spin, full opposite rudder and full aft stick. If positive recovery is not obtained after 4 or 5 gyrations from the development of the spin, it is very likely that the spin will transition to its flat-steady mode which has been demonstrated to be unrecoverable.

13. **External weather engine interference:** It has been observed that the ADV flight dynamics and engine modeling can be affected negatively when using external weather modules (such as Active Sky, for example). These issues are caused by the injection into the simulator of abrupt changes in atmospheric variables such as wind, ambient temperature, or barometric pressure. Since the ADV model is reading these values from the simulator, this instant change in these values can result in sudden engine parameter or aircraft attitude changes. In order to minimize these effects, the following settings in Active Sky are recommended:

    - Turbulence Effect Scale = 50% (max value)
    - Enhance Turbulence = OFF

In-Game Menus

ACM Panel

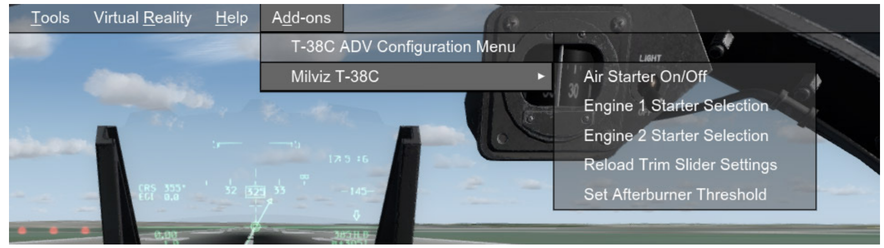
This panel is accessible either through the menu system in Prepar3D (Vehicle/Instrument Panel/ACM), or by using the keystroke combination SHIFT+1.

Through the checkbox options shown, you can choose to display or hide the pilots, the two types of air starting methods (Huffer or Puffer), the chocks, the ladder, and the travel pod. The fuel quantity can also be adjusted using the slider present on this screen.

It's important to note that for starting the T-38C, one of the two air start methods (huffer or puffer) must be chosen. **This action is essential for starting the T-38C and is performed first.**

Add-ons Menu

Browsing the 'Add-ons' menu will reveal two menu options related to the T-38C: the 'T-38C ADV Configuration Menu' will display the screen related to enabling and adjusting the various failure modes available, while the 'Milviz T-38C' menu contains options both critical for starting the Talon, as well as for adjusting control settings.



Air Starter On/Off

The air for starting the aircraft would be controlled by the ground crew; this emulates signaling the ground crew to start the compressor. **This action is essential for starting the T-38C and is performed second.**

Engine '1'/'2' Starter Selection

Normally, the pilot would signal the ground crew to provide air to the engine being started; these two options allow for this to happen. A selection must be made in order to allow the selected engine to spool up. **These actions are essential for starting the T-38C and are performed after the previous two steps.**

Reload Trim Slider Settings

This option allows for the ability to adjust the trim sliders in the AMS, then test in the sim without reloading the aircraft in order to assist the user in selecting an acceptable sensitivity level.

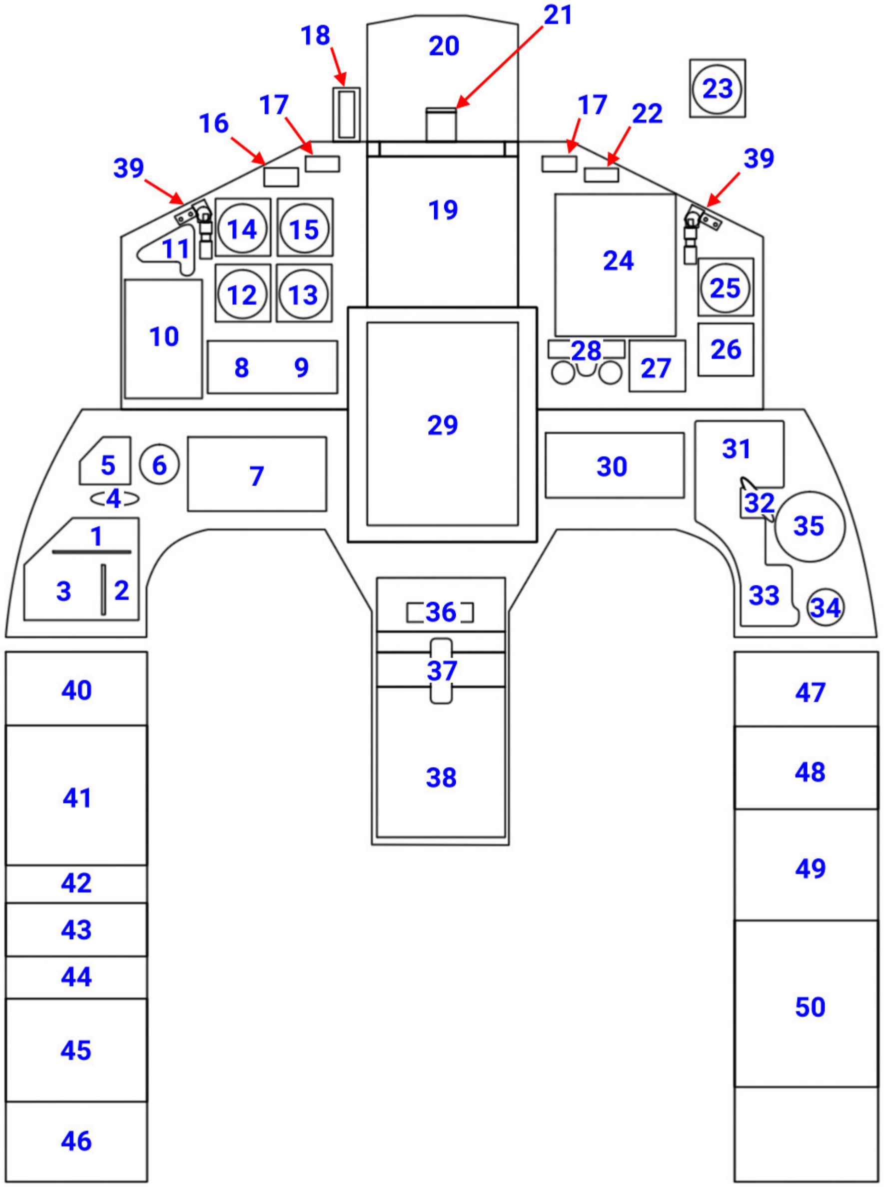
Set Afterburner Threshold

This option allows for the throttle inputs in the simulator to be used for setting the AB threshold. To do so, position the throttles in the desired position and then click this menu option.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

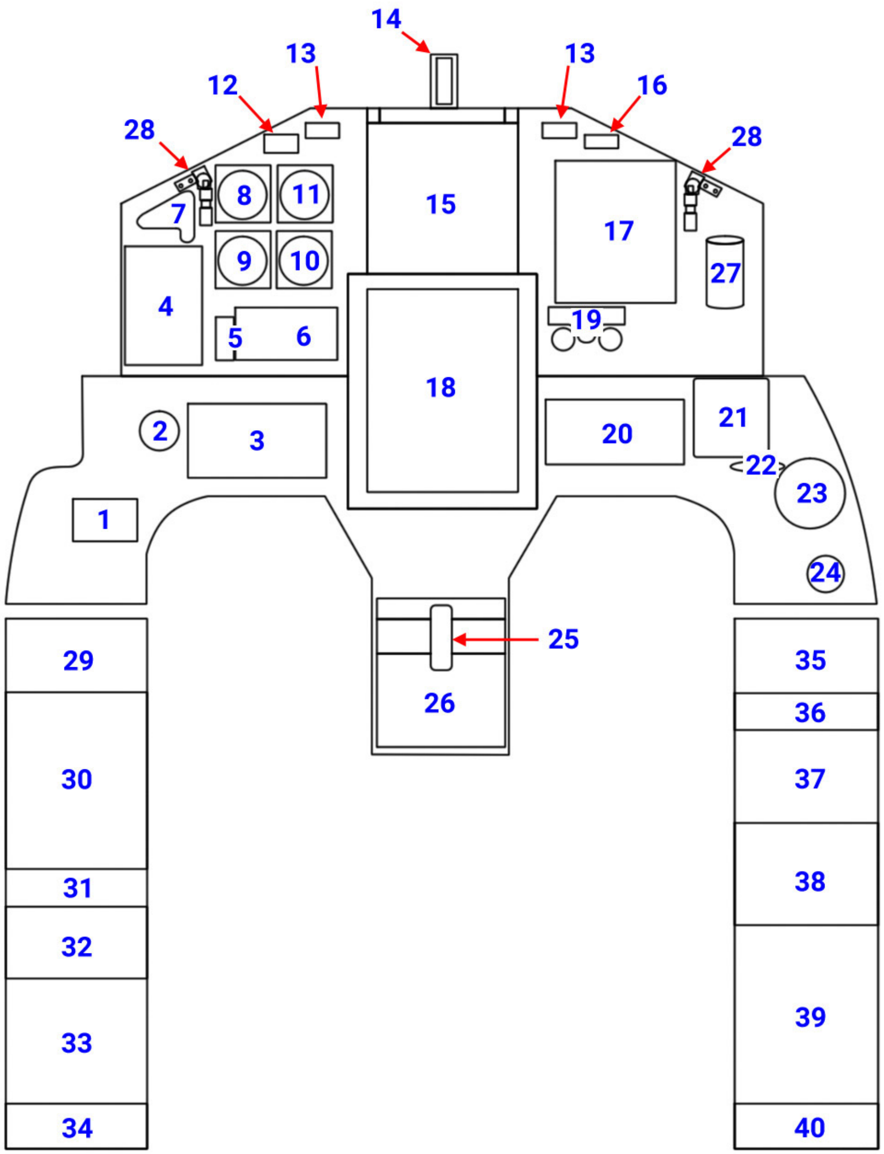
TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Front Seat



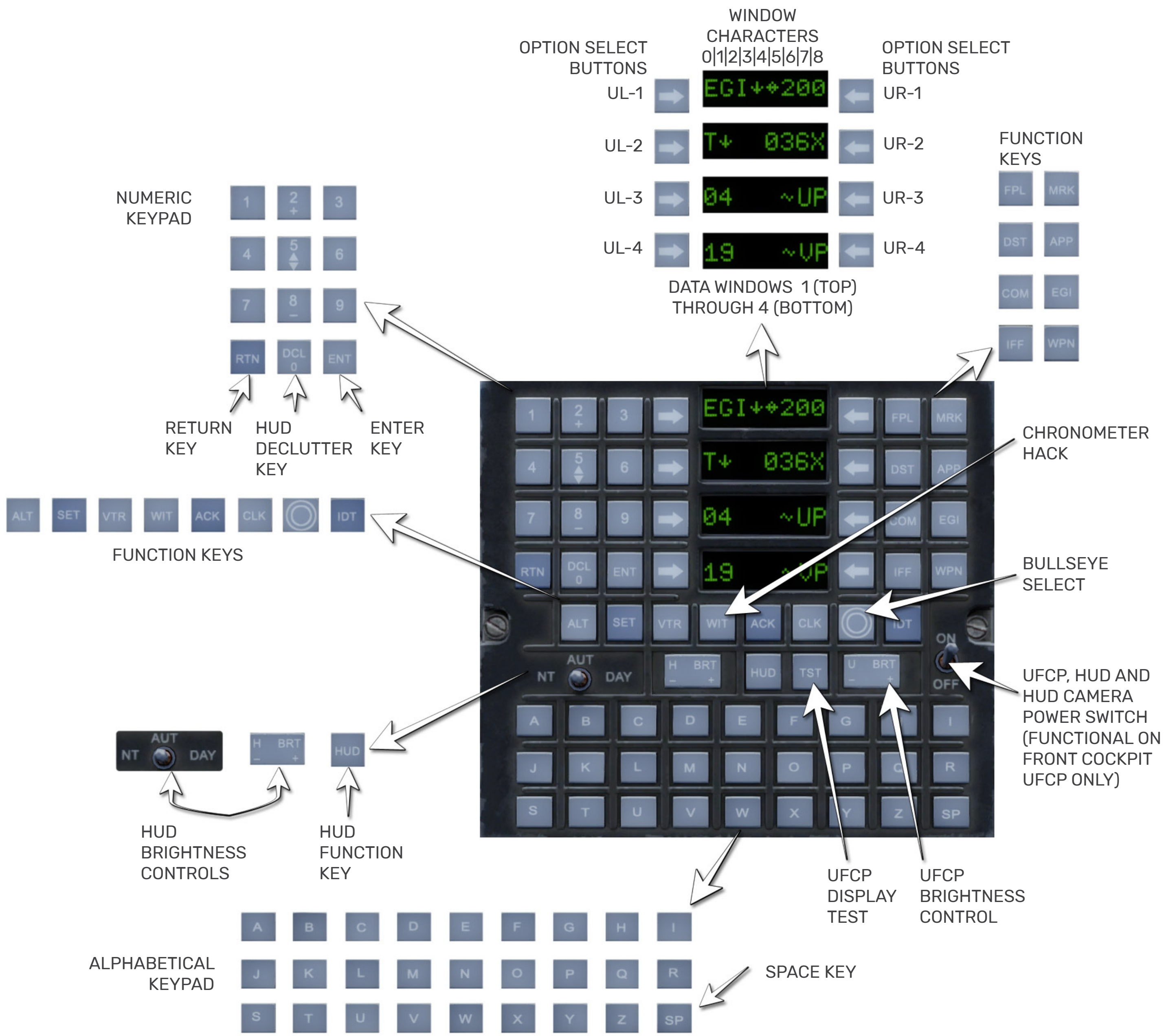
1. Engine Start Control
2. COMM Antenna Control
3. L/R Fuel Shutoff
4. Emergency Gear Control
5. Landing/Taxi Light Control
6. Flap Indicator
7. Audio Control Panel (ACP)
8. Master Arm Switch/CMD Switch
9. Marker Beacon Light
10. Landing Gear Control
11. AOA Indexer Lights Dimmer
12. STBY Vertical Velocity Indicator
13. STBY Altimeter
14. STBY Airspeed Indicator
15. STBY Attitude Indicator (AI)
16. Master Caution Light
17. Fire Warning Light
18. AOA Indexer Lights
19. Up Front Control Panel (UFCP)
20. Head Up Display (HUD)
21. HUD Video Camera
22. Canopy Warning Light
23. Standby Magnetic Compass
24. Electronic Engine Display
25. Cabin Pressure Indicator
26. NAV Backup Control Panel
27. UHF Backup Control Panel
28. Hydraulic Pressure Indicators
29. Multifunctional Display (MFD)
30. Warning/Caution/Advisory (WCA) Panel
31. Fuel Controls
32. Canopy Jettison
33. Electrical Controls
34. LOX Quantity Indicator
35. ECS Vent
36. Data Transfer Unit
37. Rudder Pedal Adjust
38. Circuit Breaker Panel
39. Instrument Panel Map Light
40. TACAN Backup Controller
41. Throttle Quadrant
42. Takeoff Trim Panel
43. YSAS Control Panel
44. Avionics Activation Panel
45. Antennuate/Anti-G Panel
46. Circuit Breaker Panel
47. Oxygen Regulator Panel
48. ECS Panel
49. Lighting Control Panel
50. Map Case

Cockpit Layout - Rear Seat



1. Engine Start Control
2. Flap Indicator
3. Audio Control Panel (ACP)
4. Landing Gear Control
5. Take Command Switch
6. Marker Beacon Light
7. AOA Indexer Lights Dimmer
8. Standby Airspeed Indicator
9. Standby Vertical Velocity Indicator
10. Standby Altimeter
11. Standby Attitude Indicator (AI)
12. Master Caution Light
13. Fire Warning Lights
14. AOA Indexer
15. Up Front Control Panel (UFCP)
16. Canopy Warning Light
17. Electronic Engine Display (EED)
18. Multifunctional Display (MFD)
19. Hydraulic Pressure Indicators
20. Warning/Caution/Advisory (WCA) Panel
21. Fuel Control Indicators
22. Canopy Jettison
23. ECS Vent
24. LOX Quantity Indicator
25. Rudder Pedal Adjust
26. Card Retainer Panel
27. Utility Light
28. Instrument Panel Map Light
29. Stowage Box
30. Throttle Quadrant
31. Takeoff Trim Panel
32. Miscellaneous Switch Panel
33. Anti-G Panel
34. Circuit Breaker Panel
35. Oxygen Regulator Panel
36. Blank Panel
37. Lighting Control Panel
38. Blank Panel
39. Map Case
40. Circuit Breaker Panel

Cockpit Layout - Up Front Control Panel (UFCP)



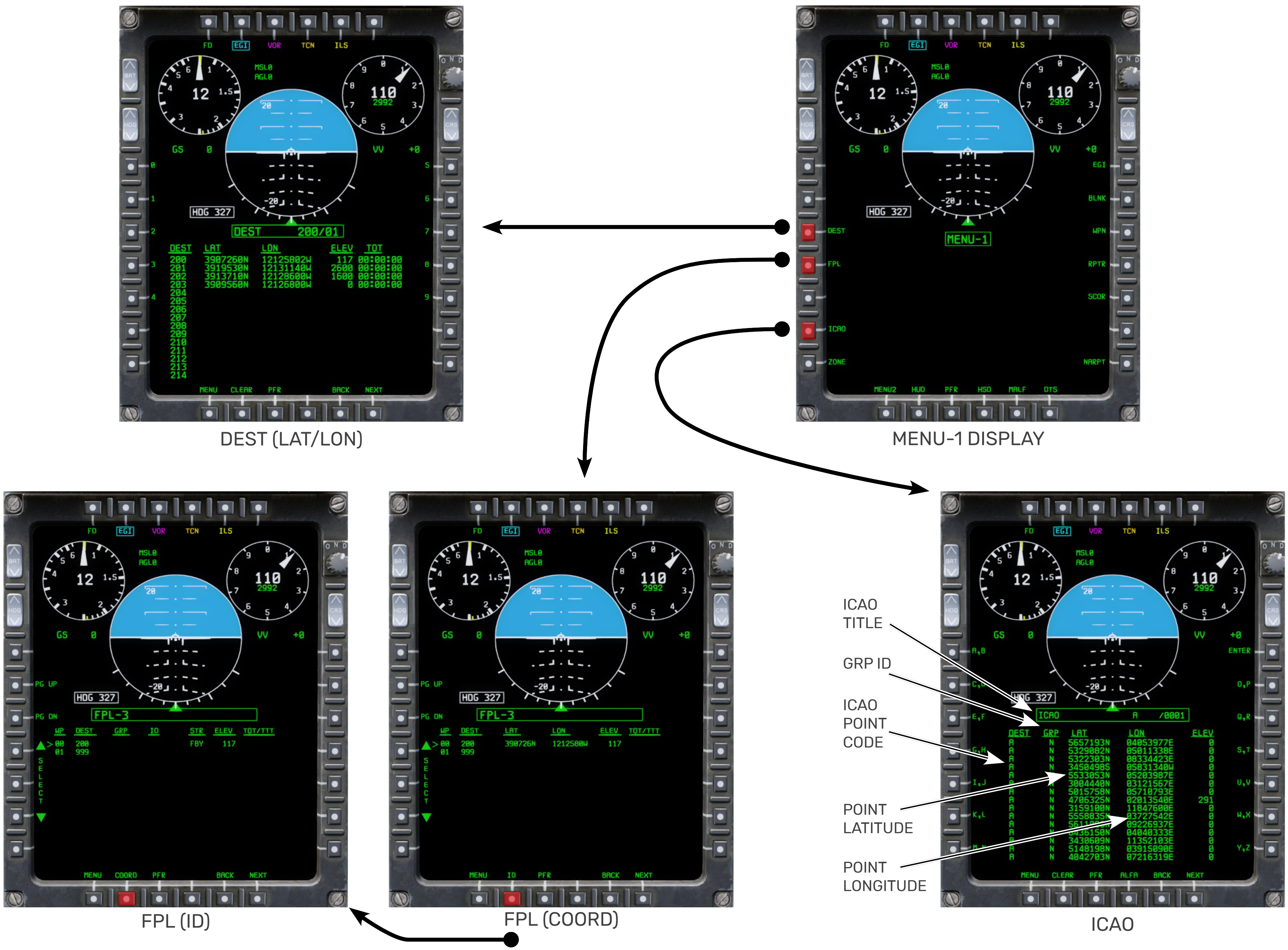
FUNCTION KEY DEFINITIONS:

FPL	FLIGHT PLAN KEY DISPLAY
MRK	MARK KEY DISPLAY
DST	DESTINATION KEY DISPLAY
APP	APPROACH KEY DISPLAY
COM	COMMUNICATIONS KEY DISPLAY
EGI	EMBEDDED GPS/INS KEY DISPLAY
IFF	IFF/TCAS KEY DISPLAY
WPN	WEAPONS KEY DISPLAY
ALT	ALTITUDE KEY DISPLAY
SET	SET KEY DISPLAY
VTR	VTR KEY DISPLAY
WIT	WITNESS KEY
ACK	ACKNOWLEDGE KEY
CLK	CLOCK KEY DISPLAY
BULLSEYE (DOUBLE CIRCLE) KEY	
HUD	HEAD-UP KEY DISPLAY
TST	UFCP DISPLAY TEST

Cockpit Layout - Multifunctional Display (MFD)

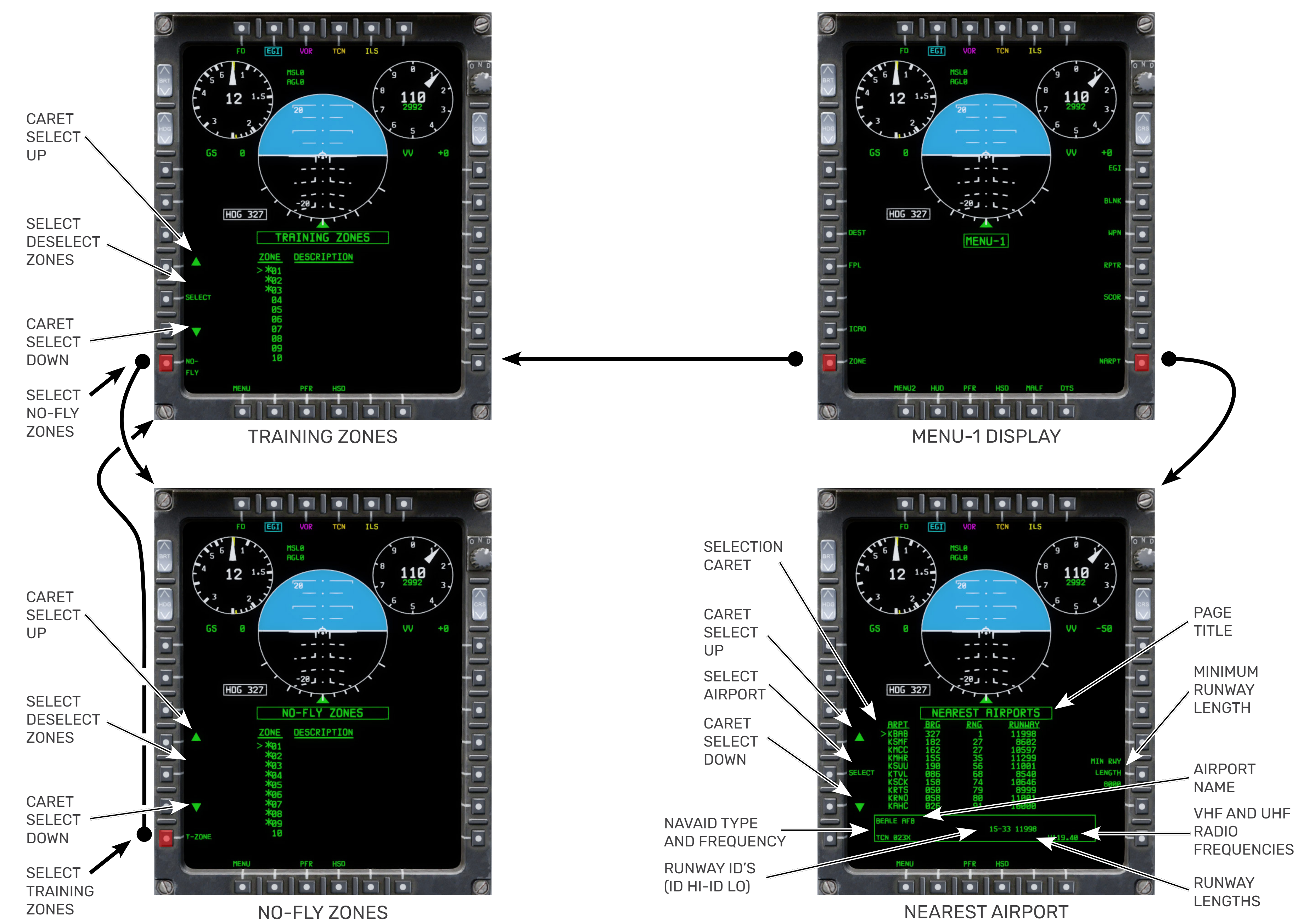
TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)



TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)



TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)

HUD (P3D DISPLAY SHOWN)

NOTE: MB3 TOGGLES BETWEEN PFR, HSD, AND SIT DISPLAYS.

THE HUD, PFR, AND HSD PAGES ARE ACCESSIBLE FROM BOTH MENU-1 AND MENU-2.

MENU-1 DISPLAY

SIT

HSD

PFR

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)

MENU-1 DISPLAY

EGI

WPN

BLNK

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)

MENU-1 DISPLAY

REPEATER OPTION AT MR-4 REPEATS OTHER COCKPIT'S MFD DISPLAY AND IS ACCESSIBLE FROM BOTH MENU-1 AND MENU-2.

SUMMARY OPTION AT MR-6 TOGGLES BETWEEN SUMMARY AND SCORING PAGES.

(FULL FUNCTIONALITY OF SIMULATED COMBAT, INCLUDING SCORING SUMMARY SCREENS, REQUIRE 3RD PARTY TACPACK SOFTWARE, NOT INCLUDED, TO BE INSTALLED)

WEAPON DELIVERY SUMMARY

SCORING

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)

OP 1

'ALL' AND 'ALL (EX ICAO)' OPTIONS AT MR-6 ALLOW ALL DATA (EXCLUDING ICAO DATA) PERTAINING TO THE OP-1 OR OP-2 PAGE TO BE LOADED FROM EXTERNAL SOURCE (MVAMS).

MENU-1 DISPLAY

OP 2

LOAD TO MDP

DTS

Cockpit Layout - Multifunctional Display (MFD)

MENU-1 DISPLAY

MENU-2 DISPLAY

WHEN BOXED, ENABLES DIRECT-TO STEERING

EED

Cockpit Layout - Multifunctional Display (MFD)

MENU-2 DISPLAY

DISCRETE IN

TEST

IBIT

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - Multifunctional Display (MFD)

EGI VELOCITIES

DISTANCE TO BEARING AND STEERPOINT

ALIGNMENT LAT/LONG ELEVATION AND STORED TRUE HEADING

ALIGNMENT TIME

INS PARAMETERS

EGI ALTITUDE SOLUTION

CURRENT TRUE HEADING

CURRENT MAGNETIC HEADING

TIME IN NAV MODE

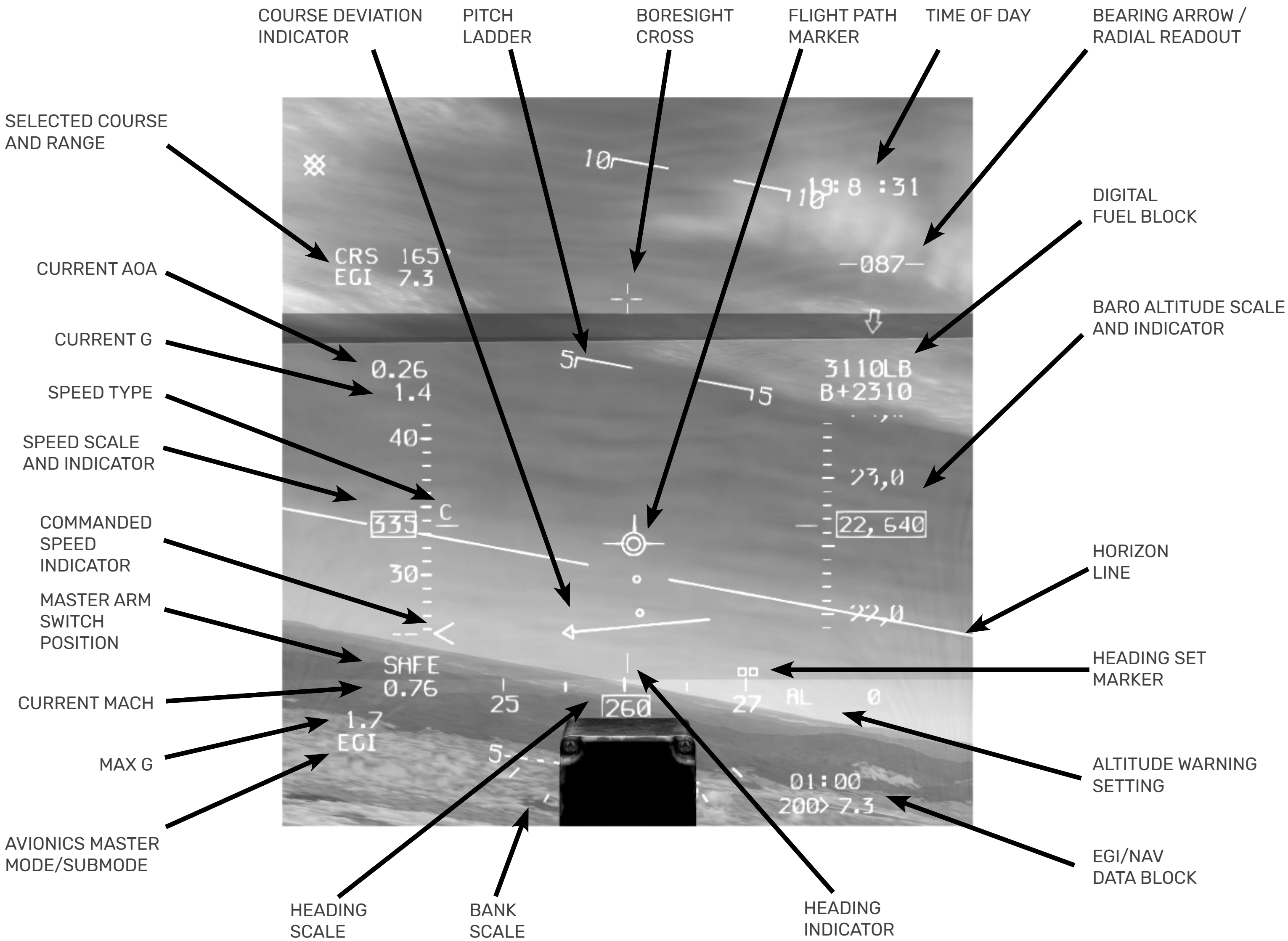
DATA

MENU-2 DISPLAY

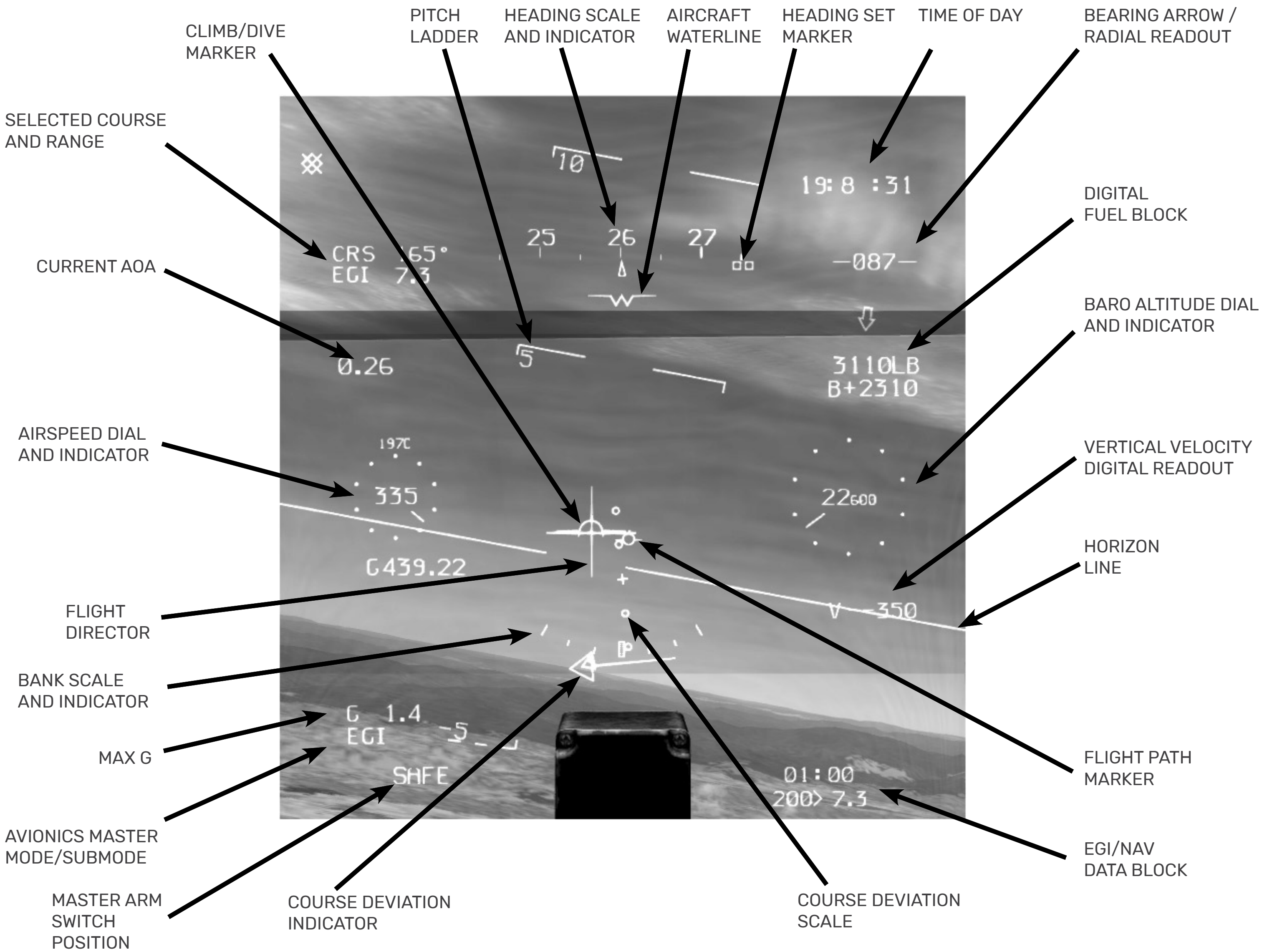
COMM

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Cockpit Layout - HUD Symbology (F-16)



Cockpit Layout - HUD Symbology (MIL-STD)



Normal Procedures

The normal procedures on the following pages are intended to paint a more or less complete picture of the processes and techniques involved in preparing, starting, flying, and landing the T-38C Talon. Multiple documents were drawn upon to provide this reference; as such, it does not match the real world procedures word for word, nor does it attempt to closely replicate any of the real world 'flows' that may be or have been taught to student pilots. But overall, it should provide a very thorough and useful resource for those interested.

References to details obviously unavailable to us within the simulator, such as flight suits and helmets, have been left in for the sake of interest, and should not be taken literally. Unless you want to wear a flight suit while sitting at a computer. We won't judge, honest!

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

INTERIOR INSPECTION

1.	BATTERY switch	ON
2.	ACP switches	AS REQUIRED
3.	Crew retractable steps	STOWED
4.	Backrest	ADJUST
5.	Safety belt, shoulder harness, seat survival kit quick-release connectors, oxygen connectors, hose retention strap, anti-G suit hose, leg garters, and helmet chin strap	FASTEN AND ADJUST
6.	Oxygen system	CHECK
7.	UHF radio backup control panel	ON, SET
8.	NAV Backup Control Panel	ON, SET
9.	TACAN Backup Control Panel	ON, SET
10.	Circuit breakers	CHECK
11.	(RCP) WOW switch	NORM
12.	Gear door switch	NORMAL
13.	AUX FLAP switch	NORMAL
14.	AAP switches	OFF / NORMAL
15.	Rudder trim knob	CENTERED

Normal Procedures

INTERIOR INSPECTION (continued)

16. Throttles	OFF
17. Speed brake switch	EXTEND / AFT
18. Fuel shutoff switches	NORMAL
19. Comm antenna switch	AUTO
20. Landing gear alternate release handle	IN
21. Landing/taxi light switch	OFF
22. Landing gear lever	DOWN
23. Standby airspeed indicator	CHECK
24. Standby attitude indicator	UNCAGE AND ADJUST
25. Standby altimeter	SET AND CHECK
26. Standby vertical velocity indicator	CHECK
27. MFD	OFF
28. EED	N/D (AS REQUIRED)
29. Magnetic compass	CHECK
30. Cabin altimeter	CHECK

Normal Procedures

INTERIOR INSPECTION (continued)

31.	Fuel boost pump switches	ON
32.	Crossfeed switch	OFF
33.	OXY/FUEL check switch	QTY CHECK
34.	Generator switches	ON
35.	Cabin pressure switch	CABIN PRESS
36.	Cabin temperature switch	AUTO
37.	PITOT HEAT	OFF
38.	Engine anti-ice switch	OFF
39.	Warning test switch	TEST
40.	Interior lights	AS REQUIRED
41.	FORMATION lights	AS REQUIRED
42.	Anti-collision BEACON	ON
43.	POSITION lights	AS REQUIRED

(Interior Inspection checklist complete)

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

STARTING ENGINES

» Open the ACM menu (SHIFT+2) to select either the huffer or puffer air compressor, which is then shown outside the aircraft. To start the compressor, select 'Air Starter On/Off' from the 'Add-ons/Milviz T-38C' menu. This replicates the ground crew operating the air compressor.

RIGHT ENGINE

1. Danger areas	CLEAR
2. External air	APPLY
3. Engine start button	PRESS (12% RPM MIN)
4. EED	CHECK EGT NOT FAILED, CHECK OIL PRESSURE NOT FAILED
5. Throttle	ADVANCE TO IDLE
6. Engine indicators	CHECK
7. Hydraulic pressure	CHECK
8. Caution light panel	CHECK

LEFT ENGINE

1. Left engine	START (SAME AS RIGHT ENGINE)
2. THROTTLE gate	ENGAGED

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

STARTING ENGINES (continued)

3.	Anti-G suit	TEST
4.	AAP switches	ON / NORM
5.	MFD	N/D
6.	UFCP/HUD	ON
7.	External air	REMOVE
8.	Circuit Breakers	CHECK
	(Engine Start checklist complete)	

BEFORE TAXIING

1.	Pitot tube/TAT probe/AOA vane heat	CHECK
2.	DTC Data	LOAD / VERIFY (AS REQUIRED)
3.	Pitch trim	CHECK FORE/AFT
4.	Aileron trim	CHECK NEUTRAL
5.	Flight control surfaces	CHECK
6.	Speed brake	CLOSED
7.	FLAPS	60%, FULL DOWN, 60%, CHECK

BEFORE TAXIING (continued)

8.	UFCP	SET AS REQUIRED
9.	Cabin temperature/canopy defog	SET
10.	OXY/FUEL check switch	GAUGE TEST
11.	Warning test/silence/tones/voice messages	TEST
12.	INS	CHECK
	» Full alignment is indicated by FULL on MFD EGI display page.	
13.	EGI	NAV
	» Operation of the EGI in NAV Mode without FULL ALIGNMENT degrades the performance of the EGI. This can result in erroneous operation	
14.	Yaw damper switch	YAW
15.	Crossover relay	CHECK
	» Turn the R GEN switch off and check for proper crossover indications (no PFLs, HUD remains on). Turn the R GEN switch on	
16.	Ejection seat and canopy safety pins	REMOVE AND STOW AS REQUIRED
17.	Brakes	CHECK PEDAL PRESSURE
18.	Chocks	REMOVE

(Before Taxiing checklist complete)

Normal Procedures

TAXIING / BEFORE TAKEOFF

- Clear in all directions before advancing the throttles. Keep the use of power to a minimum. Check the nosewheel steering and brakes as you taxi out of the parking spot. (*Nosewheel steering must be manually enabled; controlled via NWS/TGT command assigned in the MVAMS.*)
- In congested areas, reduce throttles to idle while turning to avoid jet blast damage to ground equipment, aircraft, and personnel.
- Taxi speeds should not normally exceed 25 knots groundspeed (GS) as indicated on the MFD while taxiing. Stagger only in authorized areas. Slow down and taxi on the centerline in congested areas.
- Use the brakes sparingly to prevent wear and overheating. When using the brakes, ensure the throttles are in idle.
- Simultaneous use of wheel brakes and nosewheel steering to effect turns results in excessive nosewheel tire wear.

1.	Takeoff data	REVIEW
2.	BATTERY switch	CHECK ON
3.	Cabin temperature/canopy defog	AS REQUIRED
4.	Engine anti-ice	AS REQUIRED
5.	Flight control surfaces	CHECK

- Visually confirm free and proper movement of flight control surfaces and that rudder and ailerons return to neutral at completion of flight control checks.

TAXIING / BEFORE TAKEOFF (continued)

6. Flight instruments — CHECK AS FOLLOWS

- » Pitot Heat. Check for proper operation, including the heating of the total air temperature probe and angle of attack (AOA) transducer vane.
- » Clock. Check for correct time of day.
- » Vertical Velocity. All should indicate zero.
- » Attitude System. Set the standby attitude indicator at 3 degrees nose-low. The EADI should indicate 3 degrees nose low if the aircraft is on level ground. If the climb/dive marker (CDM) is selected, the horizon line is displayed in the center of the EADI coincident with the waterline symbol when the aircraft is on level ground.
- » Heading System. Ensure the electronic horizontal situation indicator (EHSI) is within 8 degrees of the magnetic compass and within 5 degrees of a known heading. Check for correct indicator movement in turns.
- » Airspeed Indicators. Check for proper indications on the HUD, MFD, and standby indicators.
- » Altimeters. The maximum error of each altimeter at a known elevation point is 75 feet.
- » Embedded GPS/Inertial Navigation System (INS) (EGI) Area Navigation (RNAV) Check. Verify the currency of the ICAO database, the aircraft's present position during alignment, and verify the EGI accuracy.
- » Flight Director System and Instrument Landing System (ILS) Check. Tune and identify an appropriate ILS frequency, set the final approach course, select ILS as PNS.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

TAXIING / BEFORE TAKEOFF (continued)

7.	TACAN/VOR/DME Checks	AS FOLLOWS

» Tune and identify appropriate TACAN, VOR, and DME channels. Verify the MFD NAV data block displays the correct channels. The NAV data block will indicate the TACAN station identifier, if available. With valid signals, check that the range data block contains valid data and the primary flight reference provides a CDI for both TACAN and VOR as the PNS.

» Ensure the bearing pointers point toward the stations.

» Center the CDI and check for proper CDI displacement. (One technique is to change the course by 5 degrees and verify the CDI deflects one dot.)

» Check the TO-FROM indicator. Change the selected course past 90 degrees from the centered CDI course and check that the TO-FROM indicator switches sides.

8.	Takeoff trim button	PRESS
9.	NAVAIDS/UFCP/master mode	AS REQUIRED
10.	POSITION/Landing/taxi lights	AS REQUIRED
11.	Canopy	CLOSE, LOCK (CONFIRM WARNING LIGHT OUT)
12.	Ejection seat safety pins	CONFIRM REMOVED AND STOWED

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

TAXIING / BEFORE TAKEOFF (continued)

13. Canopy safety pins	CONFIRM REMOVED AND STOWED
14. SAFE/ARMED lever	ARMED
15. (RCP) ISS mode selector	BOTH OR CMD FWD (AS REQUIRED)
16. Take the Active Runway	

- Once cleared for takeoff, confirm the approach and departure ends of the runway are clear of aircraft.
- Ensure the canopy is down and locked prior to engine run-up.
- Taxi into a takeoff position that allows maximum use of the runway.
- Release the nosewheel steering button during the last few degrees of turn onto the runway and ensure the nosewheel is centered by allowing the aircraft to roll forward once it is aligned with the runway. (*Nosewheel steering must be manually disabled; toggled via Tailhook simulator command.*)

(Taxiing / Before Takeoff checklist complete)

Normal Procedures

TAKEOFF

- Two takeoff options exist for the T-38C: Static and Rolling. The static takeoff is typically used during early training because it provides a greater amount of time to accomplish required checks and verify proper engine operation. A static takeoff is also required for solo students, as well at night. A rolling takeoff provides a smooth transition from taxi to takeoff roll, as well as aiding traffic flow in a congested pattern. It should be noted that rolling takeoffs may increase the takeoff roll distance by 150 to 300 feet.

STATIC TAKEOFF

1.	PITOT HEAT	ON
2.	Nose wheel steering	DISENGAGE
3.	Throttles	MIL
4.	EED	CHECK
5.	Hydraulic pressures	CHECK
6.	MASTER CAUTION and W/C/A lights	CHECK NOT ILLUMINATED
7.	Brakes	RELEASE
8.	Throttles	MAX
9.	Engine instruments	CHECK

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

TAKEOFF (continued)

ROLLING TAKEOFF

- Ensure all lineup checks prior to engine run-up are complete and taxi onto the runway in a normal manner. After attaining proper runway alignment, check the heading system, dis-engage the nosewheel steering. Advance throttles to MAX. Monitor engine instruments to confirm proper engine operation during the takeoff roll.

TAKEOFF ROLL

- Maintain directional control via brakes until rudder becomes effective. Once rudder is effective, drop heels to the floor to prevent inadvertent application of the brakes.
- Apply backstick pressure at approximately 145 knots calibrated airspeed (KCAS) and set the bore sight cross (F-16 HUD) or the waterline (MIL-STD HUD) at 7 degrees nose high on the pitch ladder.
- Nosewheel liftoff should occur at approximately 155 KCAS. The aircraft should fly off the runway at approximately 165 KCAS depending on aircraft gross weight. (Listed speeds based on gross weight of 12,800 lbs)

AFTER TAKEOFF

1.	Landing gear lever	LG UP, WHEN DEFINITELY AIRBORNE
2.	FLAPS	UP

(Takeoff checklist complete)

Normal Procedures

CLIMB

- Smoothly reduce power out of MAX between 220 and 280 KCAS, terminating afterburner by 300 KCAS. Accelerate to and hold 300 KCAS using MIL power with approximately 12 degrees pitch until passing 10,000’ MSL. Do not exceed 300 KCAS below 10,000’ MSL.

1.	Oxygen system	CHECK
2.	Fuel quantity/balance	CHECK
3.	Cabin pressure	CHECK
4.	CANOPY DEFOG and CABIN TEMP	AS REQUIRED

(Climb checklist complete)

LEVEL-OFF / CRUISE

- The level-off should be a smooth, continuous pitch change to level flight, avoiding abrupt pitch changes and stair stepping.

1.	Oxygen system	CHECK
2.	Fuel quantity/balance	CHECK
3.	Cabin pressure	CHECK
4.	Altimeters	CHECK

- Attain cruise airspeed, set power, and trim the aircraft for level flight.
- One technique for attaining cruise speed at medium/low altitude (<10,000 feet MSL) is to set a fuel flow of approximately 1,200 pounds per hour (pph) per engine to maintain 300 KCAS.

(Level-off / Cruise checklist complete)

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

DESCENT

1.	Armament safety check	COMPLETED
2.	CMD switch	OFF
3.	Helmet visors	AS REQUIRED
4.	Heading and attitude system	CHECK
5.	Altimeters	CHECK AND SET
6.	Fuel quantity/balance	CHECK
7.	CROSSFEED switch	OFF
8.	CANOPY DEFOG and CABIN TEMP	AS REQUIRED
9.	PITOT HEAT	ON
10.	ENGINE ANTI-ICE	AS REQUIRED
11.	LDG TAXI LIGHT	ON
12.	Master mode	SELECT (AS REQUIRED)

(Descent checklist complete)

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

ENTERING PATTERN / BEFORE LANDING

1.	Pattern airspeeds	COMPUTE
2.	Landing gear lever	LG DN AND CHECK DOWN
3.	Hydraulic pressure	CHECK
4.	FLAPS	AS REQUIRED (60% TO FULL)

NORMAL STRAIGHT -IN

- Slow to approximately 240 knots or less on base, or approximately 10 to 15 miles from touchdown on an extended straight-in. Never slow to less than the final turn airspeed of 180 KCAS until established on final approach.
- Prior to intercepting glidepath, establish landing configuration and trim while allowing the airspeed to gradually decrease to the final approach airspeed (approximately .6 AOA).
- Strive to be configured at final approach speed upon intercepting the glidepath.

NORMAL OVERHEAD

- For a normal break, the end result of the break should be properly spaced downwind with an established drift correction while maintaining traffic pattern altitude. Initiate the break between the approach end and 3,000 feet down the runway.
- Adjust the breakpoint for winds, varying the bank angle or back pressure during the break to rollout on the desired ground track. Maintain level flight during the break. Slow to below 240 knots, but no less than final turn airspeed by rollout.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

ENTERING PATTERN / BEFORE LANDING (continued)

NORMAL OVERHEAD (continued)

- For a normal closed pattern, begin the pull-up with a minimum of 240 knots. Power will normally be in MIL. Execute a climbing 180 degree turn, maintaining a minimum of 200 knots until wings level on rollout.
- The goal of the final turn is to arrive over the desired rollout point on the extended runway centerline with a suitable heading, airspeed, and altitude. The rollout point is normally 300 to 390 feet AGL at 1 to 1.3 NM from the runway threshold.
- Confirm configuration and enter an approximately 45-degree banked turn with a shallow rate of descent, blending in back pressure to establish an on-speed AOA.
- Adjust power, bank, back pressure, and trim to hold final turn airspeed (180 KCAS) and fly over your rollout point, on altitude, and crabbed into the wind (if required).
- Maintain approximately .6 AOA throughout the final turn, do not allow the airspeed to decrease below final turn airspeed until initiating the rollout onto final.
- Consider the final turn made when <30 degrees of stabilized bank is required, <0.6 AOA required, and within 30 degrees of alignment to the landing runway, power may be reduced to begin slowing to final approach speed (160 KCAS).
- While rolling out on final, crab into the wind as necessary, raising the nose of the aircraft to capture the glidepath based on your desired aimpoint as you slow down. Once established on final and on airspeed, vertical velocity should be approximately 700 to 900 fpm.

(Entering Pattern / Before Landing checklist complete)

FINAL APPROACH / LANDING

NORMAL FINAL APPROACH

- The goal for the final approach is to maintain the desired glidepath, aimpoint, and final approach speed (160 KCAS) until transitioning to a flare and landing.
- It can be helpful to use the runway as a primary reference for establishing a desired 2.5 to 3 degree glidepath, with an aimpoint at the runway threshold. A 3 degree glidepath positions the aircraft 300 feet AGL at 1 NM from the threshold.
- Once the proper aimpoint is set, the HUD pitch scale should indicate 2.5 to 3 degrees nose-low with the flight path marker on the aimpoint. Correct trim application will assist in glidepath control.
- Corrections to glidepath are made by increasing or decreasing the current pitch until the desired glidepath is regained. Do not allow an excessive descent or high sink rate condition to develop. Recovery at traffic pattern altitudes may not be possible.
- The aircraft should be flown at the final approach speed and 0.6 AOA. Final approach speed is typically 160 KCAS + 1 knot for each 100 lbs of fuel or stores remaining. Approximately 90% rpm will maintain on-speed indications on a normal glidepath with gear and full flaps.
- Flying should continue down the glidepath at final approach speed to a desired aimpoint. As the aircraft approaches the aimpoint, the pilot reduces power and transitions the aircraft to level flight, where the aircraft is flared down to touchdown airspeed in ground effect.
- Transitioning from maintaining glidepath, aimpoint and airspeed to level flight in preparation for the flare involves both a power reduction and a pitch change. As the aircraft completes the transition, it must be positioned at the correct altitude, pitch, and airspeed to flare.

FINAL APPROACH / LANDING (continued)

TRANSITION - CRACK, SHIFT, IDLE, FLARE

- One available technique for a smooth transition from final approach to flare is referred to as 'Crack, Shift, Idle, Flare'. Timing and application of the four steps in this technique will vary depending on airspeed, glidepath, wind speed and wind direction.

1. CRACK
   - At approximately 1000 feet from the desired aimpoint, reduce power by pulling back the throttles approximately 1 inch. If trimmed correctly, the aircraft will try to maintain approach speed; slight back stick pressure will need to be applied to compensate so as to maintain the flight path marker on the aimpoint.
2. SHIFT
   - At approximately 750 - 500 feet from the threshold, increase back stick pressure in order to shift the flight path marker to 100 - 200 feet beyond the threshold. This will slightly shallow out the glidepath while aiding the deceleration process.
3. IDLE
   - Approximately 300-500 feet from the threshold, reduce power to idle. This should be adjusted as required to make the aircraft cross the threshold at 5 - 10 knots below the approach speed.
4. FLARE
   - As the aircraft approaches the ground, smoothly increase back stick pressure, raising the flight path marker to level so as to stop the descent, maintaining level flight with the main landing gear 1-2 feet above the ground. As the aircraft continues to decelerate, more back stick pressure will be required to maintain level flight. As the aircraft approaches touchdown speed (20-25 knots below approach speed), it will settle to the ground.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures

FINAL APPROACH / LANDING (continued)

FLARE

- Remain in level flight during the flare, dissipating kinetic energy to slow to touchdown speed. A pitch change is required as the airspeed decreases. The aircraft should reach touchdown speed in the landing attitude as the main gear smoothly touches the runway.
- A low height at the end of the transition or insufficient back stick pressure to maintain level flight during the flare will result in an early touchdown or short touchdown.
- Excessive back stick pressure during the flare with sufficient airspeed, causes the aircraft to balloon. If this happens, a go-around may be required due to remaining runway length being insufficient upon touchdown if flare is carried too long.

FULL STOP LANDING AND AEROBRAKE

- Ensure throttles are in idle.
- After touchdown of the main gear, smoothly increase back stick pressure to attain a 10 to 12 degree pitch attitude for an aerobrake. Caution should be exercised not to aerobrake abruptly, which can result in the aircraft being pulled into the air.
- Smoothly fly the nose to the runway approaching 100 KCAS. Attempting to aerobrake using full back stick until the nose can no longer be held up will produce a hard nosewheel impact at approximately 100 KCAS.
- After lowering the nosewheel to the runway, keep the stick full aft to increase weight on the main gear and use cautious wheel braking from 130 KCAS to 100 KCAS to prevent possible skidding. Optimum braking occurs below 100 KCAS.
- During a landing roll, apply aileron into the wind, maintaining directional control with the rudder. Use steady braking to reduce to taxi speed, keeping the stick full aft until 50 KIAS to maximize aerodynamic deceleration.

Normal Procedures

FINAL APPROACH / LANDING (continued)

FULL STOP LANDING AND AEROBRAKE (continued)

- A technique to estimate whether appropriate braking has been applied is to use three times the speed of the remaining runway in thousands of feet: Ground speed should be no greater than 90 knots for 3,000 feet remaining, 60 knots for 2,000 feet remaining, and 30 knots for 1,000 feet remaining
- Approximate normal landing distance is computed by adding 2,500 plus fuel from the touchdown point. For example with 1,200 lbs fuel remaining (2,500 + 1,200) + 500-1,000 ft touchdown point = 4,200-4,700 ft runway required.

(Final Approach / Landing checklist complete)

GO-AROUND

- Make the decision to go-around as early as possible. Military power is normally sufficient for go-around, but do not hesitate to use maximum power if necessary.

1.	Throttles	MIL (MAX IF REQUIRED)
2.	Landing gear lever	LG UP, WHEN DEFINITELY AIRBORNE
3.	FLAPS	UP

- If touchdown has occurred, lower nose slightly to assist in acceleration. Establish takeoff attitude in order to allow the aircraft to fly off the runway at takeoff speed.

(Go-around checklist complete)

Normal Procedures

TOUCH AND GO LANDINGS

- At touchdown, advance power to MIL (or MAX, if required) and smoothly lower the nose slightly below takeoff attitude to just prior to the nosewheel touching the runway, following normal go-around procedure.
- Check the engine instruments, and accelerate to takeoff airspeed.
- When reaching takeoff speed, establish the takeoff attitude, and allow the aircraft to fly off the runway.
- Follow initial takeoff procedures.
- If circumstances are present that may adversely affect acceleration (full flaps, high temperatures, high gross weight), consider selecting afterburner.

(Touch and Go checklist complete)

CROSSWIND LANDINGS

- Maintain flight path alignment with the runway on final approach by crabbing into the wind to counteract drift.
- The crab should be held through to touchdown; the aircraft will reduce the crab angle when both main tires are on the ground.
- If the crosswind component exceeds 15 knots, plan to touchdown on the upwind side of the runway.
- If the crosswind component exceeds 15 knots, maintain the landing attitude and do not aerobrake. The landing attitude should be maintained by increasing back stick pressure.
- Over application or too rapid of back stick pressure may cause the aircraft to become airborne or drift across the runway. Tire damage is highly probable as a result of drifting.

CROSSWIND LANDINGS (continued)

- Maintain directional control using the rudder; application of aileron into the wind will assist with directional control, prevent compression of the downwind strut, and prevent the upwind wing from becoming airborne.
- Lower the nosewheel to the runway and apply aileron into the wind just prior to losing stabilator authority. Lowering the nose prematurely may result in compression of the downwind strut and poor directional control.
- Decreased aerodynamic braking and less than optimum wheel braking may increase the landing distance by approximately 50%. Expect to be farther down the runway before the nose is lowered, with less runway to stop the aircraft.

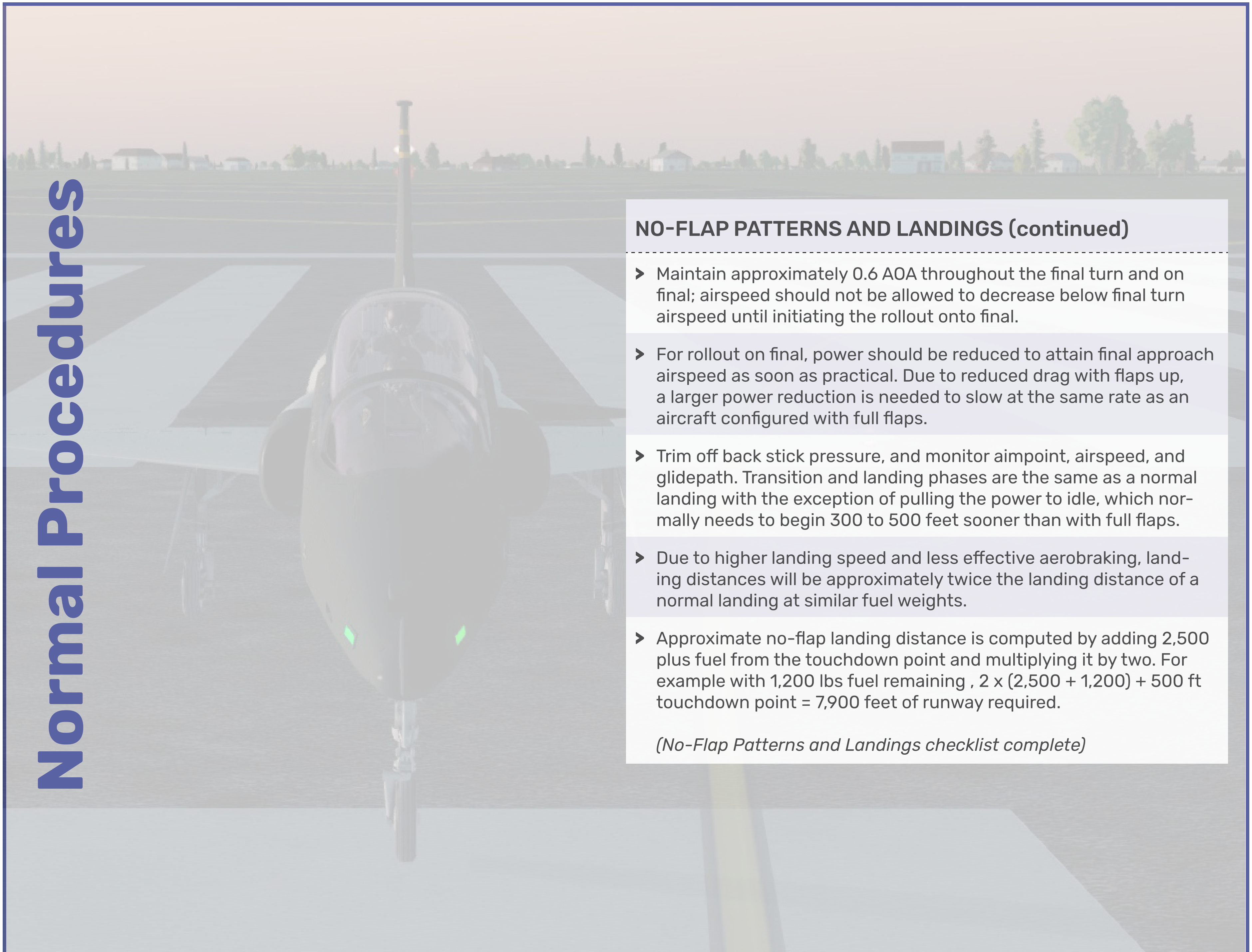
(Crosswind Landings checklist complete)

NO-FLAP PATTERNS AND LANDINGS

- Practice a no-flap straight-in approach to prepare for an emergency that requires a no-flap landing. Basic procedures for flying the approach are the same as the normal straight-in approach.
- A no-flap overhead pattern is practiced to maximise no-flap training time. Due to an increased final turn airspeed and the increased turn radius, a wider downwind displacement is required. The no-flap, no-wind spacing is about 1.5 miles for a 1,500 feet AGL traffic pattern.
- The desired rollout point for a no-flap final turn is the same as for a normal overhead pattern. Confirm configuration and enter approximately a 45-degree banked turn.
- Let the nose of the aircraft fall very slightly, and smoothly add back pressure to establish an on-speed AOA.
- In a 1,500 feet pattern, the FPM will be approximately 4 to 6 degrees nose-low in the HUD; however, the aircraft pitch attitude will be higher than what you see during the normal final turn. Trim to reduce stick pressure as pitch and airspeed are changed.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

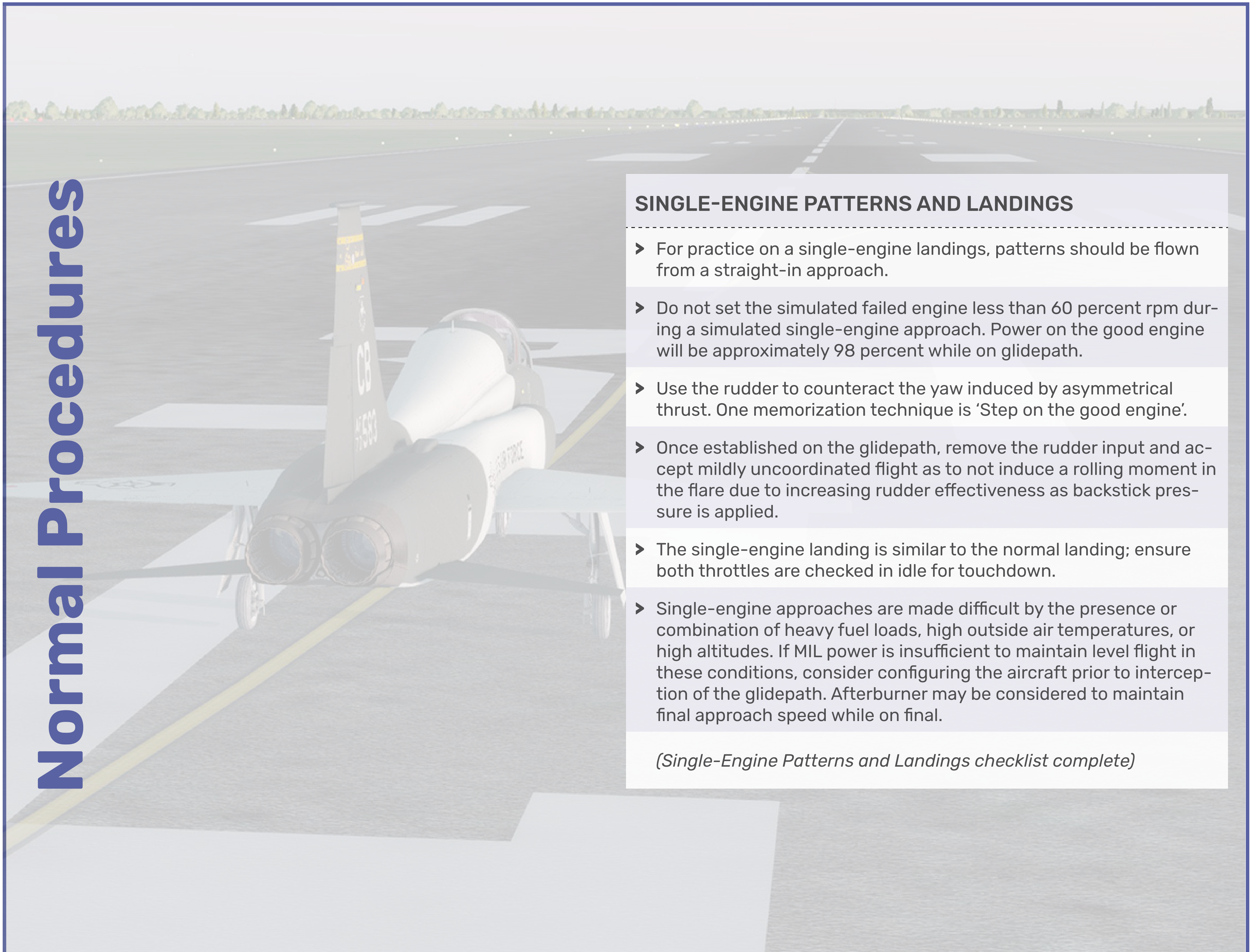
Normal Procedures



NO-FLAP PATTERNS AND LANDINGS (continued)

- Maintain approximately 0.6 AOA throughout the final turn and on final; airspeed should not be allowed to decrease below final turn airspeed until initiating the rollout onto final.
- For rollout on final, power should be reduced to attain final approach airspeed as soon as practical. Due to reduced drag with flaps up, a larger power reduction is needed to slow at the same rate as an aircraft configured with full flaps.
- Trim off back stick pressure, and monitor aimpoint, airspeed, and glidepath. Transition and landing phases are the same as a normal landing with the exception of pulling the power to idle, which normally needs to begin 300 to 500 feet sooner than with full flaps.
- Due to higher landing speed and less effective aerobraking, landing distances will be approximately twice the landing distance of a normal landing at similar fuel weights.
- Approximate no-flap landing distance is computed by adding 2,500 plus fuel from the touchdown point and multiplying it by two. For example with 1,200 lbs fuel remaining , 2 x (2,500 + 1,200) + 500 ft touchdown point = 7,900 feet of runway required.

(No-Flap Patterns and Landings checklist complete)



SINGLE-ENGINE PATTERNS AND LANDINGS

- For practice on a single-engine landings, patterns should be flown from a straight-in approach.
- Do not set the simulated failed engine less than 60 percent rpm during a simulated single-engine approach. Power on the good engine will be approximately 98 percent while on glidepath.
- Use the rudder to counteract the yaw induced by asymmetrical thrust. One memorization technique is 'Step on the good engine'.
- Once established on the glidepath, remove the rudder input and accept mildly uncoordinated flight as to not induce a rolling moment in the flare due to increasing rudder effectiveness as backstick pressure is applied.
- The single-engine landing is similar to the normal landing; ensure both throttles are checked in idle for touchdown.
- Single-engine approaches are made difficult by the presence or combination of heavy fuel loads, high outside air temperatures, or high altitudes. If MIL power is insufficient to maintain level flight in these conditions, consider configuring the aircraft prior to interception of the glidepath. Afterburner may be considered to maintain final approach speed while on final.

(Single-Engine Patterns and Landings checklist complete)

AFTER LANDING

1.	(RCP) ISS mode selector	SOLO (AS REQUIRED)
2.	SAFE/ARMED lever	SAFE
3.	Seat and canopy safety pins	INSTALL
4.	PITOT HEAT	OFF
5.	CABIN PRESS switch	RAM DUMP
6.	Cabin altimeter	CHECK
7.	Canopy	UNLOCKED
8.	Gear door switch	OPEN
9.	TAKEOFF TRIM button	PRESS
10.	FLAPS	UP
11.	Speed brake	OPEN
12.	LDG TAXI LIGHT	AS REQUIRED
13.	CABIN PRESS switch	CABIN PRESS

(After Landing checklist complete)

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

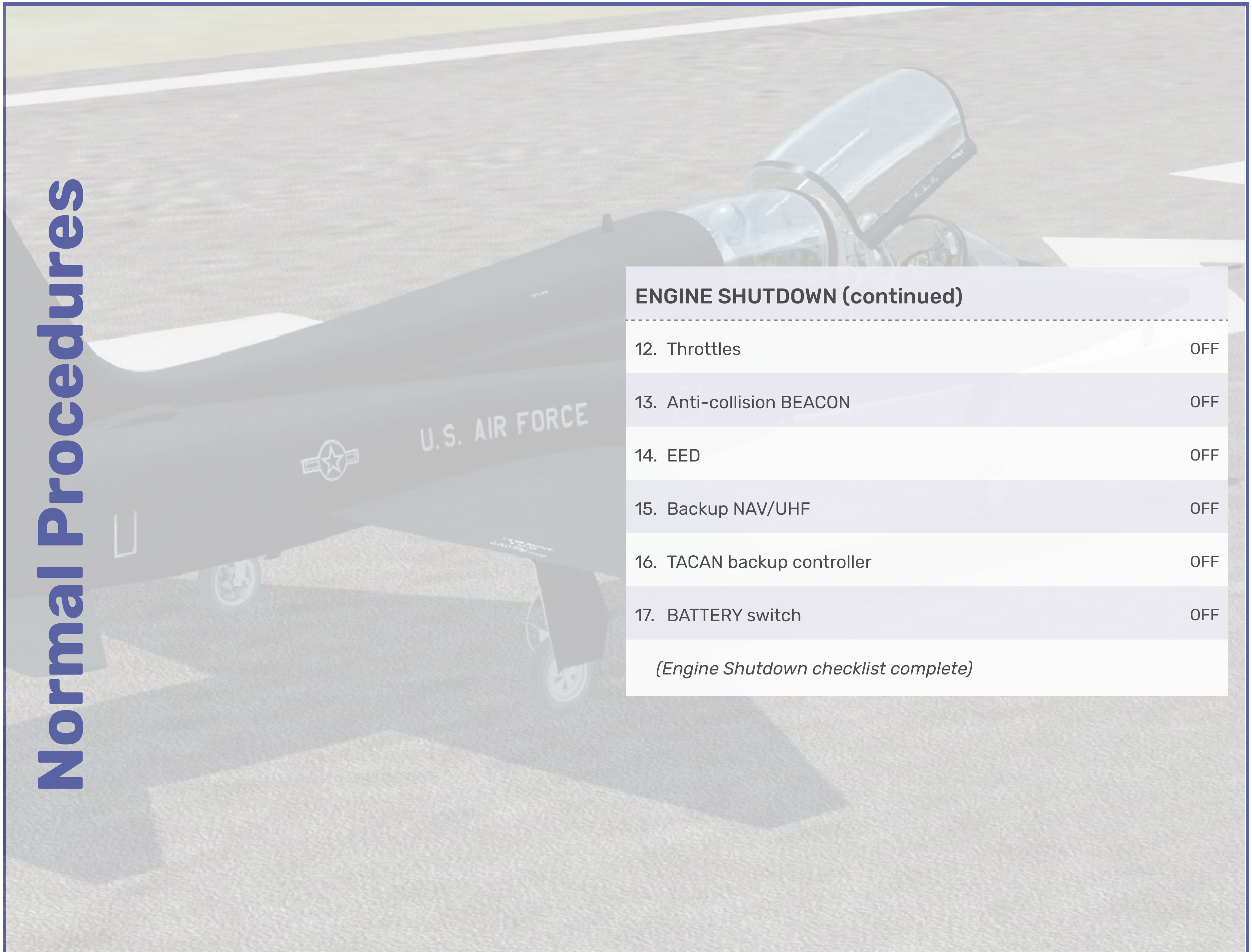
Normal Procedures

ENGINE SHUTDOWN

1.	Operate engines at 70% RPM or below for a minimum of 1 minute for engine cooling.	
2.	Seat	FULL UP
3.	POSITION lights	OFF
4.	FORMATION lights	OFF
5.	Oxygen	100%
6.	Standby attitude indicator	CAGE AND LOCK
7.	UFCP	OFF
8.	MFD	OFF
9.	AAP	
	a. TCAS	OFF
	b. MDP	OFF
	c. EGI	OFF
	d. Backup Mode Control Knob	NORM
10.	Wheels	CHOCKED
11.	Throttle gate	DISENGAGE

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Normal Procedures



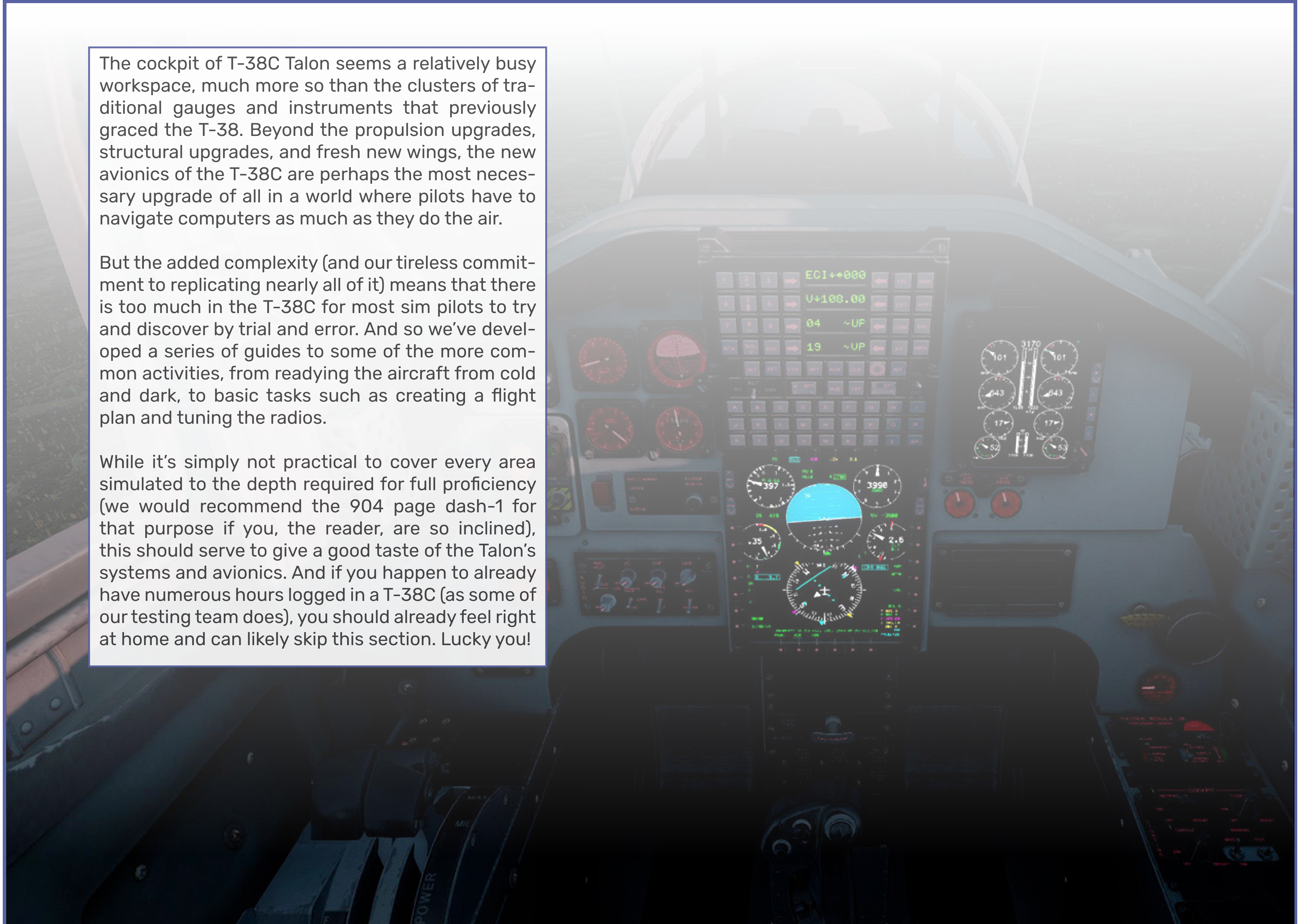
ENGINE SHUTDOWN (continued)

12.	Throttles	OFF
13.	Anti-collision BEACON	OFF
14.	EED	OFF
15.	Backup NAV/UHF	OFF
16.	TACAN backup controller	OFF
17.	BATTERY switch	OFF

(Engine Shutdown checklist complete)

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Tutorials & Walkthroughs



The cockpit of T-38C Talon seems a relatively busy workspace, much more so than the clusters of traditional gauges and instruments that previously graced the T-38. Beyond the propulsion upgrades, structural upgrades, and fresh new wings, the new avionics of the T-38C are perhaps the most necessary upgrade of all in a world where pilots have to navigate computers as much as they do the air.

But the added complexity (and our tireless commitment to replicating nearly all of it) means that there is too much in the T-38C for most sim pilots to try and discover by trial and error. And so we've developed a series of guides to some of the more common activities, from readying the aircraft from cold and dark, to basic tasks such as creating a flight plan and tuning the radios.

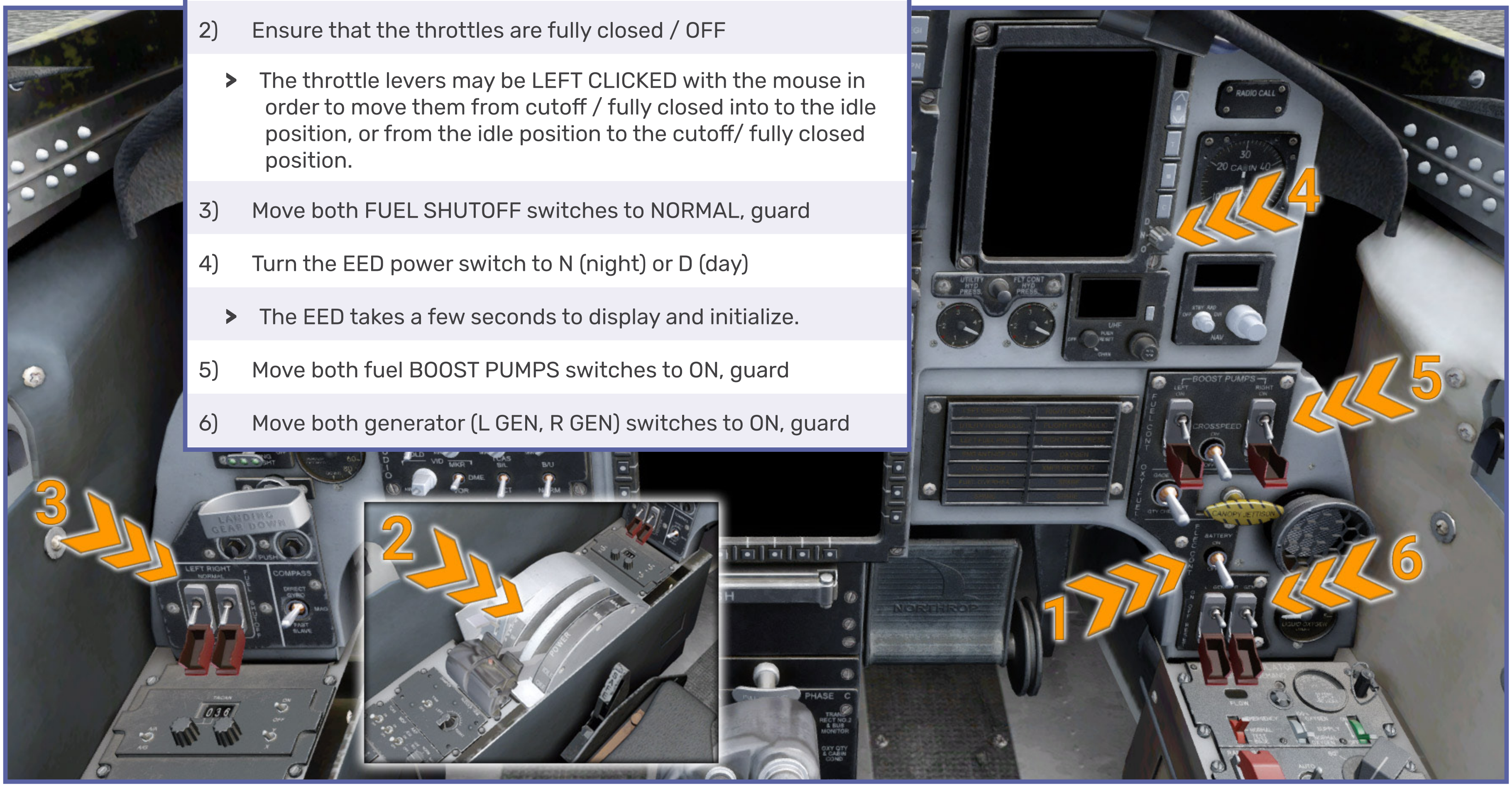
While it's simply not practical to cover every area simulated to the depth required for full proficiency (we would recommend the 904 page dash-1 for that purpose if you, the reader, are so inclined), this should serve to give a good taste of the Talon's systems and avionics. And if you happen to already have numerous hours logged in a T-38C (as some of our testing team does), you should already feel right at home and can likely skip this section. Lucky you!

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

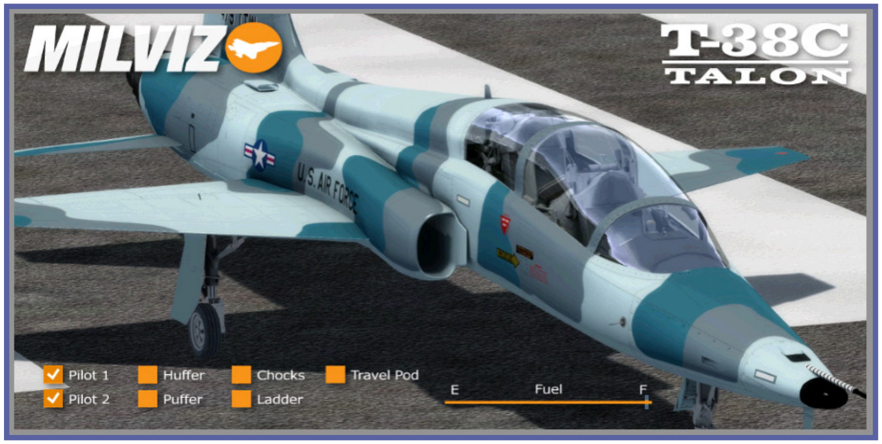
How do I... Start the Engines?

The following basic steps assume that the aircraft is in a cold and dark configuration, and does not show any other steps or processes that may be required to perform a safe flight. This walk-through is designed to build familiarity with the starting processes only. Please see the Normal Procedures for a more complete overview of steps required before, during, and after flight.

1) Turn ON the BATTERY switch
2) Ensure that the throttles are fully closed / OFF
   - The throttle levers may be LEFT CLICKED with the mouse in order to move them from cutoff / fully closed into to the idle position, or from the idle position to the cutoff/ fully closed position.
3) Move both FUEL SHUTOFF switches to NORMAL, guard
4) Turn the EED power switch to N (night) or D (day)
   - The EED takes a few seconds to display and initialize.
5) Move both fuel BOOST PUMPS switches to ON, guard
6) Move both generator (L GEN, R GEN) switches to ON, guard



TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY



7) From the ACM popup window, select either the HUFFER or the PUFFER air starting equipment

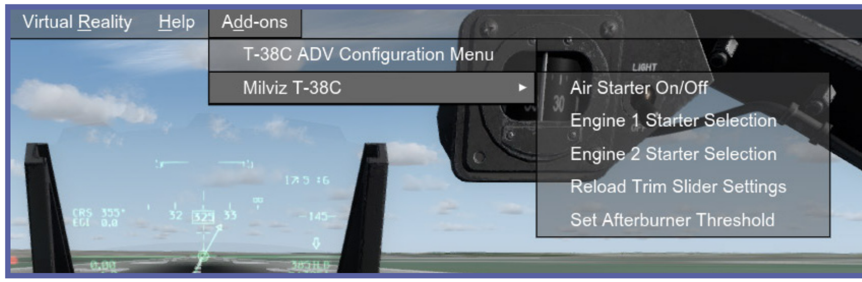
- The ACM popup window may be accessed through the top menu bar, or by using the key combination SHIFT+2.
- When selecting either method of air starting, the chocks selection is automatically made, securing the aircraft.
- Equipment appropriate to the selected method of air starting is shown outside the aircraft.

8) From the Add-ons menu, turn ON the air starter

- This menu option is located at Add-ons/Milviz T-38C/Air Starter On/Off

9) From the Add-ons menu, connect air to engine 2 (right engine)

- This menu option is located at Add-ons/Milviz T-38C/Engine 2 Starter Selection
- The right-side RPM indication on the EED will begin rising.



10) Press the RIGHT ENGINE starter button once the RPM is above 12-15%.

11) Move the right throttle lever to IDLE

- After a few seconds, the EED indications will display the result of engine ignition, before settling to normal idle values

12) From the Add-ons menu, connect air to engine 1 (left engine)

- This menu option is located at Add-ons/Milviz T-38C/Engine 1 Starter Selection
- The left-side RPM indication on the EED will begin rising.

13) Press the LEFT ENGINE starter button once the RPM is above 12-15%.

14) Move the left throttle lever to IDLE

- After a few seconds, the EED indications will display the result of engine ignition, before settling to normal idle values

15) From the ACM popup window, deselect the chosen HUFFER or PUFFER air starting equipment

- When the air starting equipment is deselected, the wheel chocks will remain in place.

16) Turn the switches and controls on the AAP panel to ON / NORM.

17) Turn the MFD power switch to N (night) or D (day)

18) Turn the UFCP / HUD power switch to ON

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

TOC

INTRO

FEATURES

INSTALL

CONFIGURE

MVAMS

FAILURES

IN-GAME MENUS

COCKPIT LAYOUT

NORMAL PROCEDURES

HOW DO I.. ?

GLOSSARY

The UFCP, HUD, and full functionality of the MFD are unavailable while the MDP is initializing. Please wait until the UFCP windows are visible before proceeding further.

The T-38C requires latitude and longitude coordinates to be entered into destination point 200 at aircraft start-up. Prior to this being done, full navigational capabilities will be unavailable.

INS alignment automatically begins when the EGI switch on the AAP Panel is turned to ON. It is not necessary to wait for this initial INS alignment to complete before continuing.

19) Press the Destination (DST) Function Key on the UFCP.

- This selects the DST Key Display on the UFCP
- The DST Key Display will default to showing blank information for D200 (destination point 200).

20) Use the UL-2 and UL-3 keys along with the numeric keypad to enter the current latitude and longitude.

- Current coordinates are available through the on screen information that may displayed using the key combination SHIFT+Z.
- Coordinate entry allows for navigation precision to degrees, minutes, and thousandths of minutes.
- Coordinates must be padded with zeros where required, with latitude following the format DDMMTTT and longitude following the format DDDMMTTT.
- N/S/E/W designators are not entered. The last digit is automatically replaced by the default designator (N for latitude, E for longitude) upon entry. The designators may be swapped by using the UR-2 and UR-3 keys.

Upon entry of latitude and longitude coordinates into destination point 200, INS alignment will restart. This can be confirmed on the EGI page on the MFD as well as by the WAIT/DEGRADED/FULL messages displayed in the HUD message center. Continue once re-alignment has finished and EGI status is FULL.

21) Press the EGI Function Key on the UFCP.

- This selects the EGI Key Display on the UFCP.
- The current EGI mode is displayed in Window 4R (ALN).

22) Press the UR-4 key once to change the EGI mode to NAV.

- Upon changing the EGI mode to NAV, the MFD EGI page will display a mode of NAV/EGI, while the HUD message will change from FULL to NAV and will then extinguish after a short period.

At this point, the aircraft is now running and ready for further mission specific flight configuration.

It should be noted that reloading the aircraft or the scenario will result in needing to restart this process; the exception being that if the aircraft is reloaded, steps 19 through 22 will have already been executed without pilot input and will not need to be performed.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

How do I... Manage DEST Points?

The T-38C contains an internally stored database of configurable destination points. These destination points are often created and loaded specifically for a mission profile, and may make up a portion or the entirety of a flight plan. Although they may be created within the MVAMS application, this guide will focus on how to create and view destination points within the aircraft.

For this walkthrough, we're going to enter in the waypoints for a real T-38C training route nearby Randolph AFB, VR-140. This training route consists of 8 waypoints. In the next walkthrough we'll create a flightplan for our training route and in order to do so, we'll need to use the DEST points created here.

1) On the UFCP, press the Destination (DST) Function Key.

- This selects and displays the DST Key Display. (Returning to the previous menu may be done by pressing the RTN key.)
- The default selection displayed in Window 1R is the current steerpoint, displayed as a three digit destination point value. In the event that the current steerpoint is an ICAO point, either destination point 200 or the last destination point selected is displayed.

2) To create a new destination point, press the Option Select Button at UR-1.

- This will blank out the three digits displaying the current selection in Window 1R.

3) Enter a new three digit destination point using the numeric keypad (for this walkthrough we will enter 201).

- There are 298 valid destination points available for use, from 201 to 499. The location held in destination point 200 is the INS alighment location.
- Upon entry of the third digit, the remaining windows will blank, or else will show new latitude / longitude / altitude data if the selected destination point is not empty.

The training route VR-140 consists of the following 8 waypoints:

A:	N29°05.00’	W98°41.00’
B:	N28°38.00’	W98°47.00’
C:	N28°39.00’	W99°22.00’
D:	N29°29.00’	W99°46.00’
E:	N29°47.00’	W99°20.00’
F:	N30°04.00’	W99°42.00’
G:	N30°17.00’	W99°30.00’
H:	N30°04.00’	W98°25.00’

4) Press UL-2 to enter new latitude data.

- Window 2 will display seven spaces to represent the seven digits that must be entered. The N or S designators are removed during data entry.
- Latitude coordinate entry allows for navigation precision to degrees, minutes, and thousandths of minutes.

5) Use the numeric keypad to enter the latitude data for the first waypoint (A).

- Data entry must be padded to utilize full precision. In the example used, this requires an entry of zero for the thousandths of minutes.
- Once entry is complete, the last digit is replaced by ‘N’.

6) Press UL-3 to enter new longitude data.

- Window 3 will display eight spaces to represent the eight digits that must be entered. The W or E designators are removed during data entry.
- Longitude coordinate entry allows for navigation precision to degrees, minutes, and thousandths of minutes.

7) Use the numeric keypad to enter the longitude data for the first waypoint of VR-140 (A).

- Data entry must be padded to utilize full precision. In the example used, this requires an entry of zero for the thousandths of minutes, plus a leading zero due to the possibility of longitude to have three digit degrees.
- Once entry is complete, the last digit is replaced by ‘E’. (This is by default, we will change the designator in the next step.)

8) Press UR-3 to switch the designator from 'E' to 'W'.

- UR-2 changes the latitude designator, while UR-3 changes the longitude designator.

9) Press UL-4 to enter new altitude data (optional).

- Window 4R will display 4 spaces for altitude entry.
- Altitude for a destination point may remain undefined (blank).

10) Use the numeric keypad to enter desired altitude data.

- Values 0 - 9998 are valid for entry.
- A value of 9999 will erase any previous altitude entry and change the altitude for the destination point to undefined.

At this point, our first destination point is fully entered. To complete entering our 8 waypoints, repeat steps 2 through 10 for each set of coordinates.

- To scroll through the list of entered destination points on the UFCP, the + key (2) and the - key (8) may be used while the DST Key Display is active.
- Destination points may also be reviewed on the MFD, through the use of the DEST page.

Submenus are available on the DST Key Display, indicated by the down arrows at Window 1L and Window 4R. These allow further adjustments of the destination point.

The DST Submenu Display, accessed by pushing UL-1, is used for selecting a different destination point, changing the coordinate system used between WGS and UTM, selecting and defining the time schedule for the destination point, as well as activating divert mode.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

In the following example, we'll use our previously entered destination point to briefly show these actions.

1) Press UL-1 to access the DST Submenu Display. (Returning to the previous menu may be done by pressing the RTN key.)

- Window 2L indicates that we are displaying coordinates in WGS format. This is the default setting.
- Window 2R indicates that time scheduling for the selected destination point is off. This is the default setting.
- Window 4R displays the option for using the selected destination point for divert mode.

2) Press UL-2 to change the coordinate display between UTM and WGS format.

- The DST Submenu is exited immediately upon button press.
- Windows 2 and 3 of the DST Key Display will now reflect the coordinate system selected in the DST Submenu Display.
- Switching between coordinate systems requires entering the DST Submenu and then pressing UL-2.
- The selected coordinate system is used for all destination points once chosen.

3) Press UR-2 to toggle between OFF/TOT/TTT for the selected destination point.

- Window 2R displays the selected time reference for TOA (Time Of Arrival) calculations.
- When OFF is selected, TOA calculations are disabled.
- When TOT is selected, TOA calculations use the TOD assigned to the destination point as the time reference. Window 3 displays the TOD currently assigned to the destination point using six digits in a 24 hour format (HH:MM:SS). Pressing UL-3 allows entry of a new TOD via the numeric keypad.
- When TTT is selected, TOA calculations use a chronometer time assigned to the destination point as the time reference. Window 3 displays the chronometer time currently assigned to the destination point using six digits in a 24 hour format (HH:MM:SS). Pressing UL-3 allows entry of a new TTT via the numeric keypad.
- The default TOT/TTT time for a new destination point is 99:99:99. This number can also be used to cancel a previously assigned TOT/TTT.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

4) Press UL-4 to toggle between Emergency Divert Mode activation / deactivation.

- An asterisk is displayed when activated (DVT*)

The other submenu available on the DST Key Display is the TD Submenu Display. This is used for making track and cross track adjustments, in feet, to the position of the Target Designator (TD) box in the HUD.

Changes made in this submenu will cause the coordinates of the selected destination point to change.

In the following example, we'll use our previously entered destination point to briefly show this capability.

1) Press UL-4 to access the TD Submenu Display. (Returning to the previous menu may be done by pressing the RTN key.)

- Window 2 specifies the along track adjustment, in terms of direction and distance, to the position of the TD Box. Pressing UL-2 toggles between N and F to move the TD Box nearer or farther away from the aircraft. Pressing UR-2 enables data entry, using the numeric keypad, of the distance in that direction to move the TD Box. The along track adjustment can be up to 9999 feet.
- Window 3 specifies the cross track adjustment, in terms of direction and distance, to the position of the TD Box. Pressing UL-3 toggles between R and L to move the TD Box to the right or left of the aircraft. Pressing UR-3 enables data entry, using the numeric keypad, of the distance in that direction. The cross track adjustment can be up to 9999 feet.
- Window 4 specifies the magnetic heading on which the aircraft will approach. Pressing UR-4 enables data entry, using the numeric keypad, of the desired magnetic heading.

Repeat steps 2 through 8 with each of the remaining destination points. When finished, you will have created and entered coordinate data for 8 destination points, 201 through 208.

We will use these destination points to create a flight plan in our next walkthrough.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

How do I... Create a Flight Plan?

Flight plans for the T-38C may be created in one of two ways: via the MVAMS application, or within the aircraft itself. For this guide, we will focus only on entering a flight plan using the UFCP in the T-38C.

Flight plan waypoints can be named ICAO waypoints, or internal destination points, or a combination of both. The primary limitation for flightplans within the MilViz T-38C is that they are limited to 15 user waypoints only. In addition, storage is only provided for 10 flight plans (indexed as FPL 0 - FPL 9)

For this walkthrough, we are going to create a flight plan consisting of ICAO points as well as the destination points we created in the previous walkthrough.

1) On the UFCP, press the Flight Plan (FPL) Function Key.

- This selects and displays the FPL Key Display. (Returning to the previous menu may be done by pressing the RTN key.)
- The flight plan selected for review or editing is displayed at Window 1R. This defaults to FPL 0 on startup.
- To change the selected flight plan, press UR-1. This then allows entry of a new flight plan number, 0 - 9, via the numeric keypad. Changing the selected flight plan via UR-1 also changes the active EGI flight plan.
- Window 2L displays a two digit waypoint number, followed by a W (waypoint); the default shown when actuating the FPL Function Key is 01.
- Window 2R displays the point allocated to the waypoint shown in Window 2L. This can be either a three digit destination point preceded by a D (destination), or a two to five digit ICAO identifier. Both W and D are not displayed for ICAO points allocated to waypoints.
- Pressing UL-2 initiates data entry of a waypoint number (0–15) in Window 2L (waypoint must already exist). The Inc (+) and Dec (-) keys on the numeric keypad, while not in data entry mode, increment or decrement the waypoint number by one, through existing waypoints.
- Pressing UR-2 initiates editing of the currently selected waypoint; either by entry of a destination number on the numeric keypad, or ICAO identifier on the alphabetic keypad. The first waypoint (D200), and the last waypoint (999), may not be edited.
- Window 3 displays the ID data for the destination point or the ICAO identifier. UL-3 and UR-3 are inactive while ID data is displayed.
- Window 4 displays the context actions for UL-4 (ADD) and UR-4 (DEL).

2) Press UL-4 (ADD) to initiate adding a waypoint to the currently selected flight plan.

- UL-4 clears the information in Window 2R and replaces it with dashes, enabling entry of a new point (Destination or ICAO).

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

- At anytime while data entry mode is active, the RTN key will function to exit data entry mode without saving any changes.

3) Use the numeric keypad to enter destination point 201.

- The previously displayed waypoint (in this case, the ending waypoint 999) is shifted to the next sequential waypoint.
- When entering destination points, only enter the three digits; do not enter any alphabetic characters.

4) Press the ENT key to accept the entered destination point and save the waypoint.

- If an error is made during data entry, pressing UR-2 will clear the information in Window 2R, allowing new data to be entered.
- Pressing the RTN key prior to pressing the ENT key will exit back to the FPL Key Display without saving any data.
- After the ENT key is pressed, Window 2L will return to displaying the waypoint number, and Window 2R will display the destination point, preceded by a D (destination).

Note: Due to the nature of how the previous waypoints, including the one currently selected, are shifted forward when a new waypoint is added, it is necessary to advance to the next waypoint before adding a new waypoint. Failure to do this will result in the waypoints not being entered in the desired order!

5) Press the Inc (+) key on the numeric keypad to advance to the next waypoint, in this case the last (dummy) waypoint, 999.

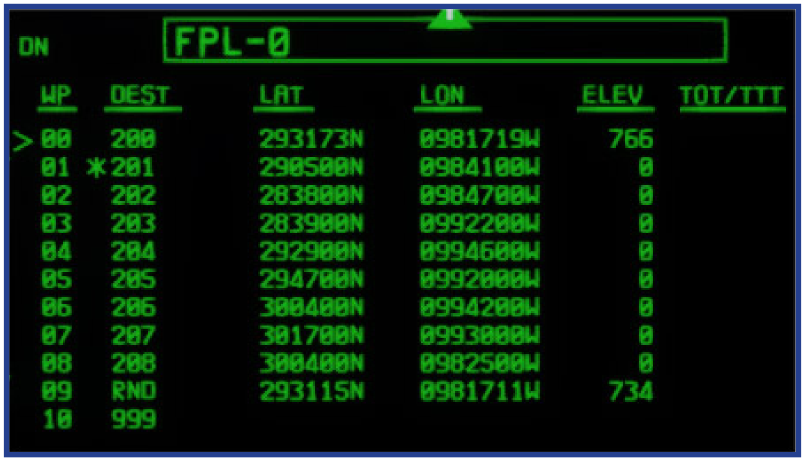
6) Repeat steps 2 through 5 for each of the remaining destination points, 202 through 208.

At this point, the flight plan will consist of 8 waypoints. To round this flight plan off, we will add the ICAO identifier RND, which is the Randolph VORTAC.

7) Press UL-4 (ADD) to initiate adding a waypoint.

8) Use the alphabetic keyboard to enter the ICAO identifier RND.

9) Press the ENT key to accept the identifier and save.



As pointed out earlier, waypoints assigned to ICAO identifiers do not display a W (waypoint) following the two digit waypoint number displayed in Window 2L.

The list of entered waypoints may be reviewed on the MFD by selecting the FPL page (see above right). By selecting the ID page button on the MFD, the MFD view will change from coordinate view to ID view (see below right).

It's noteworthy that all destination points entered using the UFCP do not have an ID assigned to them. This can only be accomplished by use of the MVAMS utility to create destination points. Also, we have not utilized any advanced actions to assign the type of waypoint (STR column), nor TOT/TTT time scheduling.

However, our basic flight plan is now complete.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

How do I... Select a Navigation Source or tune the COM Radios?

Alternatively, 'How I learned to stop worrying and love the UFCP'.

This walkthrough covers, in a quick manner, the Basic Menu on the UFCP. This is the top-level menu that the aircraft default to when the UFCP is first turned on, or that is returned to by pressing the RTN key (once or a few times, depending on where the menu system is browsed to).

First, let's take a moment to review the UFCP Basic Menu Display (as shown to the right) before we continue.

- Window 1L displays the selected PNS. This matches the PNS boxed on the MFD at MT-2 through MT-6, as well as the one shown with an asterisk on the Nav Source Submenu.
- Window 1R shows the currently selected steerpoint. The UFCP Basic Menu is the primary means of selecting EGI steerpoints. The steerpoint may displayed as a waypoint (in a format F-WW, where F is the flight plan number and WW is the way-point number), a destination point (displayed as a three digit number), or an ICAO point (displayed as a two to five digit alphanumeric value). The key to the right, UR-1, is the means of clearing and entering a new steerpoint.
- Window 2 displays the navigation source (VOR, TCN or ILS) and associated commanded frequency or channel. The key to the left, UL-2, is pressed to enter the NAVAID Submenu Display, while the key to the right, UR-2, clears and allows data entry of a new frequency or channel.
- Windows 3 and 4 allows for the display and update of UHF and VHF radio frequencies. Pressing UL-3 or UL-4 begins data entry for Window 3L or Window 4L, allowing entry of a manual frequency or a preset value, depending on the value displayed in Window 3R and Window 4R (UP/UM, VP/VM). Pressing UR-3 or UR-4 toggles between manual frequency and preset value.

TOC

INTRO

FEATURES

INSTALL

CONFIGURE

MVAMS

FAILURES

IN-GAME MENUS

COCKPIT LAYOUT

NORMAL PROCEDURES

HOW DO I.. ?

GLOSSARY

CHANGING THE NAVIGATION SOURCE ON THE UFCP

- Window 1L shows the currently selected Primary Navigation Source (PNS).

1) With the Basic Menu Display showing on the UFCP, press UL-1 to show the NAV Submenu Display.

2) With the NAV Submenu Display showing on the UFCP, press UL-1 to show the NAV Source Submenu Display.

- Pressing the desired key on the NAV Source Submenu Display selects the PNS: TCN (UL-1), VOR (UL-2), LOC (UR-2), ILS (UL-3), BC (UR-3), and EGI (UL-4)
- An asterisk next to the NAV Source indicates the currently selected PNS.
- When a new selection is made, the UFCP reverts back to the NAV Submenu Display and the newly selected PNS is boxed on the MFD.
- AAT (UR-1) is selected or deselected independent of the PNS. AAT has an asterisk in Window 1 of the NAV Source Submenu Display whenever AAT mode is selected.

CHANGING THE ACTIVE STEERPOINT ON THE UFCP

- Window 1R displays the steerpoint in one of the following forms: Waypoints are displayed as F-WW, with the F representing the flight plan number and the WW representing the waypoint number. Destination points are displayed as a three-digit number. ICAO points are displayed as a two- to five-digit alphanumeric value.

1) Press UR-1 to clear the currently displayed steerpoint, enabling new data entry of a new steerpoint.
2) Using the numeric and alphabetic keyboards, enter the steerpoint in the following format:
   - Waypoint: One or two numeric digits. (Only waypoints from the active flight plan are available for selection.)
   - Destination point: Three numeric digits.
   - ICAO point: Two to five alphanumeric digits. (Only ICAO entries contained within the loaded ICAO database are valid.)
   - Press the ENT key to accept steerpoint entry. If an invalid selection is entered, the display at Window 1 will blink repeatedly.
   - If the data entry is invalid, the display at Window 1 will blink repeatedly. Press RTN to exit out of data entry, or UR-1 to clear the incorrect data and allow re-entry.

CHANGING THE ACTIVE FLIGHT PLAN ON THE UFCP

- Although the current steerpoint can be changed directly from the Basic Menu Display, the active flight plan is changed through the NAV Submenu Display.

1) With the Basic Menu Display showing on the UFCP, press UL-1 to show the NAV Submenu Display.

   » The current flight plan is displayed in Window 3R.

2) With the NAV Submenu Display showing on the UFCP, press UR-3 to clear the current flight plan number.

3) Use the numeric keypad to enter a new flight plan number. A valid entry is a single digit, 0 - 9.

   » The flight plan is selected immediately upon entry. Press RTN to exit the NAV Submenu Display and return to the Basic Menu Display.

CHANGING THE NAVAIDS ON THE UFCP

1) With the Basic Menu Display showing on the UFCP, press UL-2 to show the NAVAID Submenu Display.

   » The information displayed in Window 2 on the Basic Menu Display is dependant on the selected PNS.

2) With the NAVAID Submenu Display showing on the UFCP, pressing the UL-1, UL-2, or UL-3 keys clears, respectively, the TACAN, VOR, or ILS frequencies and allows for data entry.

3) Use the numeric and alphabetic keys to enter a new frequency.

   » For the TACAN channel, entry can be completed by entering all three digits and X/Y or by selecting the ENT key after any digit (leading zeros and X are assumed).

   » For the VOR or ILS frequencies, entry can be completed by entering all five digits or by selecting the ENT key after a minimum of three digits (digits not entered assumed to be zero).

› UR-1 toggles between TCN and AAT to allow display and editing of A/G TACAN channel or A/A TACAN channel.

› UR-4 toggles ILS range source selection (TCN or ILS). Selecting TCN sets the ILS range source to the A/G TACAN channel displayed in Window 1L. Selecting ILS sets the ILS range source to the auto paired DME channel.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

TUNING UHF AND VHF FREQUENCIES ON THE UFCP

- UHF and VHF radio frequency selections are displayed in the form of manual frequency values or preset channels. Window 3 displays the UHF radio frequency and Window 4 displays the VHF frequency.
- For manual frequencies, Window 3/4 displays a five-character frequency value on the left side of the window and UM for UHF and VM for VHF on the right side.
- For preset frequencies, Window 3/4 displays a two-character preset channel on the left side of the window and ~UP for UHF and ~VP for VHF on the right side.

1) Pressing UR-3 or UR-4 toggles Window 3 or Window 4 between the manual frequency setting and the preset channel setting.

2) Pressing UL-3 or UL-4 initiates data entry for Window 3L or Window 4L to allow entry of a manual frequency or a preset value, depending on the setting currently displayed

   - » Frequency entry can be completed by entering all five digits or by selecting the ENT key after a minimum of three digits (digits not entered are assumed to be zero).
   - » Valid entries for UHF/VHF frequencies are in five digits (###.##) as follows:

     a) First three digits: UHF - 225 through 399; VHF - 118 through 151

     b) Fourth digit: 0 through 9

     c) Fifth digit: 0, 2, 5, 7

     d) Sixth digit (0 or 5) is not entered

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

How do I... Set the Altimeter?

Pressing the ALT Function Key activates the ALT Key display, which is used to set the altimeter, select the altitude warning data sources (RALT / MSL), and set the minimum altitude for activation of the altitude warning.

1) On the UFCP, press the Altimeter (ALT) Function Key.

   » This selects and displays the ALT Key Display. (Returning to the previous menu may be done by pressing the RTN key.)

   » Window 2R displays the barometric pressure in inches of Mercury (Hg) in four digits (decimal point is not displayed but assumed between the second and third digits of the entry).

2) Press UR-2 to initiate data entry of a new altimeter setting using the numeric keypad.

   » Alternatively, the Inc/Dec keys on the numeric keypad (while data entry is NOT active) may be used to increment / decrement the QNH by 0.01 Hg.

3) Press UL-2 to toggle between QNH and STD altitude (29.92).

   » Alternatively, the Q key on the alphabetic keypad (while data entry is NOT active) may be used to toggle altitude between QNH and STD.

How do I... Change the HUD?

Pressing the HUD Function Key selects the HUD Key Display, which is used for selecting between the MIL-STD or F-16 HUD display mode, as well as the definition and selection of options.

1) On the UFCP, press the Head Up Display (HUD) Function Key.

   » This selects and displays the HUD Key Display. (Returning to the previous menu may be done by pressing the RTN key.)

   » Window 2L shows the active HUD mode selection.

2) Press UL-2 toggles between F-16 (F16) and MIL-STD (MIL) HUD display modes.

- When the F-16 display mode is active, Window 3L shows the current FPM option, with UL-3 toggling between DCO and DRF options. When the MIL-STD display mode is active, Window 3 is blank.
- Window 4L displays the current A/A gun reticle type. Pressing UL-4 toggles between FNNL and LCOS.
- A HUD declutter function is provided by the UFCP DCL Function Key (zero key on the numeric keypad). The declutter function applies for both the MIL-STD and F-16 HUDs. Declutter options are set through MVAMS.

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

How do I... Use Hot Keys?

Hot keys provide a one-button-press option to perform various functions on the UFCP and MFD. Several keys on the UFCP alphabetic keypad act as hot keys. Hot key functionality is not available during data entry.

UFCP Key(s)	Function Restrictions	Function
A, B, C, D, E	A/G MM Only	Selection of weapons programs A through E
F	NAV MM Only	Cycles FD Modes: H2C CRS, HDG, OFF
G	None	Temporarily disables UHF Guard
H	None	Snaps HDG Set Marker to Aircraft Heading
N	None	Displays Nearest Airports page on MFD
Q	None	Toggles between standard QNE (29.92) and manually set QNH
R	None	MFD Repeater Mode Control
T	None	Displays TD submenu on UFCP
V	None	Toggles VHF squelch ON/OFF
U	None	Toggles UHF squelch ON/OFF

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

Glossary

A

A/A	Air To Air
A/C	Aircraft
A/G	Air To Ground
AAP	Avionics Activation Panel
ABC	Automatic Brightness Control
ABV	Above
AC	Alternating Current
ACCES	Attenuating Custom Communications Earpiece System
ACCR	Accuracy
ACMI	Air Combat Maneuvering Instrumentation
ACP	Audio Control Panel
ADU	Automatic Deployment Unit
AGL	Above Ground Level
ARINC	Aeronautical Radio Incorporated
AIU	Audio Interfacing Unit
ALFA	Alphabetic
ALN	Alignment/Align
ALT	Altitude
ANP	Actual Navigation Performance
AOA	Angle of Attack
AP	Approach
APP	Approach
APT	Airport
ATC	Air Traffic Control
ATT	Attenuation
ATT	Attitude
AUT	Auto
AUP	Avionics Upgrade Program
Aural Tones	Low - 250 Hz, Medium - 500 to 900 Hz, High - 1600 Hz

B

BARO	Barometric
BC (MFD) or BCRS	Back Course
BFL	Bomb Fall Line
BGO	Bingo
BIA	Baro-Inertial Altitude
BIT	Built-In Test
BLNK	Blank
BLW	Below
BRG	Bearing
BRT	Bright
BRST	Boresight
BSL	Below Sea Level
BU	Back-Up
Bullseye	Any defined destination or ICAO point
BWRD	Backward

C

C	Centigrade
CA	Course to Altitude
CAL	Coarse Alignment
CAS	Calibrated Air Speed
CCIP	Continuously Computed Intercept Point
CCRP	Continuously Computed Release Point
CCTL	Continuously Computed Tracer Line
CDI	Course Deviation Indicator
CDM	Climb Dive Marker
CFOV	Center Field Of View
CG	Center of Gravity
CH	Channel
CHAN	Channel
CLK	Clock
CLM	Climb Airspeed
CLR	Clear
CMB	Combination
CMD	Counter Measures Dispenser
COM	Communication
COMM	Communication
CRN	Chronometer
CRS	Course
CRZ	Cruise Airspeed
CSW	Course Select Window
CTFOV	Center Total Field Of View
CTVS	Color TV Sensor System (HUD Camera)

D

DC	Direct Current
DCL	Declutter

DCLT	Declutter
DCO	Drift Cut Out
DDS	Default Display Switch
DEL	Delete
DEST	Destination
DG	Directional Gyro
DH	Decision Height
DME	Distance Measuring Equipment
DRF	Drift Free
DS	Destination
DST	Destination
DTC	Data Transfer Cartridge
DTD	Data Transfer Drive
DTS	Data Transfer System

E

EADI	Electronic Attitude Director Indicator
EED	Electronic Engine Display
EGI	Embedded GPS/INS
EGT	Exhaust Gas Temperature
EHSI	Electronic Horizontal Situation Indicator
ELV	Elevation
EMER	Emergency
EMR	Emergency
(TCAS Display)	
ENT	Enter
EO	Emergency Oxygen Handle
ESUP	Escape System Upgrade Program

F

FAF	Final Approach Fix
FBY	Flyby
FD	Flight Director
FF	Fuel Flow
FIP	Final Interception Point
FL	Flight Level
FLT	Flight
FNL	Final
FOM	Figure Of Merit
FPL	Flight Plan
FPM	Flight Path Marker
fpm	feet per minute
FQ	Fuel Quantity
FRQ	Frequency
Ft	Feet
FWD	Forward

G

G/S	Glideslope
GC	Gyro Compass
GEO	Geographic
GEM	Graphics Engine Module
GHL	Ghost Horizon Line
GMT	Greenwich Mean Time
GPS	Global Positioning System
GRD	Guard
GRP ID	Group Identification
GS	Ground Speed

H

HDG	Heading
HLD	Hold
HM	Home
HOM	Home
HOTAS	Hands On Throttle And Stick
HSD	Horizontal Situation Display
HUD	Head Up Display

I

IAF	Initial Approach Fix
I/C	Intercom
IBIT	Initiated Built-In Test
ICAO	International Civil Aviation Organization
ICP	Illumination Control Panel
IFA	In Flight Alignment
ID	Identification
IFOV	Instantaneous Field-Of-View
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMN	Indicated Mach Number
INS	Inertial Navigation System
INSTR	Instrument
INWRD	Inward
ISS	Interseat Sequencing System
IVV	Instantaneous Vertical Velocity

TOC
INTRO
FEATURES
INSTALL
CONFIGURE
MVAMS
FAILURES
IN-GAME MENUS
COCKPIT LAYOUT
NORMAL PROCEDURES
HOW DO I.. ?
GLOSSARY

J

JMPS	Joint Mission Planning System

K

KHz	Kilohertz
KIAS	Knots Indicated Airspeed
Kt	Knots

L

LAC	Longitudinal Acceleration Cue
LAT	Latitude
LCD	Liquid Crystal Display
LCOS	Lead Computing Optical Sight
LED	Light Emitting Diode
LOB	Left Out Board
LOC	Localizer
LON	Longitude
LONG	Longitude
LOS	Line Of Sight
LRU	Line Replaceable Unit
LVL	Level
LWT	Left Wing Tip

M

MA	Master Arm
MACS	Minimum Acceleration Check Speed
MAG	Magnetic
MAINT	Maintenance
MALF	Malfunction
MAN	Manual
MAP	Missed Approach Point
Max	Maximum
MB-#	MFD Bottom OSB
MDA	Minimum Descent Altitude
MDP	Mission Display Processor
MFD	Multifunctional Display
MFL	Maintenance Fault List
MGRS	Military Grid Reference System
MH	Manual Heading
MHP	Missed Approach Heading Point
MHz	Megahertz
MIC	Microphone
Min	Minimum
MINIMA	Minimum Altitude
ML-#	MFD Left OSB
MM	Min Mach Airspeed
MMS	Master Mode Switch
MOR	Manual Override Handle
MR-#	MFD Right OSB
MRK	Mark
mr	Milliradian
mrad	Milliradian
ms	Millisecond
msec	Millisecond
MSL	Mean Sea Level
MT-#	MFD Top OSB

N

NACS	Normal Acceleration Check Speed
NARPT	Nearest Airports
NAV	Navigation
NDBS	No Drop Bomb Scoring
NM/NMI	Nautical Mile
NOP	Normal Operation Procedures
NOR	Normal
NORM	Normal
NOZ	Nozzle
NP	Non Precision Approach
NT	Night
NV	Navigation
NWS	Nose Wheel Steering
NXT	Next

O

OAT	Outside Air Temperature
OSB	Option Select Button
OVR	Flyover

P

PIRD	Powered Inertia Reel Device
PFL	Pilot Fault List
PFR	Primary Flight Reference
Pickle	Weapons Release Button
PMP	Propulsion Modernization Program
PNS	Primary Navigation Source
PP	Present Position

PPH	Pounds Per Hour
PSI	Pounds per Square Inch
PST	Preset
PSU	Power Supply Unit
PTT	Push-To-Talk
PU	Position Update
PUB	Power Up Bit

Q

QNE	Standard Altimeter Setting
QNH	Field Elevation Corrected For MSL (altimeter setting)

R

R	RALT In HUD
RA	Resolution Advisory
RAD	Radial
RALT	Radar Altimeter
RB	Relative Bearing
RD	Raw Data
REC	Record
RLG	Ring Laser Gyro
RNP	Required Navigation Performance
ROB	Right Out Board
ROLEX (±time)	Time line adjustment in minutes always referenced from original pre-planned mission execution time. PLUS means later; MINUS means earlier
RPM	Revolutions Per Minute
RPTR	Repeater
RST	Reset
R/T	Receiver Transmitter
RTN	Return
RWT	Right Wing Tip
RWY	Runway

S

SAT	Satellite
SBY	Standby
SC	Selected Course
SCA	Self-Contained Approach
SCANP	Self-Contained Approach Non-Precision
SCOR	Score (NDBS Display)
Sec	Second/Seconds
SH	Stored Heading
SMS	Store Management System
SPD	Speed
SQ	Squelch
SRM	Short Range Missile
SSK	Seat Survival Kit
STAT	Status
STBY	Standby
STR	Steer

T

TA	Traffic Advisory
TACAN	Tactical Air Control And Navigation
TAS	True Air Speed
TAT	Total Air Temperature
TBD	To Be Determined
TCAS	Traffic Collision and Avoidance System
TCS	TCAS
TD	Target Designator
TEMP	Temperature
TFOV	Total Field Of View
TGT	Target
TO	Technical Order
TOA	Time Of Arrival
TOD	Time Of Day
TOT	Time On Target
TR	Transmit and Receive
T/R	Transmitter/Receiver
TRU	Transformer-Rectifier Unit
TST	Test
TTG	Time To Go
TTT	Time To Target

U

UFCP	Up Front Control Panel
UHF	Ultra High Frequency
UL-#	UFCP Left OSB
UM	UHF Manual
UOSB	UFCP OSB
UP	UHF Preset
UR-#	UFCP Right OSB
UTM	Universal Transverse Mercator
UWARS	Universal Water Activated Release System

V

VAC	Volts, Alternating Current
VDC	Volts, Direct Current
VDI	Vertical Deviation Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VID	VOR/ILS/DME
VM	VHF Manual
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Range
VP	VHF Preset
VTR	Video Tape Recorder
VVI	Vertical Velocity Indicator

W

WDST	Weapon Delivery Status
WGS	World Geodetic System
WLS	Wheels
WLU	Wheels Lock-Up
WOW	Weight-On-Wheels
WPN	Weapon
WSSP	Weapon System Support Pod

Y

YSAS	Yaw Stability Augmentor System

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