T-38A
TALON V2

DESIGNED FOR
PREPAR3D V4

MILVIZ

End User License Agreement

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Any inquiries regarding use of this product in a commercial or training capacity should be directed via e-mail to info@milviz.com.

DISCLAIMER:
MilViz and all associates shall NOT be held responsible for any damages arising from the use of the T-38A product.

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T-38A Introduction

While this manual might be a new addition to the MilViz T-38A ADV package, you'd be correct in guessing that the particular aircraft it describes has been well-established in the simulation world.

At this point one could say that we're experts in regards to the T-38 airframe, with multiple iterations of the simulated Talon bearing the MilViz moniker for a large number of years. The original release of the T-38A Talon (which is still available) was designed for FSX, with the platform also seeing introduction of our ADV ('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 aircraft to which this manual belongs represents a significant upgrade and revision to the T-38A package spurred in part by our successful recent release of the T-38C Talon for P3Dv4.

The analog T-38A Talon V2 now sports beautiful PBR textures, while coding upgrades throughout ensure that the systems and avionics are true to the real aircraft. Also included is advanced flight control customization through our MVAMS utility in order to match the functionality introduced in the T-38C package.

Retained and updated, (and still impressive!), is our extensive custom-programmed ADV system, which continues to bring cutting edge, real world aircraft behavior, characteristics and physics to the desktop simulation world.

In addition, 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.

ADV

Special Features

- Custom physics & FDE engine
- Custom ground & structural dynamics
- Aerodynamic model based on Northrop and NASA data
- Realistic J-85-5A engine model
- Custom Flight Control System model
- Configurable forced and random failures system
- Basic 'Instructor' mode available
- Icing effects and damage modeling
- Accurate communication & avionics
- Custom TACAN simulation
- Professionally mastered sound set
- Ultra-detailed modeling, inside and out
- Professional PBR texturing
- RealLight implementation, providing superlative lighting

RealLight

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System Requirements

The following requirements apply as a general minimum to successfully install, configure and operate the MilViz T-38A Talon V2.

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.)

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Installing the T-38A Talon

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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-38A Talon V2.

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.

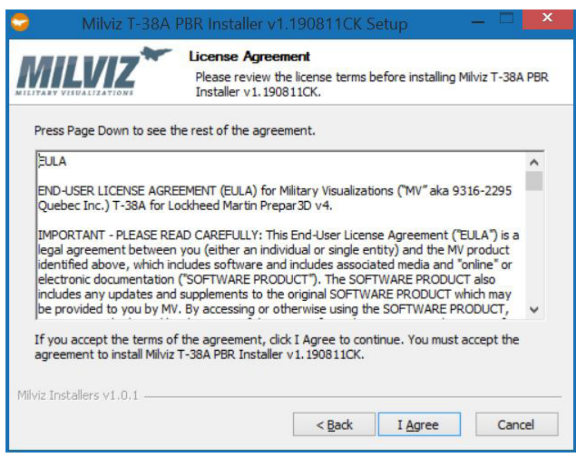
Note: *Version numbers shown in any of the following installation images may represent pre-release versions and differ from the final product.*

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.



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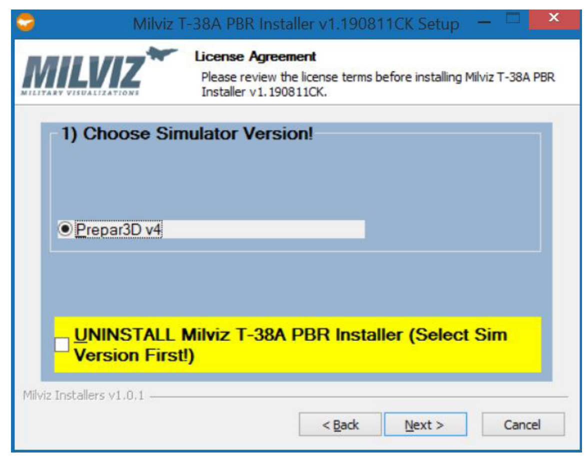
Choose Simulator Version

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-38A Talon V2 only supports Prepar3D version 4.4(+); as such, this is the only option displayed.



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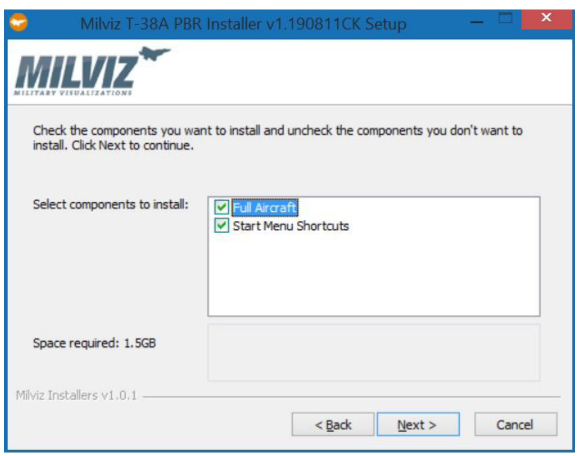
Component Selection

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



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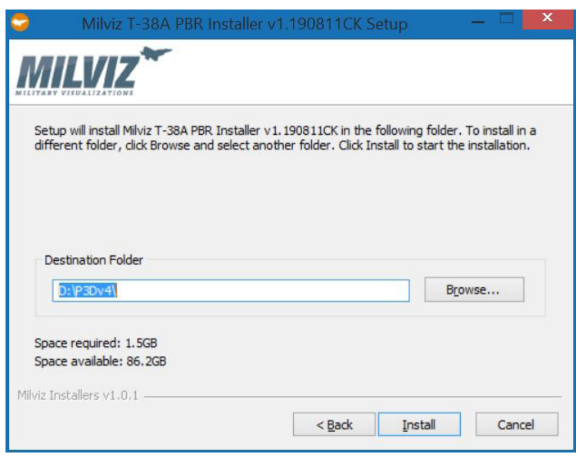
Install Location

The next screen shown will display the location where the MilViz T-38A Talon V2 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.



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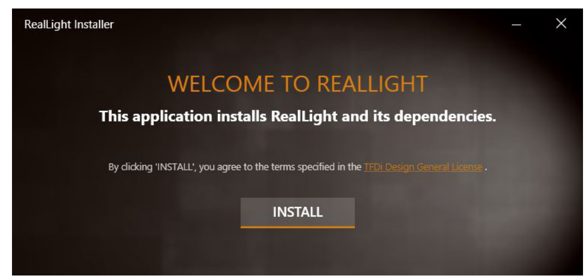
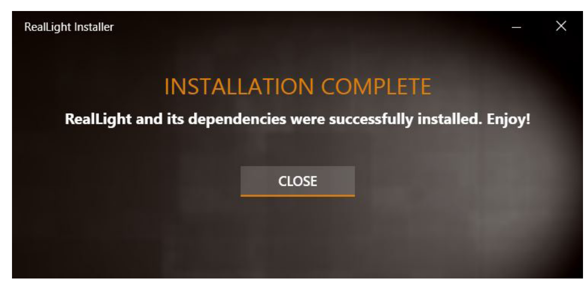
Component Installation

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.





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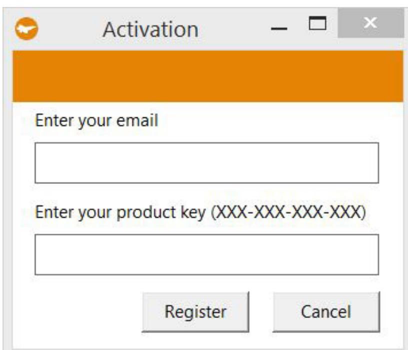
Product Registration

The MilViz T-38A Talon contains a DRM system which helps to ensure that only legitimately purchased copies of the T-38A Talon V2 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.

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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!

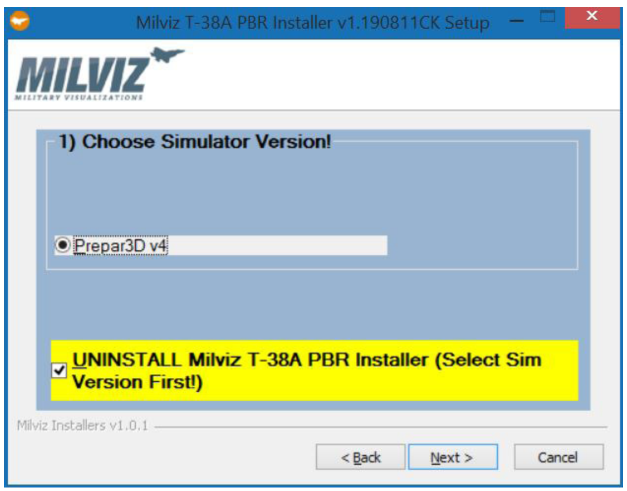
It may be worthwhile to back-up or save a copy of the downloaded installer. Please be aware that as new updates are released over time, we do not continue to offer older versions for download due to support issues. Please also note that support is intended for the latest releases of our products only.

Uninstalling the T-38A

The MilViz T-38A Talon V2 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-38A 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.

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Simulator Configuration

Within the simulator, certain configuration settings are required for full and proper functionality of the MilViz T-38A Talon V2.

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-38A.

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-38A. 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.

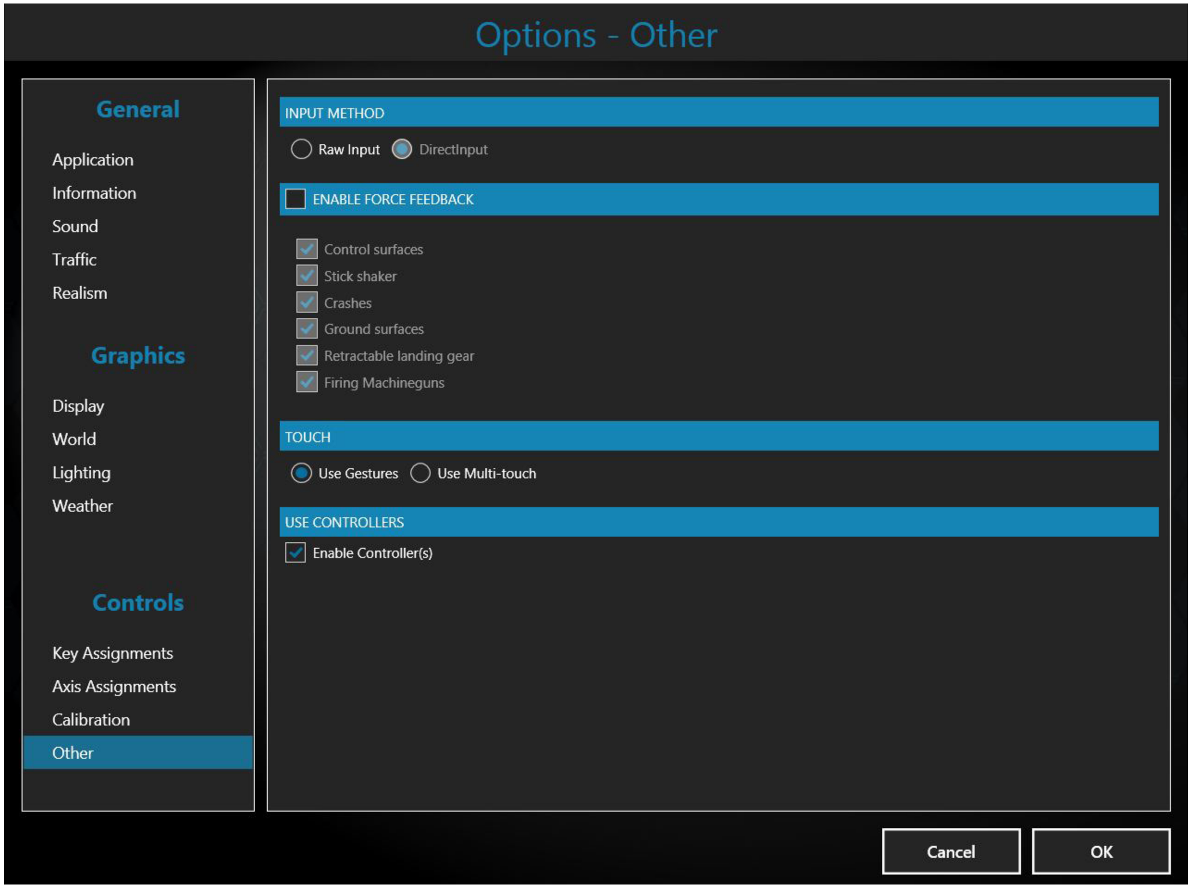
This can generally be achieved through the adjustment of the various graphics options in the Display, World, Lighting, and Weather pages.

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-38A 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.

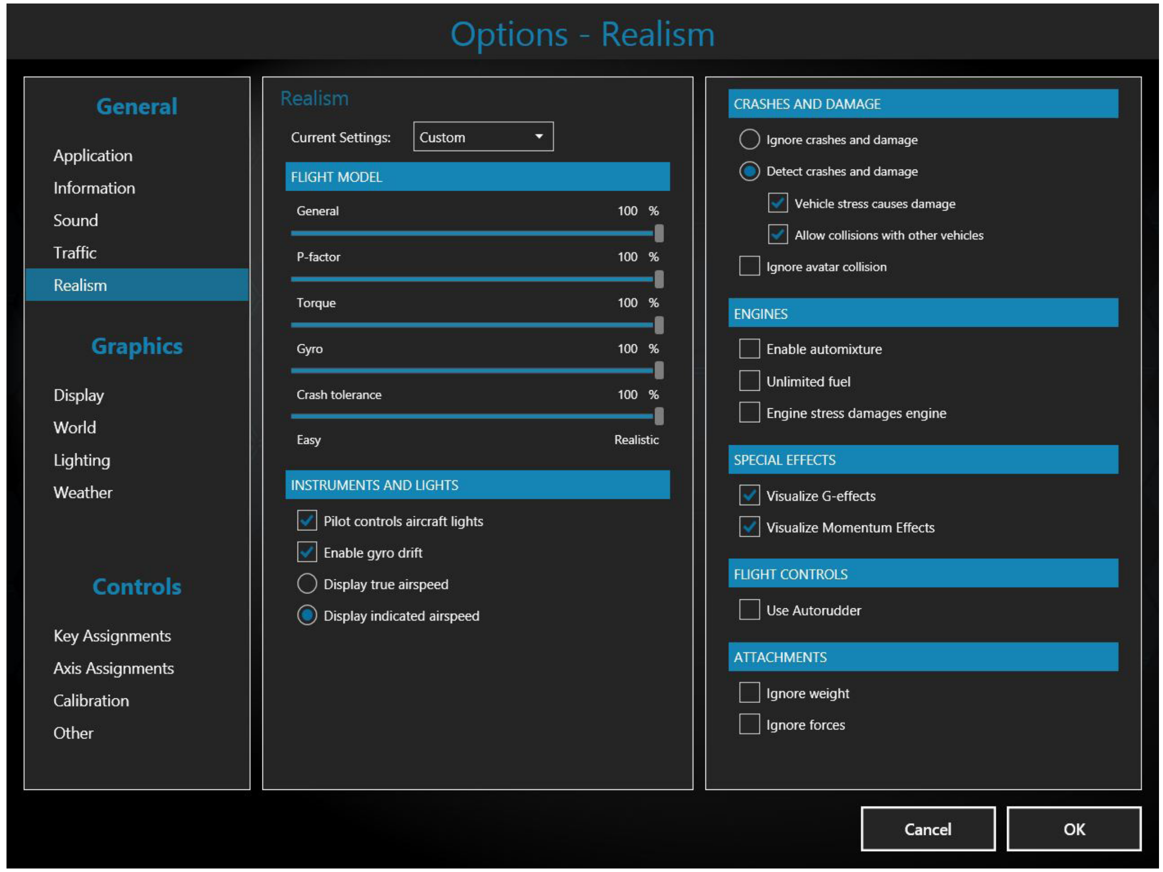


Realism Settings

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-38A 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-38A Talon V2 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.

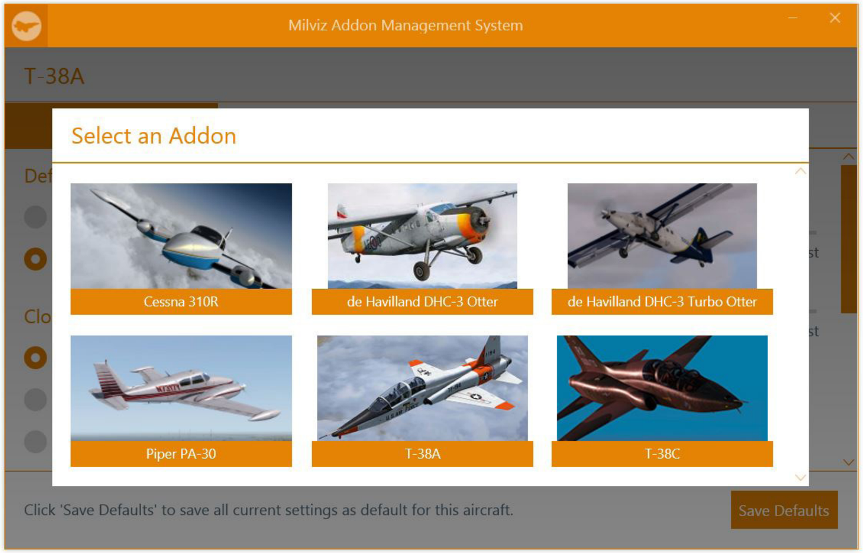
Flight Controls
For the most realistic flight experience, "Autorudder" should not be selected.

Attachments
These should remain unchecked.

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-38A Talon V2 installs, and fully integrates with, the MVAMS application. This allows the user access to a range of configuration utilities specific to this aircraft.

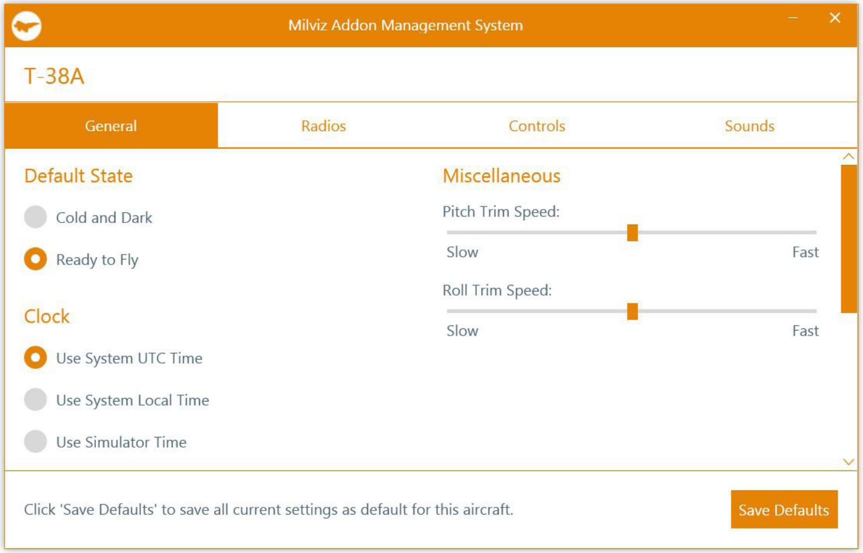


Starting MVAMS

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-38A Talon V2 will be available in this list for selection.



T-38A 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-38A, these options are organized into three tabs: General, Radios, Controls, and Sounds. You may move between these tabs freely without fear of losing changes made; the 'Save Defaults' button is used when all desired options have been set.

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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-38A. 'Ready to Fly', on the other hand, provides the convenience of being able to take to the air with very little mucking about.

Clock

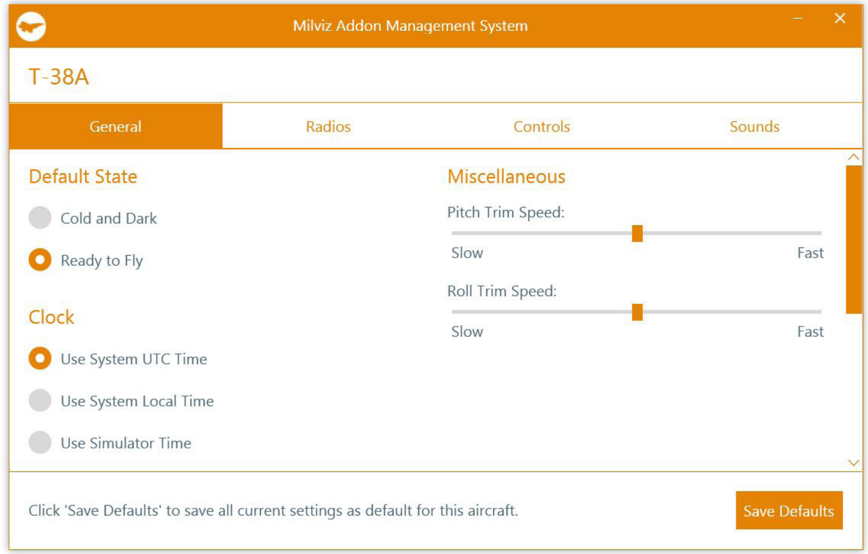
The state of how the clock displayed in the aircraft is shown can be set through these options; System UTC or Local time may be used, or the time as shown in the simulator, if it differs, may be used instead.

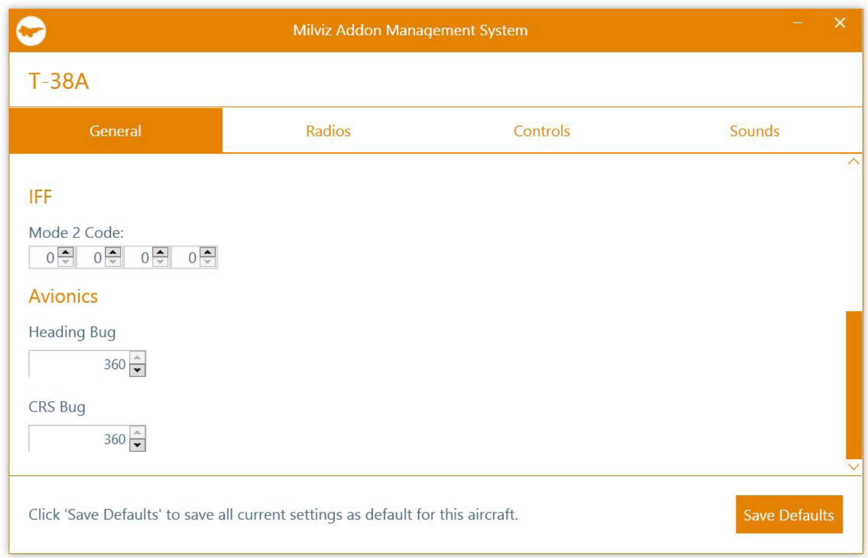
IFF & Avionics

Shown under the IFF & Avionics headings are settings for pre-selecting the IFF code, the Heading bug, and the Course bug. The latter two may be preset using the 0 - 360 degree selectors, so that the aircraft will reflect these settings when loaded.

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.





MVAMS Operation - Radios

The T-38A Talon V2 contains highly accurate radios true to the real aircraft. Customizable settings that pertain to the radio tuning when the aircraft is loaded can be accessed on the Radios tab.

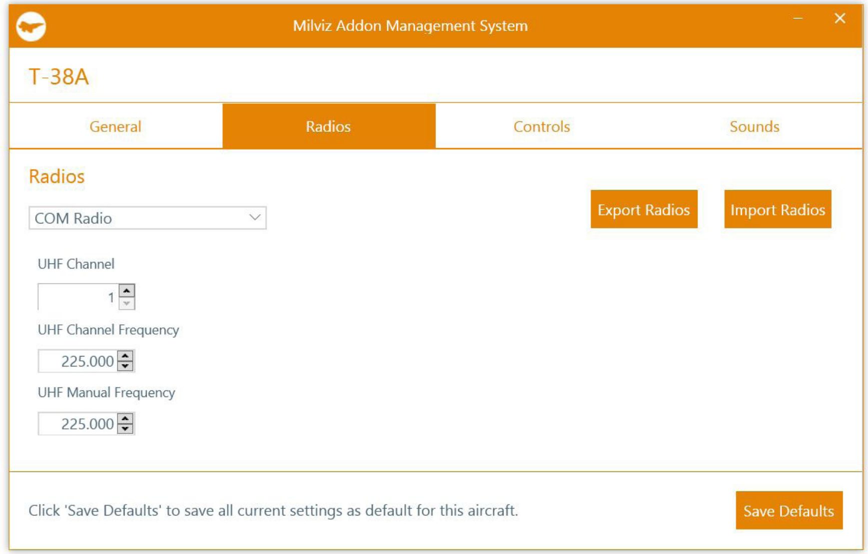
The dropdown menu on the left hand of the window contains two choices: COM Radio, and NAV Radios.

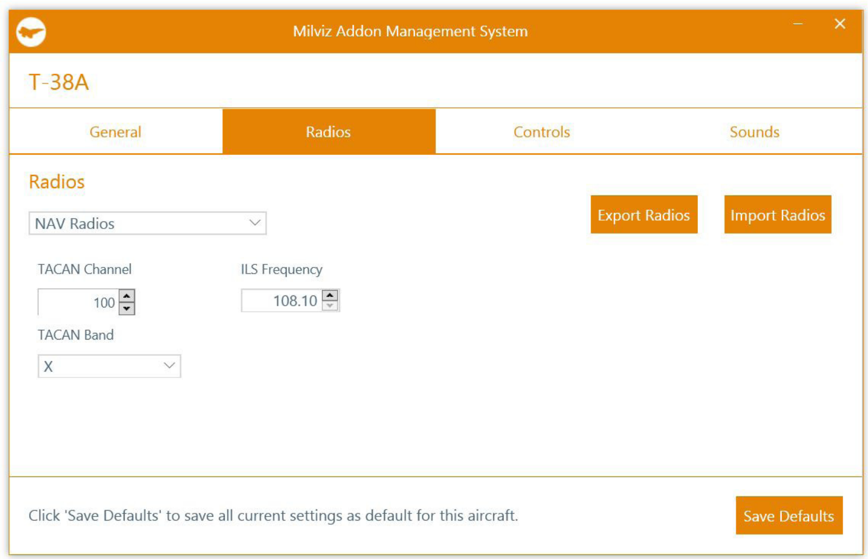
COM Radio

The UHF channel and associated frequency may be shown and set here, and the UHF manual frequency may be set as well.

NAV Radios

The TACAN channel and ILS frequency as set in the aircraft upon load are able to be set in this section.





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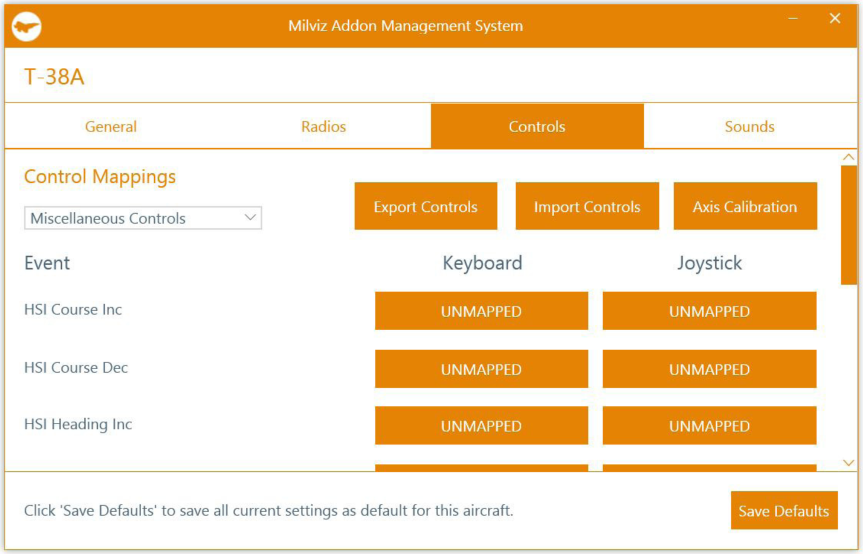
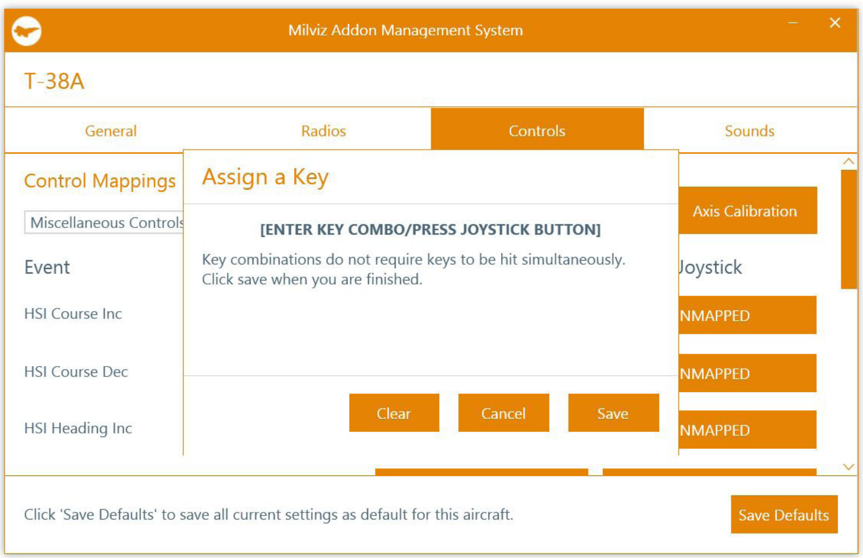
MVAMS Operation - Controls





In order to lighten the configuration burden on our pilots, we've allowed for a large amount of T-38A 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 two overall categories: Stick/Throttle 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.

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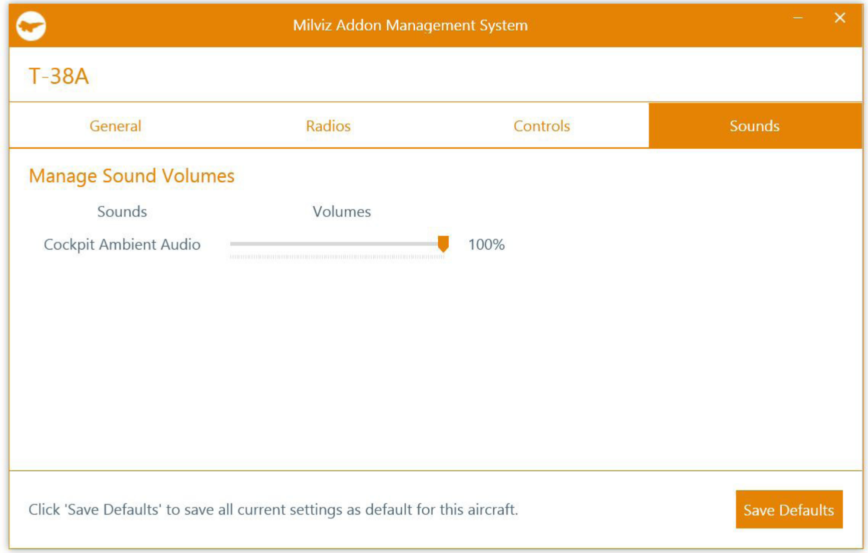
MVAMS Operation - Sounds

On the last MVAMS tab, the T-38A Talon allows for an adjustable ambient sound level in the cockpit in order to adjust 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.



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Failures Configuration & Operation

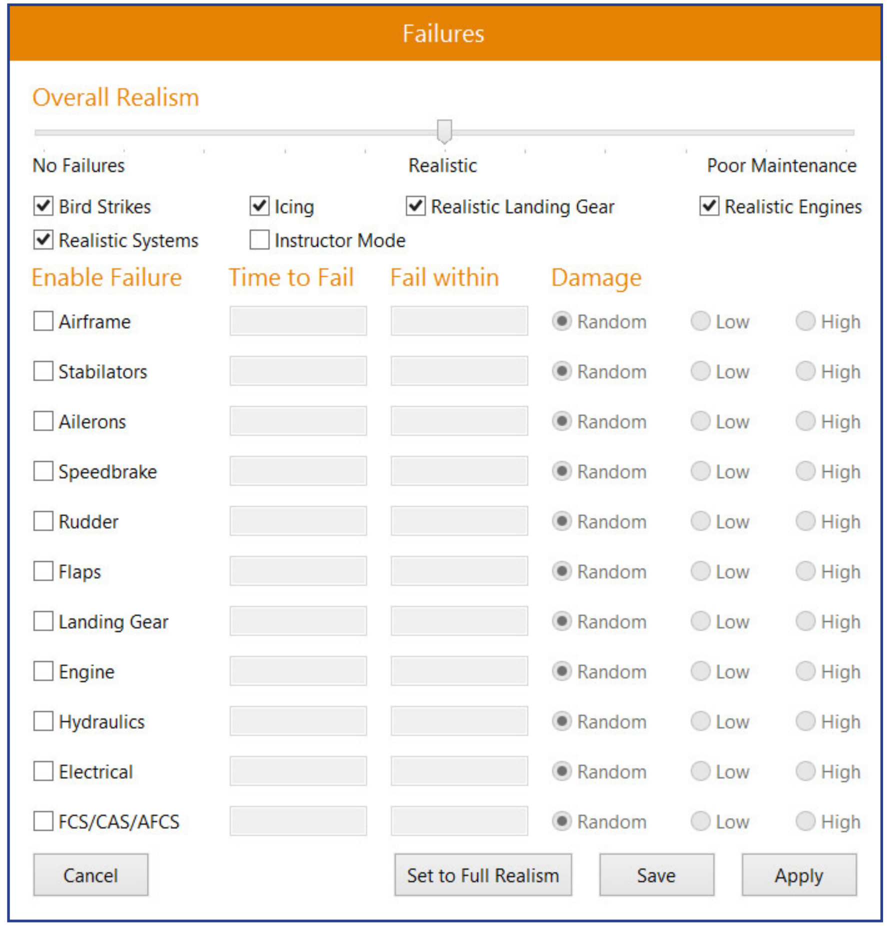
Overview

The MilViz T-38A Talon V2 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-38A 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-38A 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-38A 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 failures are fully configurable.



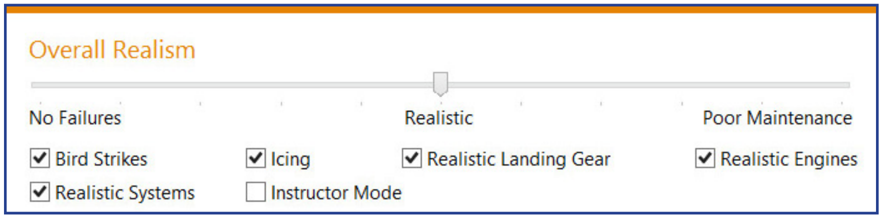
Accessing the Failures Panel

The Failures panel is where all interactive settings related to the failure modeling included in the MilViz T-38A are found. The panel is opened through the simulator's in-game menu system, with the menu item titled 'T-38A 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-38A. 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-38A 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 handing 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-J85-5A 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!

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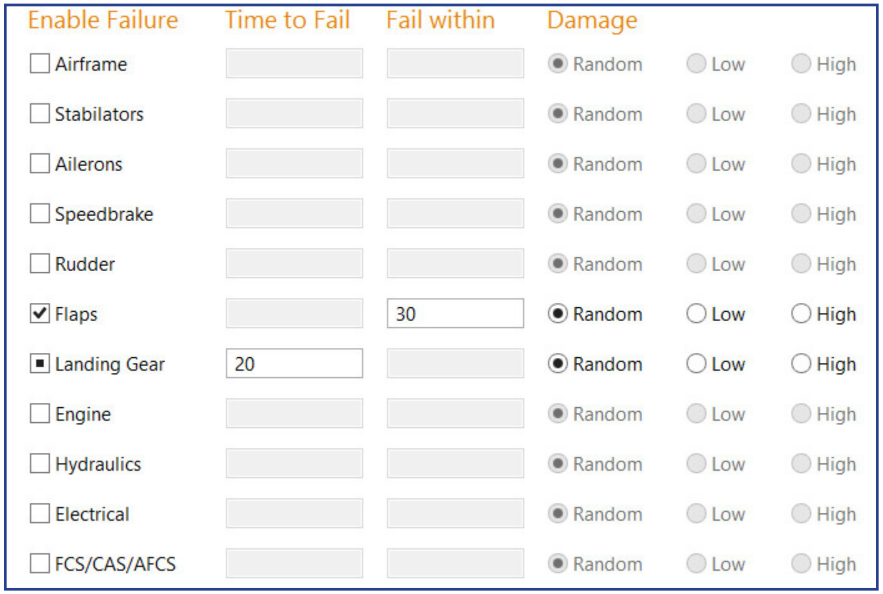
Timed System Failures



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.

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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

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

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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+2.

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-38A, one of the two air start methods (huffer or puffer) must be chosen. **This action is essential for starting the T-38A and is performed first.**

Add-ons Menu

Browsing the 'Add-ons' menu will reveal two menu options related to the T-38A: the 'T-38A ADV Configuration Menu' will display the screen related to enabling and adjusting the various failure modes available, while the 'Milviz T-38A' 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-38A 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-38A and are performed after the previous two steps.**

Reload Trim Slider Settings

This option allows for the ability to adjust the trim sliders in MVAMS, 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.

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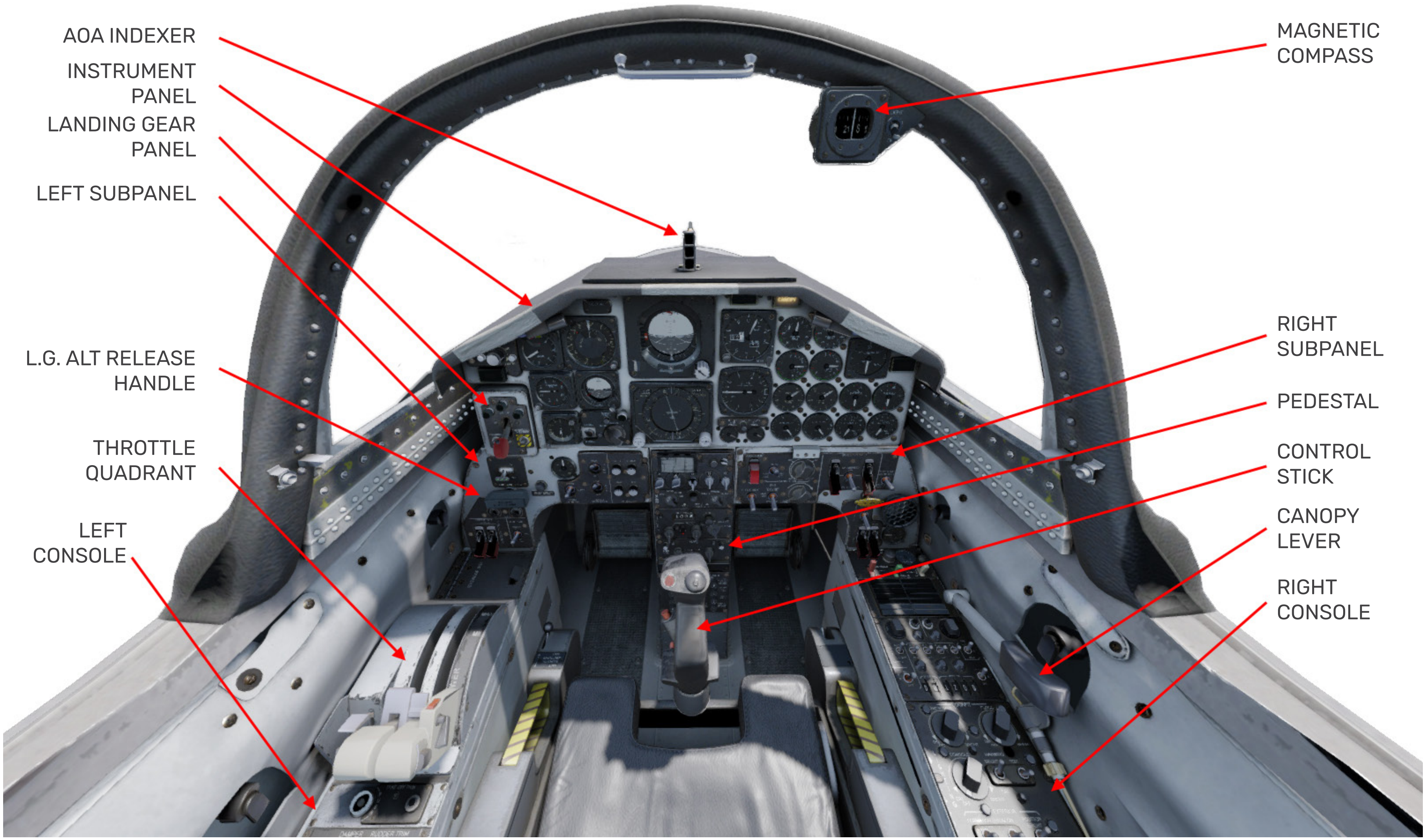
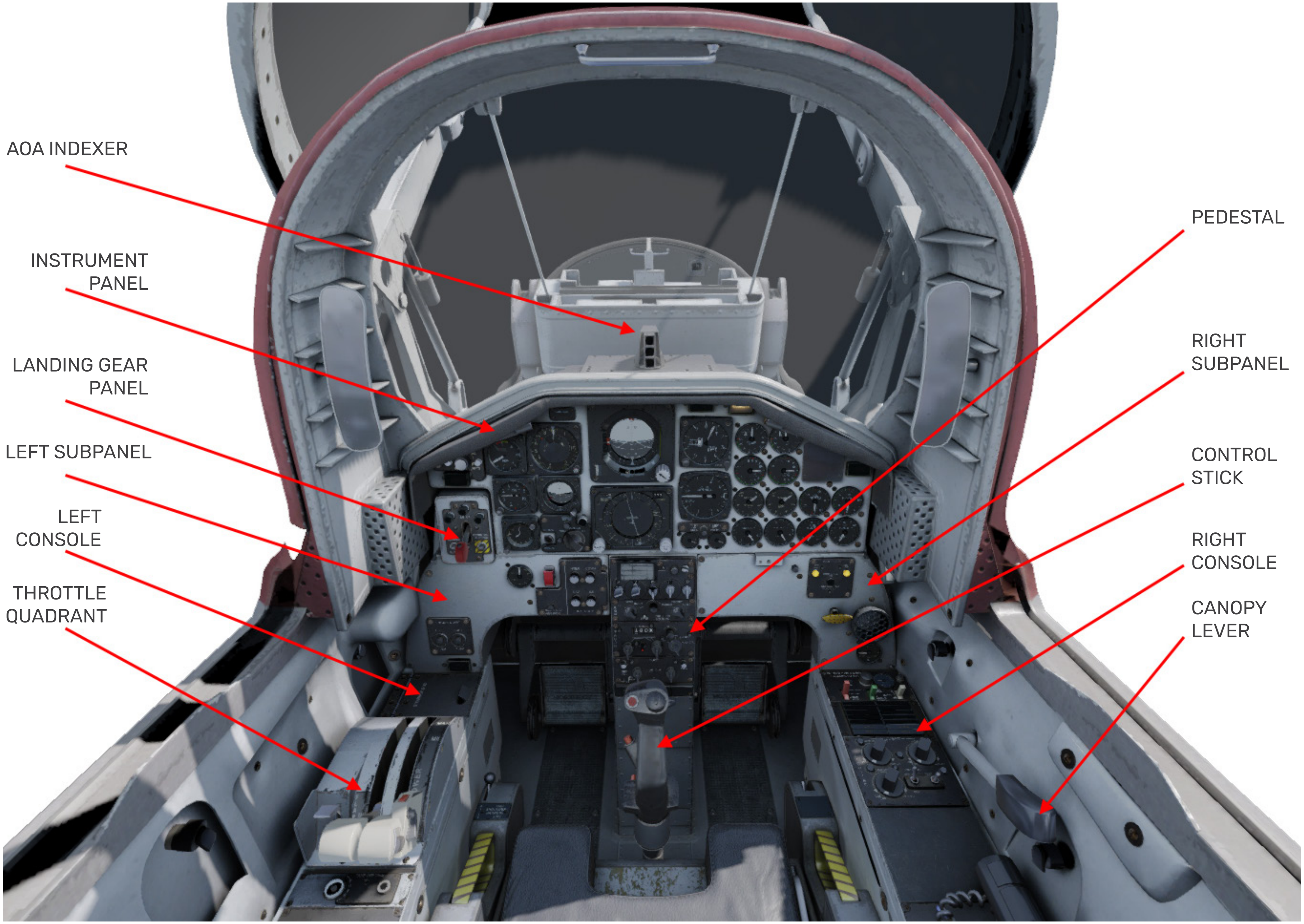
Cockpit Layout - Front Seat



Cockpit Layout - Rear



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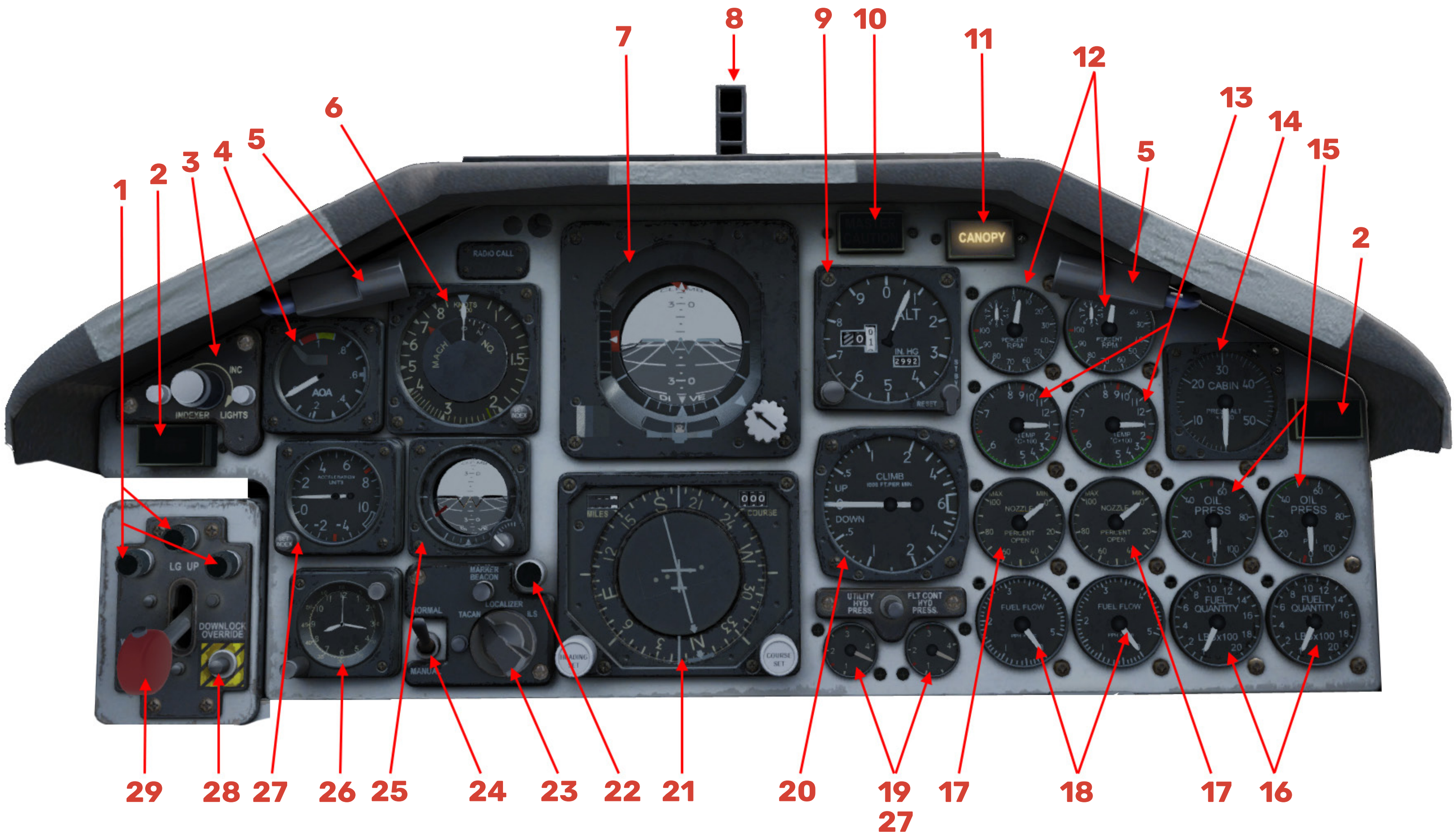
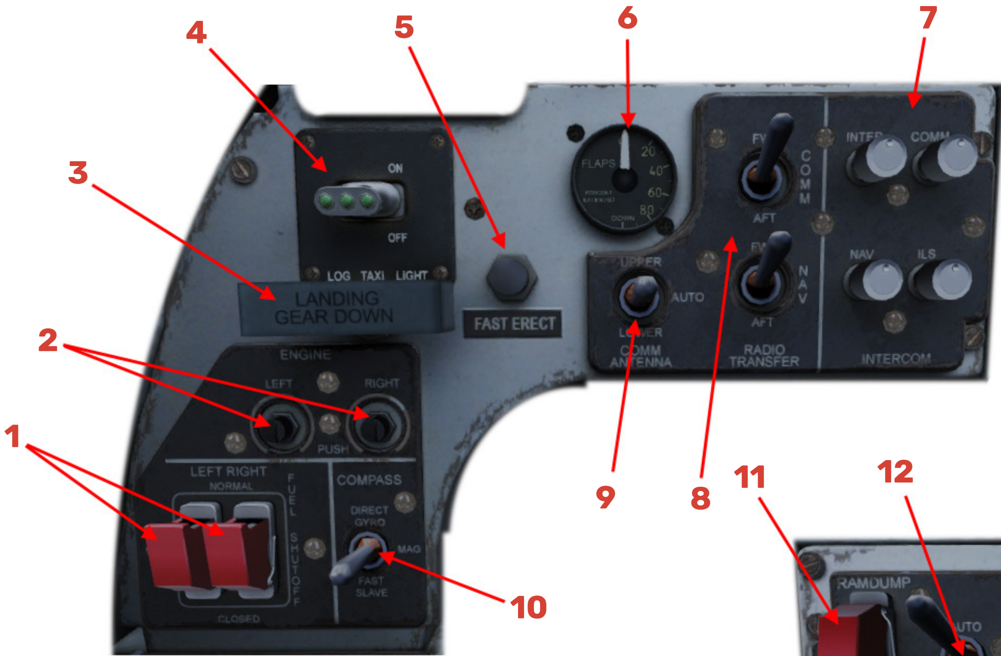
Cockpit Layout - Instrument Panel

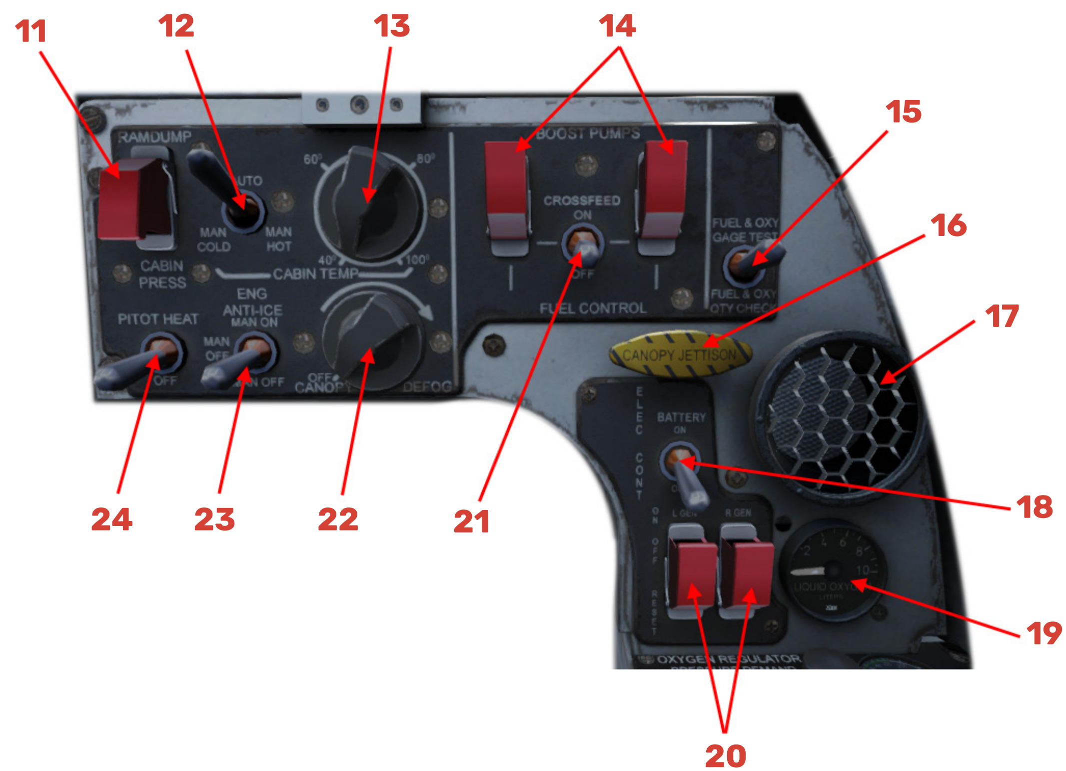


1. Landing Gear Position Indicator Lights
2. Engine Fire Warning Lights
3. AOA Indexer Dimmer
4. AOA Indicator
5. Floodlight
6. Airspeed / Mach Indicator
7. Attitude Director Indicator
8. AOA Indexer
9. Altimeter
10. Master Caution Light
11. Canopy Warning Light
12. Engine Tachometers
13. Exhaust Gas Temperature Indicators
14. Cabin Altimeter
15. Oil Pressure Indicators
16. Fuel Quantity Indicators
17. Nozzle Position Indicator
18. Fuel Flow Indicators
19. Hydraulic Pressure Indicators
20. Vertical Velocity Indicator
21. Horizontal Situation Indicator
22. Marker Beacon Light
23. Navigation Mode Switch
24. Steering Mode Switch
25. Standby Attitude Indicator
26. Clock
27. Accelerometer
28. Downlock Override Button
29. Landing Gear Lever

Cockpit Layout - Left & Right Subpanels



13. Cabin Temperature Control Knob
14. Boost Pump Switches
15. Fuel / Oxygen Check Switch
16. Canopy Jettison T-Handle
17. Cabin Air Inlet
18. Battery Switch
19. Oxygen Quantity Indicator
20. Generator Switches
21. Crossfeed Switch
22. Canopy Defog Knob
23. Engine Anti-Ice Switch
24. Pitot Heat Switch



1. Fuel Shutoff Switches
2. Engine Start Buttons
3. Landing Gear Alternate Release Handle
4. Landing-Taxi Light Switch
5. ADI Fast Erect Button
6. Flap Position Indicator
7. Intercom Switches and Volume Controls
8. Radio Transfer Switches
9. Comm Antenna Switch
10. Compass Switch
11. Cabin Pressure Switch
12. Cabin Air Temperature Switch

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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-38A 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 have been taught to student pilots. But overall, it should provide a very thorough and useful resource for those interested.

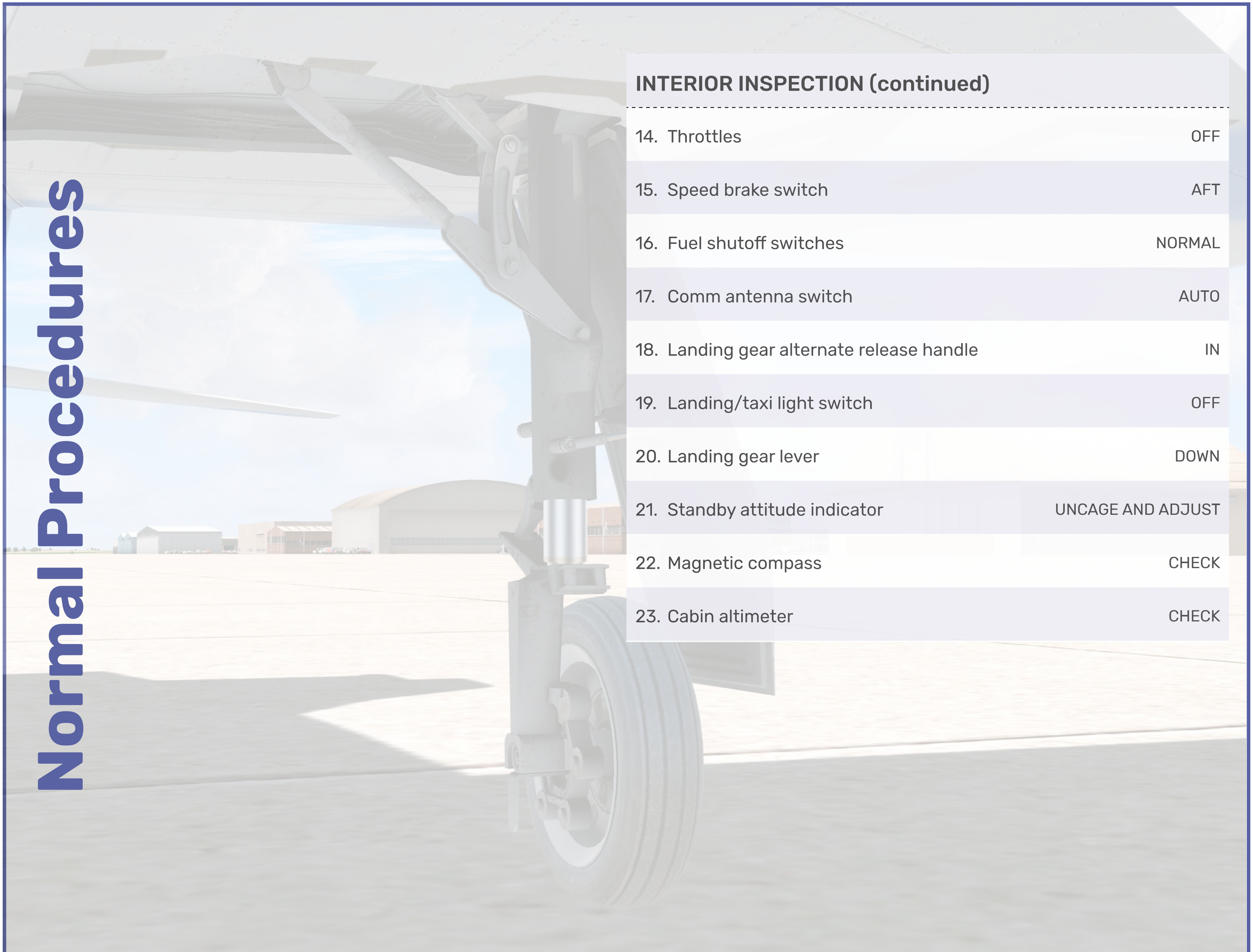
References to details obviously unavailable within the simulator, such as flight suits and helmets, have been left in for the sake of interest, and should not be taken literally. Unless you want to wear a flight suit while sitting at a computer. We won't judge, honest!

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 Control Panel	ON, SET AS REQUIRED
8. TACAN Control Panel	ON, SET AS REQUIRED
9. NAV Control Panel	SET AS REQUIRED
10. Circuit breakers	CHECK
11. LG DOORS switch	NORM
12. AUX FLAP switch	NORM
13. Rudder trim knob	CENTERED

Normal Procedures



INTERIOR INSPECTION (continued)

14. Throttles	OFF
15. Speed brake switch	AFT
16. Fuel shutoff switches	NORMAL
17. Comm antenna switch	AUTO
18. Landing gear alternate release handle	IN
19. Landing/taxi light switch	OFF
20. Landing gear lever	DOWN
21. Standby attitude indicator	UNCAGE AND ADJUST
22. Magnetic compass	CHECK
23. Cabin altimeter	CHECK

INTERIOR INSPECTION (continued)

24. Fuel boost pump switches	ON
25. Crossfeed switch	OFF
26. OXY/FUEL check switch	QTY CHECK
27. Generator switches	ON
28. Cabin pressure switch	CABIN PRESS
29. Cabin temperature switch	AUTO
30. PITOT HEAT	OFF
31. Engine anti-ice switch	OFF
32. Interior lights	AS REQUIRED
33. FORMATION lights	AS REQUIRED
34. Anti-collision BEACON	ON
35. POSITION lights	AS REQUIRED

(Interior Inspection checklist complete)

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-38A' menu. This replicates the ground crew operating the air compressor.

RIGHT ENGINE

1.	Danger areas	CLEAR
2.	External air (External air is appleid via ground crew, through the 'Engine 1/2 Starter Selection' option from the 'Add-ons/Milviz T-38A' menu.	APPLY
3.	Engine start button	PRESS (12% RPM MIN)
4.	Throttle	ADVANCE TO IDLE
5.	Engine indicators	CHECK
6.	Hydraulic pressure	CHECK
7.	Caution light panel	CHECK

LEFT ENGINE

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

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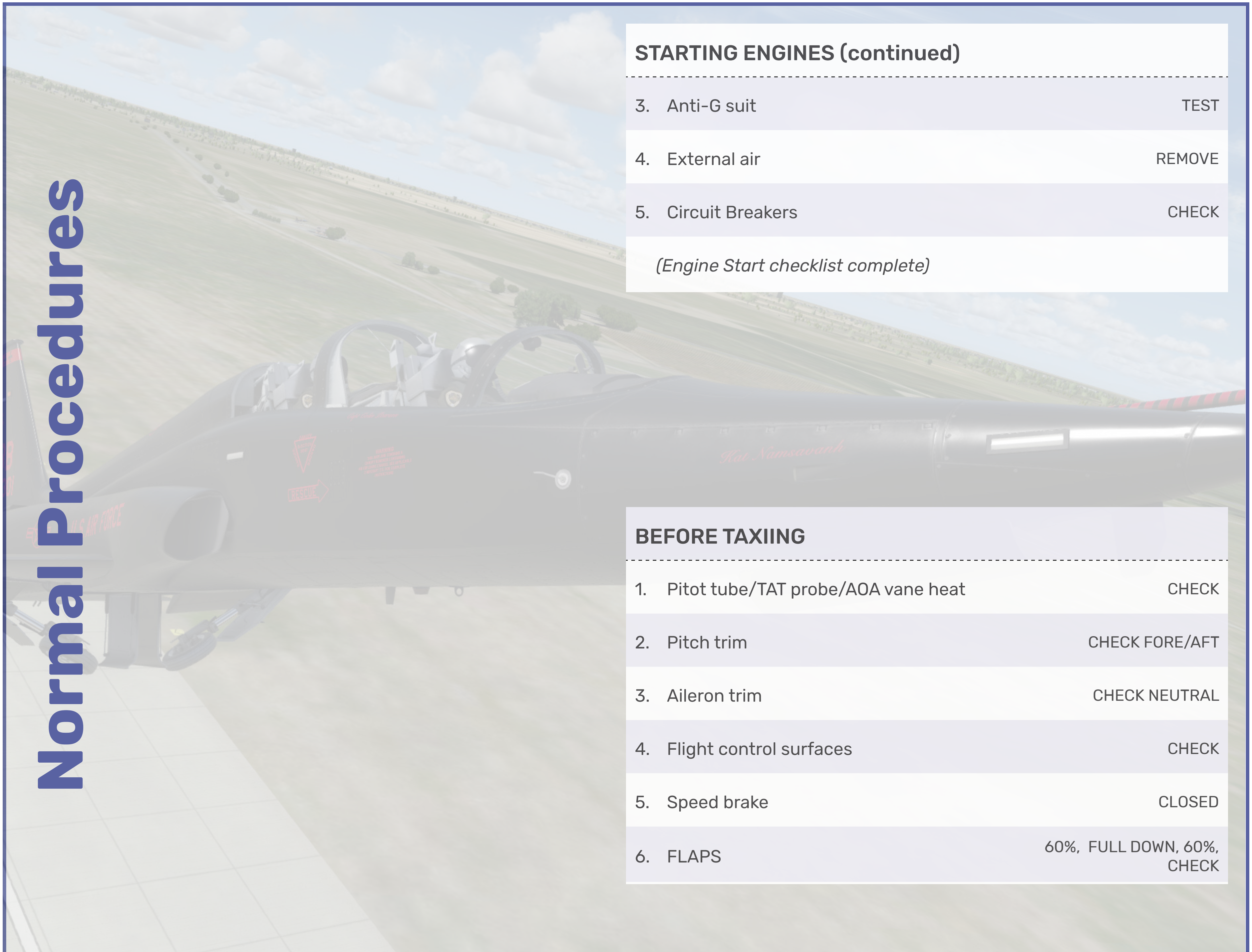
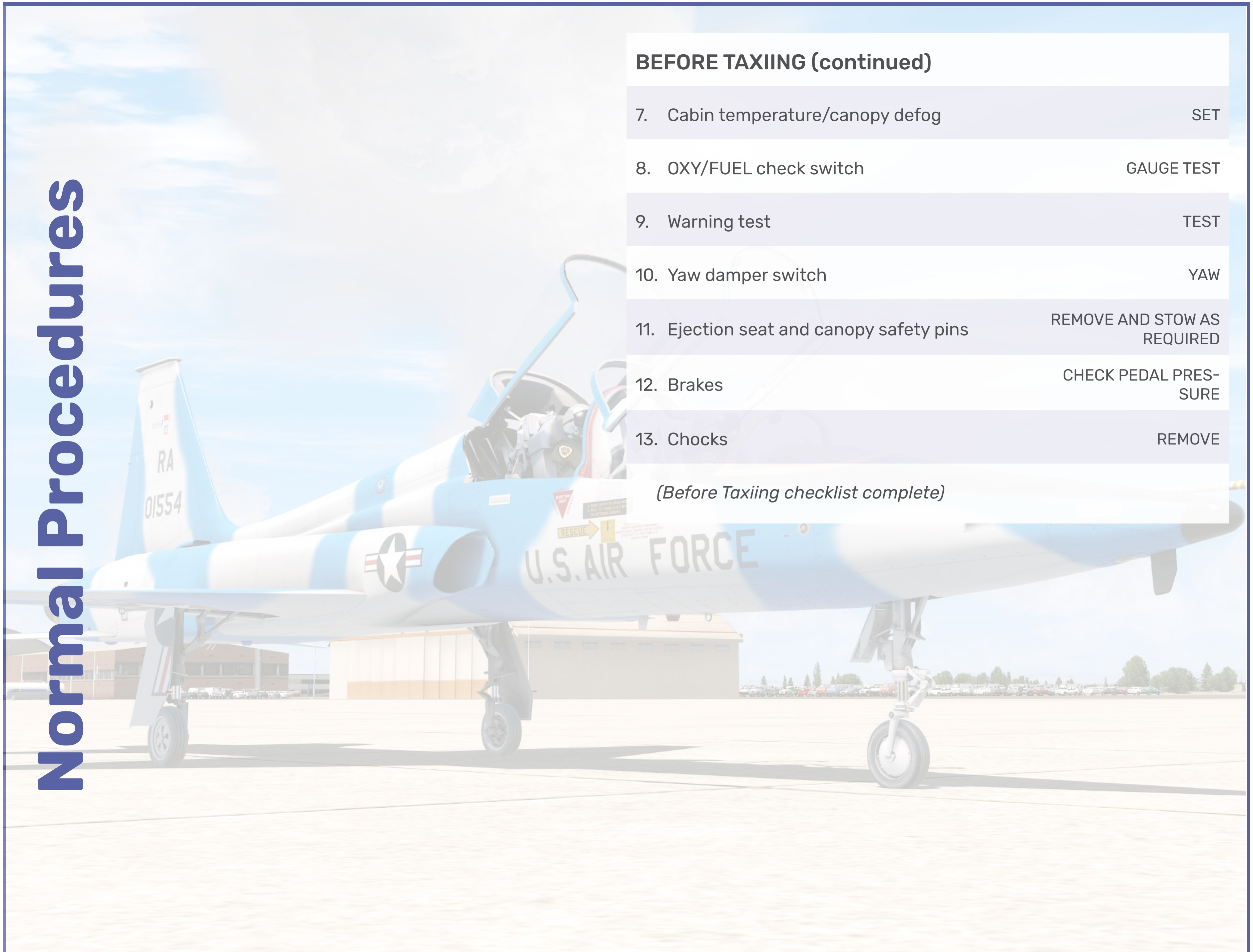


STARTING ENGINES (continued)

3.	Anti-G suit	TEST
4.	External air	REMOVE
5.	Circuit Breakers	CHECK
	(Engine Start checklist complete)	

BEFORE TAXIING

1.	Pitot tube/TAT probe/AOA vane heat	CHECK
2.	Pitch trim	CHECK FORE/AFT
3.	Aileron trim	CHECK NEUTRAL
4.	Flight control surfaces	CHECK
5.	Speed brake	CLOSED
6.	FLAPS	60%, FULL DOWN, 60%, CHECK



BEFORE TAXIING (continued)

7.	Cabin temperature/canopy defog	SET
8.	OXY/FUEL check switch	GAUGE TEST
9.	Warning test	TEST
10.	Yaw damper switch	YAW
11.	Ejection seat and canopy safety pins	REMOVE AND STOW AS REQUIRED
12.	Brakes	CHECK PEDAL PRES-SURE
13.	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) 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.

Normal Procedures

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.
   - Heading System. Ensure the horizontal situation indicator (HSI) 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 the altimeter at a known elevation point is 75 feet.
7. TACAN/VOR/DME Checks — AS FOLLOWS
   - Tune and identify appropriate TACAN, VOR, and DME channels.
   - 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 appropiately.)
   - 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.

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TAXIING / BEFORE TAKEOFF (continued)

8. Takeoff trim button	PRESS
9. POSITION/Landing/taxi lights	AS REQUIRED
10. Canopy	CLOSE, LOCK (CONFIRM WARNING LIGHT OUT)
11. Ejection seat safety pins	CONFIRM REMOVED AND STOWED
12. Canopy safety pins	CONFIRM REMOVED AND STOWED
13. SAFE/ARMED lever	ARMED
14. (RCP) ISS mode selector	BOTH OR CMD FWD (AS REQUIRED)
15. 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)

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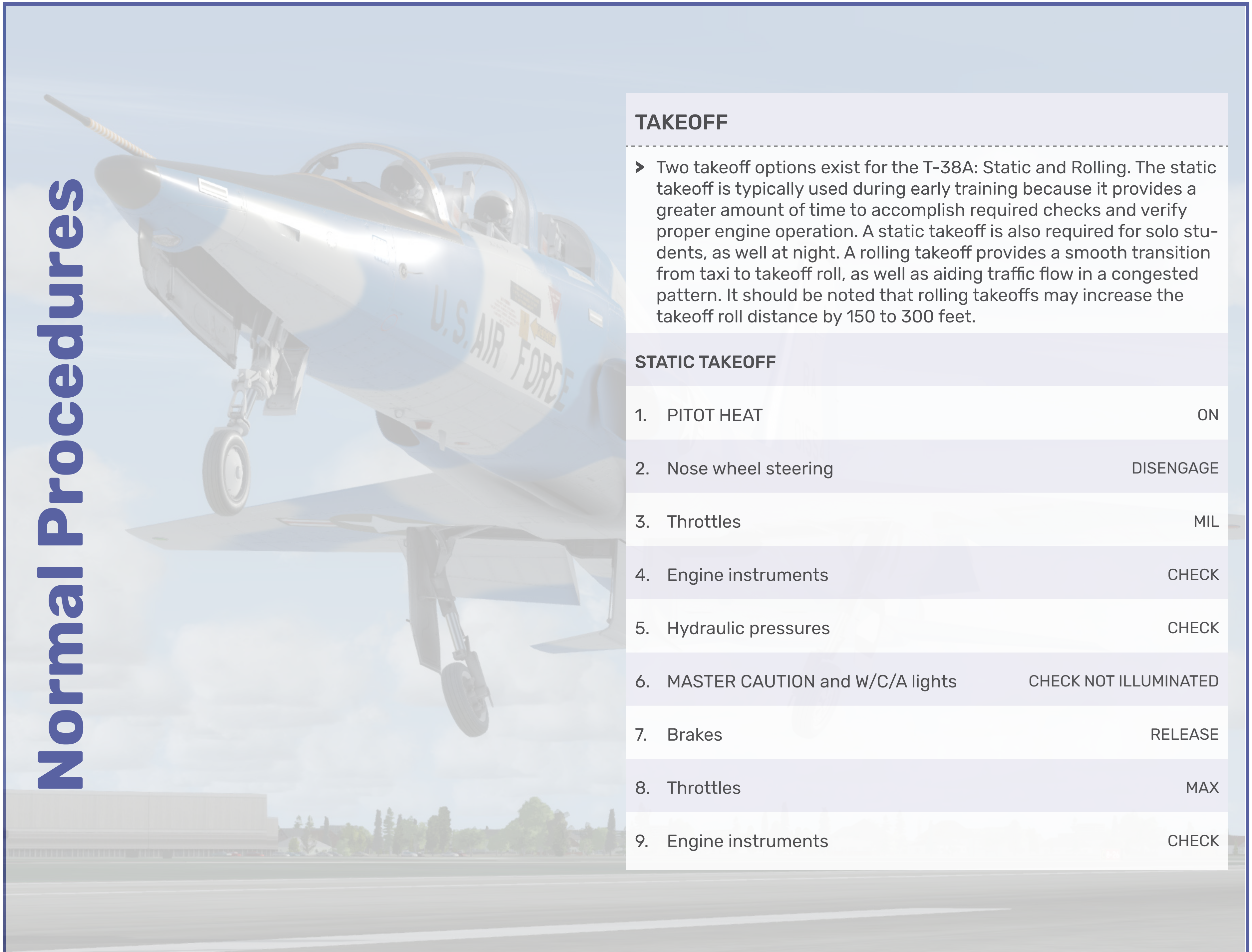

TAKEOFF

- Two takeoff options exist for the T-38A: 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.	Engine instruments	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

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, disengage 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)

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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)

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DESCENT

1.	Heading and attitude system	CHECK
2.	Altimeter	CHECK AND SET
3.	Fuel quantity/balance	CHECK
4.	CROSSFEED switch	OFF
5.	CANOPY DEFOG and CABIN TEMP	AS REQUIRED
6.	PITOT HEAT	ON
7.	ENGINE ANTI-ICE	AS REQUIRED
8.	LDG TAXI LIGHT	ON
9.	Master mode	SELECT (AS REQUIRED)

(Descent checklist complete)

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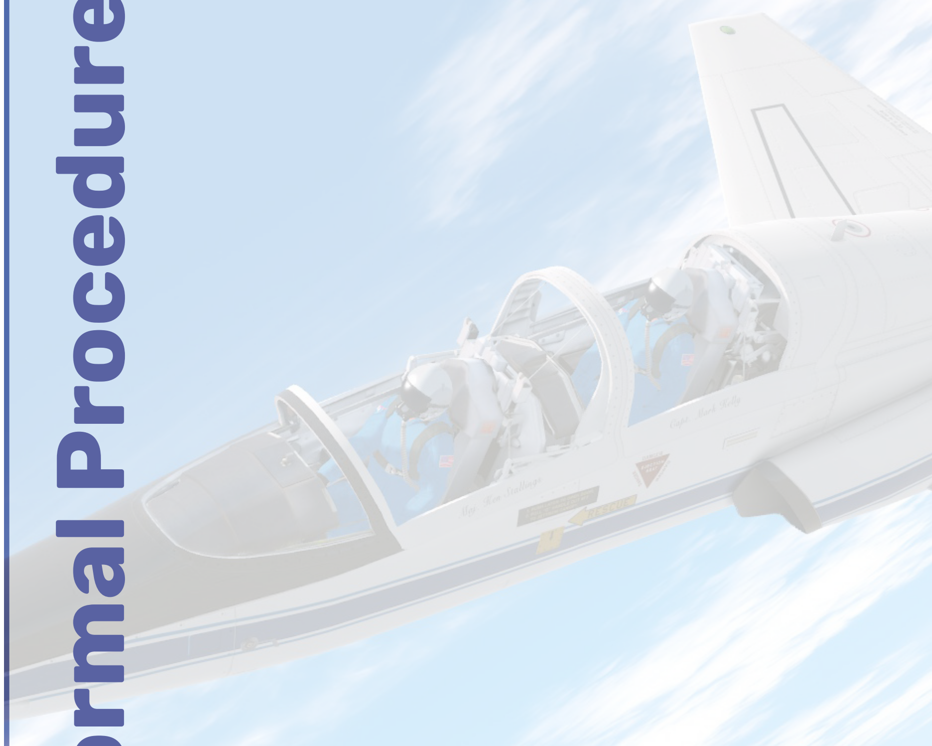

ENTERING PATTERN / BEFORE LANDING

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.

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.
- 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.

Normal Procedures

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.

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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.

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.

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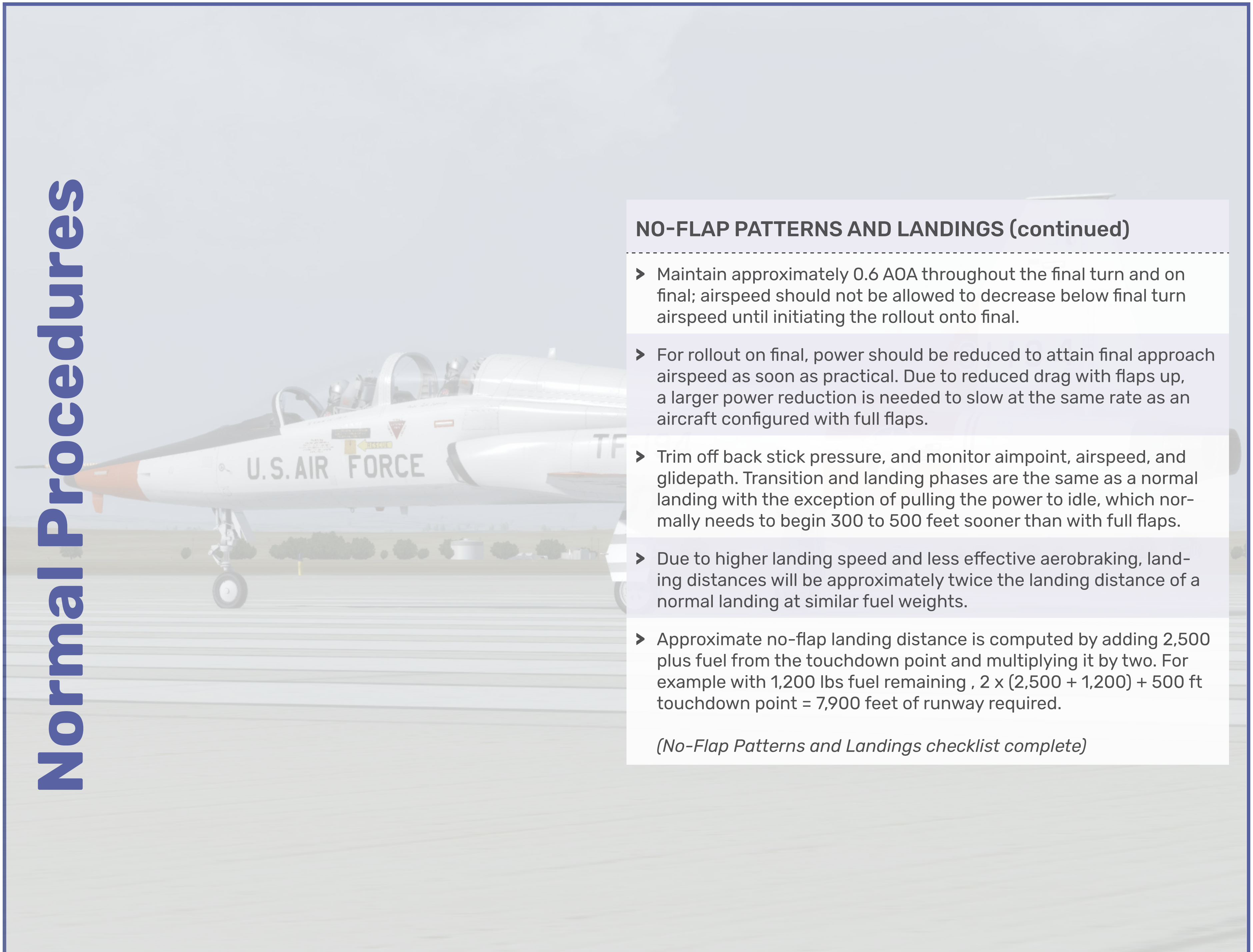
CROSSWIND LANDINGS (continued)

- 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 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.



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)

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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)

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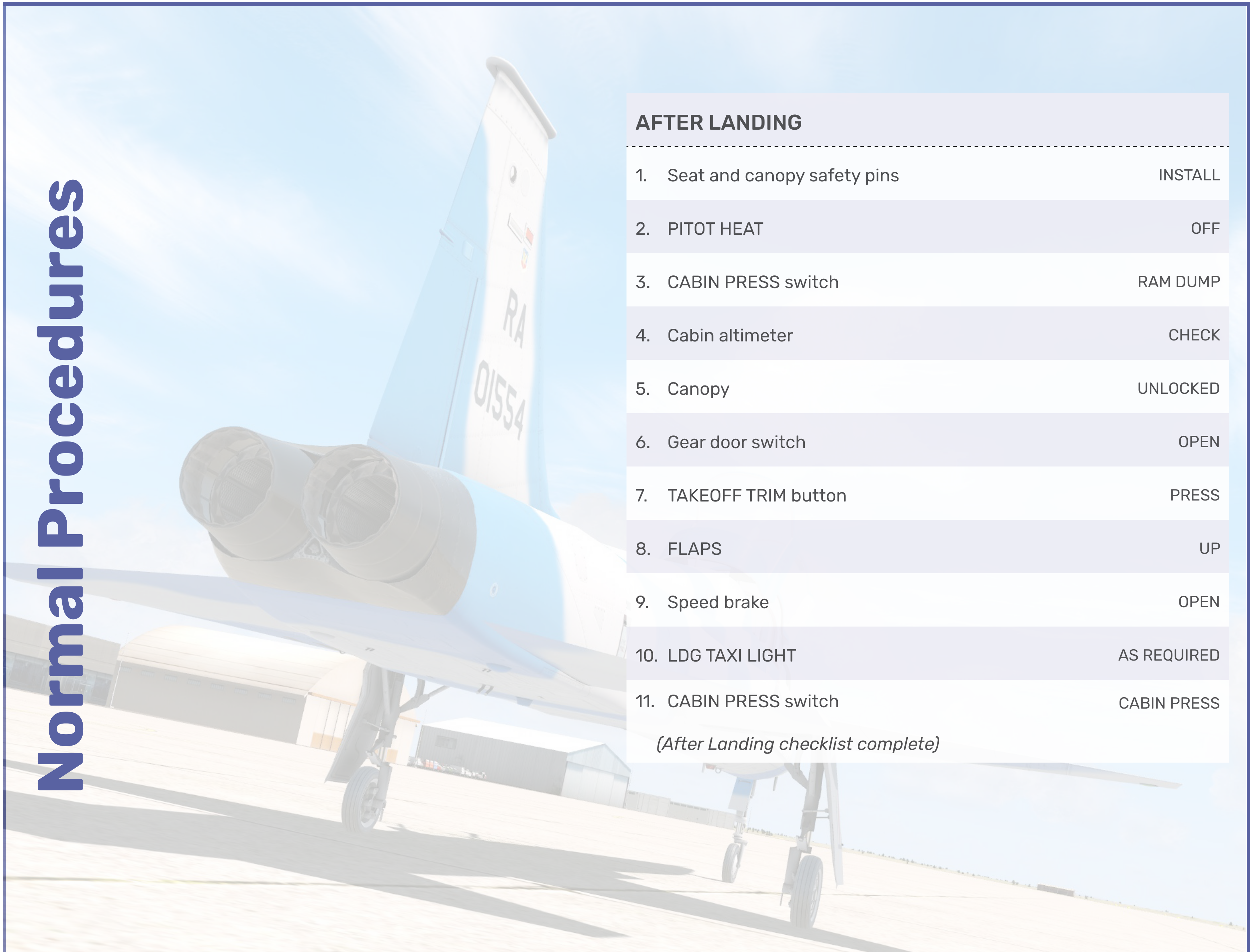

AFTER LANDING

1.	Seat and canopy safety pins	INSTALL
2.	PITOT HEAT	OFF
3.	CABIN PRESS switch	RAM DUMP
4.	Cabin altimeter	CHECK
5.	Canopy	UNLOCKED
6.	Gear door switch	OPEN
7.	TAKEOFF TRIM button	PRESS
8.	FLAPS	UP
9.	Speed brake	OPEN
10.	LDG TAXI LIGHT	AS REQUIRED
11.	CABIN PRESS switch	CABIN PRESS

(After Landing checklist complete)

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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.	Wheels	CHOCKED
8.	Throttle gate	DISENGAGE
9.	Throttles	OFF
10.	Anti-collision BEACON	OFF
11.	UHF	OFF
12.	TACAN	OFF
13.	BATTERY switch	OFF

(Engine Shutdown checklist complete)

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Glossary

A

A/A	Air To Air
A/C	Aircraft
A/G	Air To Ground
ABV	Above
AC	Alternating Current
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
AOA	Angle of Attack
AP	Approach
APP	Approach
APT	Airport
ATC	Air Traffic Control
ATT	Attenuation
ATT	Attitude
AUT	Auto

B

BARO	Barometric
BC	Back Course
BGO	Bingo
BIA	Baro-Inertial Altitude
BLNK	Blank
BLW	Below
BRG	Bearing
BRT	Bright
BSL	Below Sea Level
Bullseye	Any defined destination or ICAO point
BWRD	Backward

C

C	Centigrade
CA	Course to Altitude
CAL	Coarse Alignment
CAS	Calibrated Air Speed
CDI	Course Deviation Indicator
CG	Center of Gravity
CH	Channel
CHAN	Channel
CLK	Clock
CLM	Climb Airspeed
CLR	Clear
CMB	Combination
COM	Communication
COMM	Communication
CRS	Course
CRZ	Cruise Airspeed

D

DC	Direct Current
DEST	Destination
DG	Directional Gyro
DH	Decision Height
DME	Distance Measuring Equipment
DRF	Drift Free
DST	Destination

E

ADI	Attitude Director Indicator
EGT	Exhaust Gas Temperature
ELV	Elevation
EMER	Emergency
EO	Emergency Oxygen Handle

F

FAF	Final Approach Fix
FF	Fuel Flow
FL	Flight Level
FLT	Flight
FNL	Final
FOM	Figure Of Merit
fpm	feet per minute
FQ	Fuel Quantity
FRQ	Frequency

Ft	Feet
FWD	Forward
G	
G/S	Glideslope
GC	Gyro Compass
GEO	Geographic
GMT	Greenwich Mean Time
GPS	Global Positioning System
GRD	Guard
GS	Ground Speed
H	
HDG	Heading
HOTAS	Hands On Throttle And Stick
HSI	Horizontal Situation Indicator
I	
IAF	Initial Approach Fix
I/C	Intercom
ICAO	International Civil Aviation Organization
ICP	Illumination Control Panel
ID	Identification
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMN	Indicated Mach Number
INSTR	Instrument
INWRD	Inward
K	
KHz	Kilohertz
KIAS	Knots Indicated Airspeed
Kt	Knots
L	
LAT	Latitude
LED	Light Emitting Diode
LOB	Left Out Board
LOC	Localizer
LON	Longitude
LONG	Longitude
LOS	Line Of Sight
LVL	Level
LWT	Left Wing Tip
M	
MACS	Minimum Acceleration Check Speed
MAG	Magnetic
MAINT	Maintenance
MALF	Malfunction
MAN	Manual
MAP	Missed Approach Point
Max	Maximum
MDA	Minimum Descent Altitude
MGRS	Military Grid Reference System
MH	Manual Heading
MHP	Missed Approach Heading Point
MHz	Megahertz
MIC	Microphone
Min	Minimum
MINIMA	Minimum Altitude
MM	Min Mach Airspeed
MMS	Master Mode Switch
MOR	Manual Override Handle
mr	Milliradian
mrad	Milliradian
ms	Millisecond
msec	Millisecond
MSL	Mean Sea Level
N	
NACS	Normal Acceleration Check Speed
NARPT	Nearest Airports
NAV	Navigation
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
O	
OAT	Outside Air Temperature

P

PFR	Primary Flight Reference
PP	Present Position
PPH	Pounds Per Hour
PSI	Pounds per Square Inch
PSU	Power Supply Unit
PTT	Push-To-Talk
PU	Position Update

Q

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

R

RAD	Radial
RALT	Radar Altimeter
RB	Relative Bearing
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
R/T	Receiver Transmitter
RWT	Right Wing Tip
RWY	Runway

S

SBY	Standby
SC	Selected Course
Sec	Second/Seconds
SH	Stored Heading
SPD	Speed
SQ	Squelch
STAT	Status
STBY	Standby

T

TA	Traffic Advisory
TACAN	Tactical Air Control And Navigation
TAS	True Air Speed
TAT	Total Air Temperature
TBD	To Be Determined
TEMP	Temperature
TO	Technical Order
TOA	Time Of Arrival
TOD	Time Of Day
TOT	Time On Target
TR	Transmit and Receive
T/R	Transmitter/Receiver
TST	Test
TTG	Time To Go
TTT	Time To Target

U

UHF	Ultra High Frequency
UTM	Universal Transverse Mercator

V

VAC	Volts, Alternating Current
VDC	Volts, Direct Current
VFR	Visual Flight Rules
VHF	Very High Frequency
VID	VOR/ILS/DME
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Range
VVI	Vertical Velocity Indicator

W

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

Y

YSAS	Yaw Stability Augmentor System

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Modeling & Textures	**Dmi Usatyi - 3DReach**
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