BLACKBIRD SIMULATIONS

T-6A ADV

USER GUIDE

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INTRODUCTION

Welcome to the ranks of T-6A ADV pilots. This Guide has been prepared to help you get started with your new T-6A ADV.

It contains useful information about the T-6A ADV's equipment, operating procedures, and performance - it also contains instructions for installation and updating. We recommend that you take some time to read through this guide from cover to cover, and to refer to it as needed.

Our interest in your flying pleasure has not ceased with your purchase of the T-6A ADV. Worldwide, the Blackbird Sims staff stands ready to assist and serve. For technical support, please post a request on our T-6A ADV support forum. Our dedicated and talented staff are ready to help you. For forum access, please email support@ blackbirdsims.com with your proof of purchase and your preferred (or existing) forum username.

This User Guide is split into several sections: The second section deals with installation and configuration of the T-6A ADV, while the third section provides an overview of the operation of the aircraft within the simulator. The fourth section covers the normal procedures of the aircraft. The fifth section details emergency procedures. The sixth limitations. Section seven - flight characteristics. Section eight contains performance charts, and nine is the glossary.

Frequently Asked Questions (FAQ), and information on hardware assignments is also included.

To navigate this manual, helpful features have been included. In the index, all section titles are live bookmarks that will jump to the appropriate page with a single click. In your PDF viewer, you are also able to browse the sections by use of the bookmarks panel.

NOTE:
THIS GUIDE IS NOT TO BE USED FOR REAL-WORLD AVIATION OR TRAINING.

FEATURES

FAILURES/DAMAGE MODEL:

- **Custom failures model affecting:**
  - Airframe
  - Engine
    - PLC effects on ITT (thermal model)
    - Overtorque effects on engine damage
    - ITT overtemp effects on engine damage
    - Engine compressor stall model
  - Landing gear
  - Hydraulic/Electric Systems
  - Flight Controls (control surfaces, TAD, etc.)

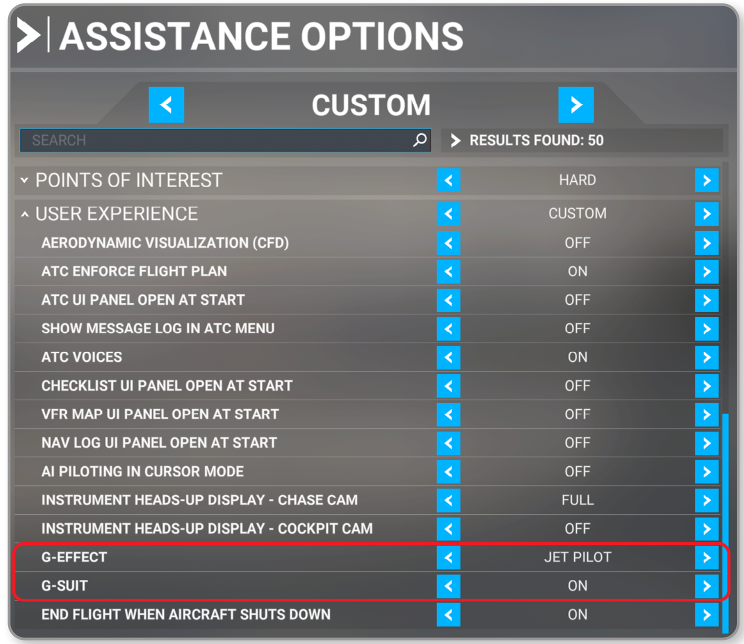
- **Forced and random failures system**

  Possibility to create time dependent events or randomly created failures on different systems with scalability in damage. In case of random failures selection, the probabilities can be adjusted to realistic values based on actual T-6A fleet maintenance data.

- **Operating limitations damage**
  - Exceeding real aircraft operating limitations will cause damage depending on the system affected: IE: flaps jamming, tires blowout, etc.
    - Flaps & Landing gear overspeed damage models

- **Bird strikes**

  Based on real data for military aircraft, bird strikes could happen if flying at low altitudes. Damage severity and systems affected are based on a probabilistic system.



- **Recommended simulator settings (G-Effects)**

  The recommended settings (realistic) would be G-suit + civil pilot for cadet and G-suit + jet pilot for IP's G-resistance level. In this last case, getting a blackout is very unlikely to happen, as in the real world.

VERY IMPORTANT!

You must disable CRASH DAMAGE in the MSFS > OPTIONS > ASSISTANCE OPTIONS > FAILURE AND DAMAGE.

(STRESS DAMAGE engine/aircraft settings will have no effect as the are overridden by tablet settings)

Note:

The MSFS Assistance Options > INSTRUMENT HEADS-UP DISPLAYS presently give spurious readings for trim and flap angle.

SYSTEM REQUIREMENTS

The following requirements apply as a minimum to successfully install, configure, and operate the Blackbird T-6A ADV.

(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:

- Microsoft Flight Simulator

(Note: Our product is tested with, and designed to operate in, the most recent updates to the simulator; this includes all hotfixes available at date of release.)

Supported Operating Systems:

- Windows 10
- Windows 11

Processor (CPU):

- 3.0 GHz quad core processor required (higher core counts and clock speeds strongly recommended.)

Video Card (GPU):

- DirectX 11 compliant video card with a minimum of 6 GB video ram. (11GB VR)

System Memory (RAM):

- 16 GB RAM minimum (32 GB or greater recommended for Virtual Reality (VR).)

Storage:

- 4.5 GB or greater free disk 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 Blackbird products require a minimum of one functioning gaming device such as a joystick for proper operation and control.)

INSTALLATION INSTRUCTIONS

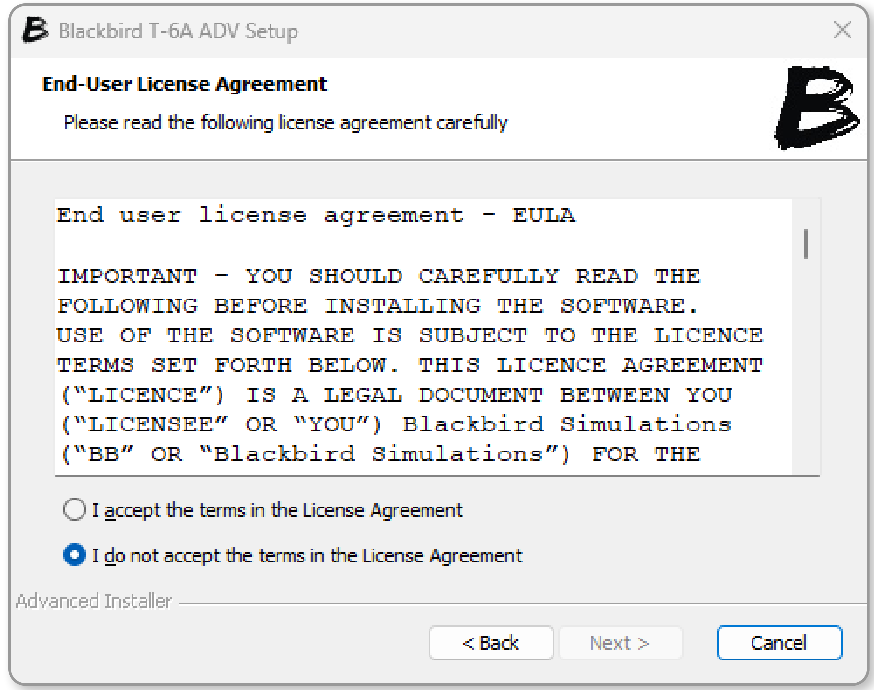
Important Information

As with other flight simulator add-ons, preinstallation 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 nonfunctioning product and/or simulator!!!

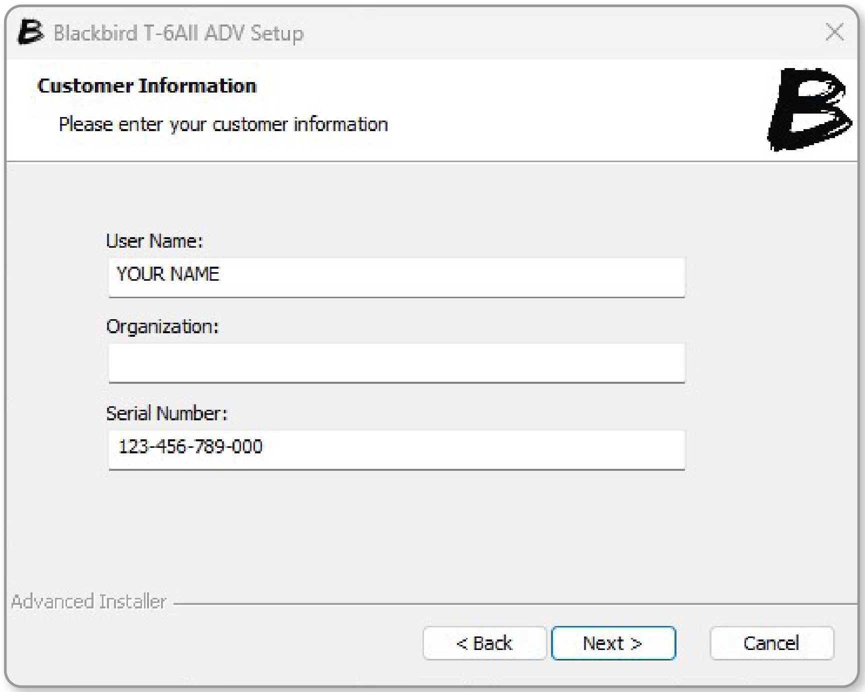
Note: *Version numbers shown in any following images may differ from the downloaded product.*

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 Blackbird T-6A ADV. 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.

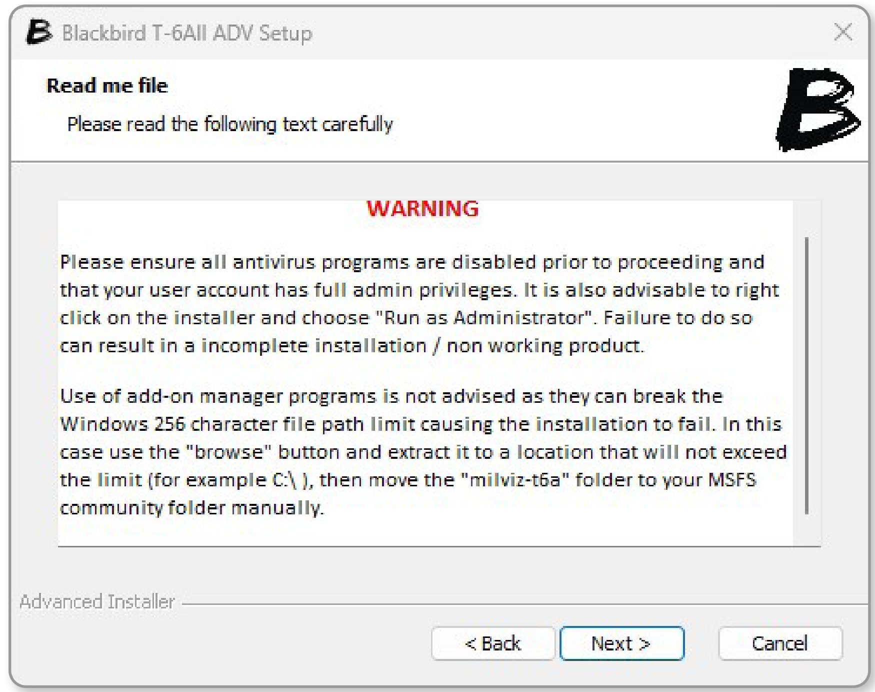
This screen will allow you to view the End User License Agreement (EULA). Please take the time to review the included details. Clicking "I Agree" at this screen will confirm your acceptance of the license agreement and will allow you to proceed to the next step of the installation.



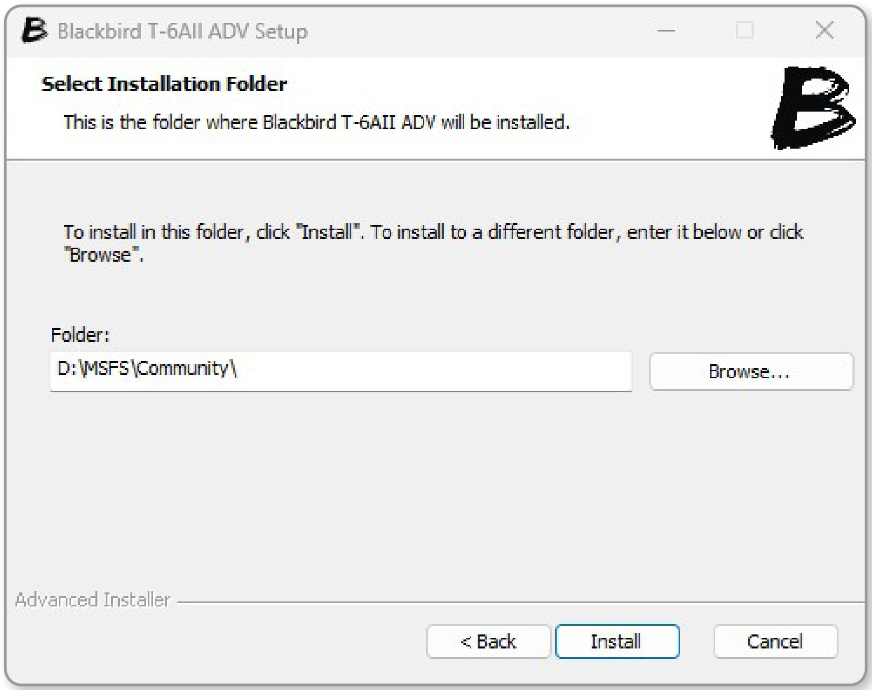
You will then come to the Customer Information window. Fill in the fields and enter the 12-digit activation key that was included in the purchase confirmation documentation. Click Next.



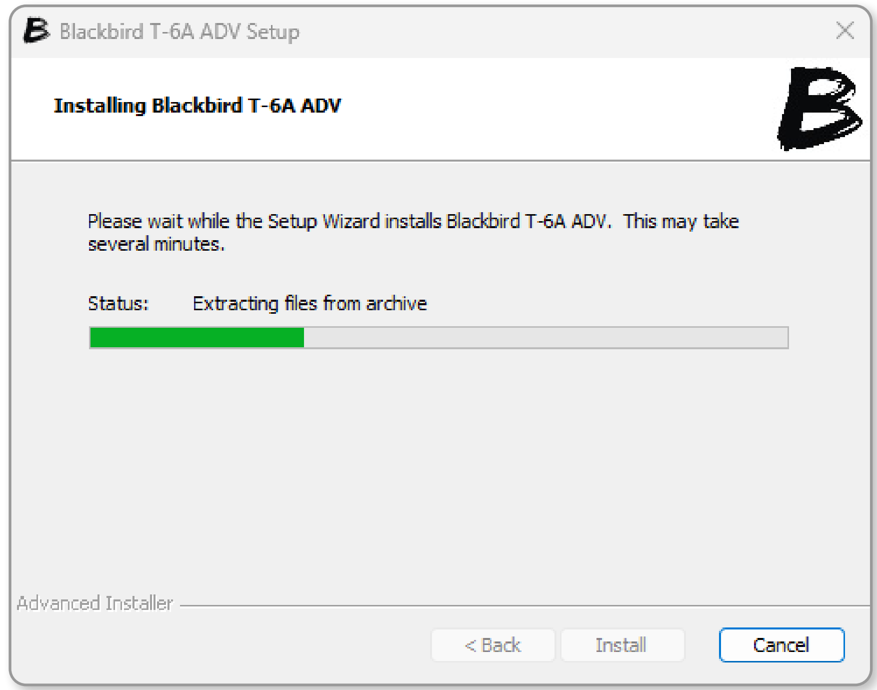
For an error-free install, please take a moment to read through the important information shown on this 'Read me' screen. Click Next.



The installer is designed to automatically locate the MSFS "community" folder on your system. If your simulator cannot be automatically located (typically due to re-installing MSFS to another location/ drive), or if you have a custom installation path, "browse" to the correct location. Please verify the correct path to your "community" folder before clicking the "Install" button.



The installer will extract the files to your chosen location, after it completes click finish.



POST INSTALLATION TASKS

- Be sure to turn your antivirus program back to its previous state. Also, ensure that your MSFS directory is off-limits to any automatic antivirus scanning. Failure to do this may result in a nonfunctioning simulator!
- It may be worthwhile to backup or save a copy of your downloaded installer. It's worth noting that as new updates are released, we do not continue to offer older versions for download.

UPDATING YOUR AIRCRAFT

To update the Blackbird T-6A ADV:

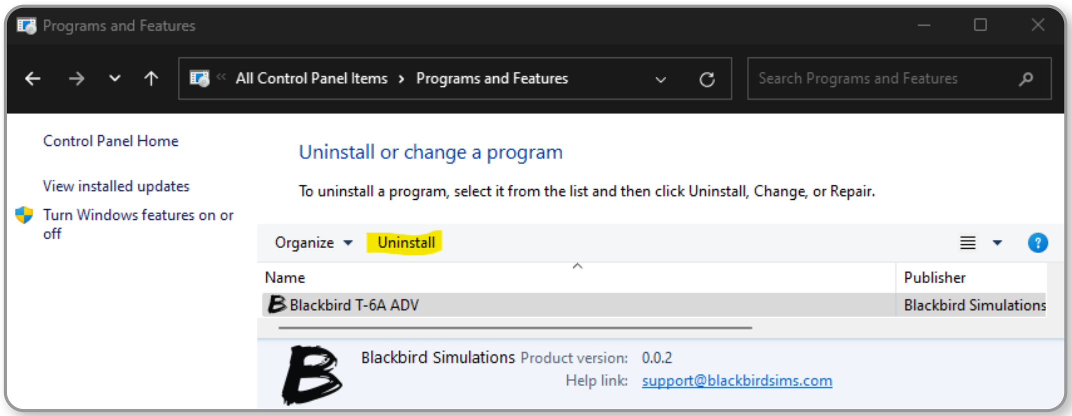
- Back up any custom liveries and files
- Uninstall using Windows programs and features.
- Install the updated version.
- Replace custom files.

UNINSTALLING

It is not recommended to manually delete folders or files from your MSFS “community” folder.

The Blackbird T-6A ADV may be uninstalled using Windows Control Panel “Programs and Features”.

Note: Prior to uninstalling the aircraft, please be sure to back up any customized files, flight plans, or custom liveries you have installed. Once the uninstall is complete, it is safe to delete the milviz-T6AII-ADV folder from your MSFS “community” folder.



MICROSOFT UPDATES

From time to time, Microsoft will update the MSFS platform, which has the potential to break our custom code and cause issues with our T-6A ADV simulation. Blackbird Simulations will always make its best endeavors to ensure a revised build is available as soon as possible following the release of sim updates; however, it’s not always possible to do this in a timely manner.

We thank you for your patience in these circumstances.

IN-GAME EFB

The tablet's function is to provide in-game configuration options for our custom ADV system via its 3 main tabs.

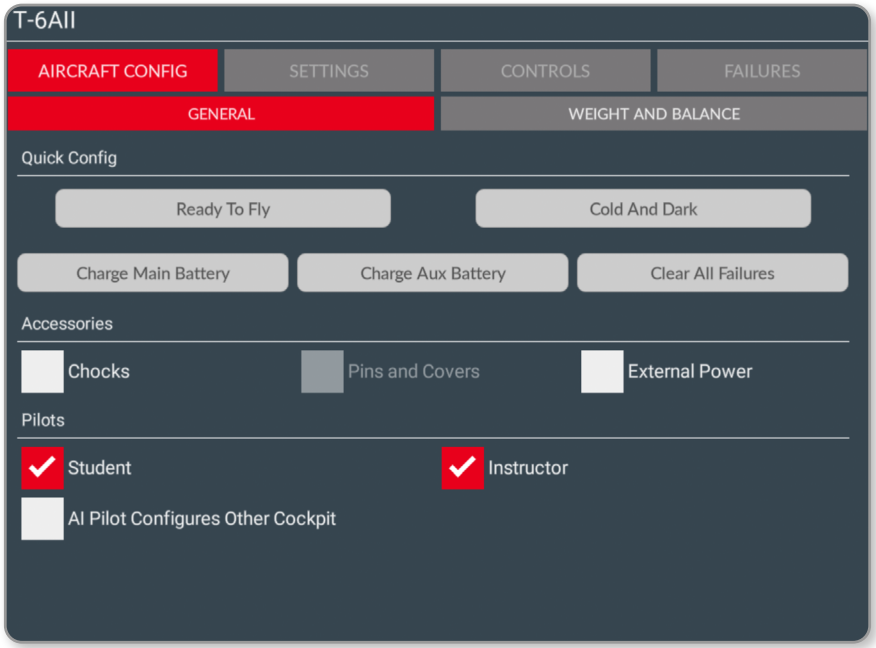
- General
- Controls
- Failures

Most of the controls are self-explanatory.

To view or stow the tablet on the right side of the cockpit, click the Windows button located in the bottom middle of the tablet.

GENERAL SETTINGS

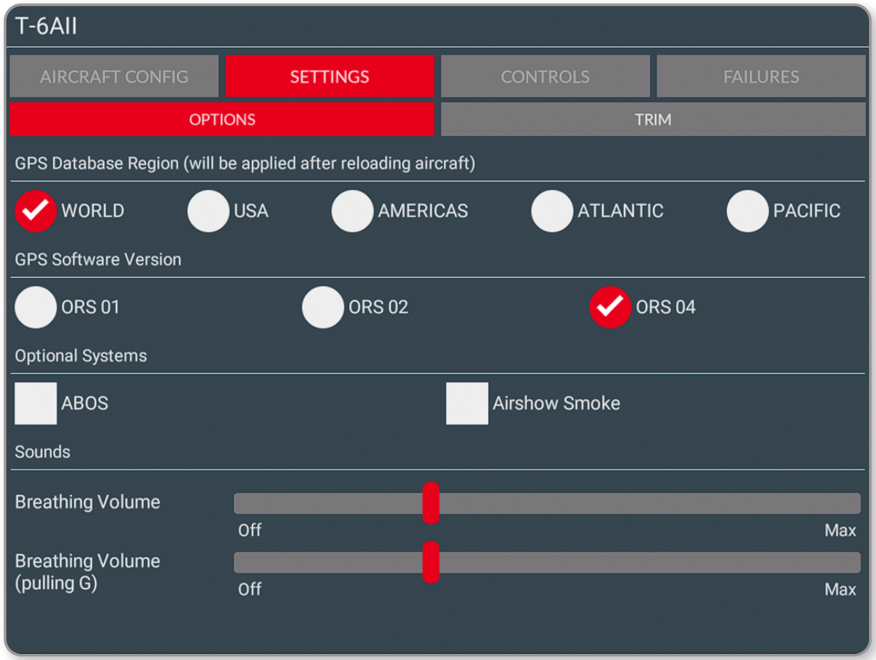
The General tab allows configuration of start-up states other than default MSFS, plus control of trim input sensitivity.



OPTIONS

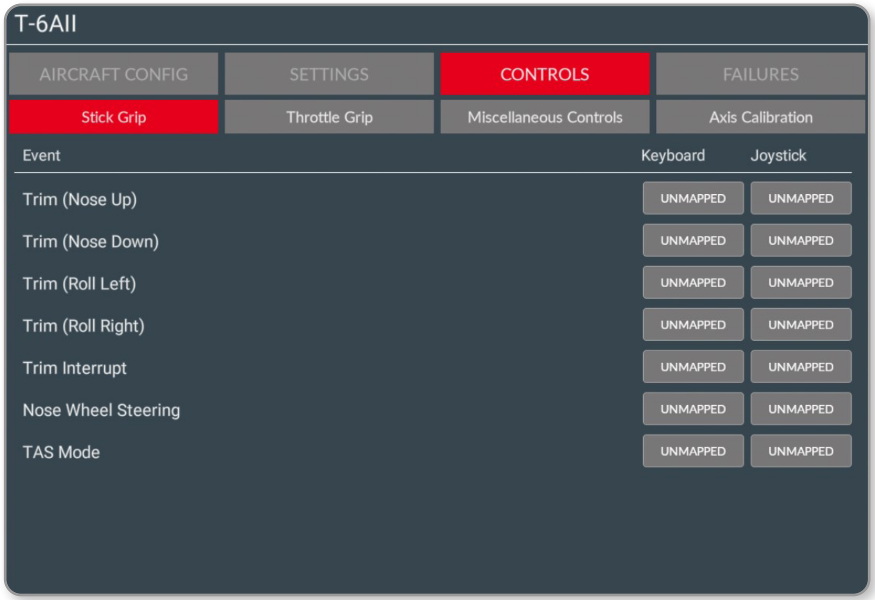
This section allows you to select the GPS database and software revision of the GPS.

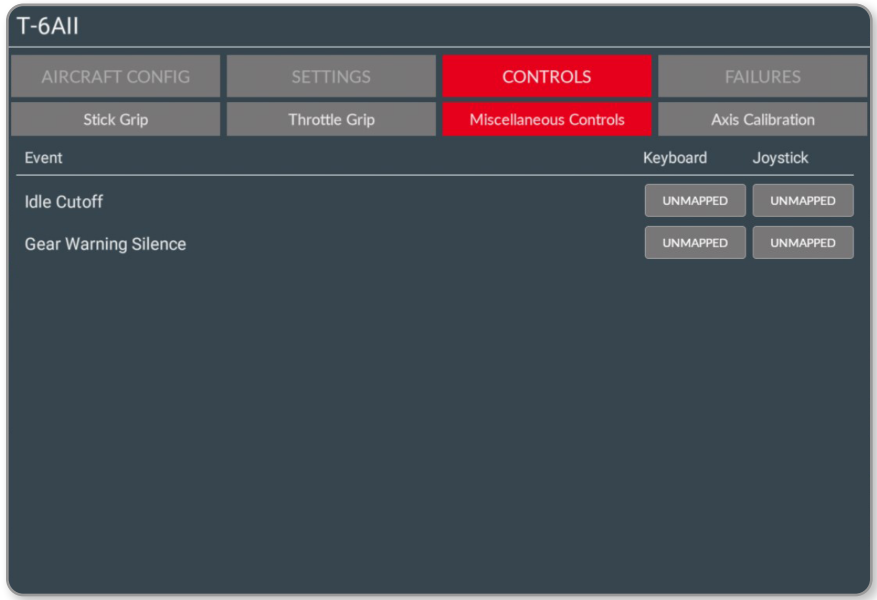
You can also enable the optional ABOS system and a panel that allows you to produce colored smoke like used in airshows.

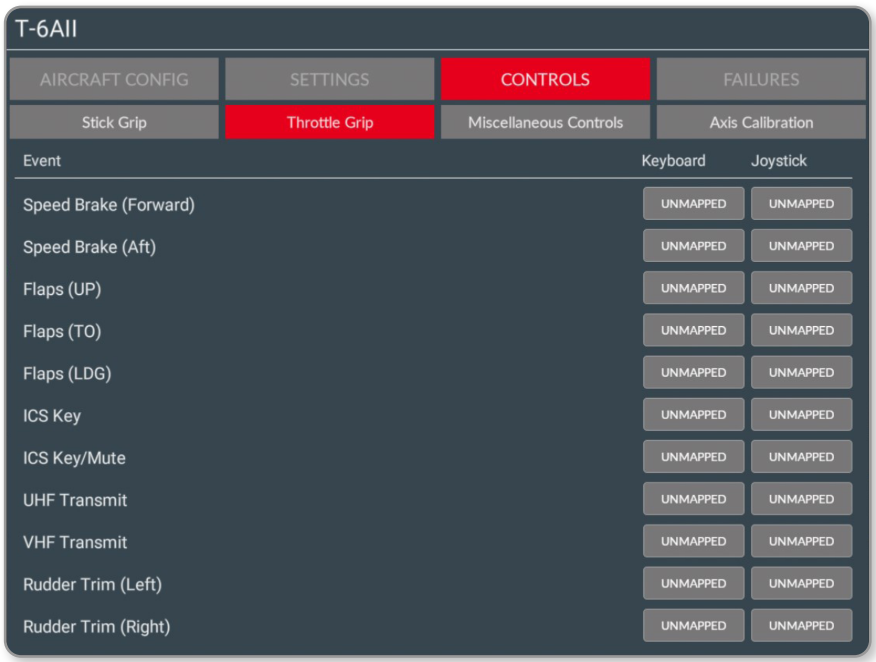


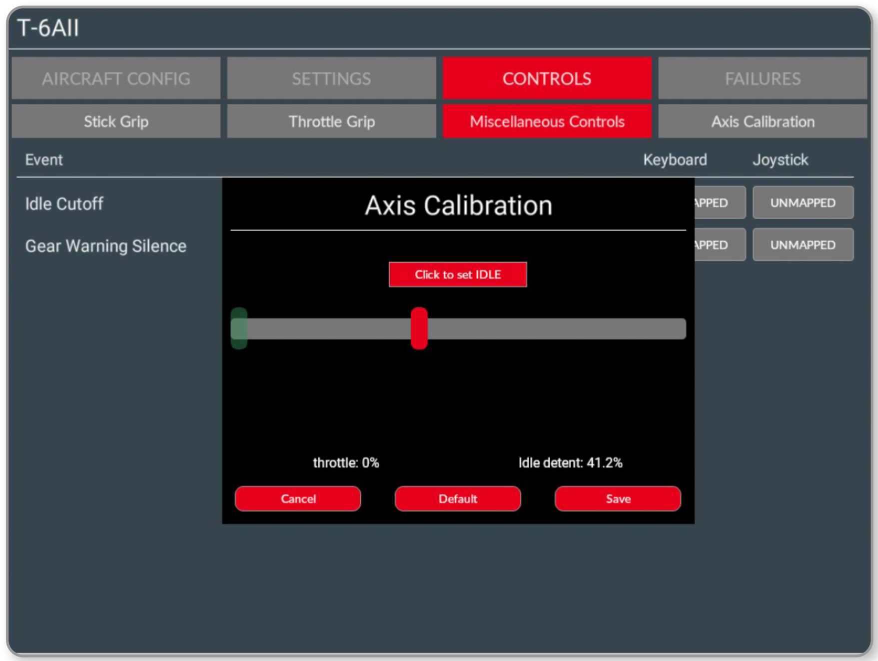
TRIM

CONTROL MAPPING









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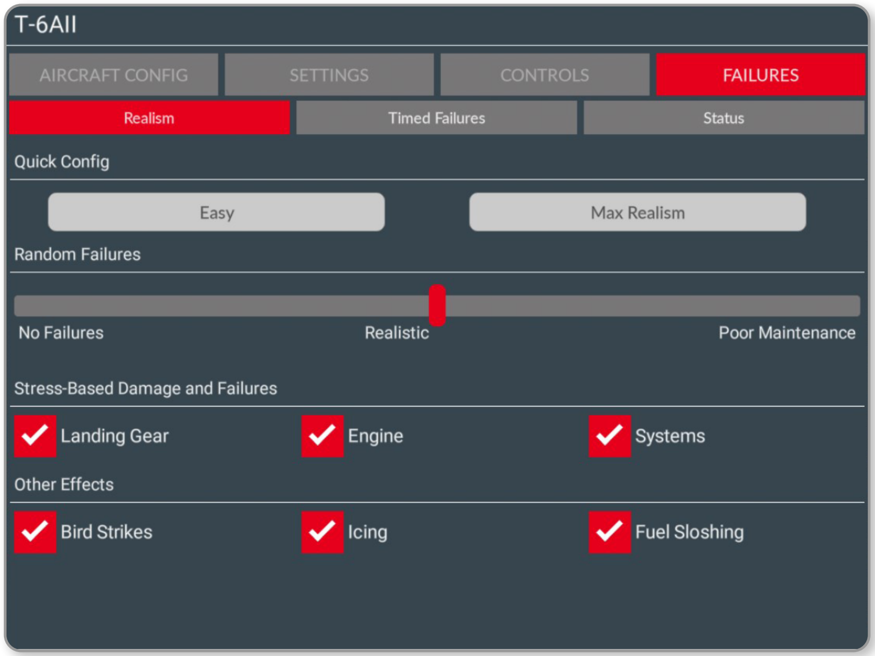
REALISM & FAILURES

The level of realism together with the items it applies to are configurable via the Realism tab.

Granular control of the failures is possible including the setting of 3 levels of damage and the choice of specifying a time within which to fail (Fail within) or a time at which the failure will occur (Time to fail).

Mixing and matching the failures allows the creation of complex and challenging scenarios to tax the reactions of even the most experienced pilots!



NOTE:

The tablet takes the place of the corresponding default MSFS configuration, control mapping, and failures screens.

The corresponding MSFS options controls are not compatible with the ADV system.

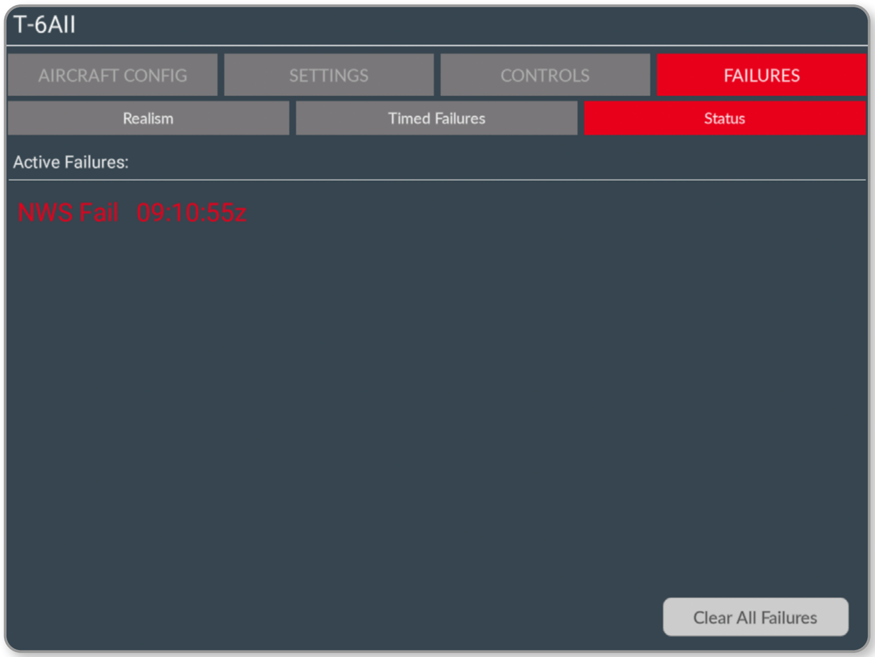
WARNING:

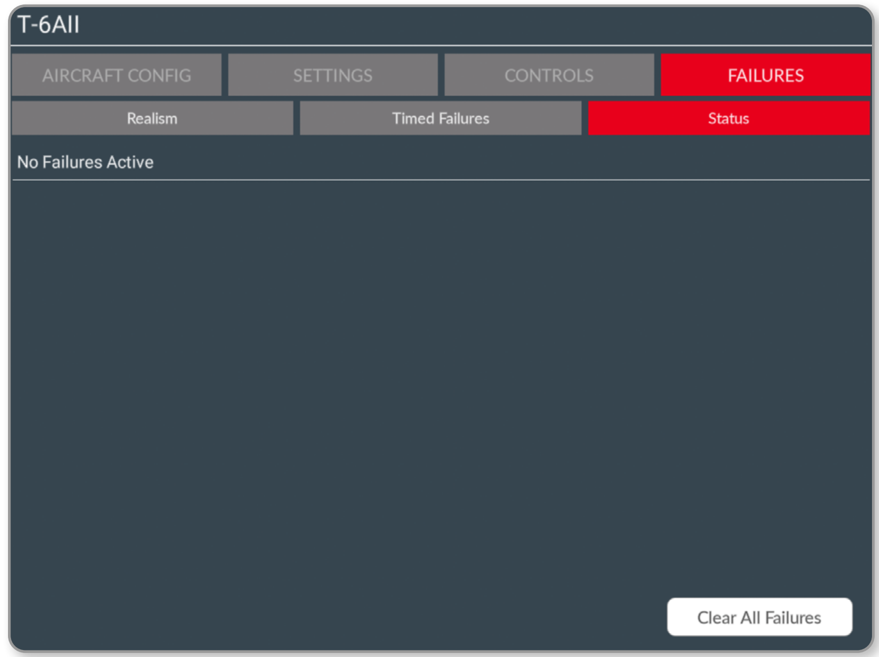
At the highest realism settings (all boxes checked), complex cascade failures can happen. Troubleshooting how and why, requires intricate systems knowledge is beyond the scope of this manual.
For instance, flying inverted at 0-G (not allowed)

- **The boost pumps turn on to avoid a flameout (15 seconds).**
- **If the oil pressure decays too much, the propeller feathers automatically.**
  - **The propeller and the engine can be damaged due to over torque.**
  - **A PMU failure is likely to happen. It can be reset with the PMU switch depending on if the PMU considers a sensor failed. In this case the PMU becomes failed and only restarting the flight will correct it.**
  - **If a flameout occurs, an airstart with the PMU offline, additional caution is needed to prevent turbine damage.**

FAILURE STATUS

To confirm a sneaking suspicion that something in the plane might have gone awry, you can verify via the Status tab.





The 'Clear All Failures' button does exactly what you would expect and returns the aircraft to a failure-free condition.

THE AIRCRAFT

The T6A is a training aircraft with one engine and two seats arranged in tandem. It has a pressurized cabin and a low wing design. This aircraft is capable of VFR and IFR flight during both day and night. It is equipped with a PT6A-68 turboprop engine and a four-blade propeller. The landing gear, which is electrically controlled and hydraulically operated, consists of a retractable tricycle-type. Steering can be achieved through the rudder, differential braking, and hydraulically operated nose wheel steering. Additionally, the aircraft is equipped with electrically controlled and hydraulically operated split flaps and a single speed brake positioned between the flaps. Manual operation is used for the primary flight controls, which also feature electric trim. Both cockpits have the capability to operate all flight controls and avionics.

GROSS WEIGHT

The aircraft's empty weight is approximately 4900 pounds, while its maximum takeoff gross weight is 6500 pounds.

COCKPIT ARRANGEMENT

The cockpits are arranged in a stepped tandem configuration, with the rear pilot sitting in a higher cockpit for better visibility over the front cockpit. When flying alone, the front cockpit is used exclusively. Both cockpits have similar instrument panels, with all flight instruments and controls in the same positions. Additionally, both cockpits have side console panels containing extra controls, circuit breakers, and switches. The controls for the environmental system and the circuit breakers for the main avionics and systems are in the left and right-side consoles in the front cockpit. The rear cockpit has its flight essential switches and circuit breakers in the left and right-side consoles in its own cockpit.

ENGINE

The PT6A-68 is a free-turbine turboprop engine flat rated to produce 1100 shaft horsepower (SHP) as installed in the aircraft.

REDUCTION GEARBOX (RGB)

The RGB is a gearbox used to decrease the speed of the power turbine output shaft from over 30,000 RPM to 2000 RPM for the propeller. Inside the RGB, a chip detector is installed to identify any ferrous material in the oil. When the chip detector is triggered, a signal is sent to the red CHIP annunciator, notifying of oil contamination. The torque generated by the reduction gearbox is used to measure the engine power output.

PROPELLER

The reduction gearbox connects the power turbine to the aluminum 97-inch, four-bladed propeller. The propeller can adjust its blade angle and speed automatically through the engine power management unit (PMU) and the propeller interface unit (PIU). These adjustments ensure a constant speed of 2000 RPM (100% NP) in various flight conditions.

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Front Instrument Panel

1. MASTER CAUTION/WARN PANEL
2. ELECTRONIC ATTITUDE DIRECTOR INDICATOR
3. ELECTRONIC HORIZONTAL SITUATION INDICATOR
4. ELECTRONIC ALTIMETER
5. ELECTRONIC VERTICAL SPEED INDICATOR
6. PRIMARY ENGINE DATA DISPLAYS
7. STANDBY MAGNETIC COMPASS
8. EMERGENCY LOCATOR TRANSMITTER SWITCH PANEL
9. TAS SWITCH PANEL
10. ENGINE/SYSTEMS DISPLAYS
11. AHRS CONTROL PANEL
12. PARKING BRAKE HANDLE
13. CENTRAL WARNING SYSTEM (CWS) ANNUNCIATOR PANEL
14. ALTERNATE ENGINE DATA DISPLAYS
15. STANDBY TURN AND BANK
16. STANDBY ALTIMETER
17. EFIS CONTROL PANEL
18. BACKUP UHF CONTROL
19. DEFOG SWITCH
20. VENT CONTROL LEVER
21. STANDBY ATTITUDE INDICATOR
22. STANDBY AIRSPEED INDICATOR
23. RADIO MANAGEMENT UNIT
24. AUDIO CONTROL PANEL
25. FLAP POSITION INDICATOR
26. LANDING GEAR CONTROL PANEL
27. EMERGENCY GEAR EXTENSION HANDLE
28. GPS CONTROL PANEL
29. SPEED BRAKE ANNUNCIATOR
30. NOSE WHEEL STEERING ANNUNCIATOR
31. DIGITAL CLOCK
32. ACCELEROMETER
33. ANGLE OF ATTACK GAUGE
34. ELECTRONIC AIRSPEED INDICATOR
35. ANGLE OF ATTACK INDEXER

Rear Instrument Panel

1. MASTER CAUTION/WARN PANEL
2. ELECTRONIC ATTITUDE DIRECTOR INDICATOR
3. ELECTRONIC HORIZONTAL SITUATION INDICATOR
4. ELECTRONIC ALTIMETER
5. ELECTRONIC VERTICAL SPEED INDICATOR
6. PRIMARY ENGINE DATA DISPLAYS
7. STANDBY MAGNETIC COMPASS
8. ENGINE/SYSTEMS DISPLAYS
9. TAS SWITCH PANEL
10. CENTRAL WARNING SYSTEM (CWS) ANNUNCIATOR PANEL
11. ALTERNATE ENGINE DATA DISPLAYS
12. STANDBY TURN AND BANK
13. STANDBY ALTIMETER
14. EFIS CONTROL PANEL
15. STANDBY ATTITUDE INDICATOR
16. STANDBY AIRSPEED INDICATOR
17. RADIO MANAGEMENT UNIT
18. AUDIO CONTROL PANEL
19. FLAP POSITION INDICATOR
20. LANDING GEAR CONTROL PANEL
21. GPS CONTROL PANEL
22. SPEED BRAKE ANNUNCIATOR
23. NOSE WHEEL STEERING ANNUNCIATOR
24. DIGITAL CLOCK
25. ACCELEROMETER
26. ANGLE OF ATTACK GAUGE
27. ELECTRONIC AIRSPEED INDICATOR
28. ANGLE OF ATTACK INDEXER

1. LEFT FORWARD SWITCH PANEL
2. POWER CONTROL LEVER (PCL)
3. FLAP SELECTOR
4. CANOPY FRACTURE PANEL
5. SYSTEM TEST PANEL
6. BATTERY CIRCUIT BREAKER PANEL
7. ANTI-G HOOKUP
8. RECORDER MAINTENANCE ANNUNCIATOR
9. FIREWALL SHUTOFF HANDLE
10. ANTI-G TEST

11. RIGHT FORWARD SWITCH PANEL
12. ENVIRONMENTAL CONTROL PANEL
13. OXYGEN REGULATOR
14. GENERATOR CIRCUIT BREAKER PANEL
15. PHONE JACK
16. UTILITY LIGHT

Front Console Panels

1. LEFT FORWARD SWITCH PANEL
2. FLAP SELECTOR
3. POWER CONTROL LEVER (PCL)
4. CANOPY FRACTURE PANEL
5. SYSTEM TEST PANEL
6. SEAT SEQUENCER PANEL
7. BATTERY CIRCUIT BREAKER PANEL
8. ANTI-G HOOKUP
9. ANTI-G TEST

10. RIGHT FORWARD SWITCH PANEL
11. ENVIRONMENTAL CONTROL PANEL
12. OXYGEN REGULATOR
13. GENERATOR CIRCUIT BREAKER PANEL
14. PHONE JACK

Rear Console Panels

Power Control Lever

1. ICS KEY/MUTE
2. RUDDER TRIM
3. PCL CUTOFF FINGER - LIFT
4. UHF/VHF KEY
5. ICS KEY
6. SPEED BRAKE

7. AILERON/ELEVATOR TRIM
8. TRIM INTERRUPT
9. NOT USED
10. NORM/BEL/ABV
11. NOSE WHEEL STEERING

Control Stick

START AND IGNITION SYSTEM

There are three positions for the STARTER switch (both cockpits) AUTO/RESET, NORM, and MANUAL. To choose MANUAL, the STARTER switch must be lifted past a detent to reach the MANUAL position. When MANUAL is selected, the starter will be activated until the switch is manually moved back to NORM. To switch from NORM to AUTO/RESET, simply move the switch forward. The switch will automatically return to the NORM position due to its spring-loaded feature. When the starter switch is briefly set to the AUTO/RESET position, it will automatically activate the starter and provide power to the ignition system.

The power for the start control is supplied by the circuit breaker (START). This circuit breaker is situated on the battery bus circuit breaker panel (front cockpit).

The IGNITION switch is found in both cockpits and has two settings: NORM and ON. When the ignition switch is set to NORM during an auto start or regular operation, the PMU will activate and deactivate the igniters as necessary. If the IGNITION switch is set to ON or the igniters are activated in AUTO mode, an indicator light (IGN SEL) will light up in green.

The power for the ignition system is supplied via a circuit breaker (IGN), located on the battery bus circuit breaker panel in the front cockpit.

POWER CONTROL LEVER (PCL)

The engine Power Control Levers (PCLs) are located on the left console of each cockpit. A push-pull rod interconnects the PCLs in such a way that any movement of one PCL causes the other to move. The connection between the front PCL and the fuel management unit (FMU) is both electrical and mechanical.

To prevent unintended engine shutdown, the PCL includes a gate with a cut-off mechanism. When the PCL is pushed forward to the idle position while starting the engine, two roller bearings securely lock the gate in place at the front of a rocker cam detent. By lifting the cut-off gate handle, the PCL can be moved to the cutoff position. The PCL in each cockpit contains switches for activating the speed brake, rudder trim, UHF and VHF communications, and intercommunications system.

ENGINE DATA MANAGER (EDM)

The Engine Data Manager (EDM) is responsible for monitoring engine operating parameters and activating the appropriate notification light when necessary. The EDM also performs non-engine-related functions such as fuel balancing, fuel quantity display, and determination and display of DC volts, DC amps, hydraulic pressure, cockpit pressure altitude, and cockpit differential pressure. The EDM transmits its outputs through channels EDM A and EDM B. In the event of a faulty output or failure of either data bus channel, the affected electronic instrument display (EID) will show EDM A or EDM B FAIL in amber text respectively, but only when the aircraft is on the ground (with weight on the wheels). If the EDM itself fails, the affected EIDs will display EDM FAIL in red text. Redundant power is provided through circuit breakers (EDM), located on the battery bus and generator bus circuit breaker panels in the front cockpit.

ENGINE AND AUXILIARY INSTRUMENTS

Each cockpit is equipped with three electronic instrument displays (EIDs) that show engine and auxiliary instrument information. These displays include a primary engine data display, an alternate engine data display, and an engine/systems/NACWS display. The following table provides information about the messages displayed on the EIDs and their explanations.

The primary display of the engine data shows torque, propeller RPM (NP), indicated outside air temperature (IOAT), gas generator speed (N1), and ITT.

The alternate engine data display shows alternative torque, alternative N1, altitude of cockpit pressure, difference in cockpit pressure (delta P), fuel consumption, fuel quantity in each wing, and raw ITT (RITT).

The enginie / systems display shows various readings such as oil temperature, oil pressure, DC volts, DC amps, hydraulic pressure, and NACWS traffic alerts.

LOWER SCREEN ANNUNCIATORS	
ADC A FAIL	Internal failure in ADC or no ARINC data received on channel A
ADC B FAIL	Internal failure in ADC or no ARINC data received on channel B
EDM A FAIL	Internal failure in EDM or no ARINC data received on channel A
EDM B FAIL	Internal failure in EDM or no ARINC data received on channel B
PMU FAIL	Internal failure in PMU or no ARINC data received at PMU input on EDM
MAN FUEL XFER	Indicates fuel balance switch has been set to MANUAL
FP 0 FAIL	Failure of collector tank fuel probe (maintenance mode only)
FP 1 FAIL	Failure of left inboard fuel probe (maintenance mode only)
FP 2 FAIL	Failure of right inboard fuel probe (maintenance mode only)
FP 3 FAIL	Failure of left middle fuel probe (maintenance mode only)
FP 4 FAIL	Failure of right middle fuel probe (maintenance mode only)
FP 5 FAIL	Failure of left outboard fuel probe (maintenance mode only)
FP 6 FAIL	Failure of right outboard fuel probe (maintenance mode only)
ALT N1 FAIL	Failure of alternate N1 instrument function or loss of alternate N1 data
ALT ITT FAIL	Failure of alternate ITT instrument function or loss of alternate ITT data
ALT TQ FAIL	Failure of alternate torque instrument function or loss of alternate torque data
EDM FAIL	Failures on both EDM channels (A and B), or no ARINC data on channels A and B
FULL SCREEN ANNUNCIATIONS	
ADC FAIL	Failures on both ADC input channels (A and B), or no ARINC data on channels A and B.
CONFIG ERROR	Invalid or missing configuration straps for EID.
EID FAIL	Failure within EID (may not display depending on failure)

Annunciator codes

POWER MANAGEMENT UNIT (PMU) OPERATION

The PMU functions in two modes: flight mode and ground mode, which are controlled by the weight-on-wheels switches on the main gear struts. In ground mode, the idle speed is set at 60% N1, while in flight mode, it is around 67% N1. When the aircraft reaches an altitude of 10,000 feet above mean sea level, the PMU increases the N1 to ensure that NP remains above 80% to prevent excessive strain on the propeller during spinning maneuvers.

During ground starts, the PMU is responsible for initiating the engine and monitoring its parameters. If the engine fails to ignite within 10 seconds after selecting the AUTO/RESET option with the STARTER switch, or if the PMU detects potential issues such as a hung or hot start, the autostart function will automatically stop the ground start sequence. The autostart will also be aborted if the ITT (interstage turbine temperature) exceeds certain thresholds for specific durations or if the N1 acceleration rate to idle is less than half of the normal rate. The engine start sequence is controlled by the PMU, including the starter, igniters, and fuel, and will only shut off after a successful start. While in flight mode, the automatic shutdown feature is disabled for safety reasons.

AUTO START OPERATIONS

To start the engine automatically, move the PCL to the auto start position until the green ST READY light turns on. Briefly switch the STARTER switch to the AUTO/RESET position while the ST READY light is still on to initiate the fully automated starting sequence. The PMU will activate the starter, boost pump, and igniters, and add fuel at the appropriate N1 speed. Once the N1 speed reaches around 50%, the starter and igniters will be turned off, and the boost pump will be deactivated if the fuel pressure is above 10 PSI. The engine will continue to accelerate to idle speed (60% N1). As the engine oil pressure rises, the propeller will automatically unfeather during the start. The PCL can be moved to the IDLE position at any time when N1 is at or above 60%.

PMU INOPERATIVE (MANUAL MODE)

The PMU constantly monitors itself and can handle various faults. However, if faults occur that prevents the PMU from adjusting power or respecting engine limits, or if the pilot turns off the PMU, the system will switch to manual mode. When both the PMU FAIL and PMU STATUS indicators are illuminated, it means that the system is in manual mode.

FIRE WARNING SYSTEM

To ensure the electrical continuity of the two fire warning systems, a test switch (FIRE) is positioned on the test panel of the front cockpit left console.

FIREWALL SHUTOFF HANDLE

The firewall shutoff handle is positioned on the front left console panel and is responsible for controlling the closure of valves at the firewall. This action effectively cuts off the supply of fuel, hydraulic fluid, and bleed air from the engine. Activating the firewall shutoff valves is a simple process. First, lift the handle guard and move it aside. Then, pull up on the handle itself.

FUEL SUPPLY SYSTEM

The fuel system incorporates an auto balance system to keep the fuel level in the wing tanks within 20 pounds of each other. When a fuel imbalance of 20 pounds or more is detected for more than 30 seconds, the transfer valve will close the motive flow line to the light tank. This action stops fuel in the light tank from being transferred to the collector tank while fuel continues to be transferred from the heavy tank to the collector tank. If the fuel imbalance is not reduced to less than 30 pounds within 2 minutes, the FUEL BAL annunciator will illuminate, and the auto balance system will shut off. The FUEL BAL annunciator will remain illuminated until the system is reset.

INSTRUMENTS

This discussion focuses on instruments that are not part of an integrated system. The specific instruments that are covered are the standby flight instruments, digital clock, and accelerometer.

STANDBY FLIGHT INSTRUMENTS

Standby mechanical attitude, altitude, airspeed, and turn/ bank indicators are provided in the lower center of the instrument panel in each cockpit. A standby compass is located on the upper right side of each glareshield. These instruments provide backup indications in the event of failure of the electronic flight instrumentation system or the aircraft electrical system. The standby instruments are normally powered by the battery bus. In the event of a battery bus failure, the standby instruments are powered by the auxiliary battery, which is activated with the AUX BAT switch on the engine/electrical switch panel in the front cockpit. Power for lighting the standby instruments is provided through a circuit breaker, (STBY), on the LIGHTS portion of the battery bus circuit breaker panel in the front cockpit. Lighting is controlled by the instrument panel dimmer switch on the front left console panel in each cockpit when aircraft main power is available. Power for the standby instruments in the rear cockpit is provided through a circuit breaker, (AFT INST), located on the STANDBY portion of the battery bus circuit breaker panel in the front cockpit.

FLAP INDICATOR

The landing gear control handle in each cockpit has a flap indicator located above it on the lower left side of the instrument panel. The pointer shows the position of the flaps (UP, TO (takeoff), or LDG (landing)). When the flaps are moving, the pointer will be between the designated markings to show this motion. If the power to the indicator is turned off or there is a battery failure, the pointer will move counterclockwise from the UP position.

DIGITAL CLOCK

A digital clock in each cockpit provides Greenwich Mean Time (GMT) in 24-hour format; local time (LT), in 12-hour format; and a resettable elapsed time (ET) counter, operating from 1 second to 99 hours and 59 minutes; and count down timer, operating from 1 second to 1 hour including a flashing display alarm. The flight time (FT) function is disabled.

The clock face has a select button (SEL), and a control button (CTL). The digital clock is powered via hot battery bus. Each press of the SEL button will scroll through the available clock functions. Pressing the CTL button will start and reset elapsed time (ET), and is used to set time for GMT, LT, and ET count up and ET count down.

SETTING GREENWICH MEAN TIME (GMT)

To set Greenwich mean time (GMT), press the SEL button until the function indicator is present over the GMT label. Press SEL and CTL buttons simultaneously. The tens of hours digits will flash. Press CTL until the proper hour is set. Press the SEL button to select the remaining fields and use the CTL button to set the proper time. Once time entry is complete, press the SEL button to return to normal mode.

SETTING LOCAL TIME (LT)

To adjust the local time (LT), first, repeatedly press the SEL button until the function indicator appears over the LT label. Then, press the SEL and CTL buttons at the same time. This will cause the tens of hours digits to start flashing. Use the CTL button to adjust the hour to the correct value. After inputting the correct hour, press the SEL button again to exit and return to normal mode.

ELAPSED TIME (ET) COUNT UP

To start ET count up, press the SEL button until the ET label is highlighted. Press the CTL button to begin the ET. The counter will increment up to 59 minutes and 59 seconds, and then switch to displaying hours and minutes, with a maximum limit of 99 hours and 59 minutes. Pressing CTL again will reset the ET counter back to zero.

ELAPSED TIME (ET) COUNT DOWN

To start the ET count down, press and hold the SEL button until the function indicator appears on the ET label. Then, simultaneously press the SEL and CTL buttons to enter the set mode. During this mode, you can set a count down for a maximum of 59 minutes and 59 seconds. Input the desired time in the same manner as setting the GMT. To exit the set mode, simply press the SEL button.

To initiate the ET count down, press the CTL button. Once the countdown reaches zero, the display will flash until either the SEL or CTL button is pressed. Following this, the ET counter will start counting up until the CTL button is pressed.

ACCELEROMETER

An accelerometer is installed in each cockpit to show the instantaneous normal acceleration (G load) ranging from -6 to +10 G. Resettable pointers are used to display the highest and lowest G load experienced during the flight. These pointers will keep their readings until they are reset by pressing the PUSH TO SET knob on the accelerometer's front face.

ANGLE OF ATTACK SYSTEM

The Angle of Attack (AOA) system consists of several components: an AOA vane positioned near the left-wing tip, an AOA computer, two AOA gauges (one in each cockpit), and two AOA indexers (one in each cockpit). This system displays the angle of attack information on the gauges and, with the extension of the landing gear, on the indexers. The flap compensated AOA information remains accurate regardless of variations in weight, configuration, and steady state bank angles.

The control for anti-ice protection is found on the electrical switch panel in the front cockpit. It is the PROBES ANTI-ICE switch.

The AOA system is powered by a circuit breaker (AOA), which can be found on the battery bus circuit breaker panel in the front cockpit. The AOA vane anti-ice heat is powered by a circuit breaker (AOA HT), located on the generator bus circuit breaker panel in the front cockpit.

By cross-checking and verifying the optimum angle of attack (indicated by the green band on the gauge and the amber donut on the indexer) with the airspeed, pilots can utilize the angle of attack to maintain the ideal no-wind airspeed while flying in the landing pattern.

AoA gauges

MAXIMUM ENDURANCE/MAXIMUM RANGE AOA

The AOA gauge consists of two marks that give indication for flying at the highest endurance and range AOA. These AOA indications are reliable regardless of the aircraft's weight or configuration.

MAXIMUM ENDURANCE AOA

Flying at the AOA indicated by the white diamond (8.8 units) on the AOA gauge results in the longest possible flight time for every pound of remaining fuel. To achieve maximum endurance, adjust both the power and pitch to maintain the aircraft at this AOA.

MAXIMUM RANGE AOA

Flying at the AOA indicated by the white triangle (4.9 units) on the AOA gauge results in the longest possible flight distance for every pound of remaining fuel. To achieve maximum range, adjust both the power and pitch to maintain the aircraft at this AOA.

STICK SHAKER

The stall warning system (stick shaker) uses the angle of attack system to provide a warning. A small electric motor with an eccentric weight is attached to the control stick interconnect tube near the rear control stick. When the aircraft's speed exceeds the stall speed by approximately 5 to 10 knots (15.5 units), the stick shaker is activated. The motor starts spinning and the eccentric motion of the weight causes both the front and rear control sticks to shake, indicating an upcoming stall.

CANOPY

A red CANOPY annunciator signals that the canopy latch mechanism and microswitches are not indicating that the canopy is closed and locked.

To close the canopy:

1. Click canopy lock release lever in either cockpit.
2. Click the canopy handle.
3. Check that the CANOPY light is off.

To open the canopy

1. Raise the lock release lever located aft of the canopy locking handle.
2. Click the canopy handle.

INTERSEAT SEQUENCING SYSTEM (ISS)

The ejection system of the aircraft includes an interseat sequencing system (ISS) that is operated by gas. The mode selector for the ISS is situated on the left side console panel in the back cockpit. (Ejection system is not modelled - no function)

ENVIRONMENTAL CONTROL SYSTEM (ECS)

Conditioned engine bleed air is used to provide heating and pressurization. The cockpit is cooled by a vapor cycle system that has an engine-driven compressor. For ground operations and non-pressurized flight, fresh air ventilation is available.

The circuit breaker is labelled CKPT TEMP and is located on the generator bus panel.

BLEED AIR SUPPLY SYSTEM

Engine bleed air is utilized for the canopy pressurization seal, anti-G system, cockpit heating and defogging, pressurization, and on-board oxygen generation system (OBOGS).

Power for both the defog valve and the inflow valve is provided through the INFLOW SYS circuit breaker on the forward battery bus.

The BLEED AIR INFLOW switch has three designated positions: HI, NORM, and OFF. Its purpose is to regulate the state of two solenoids on the inflow valve. When the switch is in the OFF position, neither solenoid is powered, resulting in a closed valve. In the NORM position, one solenoid is powered, allowing the inflow valve to partially open. Finally, when set to HI, the second solenoid is activated, causing an increase in airflow passing through the valve.

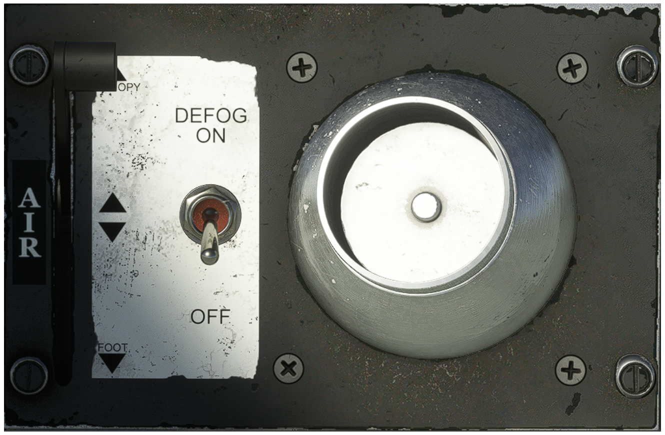
If the aircraft is operating below 7500 feet MSL and the air conditioning compressor is running, the inflow valve will automatically close, even if the BLEED AIR INFLOW switch is in a different position.

When the DEFOG switch is turned ON, the inflow valve is completely opened to maximize the amount of bleed air that enters the cockpit.

HEATING AND DEFOGGING SYSTEM

The heating and defogging system makes use of engine bleed air to provide warmth and remove fog. The bleed air is extracted from the right side P3 port and directed to the cockpit through the inflow and/or defog valves. It then passes through or bypasses the heat exchanger before entering the cockpit through the defog outlets or footwarmers.

The distribution of air in the two cockpits depends on the position of the vent control lever, which is labeled AIR and located on the center console in the front cockpit only. When the vent control lever is set to CANOPY, air is directed to the windshield defog outlets in the front cockpit and the canopy defog outlets in both cockpits. The canopy receives defog air from the mid-lever position and above. On the other hand, when the vent control lever is set to FOOT, air is routed to the footwarmer outlets in both cockpits.



COMMUNICATIONS AND AVIONICS EQUIPMENT

The aircraft comes with communications and avionics equipment that are fully integrated. These systems can be controlled by either the front pilot (FP), rear pilot (RP), or both. The included communications and avionics equipment consist of:

- intercommunications system (ICS)
- communications system
- transponder system
- radio management system
- emergency locator transmitter (ELT) system
- attitude heading reference system (AHRS)
- naval aircraft collision warning system (NACWS)
- traffic advisory system (TAS)
- very high frequency navigation (VHF NAV) system
- distance measuring equipment (DME) system
- global positioning system (GPS)
- integrated data acquisition recording system (IDARS)

AVIONICS MASTER SWITCH

All avionics and radio systems, except for the back-up UHF control unit and UHF transceiver, receive power from the avionics master switch. The AVIONICS MASTER switch is on the electrical switch panel in the front cockpit. When the AVIONICS MASTER switch is turned on, it disables the relays that power the forward and aft avionics buses from the battery and generator buses. However, pulling the AVI MSTR circuit breaker and turning the avionics master switch off will not cut off power to the avionics. Instead, if the battery bus is not receiving power, the forward and aft generator buses will still be powered by the generator bus, regardless of the position of the avionics master switch.

INTERCOMMUNICATIONS SYSTEM (ICS)

The intercommunications system (ICS) enables pilots to simultaneously monitor incoming navigation and communications radio audio, as well as communicate within the cockpits.

AUDIO CONTROL PANELS

The lower left corner of each instrument panel houses an audio control panel.

Each audio control panel is equipped with a toggle switch (V, R, and BOTH) to allow for the selection of voice only, recognition or Morse code only, or both voice and recognition channels for the VHF NAV radio. Additionally, there is a toggle switch (ALTN and NORM), which allows for the selection of raw audio if the amplifier stops working.

The front audio control panel contains a marker beacon switch, which is marked as MKR and has three positions: HI, LO, and TEST. These positions allow for testing the marker beacon function or adjusting the sensitivity level for regular use. The front cockpit audio amplifier receives power from a circuit breaker (AUDIO). This circuit breaker is located on the battery bus circuit breaker panel in the front cockpit.

The interphone control switch on the rear audio control panel (INTPH) and has two positions: HOT and COLD.

COMMUNICATIONS

The communication system consists of a UHF transceiver and a VHF transceiver that enable voice communication for air-to-air or air-to-ground purposes. The ability to transmit communications is controlled by the UHF/VHF key toggle switch located on the inner side of either Power Control Lever (PCL).

ULTRA-HIGH FREQUENCY (UHF)

The UHF transceiver allows for both air-to-air and air-to-ground voice communications. It operates within a frequency range of 225.00 to 399.975 MHz, with 25 kHz increments. In addition, it has a dedicated receiver for monitoring the GUARD frequency of 243.00 MHz. The tuning functions for both receiving and transmitting are controlled by the radio management unit (RMU) in each cockpit. The UHF backup control unit, located exclusively in the front cockpit, also has control over these functions.

VERY HIGH FREQUENCY (VHF)

The VHF transceiver enables both air-to-air and air-to-ground voice communication in a frequency range of 118.00 to 151.95 MHz, with increments of 25 kHz. The radio management unit (RMU) is responsible for controlling all tuning functions for receiving and transmitting. To monitor the VHF emergency frequency, the VHF system needs to be set to 121.50 MHz.

TRANSPONDER

The aircraft has a Mode S transponder installed, which can communicate with ground station and airborne queries to provide altitude information. The transponder is controlled through the RMU. It offers three modes: standby, on, and altitude reporting. In standby mode (STBY displayed in the ATC field on the RMU), the transponder code can be selected, but it will not respond to any ground or airborne inquiries. In on mode (ON displayed in the ATC field on the RMU), the transponder code can be chosen, and it will transmit the selected code when interrogated, but it will not provide altitude information. In altitude reporting mode (ALT displayed in the ATC field on the RMU), the transponder code can be selected, and it will respond to interrogations with the chosen code and altitude information received from the air data computer. The transponder system offers modes A, C, and S for operation in air traffic control radar beacon systems.

RADIO MANAGEMENT UNIT (RMU)

The radio management unit (RMU) fine-tunes each communication and navigation radio, as well as the transponder.

RADIO TUNING

Each RMU provides remote tuning and mode selection for VHF communications, UHF communications, transponder, VOR navigation, and DME.

RMU buttons:

- On the display's left side, there are select keys for five fields that span five pages.
- There are three transfer switches on the display, each spanning a single page and marked with a diamond shape on the right side.
- PAGE is used to select displays such as memory programming pages, and to access message and special function pages.
- DMEH is used to slave DME frequency to current active NAV frequency.
- IDT is used to command the transponder to transmit the identification pulse when requested by ATC.
- SQ is used to enable/disable UHF/VHF transceiver squelch.
- MEM switch is used to select the memory pages for selected UHF, VHF, and NAV systems.
- DIM switch is used to select and adjust the brightness of the RMU display.

To adjust frequencies, codes, or any selected information, a rotary knob with two concentric knobs beneath the display is utilized **[SCROLL WHEEL]**. The larger knob is to tune the first or second fields, the smaller knob is used for fine-tuning smaller fields. If tuning UHF and NAV, the smaller knob can be pulled out **[RIGHT CLICK]** to enable quarter frequency tuning. When the memory mode is activated, rotating either knob allows scrolling through the available memory presets.

The table below shows the function for each rotary.

RADIO KNOB FUNCTION				
Control	UHF	VHF	ATC	NAV
Lg. Knob	227.50	118.20	6543	113.80
Sm. Knob	227.50	118.20	6543	113.80
Sm. Knob (pulled)	227.50	118.20	6543	113.80

PREFLIGHT TEST PAGE

Upon initial startup, the preflight test page will be shown on each RMU. The preflight test mode is denoted by "PFT" displayed in the upper field of the RMU, followed by a "PASS" or "FAIL" indication for the respective RMU, data adapter, or individual radios. If all systems pass the preflight test, the RMU will automatically switch to the normal operating page. However, if any system fails the preflight test, the display will remain on the preflight test page. In the event of a failure, the fail indications can be overridden by pressing the key next to "ACCEPT", which accepts the failure and proceeds to the normal operating page.

NORMAL OPERATING PAGE

On the standard operational page, the first field shows tuning and mode options for UHF communications, the second field displays options for VHF communications, the third field is dedicated to the transponder (ATC), the fourth field is empty, and the fifth field shows options for NAV and DME. The frequency and functions in active fields are controlled by the page-defined keys. An active field is contained within a box cursor, which can be adjusted using the rotary tuning knob or other function keys. If no inputs are made within 20 seconds, the box cursor will automatically return to the top field (UHF).

The field select keys enable the selection of a system. Following system selection, it becomes possible to modify frequencies, choose or remove modes, and switch between active, memory, and special functions pages.

To utilize a pre-set frequency, start by choosing (UHF, VHF, ATC or NAV) using the corresponding field select key. Then push the MEM button. Once the cursor box becomes visible, rotate the outer knob either clockwise or counterclockwise to scroll through the pre-set frequencies. When the desired pre-set frequency appears on the display, press the suitable transfer switch to designate it as the active frequency. The pre-set frequency will be shown in both the active and standby fields.

To transponder to 1200, simply press and keep holding the transponder field select key for a duration of 3 seconds.

UHF COMMUNICATIONS SPECIAL FUNCTIONS PAGE

The UHF special functions page is accessed from the normal operating page.

Choose the appropriate UHF field by turning the Large or Small Knob to the corresponding frequency for RADIO CONTROL, UHF, VHF, ATC, or NAV. The frequencies for each knob are 227.50, 118.20, 6543, and 113.80. If the Small Knob is pulled out, the frequency will be the same as the previous selection. To access the UHF special functions page, press the field select key, followed by depressing the PAGE switch. If the MSG annunciation is flashing, press the PAGE switch again to access the special functions page. The special functions page allows you to select the normal operating mode, activate the guard mode, or transmit a 1000 Hz test tone on the active frequency.

The MODE message switch alternates between the main and transceiver modes. The currently selected mode (MAIN or BOTH) is shown below the MODE message along with the active frequency. When in BOTH mode, the transceiver tracks both the guard receiver and main receiver. If a signal is detected in either receiver, the transceiver will pause on the active receiver.

On the special functions page, you can view the active and standby frequencies for the UHF main transceiver and conveniently change them if needed. The field select key and transfer switch function the same way on this display as they do on the regular operating page.

The selection of the guard frequency can be done using the GUARD function switch. By pressing and holding down the TONE function switch, the transceiver will generate a continuous tone.

UHF MEMORY PAGES

The memory pages for UHF communication have the capacity to store 20 frequencies.

Communications and navigation systems have memory channels or programmed frequencies available. To edit these, the memory pages can be accessed from the normal operating page. When no message label is present in the UHF field, pressing the PAGE switch will show the memory page. From there, rotating the tuning and data entry knobs will cycle through all the UHF memory pages. By pressing the field select key next to the memory channel to be edited, the cursor will move to highlight the current stored frequency. The tuning and data entry knobs can then be used to input the new frequency, which will be temporarily stored until the switch next to the ACCEPT message is pressed. Pressing this switch will permanently save the new frequency, replacing the old frequency. If the ACCEPT message switch is not pressed, the old frequency will reappear when the cursor is moved.

By using the INSERT message switch, users can insert an extra memory channel at their preferred location in memory. This insertion action pushes down all the memory channels below it. In cases where all memory locations are already occupied, inserting an additional memory channel will result in the loss of the last channel.

The purpose of the CLEAR message switch is to eliminate a specific memory channel from memory. As a result, all memory channels positioned below the cleared channel are shifted upward, ensuring that there is always at least one vacant channel at the bottom.

The changes made to the memory channels, whether it's editing, inserting, or clearing, must be entered into the permanent memory by pressing the ACCEPT message switch.

To exit the memory programming page and return to the normal operating page, either the RETURN message switch or the PAGE switch can be utilized.

VHF MEMORY PAGES

20 frequencies can be stored in the memory pages for VHF communications.

The memory programming for VHF communication is comparable to the UHF, with the exception that once the memory page is shown, pressing the transfer switch next to this page field will move the cursor box to the page field. To access the VHF memory pages, press the field select key next to the VHF field and then press the PAGE key. The memory functions for VHF are identical to those for UHF memory.

NAV MEMORY PAGES

10 frequencies can be stored in the memory pages for NAV.

The process of programming memory for NAV is quite like that of UHF. However, there is one key difference - after the memory page is shown, you can move the cursor box to the page field by pressing the transfer switch adjacent to this field. To access the NAV memory pages, you need to press the field select key next to the NAV field and then press the PAGE key. The memory functions for NAV are the same as those for UHF memory.

TRANSPONDER SPECIAL FUNCTIONS PAGE

You can use the transponder special functions page to store and recall a single transponder code. From this page, you can also initiate the transponder test function. To access the transponder special functions page, place the cursor on the transponder field of the normal operating page and press the PAGE switch. To edit the single transponder code, use the tuning and data entry knobs. Press the ACCEPT message switch to store the new code.

GUARD FREQUENCY

During flight operations, it might be necessary to use the GUARD frequency. There are 2 ways to set the GUARD frequency for single-step operation. The first method is to set the UHF backup control unit to 243.00 MHz during the pre-flight test of the UHF backup control function. To use this method, turn on the UHF backup control. The RMU will show "REMOTE" in the UHF box and GUARD will become the selected frequency. The second method is to set the GUARD frequency (243.00 MHz) as the standby frequency on the active tuning page of the RMU. To access the GUARD frequency, press the transfer switch to change the current active frequency and the standby frequency to transmit on GUARD. The GUARD frequency can also be saved as a preset frequency on the memory page and then accessed like any other memory preset.

EMERGENCY LOCATOR TRANSMITTER (ELT)

No function in MSFS

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UHF BACKUP CONTROL UNIT

The UHF backup control unit is situated in the front cockpit's central console. In case of RMU failure or main battery power loss, the backup UHF control unit enables tuning of the UHF communications transceiver.

If the UHF backup control unit is turned ON, the UHF box on the RMU will display the word "REMOTE" as long as the RMU is operational.

OPERATION OF UHF BACKUP CONTROL UNIT

POWER ON/OFF, TEST, TONE TRANSMIT AND TUNING MODE SELECT

To turn on the backup UHF turn the knob clockwise from the OFF position.

Clicking PUSH TST will disable the squelch. Clicking on the PUSH TONE knob will make a 1kHz tone, TX illuminates while the tone is broadcasting.

When the UHF backup is on the channel select button can be pushed to select between preset or manual tuning.

ENTERING PRESETS

1. Click and hold the channel select button for 3 Seconds.
2. When the top line on the display flashes P01 turn the inner or outer select knob to change channels
3. Click the MODE button.
4. Use the inner and out select rotaries to select the frequency when the display stats flashing.
5. Press the MODE button to enter more channels and repeat the step above.

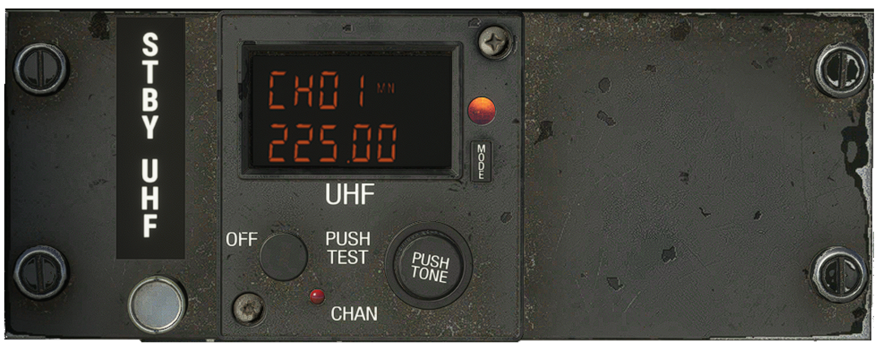
DELETING PRESETS

Click and hold MODE for 3 seconds.

When the display flashes, select the channel you want to delete.

Press MODE tune the frequency to 225 or 399 MHz.

Use the frequency/channel rotary, turn the outer knob one step to the left from 225, or one step to the right from 399.



UHF Backup Control Unit

PRESET TUNING

In the preset mode, the display will show "CH" along with the number of the preset frequency, ranging from 1 through 20, on the upper row. You can use either the inner or outer frequency/channel select knob to navigate through the preset channels. The display will also show the "GD" for the guard frequency of 243.00 MHz, which will be displayed between the highest numbered preset channel and channel 1.

MANUAL TUNING

In the manual tuning mode, the display does not show the CH and preset number. To choose the frequency, the outer frequency/channel select knob adjusts the frequency in increments of 1 MHz. The inner frequency/channel select knob adjusts the frequency in increments of 25 kHz.

RECEIVE MODE SELECT

The MODE button will switch between different receiver modes. main (MN) or main and guard (GD / MN) In (MN), the transceiver will both receive and transmit on the frequency that is currently selected. In (GD / MN) mode, the transceiver will monitor both the main and guard frequencies, and it will stop on the frequency that has an active signal. The transmitter function is available when using the selected frequency.

ELECTRONIC FLIGHT INSTRUMENT SYSTEM

The EFIS, comprising a control panel and two 5-inch displays in each cockpit, incorporates integrated units that can generate and exhibit the required graphics for either attitude or heading indication. It is crucial to note that a malfunction in one display should not render any other display in either cockpit inoperative.

If one display fails in a cockpit, it should not affect or disable any other displays.

EFIS Displays

Both the front and rear EFIS displays are equipped with a composite attitude/heading/navigation display when switched to composite mode. The primary attitude and heading information are sourced from the attitude heading reference system (AHRS).

The EADI portion of the EFIS offers the main display of the aircraft's attitude, showing rate-of-turn, mode selection information, localizer/glideslope deviation, and marker beacon alerts.

In addition to displaying primary navigation information, course selection, and selected heading reference bug, the electronic horizontal situation indicator (EHSI) also provides primary heading, nav source annunciation, DME, localizer and glideslope deviation, as well as RMI display.

EFIS CONTROL PANEL

The EFIS control panel adjusts the modes shown on the EFIS display. It manages the selection of primary navigation source, display mode, heading set marker (bug), and course pointer position, as well as executing self-test.

The control panel includes all mode controls, except for the selection of composite display, manual dimming controls, and GPS approach mode select.

On the left side of every instrument panel, there is a composite display switch. The composite switches, are for EADI or EHSI, can be operated by either pilot or work together simultaneously.

HEADING SELECT (HDG) KNOB

The HDG knob sets the heading on the EHSI, clicking on the knob resets the HDG bug to the aircrafts current heading.

COURSE SELECT (CRS) KNOB

The CRS knob sets the course pointer on the EHSI, clicking on the CRS knob resets the pointer to the current GPS waypoint or VOR.

TEST (TST) BUTTON

The TST button will initiate an EFIS self-test. The self-test mode consists of two phases. The first phase involves a static display that tests the indicator and annunciation functions. The second phase is a display that shows failure and warning flags. By clicking and holding the TST button, each phase is displayed for 5 seconds. Normal indications and displays will resume either after 10 seconds or when the TST button is released.

HORIZONTAL SITUATION INDICATOR (HSI) BUTTON

The HSI button will switch between a basic nav data page or the directional gyro page.

MAP BUTTON

- The MAP button will cycle between:
- Flight plan waypoints
- Flight plan waypoints plus ground stations
- Flight plan waypoints plus airports
- Flight plan waypoints plus ground stations and airports

ARC BUTTON

The ARC button is used to choose between two different 85-degree arc display formats on the EHSI. If the information is being shown in a 360-degree format, pressing the ARC button will maintain the display information but present it in an 85-degree arc layout. To switch between the HSI compass rose and map displays, press the MAP button. However, if the EHSI is already in an arc display mode, pressing the ARC button will not have any impact.

NAV SOURCE SELECTOR BUTTON

The NAV source selector button will cycle through the primary nav sources. When VOR or GPS is selected it will be shown on the left side of the display. Both navigation sources can be displayed with or without time-to-go (TTG) and groundspeed (GS) displayed. The distance display, TTG, and GS information are shown in the upper left corner and are based on the primary navigation source. To remove the distance, TTG, or GS display, press the NAV button until the desired display is shown.

RMI SINGLE NEEDLE AND DOUBLE NEEDLE SOURCE BUTTONS

The RMI single needle source button (↑), and the RMI double needle source button (⇑), are utilized to switch between the navigation sources available for the single needle and double needle RMI indicators on the EFIS. Each press of either RMI source button will cycle to the next navigation source selection. Three options for navigation display include VOR, GPS, or no selection made (blank nav source indicator). The single needle bearing pointer is white and the double needle pointer is magenta on the EHSI.

When in map mode and the navigation source is within the selected range, a VOR or GPS waypoint symbol will be shown instead of a bearing pointer.

INCREASE RANGE AND DECREASE RANGE BUTTONS

The increase range button (RNG ▲) and range degrease button (RNG ▼) will change the range on the EHSI in NAV MAP mode. After the maximum selectable range has been shown, press the decrease range button to adjust the scale of the EHSI display. Half-range options include 2.5, 5, 10, 20, 40, 80, 120, 160, and 500 NM scales. For the full circle or compass rose outer ring, the choices are 5, 10, 20, 40, 80, 160, 240, 320, and 1000 NM.

EFIS INDICATORS

Two displays are installed for each cockpit. The upper unit is an EADI (Electronic Attitude Director Indicator), the lower unit is an EHSI (Electronic Horizontal Situation Indicator). The breakers are located on the battery bus breaker panel in both cockpits.

BRIGHTNESS/DIMMING WHEEL

The BRT/DIM dial on each screen controls the brightness of the displays,

COMPOSITE MODE BUTTON

The CMP button on each display allows composite display, should either EFIS display fail, or composite display is desired. Both basic EADI and EHSI displays are overlayed together on a single screen.

GPS APPROACH MODE DISARM/DESELECT BUTTON

The GPS APR button is used for GPS approaches and controls the CDI sensitivity. Pushing it again will return it to "non-approach" mode.

EFIS FAULT ANNUNCIATIONS

If there is a failure in the pitch or roll attitude, the EADI will eliminate certain elements from the display, including the blue-sky raster, horizon line, sky pointer, and roll and pitch scales. However, the aircraft reference symbol, air data, and navigation-related items will remain visible.

A red box and letters showing ATTITUDE FAIL is at the top center of the screen. This signifies that the EADI cannot be used because there is no valid or accessible attitude data. The display will persist as long as the input flags indicate the data is not valid.

If the heading data is no longer accessible or accurate, the EHSI will display a heading fault annunciation. The failure will be indicated by the red letters HDG displayed within a red box.

Additional fault indicators:

- EADI Red X - indicates the necessary data, such as glideslope or localizer, is invalid.
- EHSI Red X - indicates the necessary data, such as failure of the source, or invalid data.

EADI NORMAL MODES

The EADI normal modes comprise of the enroute mode, approach mode, composite mode, and unusual attitude display. The subsequent paragraphs provide an explanation of the common displays that pilots may encounter during a flight.

EADI ENROUTE MODE

The symbols used to show the pitch and roll position include: a rotating white horizon line that moves with the roll and pitch of the aircraft, a blue sky above the horizon line and a black ground below it, an unchanging amber aircraft symbol (W), a pitch scale, and a roll scale. The moving white horizontal line, connected to the aircraft symbol, indicates the angle of pitch from level (0 degrees) to zenith (+90 degrees) and nadir (-90 degrees), as well as the angle of roll during a full 360 degrees rotation. The pitch scale displayed shows the normal pitch position. The EADI shows the pitch position in all valid modes of operation, displaying a moving white pitch scale relative to the fixed aircraft symbol. As the pitch of the aircraft changes, the pitch scale moves accordingly, and the current pitch value is indicated at the location of the fixed aircraft symbol.

If the aircraft's pitch attitude becomes too extreme, the horizon line on the display may be out of view. However, the pitch marks will still show accurate information. If the pitch angle goes beyond +30° or -20°, or if the roll angle exceeds 65°, only the attitude presentation will be visible on the display and all other information will be removed. Regardless of how severe the pitch angle is, there will always be a small part of the sky or ground visible (called the "eyebrow") to show the direction needed to correct the pitch and return to level flight.

The best recovery direction for unusual attitudes is indicated by red chevrons, they will be visible on the black ground raster and the blue-sky raster when the aircraft is between 40° and 90° in both pitch and bank angles. When the aircraft passes through the nadir or zenith, the displayed attitude will roll over, with the sky pointer or roll indicator scale appearing at the bottom of the display unit. This rollover indicates the correct sky/ground reference during inverted maneuvers. Once the aircraft returns to a pitch orientation of less than 25° up or 15° down, and the bank angle is less than 60°, the normal EADI presentation will appear again.

EADI APPROACH MODE

The normal modes of EHSI include the enroute and approach modes. Each mode has five display formats to choose from, including directional gyro, standard HSI compass rose, HSI map, expanded ARC compass rose, and expanded navigation map. There are two bearing pointers that can be used to select any available combination of NAV sensors. If the chosen sensor provides distance information, it will be displayed alongside the bearing pointer. Users can select various displays, ranging from a simple compass card to more detailed displays showing the NAV map, course, and approach.

EADI COMPOSITE MODE

Composite mode is enabled by pressing the CMP button. If one cockpit chooses the EHSI composite format, both cockpits will show the same composite format on the EHSI. The same applies to the selection of the composite format for the EADI.

UNUSUAL ATTITUDE DISPLAY

The EFIS system will simplify the attitude display on the EADI during unusual attitudes. It removes any clutter and only shows clear and concise information about the aircraft's pitch and roll attitudes if they exceed predetermined limits. During these excessive angles, all non-attitude related information is removed, except for the turn rate indications which are still shown. Furthermore, if the pitch value gets close to the lowest or highest point, red chevrons appear to indicate the direction closest to achieving a level attitude recovery.

In the event of excessive pitch attitude, the horizon line may be shifted out of view. However, the pitch marks on the display will still give accurate pitch information. If the pitch angle goes beyond +30° or -20°, or if the roll angle exceeds 65°, only the attitude presentation will be visible on the display and all other information will be removed. Regardless of the extent of the pitch angle, a small portion of the sky or ground (called the eyebrow) will be displayed to indicate the direction of the minimum correction needed to return to level flight.

The best unusual attitude recovery direction is indicated by red chevrons. These chevrons will be seen on the black ground raster and the blue-sky raster between 40° and 90°. When the aircraft reaches the nadir or zenith, the displayed attitude will roll over to show the correct sky/ground reference during inverted maneuvers. The sky pointer or roll indicator scale will be at the bottom of the display unit. Once the aircraft returns to a pitch orientation of less than 25° up or 15° down, with a bank angle of less than 60°, the normal EADI presentation will come back.

EHSI MODES

The normal modes of EHSI include the enroute mode and approach mode. There are five display formats available for each mode, including directional gyro only, standard HSI compass rose, HSI map, expanded ARC compass rose, and expanded navigation map. Two bearing pointers can be selected to use with any available combinations of NAV sensors. If the selected sensor provides distance information, it will be shown next to the bearing pointer announcement.

EHSI ENROUTE MODE

The EHSI compass card display consists of a white compass scale that can rotate a full 360°. It shows the aircraft's heading in relation to a white triangular index line. The compass scale is divided into increments of 5° and 10°. Additionally, there are fixed index marks at intervals of 45° next to the compass scale.

The annunciation for VOR/ILS and GPS approach mode is green, while GPS enroute mode is cyan (light blue).

The HDG knob on the EFIS control panel allows manual adjustment of the heading bug's position (colored magenta). The bug moves with the compass card to indicate the desired heading in both cockpits. Additionally, a digital readout of the chosen heading is visible in the upper right corner of the display.

When GPS is chosen as the navigation source, the Desired Track (DTK) readout replaces the Course (CRS) readout.

CDI		
	1 Dot	**2 Dot**
LOCALIZER	0.25 ° x width of localizer	0.5 ° x width of localizer
VOR	5 °	10 °
GLIDESLOPE	0.25 ° x width of glideslope	0.5 ° x height of glideslope
GPS APR ACT	0.15 NM	0.3 NM
GPS EN ROUTE	2.5 NM	5.0 NM
GPS APR ARM	0.5 NM	1.0 NM

When selecting DME HOLD, the distance, VOR/LOC frequency (if applicable), and the HOLD (H) annunciator for that specific DME will be constantly displayed in the available DME field(s). The distance and frequency parameters will be shown in white and remain that way until the HOLD function is deactivated.

These items can be unselected on the display:

TIME TO GO

The Selection of Time to Go (TTG) feature offers a precise estimate of the time it will take to reach the ground station DME or GPS waypoint, based on the chosen primary navigation source. This information is displayed in hours and minutes at the top left corner of the screen.

TO/FROM AND COURSE DEVIATION DISPLAY. The TO/FROM

The white arrowhead display, (TO/FROM), is located near the center of the EHSI. It points towards the head of the course pointer to indicate the selected course is "TO," or towards the tail of the course pointer to indicate "FROM." TO/FROM indicates whether the aircraft is heading towards or away from the station or waypoint. However, during ILS operations, the TO/FROM annunciator is not visible. The course deviation scale acts as a reference for the course deviation bar, which shows the selected navigation or localizer course's centerline in relation to the symbolic aircraft.

EHSI APPROACH MODE

To perform a VOR/ILS approach, the right side of the display shows a vertical deviation scale. The EHSI's vertical deviation scale corresponds to the EADI's vertical scale. If the heading marker position on the EHSI cannot be deselected, the vertical deviation scale will show the glideslope deviation. When a localizer frequency is selected, the EHSI will initially display both a glideslope deviation scale and a localizer deviation scale.

The heading marker cannot be deselected on the EHSI. When a localizer frequency is chosen, the EHSI will automatically show a glideslope deviation scale and a localizer deviation scale upon initialization.

LINEAR DEVIATION				
ENROUTE	1 dot	2.5 nm	2 dots	5.0 nm
APPR ARM	1 dot	0.5 nm	2 dots	1.0 nm
APP ACT	1 dot	0.15 nm	2 dots	0.3 nm

ATTITUDE HEADING AND REFERENCE SYSTEM (AHRS)

The AHRS is a comprehensive inertial sensor system that offers essential information regarding the aircraft's attitude, heading, and flight dynamics to the aircraft systems and displays. The EADI serves as the main display for attitude, while the EHSI is the primary display for heading in both cockpits.

ATTITUDE HEADING REFERENCE UNIT

AHRS CONTROLLER

The AHRS controller can be found on the right side of the instrument panel in the front cockpit. It includes two switches, a meter, and a recessed switch that is situated at the front of the unit. When the aircraft is on the ground, activating the recessed switch will trigger the functional self-test mode.

The mode control switch allows you to choose between three modes: directional gyro (DG), slaved (SLVD), and gyro-stabilized magnetic heading. In slaved mode, the AHRS heading is synchronized with the flux valve data, providing accurate magnetic heading information.

In certain circumstances, it may not be recommended to rely on the slaved magnetic heading. This could be due to disruptions in the earth's magnetic field in the area or when flying close to the magnetic poles, where the magnetic heading and true heading could diverge by up to 180°

In this instance, to furnish the pilot with usable heading information, it is recommended to switch the AHRS to the DG mode.

The pilot is given notice that DG mode is in use through the indication of FHDG appearing to the left and slightly above the Heading Lubber Mark on the top of the Compass Card on the EHSI. To input the desired heading into the system, the pilot must use the slew switch.

After a complete initial alignment, the AHRS heading may experience a drift of less than 9° per hour in this mode.

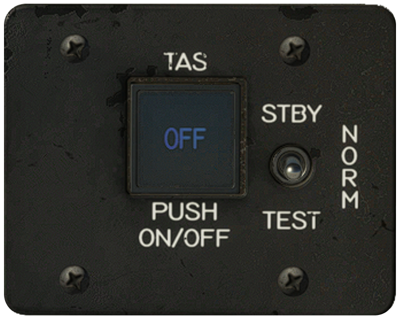
MAGNETIC SENSOR UNIT

The right wing of the aircraft houses the magnetic sensor unit, which can be accessed through a panel located on the wing's top surface. This unit is responsible for transforming the earth's magnetic lines of flux into an electrical signal, which is then transmitted to the AHRU (Attitude, Heading, and Reference Unit).

TRAFFIC ADVISORY SYSTEM (TAS)

Traffic advisory information is presented to pilots through the TA/VSI located in their cockpits. Additionally, they receive auditory warnings through the aircraft audio system.

- Avoid relying on TAS as the main method for avoiding traffic conflicts.
- Pilots should not rely solely on this as a substitute for ATC or see-and-avoid procedures. They still need to visually scan the surrounding airspace.
- Do not rely on the TAS as a Traffic Collision Avoidance System (TCAS)
- There is a possibility that it may not provide accurate information or that the traffic display on TAS may suddenly vanish during aerobatic maneuvers.



TAS CONTROL PANEL

Activate or deactivate the TAS by pressing the TAS PUSH ON/OFF switch/annunciator on the right side of either instrument panel.

The forward TAS control panel includes a switch labeled TEST/STANDBY/NORM. This switch starts the built-in test (BIT) program, transitioning the TAS processor into standby mode, or choosing regular operation. No traffic advisories will be provided in standby mode.

NORMAL/BELOW/ABOVE PUSHBUTTON SELECTOR SWITCH

The pushbutton selector switch is on the control stick grip. The button will cycle airspace volume limits.

In **normal** mode, the display will show traffic that is within 2700 feet above to 2700 feet below the aircraft. This mode is usually selected during the enroute phase.

In **above** mode, the display will show traffic that is between 8700 feet above to 2700 feet below the aircraft. This mode is typically used during climb.

In **below** mode, the display will show traffic that is between 2700 feet above to 8700 feet below the aircraft. This mode is usually used during descent.

FIG1-59.1

TA/VSI CONTROLS

The TAS, monitors and records the distance, height, and direction of aircraft that are located within a 40 nautical mile radius. It specifically focuses on aircraft that are positioned either 10,000 feet higher or lower than the current aircraft. The TAS system then visually displays the identified aircraft on the indicators for Traffic Advisory and Vertical Speed Indicator.

TAS RANGE SELECT SWITCHES

To choose the range on the traffic display, the TAS range select switches are utilized. The available range selections include 3, 5, 10, 15, 20, and 40 NM. This function is independent per cockpit.

TA/VSI BRIGHTNESS CONTROL

The TA/VSI brightness control knob allows independent adjustment of display brightness in each cockpit.

TAS SENSITIVITY LEVELS

The airspace surrounding the aircraft is divided by TAS into two altitude layers, each with its own level of sensitivity for issuing traffic advisories (TAs).

1. The sensitivity level A for TAS is activated when the landing gear is in the extended position. A Traffic Advisory (TA) will be provided when any of the following conditions occur:
   a. The vertical distance between the intruder is within 600 feet and the horizontal distance is within 0.2 NM.
   b. According to TAS's calculations, maintaining the current closing rate with the intruder aircraft will result in a vertical separation of less than 600 feet within 20 seconds.
   c. The intruder is horizontally separated by either 15 seconds or 0.2 NM from the altitude reporting.
2. The sensitivity level B of TAS occurs when the landing gear is in the retracted position. An alert will be generated by TA if any of the stated conditions are satisfied:
   a. The intruder is at a vertical separation of fewer than 800 feet and a horizontal separation of fewer than 0.55 NM.
   b. According to calculations by TAS, if the current rate at which the intruder aircraft is closing is maintained, vertical separation of 800 feet or less will be reached within 30 seconds.
   c. The non-altitude reporting intruder is within a horizontal separation of 0.55 NM or 20 seconds.

TAS OPERATION

TAS utilizes transponders to locate and monitor other aircraft by sending inquiries. By examining the responses from the transponders, TAS can determine the distance, direction, and altitude differences (if the intruding aircraft is providing altitude information). If TAS identifies a potential risk of collision, visual advice will appear as symbols on the TA/VSI indicator, and audible alerts will be played through the audio system.

TAS PILOT-INITIATED SELF-TEST

a. The Cyan TCAS STBY annunciator changes to an amber TEST annunciator.
b. A Traffic advisory annunciator (yellow filled circle) is present at the 9 o'clock position, 2 NM away, 200 feet below and ascending.
c. A Proximity traffic annunciator (solid white diamond) appears at the 1 o'clock position, 3.6 NM away, 1000 feet below and descending.
d. Another traffic annunciator (open white diamond) is seen at the 11 o'clock position, 3.6 NM away, 1000 feet above and in level flight.
e. The range default upon powering up is set to 10 NM, displayed in the upper right portion of the screen, and an audible "TAS SYSTEM TEST OK" message is heard on the audio system.

TAS DISPLAY SYMBOLOGY:

- Non-threat traffic: An open white diamond signifies that an intruder's altitude is greater than ±1200 feet relative altitude or its distance is beyond 5 NM. It is not considered a threat.
- Proximity traffic: A filled white diamond indicates that the intruding aircraft is within ±1200 feet relative altitude and within 5 NM range, but it is still not considered a threat.
- Traffic advisory (TA): A filled yellow circle suggests that the intruding aircraft is potentially hazardous. A TA is displayed when the time to the closest point of approach is between 15 to 30 seconds. The audio system will announce a "TRAFFIC, TRAFFIC" voice message.
- No bearing: TAS cannot determine the azimuth to the intruder listed on display.
- Off scale traffic: Threat aircraft beyond the selected display range are indicated by half of the traffic symbol at the edge of the display. The position of the half symbol represents the bearing to the intruder.
- Trend arrows: Trend arrows are provided to indicate if traffic is climbing or descending.

TAS AUDIO MESSAGES

- There will be an announcement over the audio system for traffic advisory. If there is an active previous traffic advisory, only "TRAFFIC" will be announced.
- The self-test has passed, and "TAS SYSTEM TEST OK" will be announced over the audio system.
- The self-test has failed, and "TAS SYSTEM TEST FAIL" will be announced over

the audio system.

TAS CAUTION ANNUNCIATORS

The TA/VSI indicator will display amber caution announcements:

- VSI: The vertical speed indicator has stopped working (no ADC).
- TCAS: The TAS system has stopped working.
- TEST: A self-test initiated by the pilot.

VERY HIGH FREQUENCY (VHF) NAVIGATION (NAV) SYSTEM

The VHF NAV system, offers various functions such as VOR and ILS capabilities, including LOC and GS reception. It includes a NAV receiver that can access 200 VOR/LOC channels ranging from 108.00 to 117.95 MHz, 40 glideslope channels from 329.15 to 335.00 MHz (automatically paired with localizer channels), and a marker beacon receiver tuned to 75.00 MHz. The RMU controls the VHF NAV, and the VOR display is shown on the electronic horizontal situation indicator (EHSI). The ILS and glideslope display can be seen on the electronic attitude director indicator (EADI) and the EHSI. Power for the VHF NAV receiver is provided through the VHF NAV circuit breaker, located on the generator bus circuit breaker panel in the front cockpit.

DISTANCE MEASURING EQUIPMENT (DME)

The DME system enables ground station distance measurements based on the selected VOR frequency. Controls on the RMU allow for DME mode selection. The DME offers information such as distance to the station, time to go (TTG), and DME ground speed. The EHSI provides a display for the DME. Power for the DME system is supplied through the DME circuit breaker, located on the front cockpit's generator bus circuit breaker panel.

GLOBAL POSITIONING SYSTEM (GPS)

The GPS system consists of two receiver/control/display units that are mounted on panels, each with eight channels. These units are situated on the left side of the instrument panel in both cockpits. Each unit is equipped with a battery to store flight plans and other user data that remains unaffected even when power is lost.

Data is provided on the GPS unit and on the EHSI in each cockpit. Power for the respective GPS is through the GPS circuit breaker, located on the battery bus circuit breaker panel in the front cockpit, and on the generator bus circuit breaker panel in the rear cockpit.

SEE INCLUDED GPS SUPPLEMENT

LIGHTING SYSTEM

Lighting Panel

INTERIOR LIGHTING

To facilitate operation during night or reduced light conditions, all instruments, control panels, and displays in both cockpits are equipped with lighting. Near the circuit breaker panels in each cockpit, area lights are installed. The lighting within the cockpits, excluding the electronic displays, is blue/white in color. Furthermore, all switches and placards necessary for safe flight are also illuminated.

AREA LIGHTING

Area lighting is controlled via the FLOOD knob.

The breaker for the area lighting (FLDT) is on the battery bus panel of each cockpit.

INSTRUMENT PANEL LIGHTING

Instrument panel lighting is controlled via the INST knob.

Side panel lighting is controlled via the SIDE knob.

The breakers for the instrument lighting (INST) are for the front and INST LT for the rear cockpits. They are both located on each respective cockpits' battery bus breaker panel.

KNEE BOARD LIGHTS

The knee board lights are attached to the front and back glareshield. Each light can be controlled separately. The light turns on when the assembly is moved down for use and turns off when it is moved back to the stowed position.

The breakers for the lights (UTIL) for the front, and (UTIL LT) for the rear cockpits are both located on each respective cockpits' battery bus breaker panel.

EXTERIOR LIGHTING

LANDING AND TAXI LIGHTS

Only when all three gears are down and locked will the landing light illuminate.

The breaker for the landing light (LDG), is located on the battery bus breaker panel in the front cockpit.

Only when all three gears are down and locked will the taxi light illuminate.

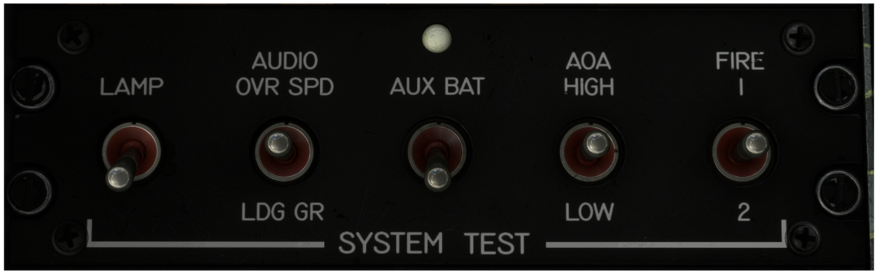
The breaker for the taxi light is labelled TAXI, located on the generator bus breaker panel in the front.

NAVIGATION AND ANTI-COLLISION STROBE LIGHTS

Installed at the leading edge of the left wing tip is a red light, while at the leading edge of the right wing tip is a green light. Additionally, a white light is installed at the trailing edge of each wing tip.

The breaker for the strobe lights is labelled COLL, located on the battery bus breaker panel in the front cockpit.

SYSTEM/LAMP TEST PANEL



System/Lamp Test Panel

A system / lamp test panel is on the left side console of the front cockpit just behind the PCL and the left console of the rear cockpit. The power is supplied via the TEST breaker located on the front generator bus breaker panel.

SWITCHES

- Lamp test: The lamp test switch will illuminate:
  - master caution
  - master warning
  - annunciator
  - landing gear handle
  - fire annunciator
- Audio - overspeed/landing gear: This will sound the warning tones for overspeed and landing gear when the switch is moved to the respective position.
- AUX BATT: Checks the voltage of the auxiliary battery, if the battery is above 50% the lamp will illuminate.
- AOA high/low: HIGH will simulate a high AOA condition, lighting up the AOA indexers, gauges, and stick shaker. The LOW position will simulate optimal AOA.
- FIRE TEST 1/2: Will test the fire detection system. The top and bottom half of the FIRE warning light will illuminate.

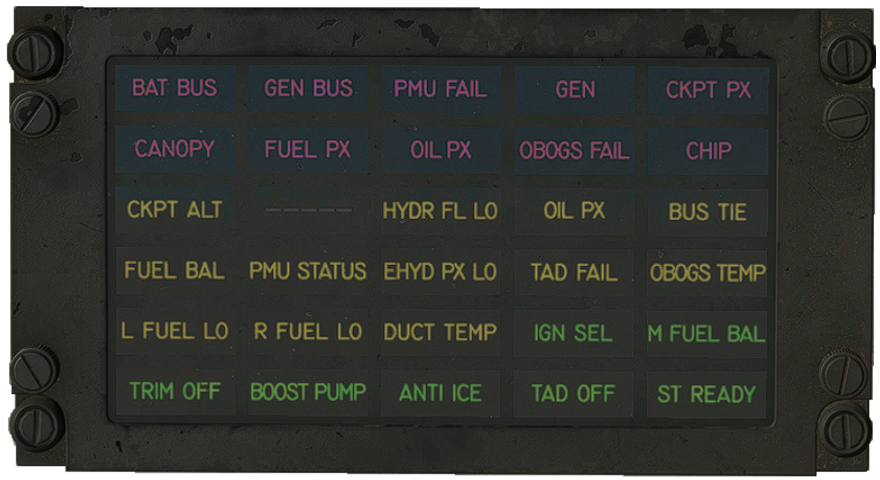
CENTRAL WARNING ANNUNCIATOR SYSTEM

The Central Warning/Advisory Annunciator System (CWS) is equipped with annunciators and switch lights that are strategically placed on the instrument panels and glareshields. Additionally, there is an aural tone generator that swiftly notifies users of any malfunctions or the status of important aircraft systems. Each cockpit features an annunciator panel located on the lower right side of the instrument panel, which showcases red warning legends, amber caution legends, and green status legends for the systems. These annunciator panels are interconnected with the master caution and warning switch lights found on the respective glareshields. To be specific, on each glareshield, the master caution/warning system consists of an amber master caution switch light, a red master warning switch light, and a red fire switch light

MASTER WARN AND MASTER CAUTION SWITCHLIGHTS AND FIRE WARNING ANNUNCIATOR

Under the glareshield in each cockpit, there are resettable, color coded switches for master warning and master caution. These switch lights are located below the lip and serve as indicators. When the red warning switch lights are illuminated, it means MASTER WARN is activated. When the amber caution switch lights are illuminated, it indicates MASTER CAUTION. Additionally, the red fire warning annunciators illuminate when there is a fire detected.

Flashing lights on the main annunciator panel in both cockpits will alert the crew to any warnings or cautions. To address these issues, the crew can press the flashing master caution or master warn switch lights, which will turn off the lights and prepare them for any future system failures. If the red FIRE annunciator illuminates, it will trigger the master warn switch light and a warning tone. Even after resetting the master switch light, the specific warning on the main panel will remain lit until the problem is resolved. The FIRE annunciator will stay lit until the cause of the alarm, such as a fire or bleed air leak, is resolved.



Master Caution and Fire Warning Annunciator

AURAL WARNING TONE GENERATOR

Various distinguishable tones for pilot warnings are provided by an electronic tone generator in the AOA computer unit below the forward glareshield.

Power for the tone generator unit is provided through the circuit breaker labeled AURAL WARN, on the generator bus breaker panel in the front cockpit.

ON-BOARD OXYGEN GENERATING SYSTEM

The airplane is equipped with an on-board oxygen generating system (OBOGS) that supplies regulated oxygen to each pilot. The oxygen supply is maintained at a slightly higher pressure and has no time restrictions. The OBOGS uses a molecular sieve to extract oxygen from conditioned bleed air through pressure swing absorption.

OXYGEN PRESSURE REGULATOR SUPPLY LEVER

The supply lever can be set in two positions, ON and OFF.

When the lever is in the OFF position, the electrical power and oxygen flow to the respective regulator of the OBOGS system are disconnected. However, if the supply lever for either regulator is set to ON, the OBOGS system will be functional. To disable the OBOGS system, both supply levers must be set to the OFF position.

OXYGEN PRESSURE REGULATOR CONCENTRATION LEVER

The pressure lever has three positions: EMERGENCY, NORMAL, and TEST MASK. The EMERGENCY position provides the pilot with the required positive pressure in emergency scenarios like cockpit fires or hypoxia symptoms. When set to NORMAL, the regulator provides a slight additional positive pressure along with the pressure requested by the pilot through the mask. The TEST MASK position supplies a highly pressurized flow to test the seal between the face and mask.

OXYGEN PRESSURE REGULATOR PRESSURE LEVER

The pressure lever has three positions: EMERGENCY, NORMAL, and TEST MASK, respectively. The EMERGENCY position provides the pilot with the required positive pressure in emergency situations like cockpit fires or symptoms of hypoxia.

OXYGEN PRESSURE REGULATOR BIT BUTTON

You can activate the OBOGS BIT (Built-in Test) by pressing the BIT button after the engine has started and warmed up for 3 minutes. The I-BIT ensures that the OBOGS sensor and OBOGS FAIL indicator are working properly. When you briefly press the BIT button, a valve in the concentrator opens to let in ambient air, causing the oxygen concentration to decrease. This should trigger the OBOGS FAIL light to turn on within 20 to 30 seconds. Once the valve closes and the oxygen concentration returns to normal, the OBOGS FAIL indicator should turn off within 2 minutes. If the indicator fails to turn on or off correctly, either the indicator or the monitor has malfunctioned.

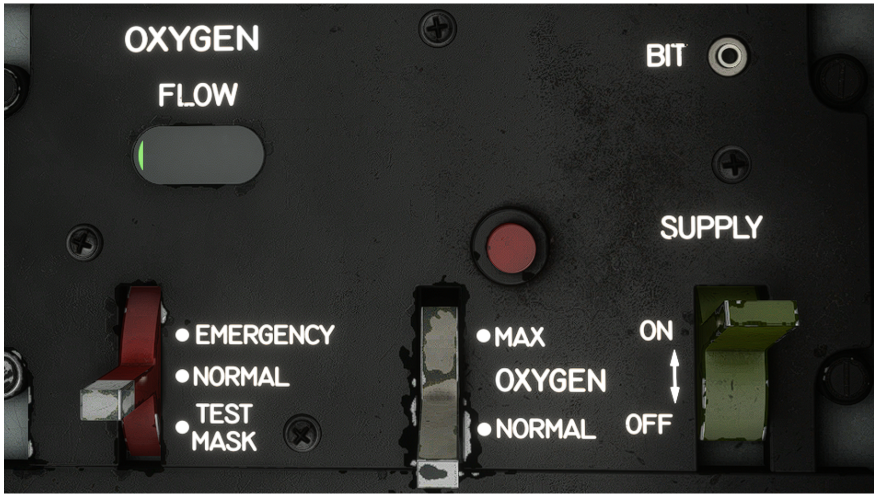
OXYGEN PRESSURE REGULATOR FLOW INDICATOR

The flow indicator on the regulator visually displays the oxygen flow. It is activated with every breath taken through the regulator and remains displayed for the entire duration of the flow.

AUTOMATIC BACKUP OXYGEN SYSTEM (ABOS)

This optional system may be enabled via the tablet. It provides a backup oxygen supply should the OBOGS system fail.

- If either OBOGS fail or CKPT ALT annunciators illuminate, the system automatically operates. If the issue is resolved it will keep delivering oxygen for an additional 30 seconds and then turns off.
- The system will provide backup oxygen for approximately 20 minutes for 1 pilot or 13 minutes for two.
- At 500 PSI remaining the BOS FAIL annunciator will illuminate indicating 1-4 minutes of supply remain.
- If both OBOGS systems have failed and the ABOS has failed , then the OXY CRIT annunciator will illuminate.
- Pressing the ABOS button in the cockpit that activated the system will deactivate it.
- If either cockpit leaves OBOGS on and shuts down the engine, it will trigger the ABOS system.



FLIGHT PLANNING

One can obtain the necessary information, such as takeoff performance, required fuel, cruise data, and other crucial data to fulfil the planned mission, from the relevant performance charts [p. B6-1].

NORMAL CHECKLIST

The methods outlined in this part of the guide are intended for flight crew members who are actively involved in operating the aircraft. Steps or items that need to be checked in both cockpits, if both are occupied, are marked with (BOTH) after the step.

PREFLIGHT CHECK

1. ISS mode selector - SOLO (as required) (Verify ISS mode selector lever is locked in SOLO)
2. STARTER switch - NORM (BOTH)
3. IGNITION switch - NORM (BOTH)
4. AVIONICS MASTER switch - OFF
5. EVAP BLWR control - OFF (BOTH)
6. Circuit breakers - In
7. PCL - OFF (BOTH)
8. Gear handle - DOWN (BOTH)
9. Brake reservoir - Check (Notify maintenance if filler plug green band is not visible)
10. FIREWALL SHUTOFF handle - Down, guard in place
11. AUX BAT - TEST
    (Position switch forward and hold for a minimum of 5 seconds, then release. Verify test indicator illuminates when switch is moved to forward position, remains illuminated while switch is held forward, and extinguishes when switch is released.)
12. AUX BAT switch - ON and check:
    a. Standby instruments - Verify functioning.
    b. Backup UHF control head - Verify functioning then OFF.
    c. Fire warning system test switch - Test FIRE 1 position (upper half of annunciator should illuminate)
    d. Central warning system (CWS) panel and alternate engine data displays - Verify not functioning.
13. AUX BAT switch - OFF
14. BAT switch - ON

NOTE

- Typical annunciators which may be illuminated on initial application of power are GEN, OBOGS FAIL, FUEL PX, OIL PX, TAD FAIL, TAD OFF, and HYDR FL LO.
- Aural warning, PMU FAIL, PMU STATUS, HYDR FL LO, and TAD FAIL annunciators should extinguish when MASTER WARN/MASTER CAUTION switch lights are depressed.

15. Battery voltage - Check (23.5 VDC minimum for a battery start)
16. Fuel quantity - Check
17. BAT switch - OFF
18. Vent control lever - FOOT

INTERIOR INSPECTION

REAR COCKPIT (SOLO FLIGHT)

1. ISS mode selector - SOLO (Verify ISS mode selector lever is locked in SOLO.)
2. Left console circuit breakers - Check in.
3. TRIM DISCONNECT switch - NORM.
4. Interior lighting - OFF
5. INTPH switch - As required.
6. Standby attitude indicator - CAGE
7. BAT and GEN switches - OFF
8. STARTER switch - NORM
9. IGNITION switch - NORM
10. BOOST PUMP switch - ARM
11. EVAP BLWR control - As required.
12. OBOGS - OFF:
    a. OBOGS supply lever - OFF
    b. OBOGS concentration lever - NORMAL
    c. OBOGS pressure lever - NORMAL
13. Right console circuit breakers - Check in.
14. Rear cockpit GPS - As required NOTE With rear cockpit GPS off, a message will be continuously displayed on the front cockpit GPS during operation.

COCKPIT

1. BAT switch - ON
    a. Typical annunciators which may be illuminated on initial application of power are GEN, OBOGS FAIL, FUEL PX, OIL PX, TAD FAIL, TAD OFF, and HYDR FL LO.
    b. Aural warning, PMU FAIL, PMU STATUS, HYDR FL LO, and TAD FAIL annunciators should extinguish when MASTER WARN/MASTER CAUTION switch lights are depressed.
2. External power - As required.
3. Flight controls - Check (BOTH)
4. System test panel - Check
    a. LAMP test switch - Check (BOTH) (Check that all caution and warning annunciators illuminate, and that red gear handle and red and green gear and gear door lights illuminate.)
    b. AUDIO test switch - OVR SPD, LDG GR (Check overspeed and landing gear warning horns.)
    c. AOA system test switch - Test
        i. LOW - Amber donut, 10.5 units (Check AOA indexer amber donuts illuminate, red chevrons deactivate, and AOA gages show 10.5±0.25 units.)
        ii. HIGH - Green chevron, stick shaker, 18 units (Check AOA indexer green chevrons illuminate, stick shaker activates, and AOA gages show 18±0.25 units.)
    d. FIRE warning system - FIRE 1, FIRE 2 (BOTH) (Check that both upper engine FIRE lights illuminate in FIRE 1 position and both lower engine FIRE lights illuminate in FIRE 2 position.) WARNING Both FIRE test positions must check good (all four bulbs in each annunciator) in both cockpits (if occupied)
5. Flaps - UP
6. Exterior lights - OFF
7. TRIM DISCONNECT switch - NORM (BOTH)
8. Interior lights - As required.
9. TRIM AID switch - OFF
10. Trim operation - Check (BOTH):
    a. Aileron, elevator, and rudder trim - Check
    b. Elevator and aileron trim - Set for T/O (Set elevator and aileron trim to respective green ranges.)
    c. Rudder trim - Set outside green range (Set rudder trim out of green range to check/verify correct TAD operation during the Before Taxi checklist.)
11. EMER LDG GR handle - Check stowed.
12. GPS power switch - ON
13. Clock - Set
14. Accelerometer - Reset
15. Audio panel - As required.
16. Standby flight instruments - Check (Ensure standby attitude indicator is caged.)
17. Standby magnetic compass - Check (Check fluid, heading, and current correction card.)
18. ELT switch - ARM
19. TAS STBY/NORM/TEST switch - STBY
20. AHRS compass switch - SLVD
21. PARKING BRAKE - Failure to ensure that the parking brake is set properly will result in the aircraft creeping upon the start of the engine, which could pose a danger.
22. Chocks - Removed
23. GEN switch - OFF (BOTH)
24. FUEL BAL switch - AUTO
25. MANUAL FUEL BAL switch - OFF
26. AVIONICS MASTER switch - OFF
27. BUS TIE switch - NORM
28. PROBES ANTI-ICE switch - Ensure that the anti-ice switch is turned on briefly to verify its functionality, and then switch it off. Confirm that the ANTI ICE annunciator lights up and that there is an increase in amperage draw.)
29. BOOST PUMP switch - Verify that the ARM (Activate Ready Mode) switch is functioning properly by briefly turning ON the BOOST PUMP switch. After that, activate the ARM function. Make sure that the BOOST PUMP annunciator lights up and observe that the amperage draw increases.)
30. PMU switch - NORM (lever locked)
31. DEFOG switch - OFF.
32. EVAP BLWR control - As required.
33. AIR COND switch - As required.
34. BLEED AIR INFLOW switch - OFF
35. PRESSURIZATION switch - NORM (guarded position)
36. RAM AIR FLOW switch - As required.
37. TEMP CONTROL switch - AUTO

ENGINE START

CAUTION

If the battery voltage is below 22.0 volts, refrain from connecting external power. Doing so may result in potential harm to the aircraft battery.

Battery power is the main way to start the engine. If there haven't been any issues with starting, but a battery start attempt was stopped (either by the PMU or manually), follow the Abort Start Procedure.

External power may be used to perform a normal engine start. External power shall be used to perform a normal engine start if battery voltage is less than 23.5 volts. Also, consider using external power when motoring the engine.

HIGH IOAT AT START >80 °C.

The aircraft IOAT indication is produced by a sensor located in the engine inlet plenum. It is possible for the IOAT sensor to become heated by radiant heat from the engine during periods on the ground after the engine has been turned off. This can cause the IOAT to increase beyond ambient temperatures.

If this happens and the IOAT becomes greater than 96 °C but less than 121 °C, the PMU will default to a temperature of 121 °C for all PMU functions, including the display of IOAT. However, if the IOAT does not exceed 96 °C, the PMU will display the indicated value.

If the PMU is activated while the IOAT is above 96 °C, the IOAT and ITT data will be considered invalid. This will be indicated by amber dashes in the counter display and a missing ITT pointer, as well as the display of the message "EDM FAIL" at the bottom of the primary engine data display. The IOAT and ITT will remain invalid until the PMU is reset by cycling the PMU switch from the "NORM" position to "OFF" and then back to "NORM". Once the PMU is reset, the IOAT and ITT displays should return to normal, and the "EDM FAIL" message should be removed.

When the IOAT surpasses 121 ° C, the PMU will detect this and trigger a signal. As a result, the PMU will be unable to calculate ITT and will become inactive. You can identify this situation by observing amber dashes in the IOAT and ITT counters, the disappearance of the ITT marker on the main engine data display, and the activation of the PMU FAIL indicator. The PMU will only reset once the IOAT falls below 121 ° C.

If the IOAT exceeds 80 °C, follow the steps outlined below:

1. Propeller area - Clear
2. PMU - Reset if necessary.
   (The PMU resets when the IOAT reading is 121 ° C or lower, the primary engine data display shows the ITT counter and pointer, and the EDM FAIL message is not shown.)
3. PMU switch - OFF
4. STARTER switch - MANUAL for 20 seconds maximum (Observe starter duty cycle cool-down period.)
5. PMU switch - NORM
6. Verify IOAT indicates 80 °C or less.
7. Repeat steps 3 through 6 as necessary.
8. Continue with Engine Start (AUTO) procedure.

ENGINE START (AUTO)

1. Canopy - Closed and latched (BOTH) (Check annunciator extinguished and green canopy mechanical lock indicators visible.)
2. Navigation and anti-collision lights - As required. Anti-collision strobes may be left off if operation is distracting, such as for ground operations at night.
3. PMU FAIL/PMU STATUS annunciators - Extinguished (If PMU FAIL or PMU STATUS annunciators are illuminated, set PMU switch to OFF, then NORM.) CAUTION With the PMU STATUS annunciator illuminated the PMU auto abort function may be unavailable. Do not continue Engine Start (AUTO) procedures.
4. PCL - Advance to start position (ST READY illuminated)
5. Propeller area - Clear
6. STARTER switch - AUTO/RESET
   - Abort engine start if anything abnormal occurs during the start sequence, or severe damage could occur to the engine.
   - Abort engine start if the PCL is inadvertently moved before N1 reaches 60%.
7. Engine instruments - Monitor and check.
   CAUTION
   - If a start attempt is aborted (PMU or manual abort), execute Motoring Run Procedure
8. PCL - Advance past two clicks, then IDLE, at or above 60% N1
9. External power - Disconnect (if used)

BEFORE TAXI

1. GEN switch - ON, annunciator extinguished.
2. BLEED AIR INFLOW switch - NORM
3. EVAP BLWR control - As required.
4. AIR COND switch - As required.
5. AVIONICS MASTER switch - ON
6. OBOGS - Check (BOTH):
    a. OBOGS supply lever - ON
    b. OBOGS concentration lever - NORMAL
    c. OBOGS pressure lever - Check EMERGENCY (increased pressure) then back to NORMAL Check flow indicator for normal operation (BOTH)
7. NACWS - ON
8. TAS - ON
    a. TAS STBY/NORM/TEST switch - NORM
    b. TAS UP/DN buttons - 5 NM
    c. NORM/BEL/ABV switch - ABOVE
    d. TAS STBY/NORM/TEST switch - STBY
9. Standby attitude indicator - Uncage/adjust (BOTH)
10. Speed brake - Check (ground crew observer if available) (BOTH) (Check annunciator is illuminated when extended.)
11. Anti-G test - Depress as required (BOTH)
12. Flaps - Check (ground crew observer if available) (BOTH):
    a. Set flaps LDG - Verify flaps move to LDG, indicator reads LDG, and speed brake retracts (annunciator extinguishes)
    b. Set flaps TO - Verify flaps move to TO and indicator reads TO
    c. Attempt to extend speed brake - Verify speed brake does not extend.
13. TRIM AID switch - ON:
    a. Verify TAD OFF annunciator extinguished.
    b. Verify yaw (rudder) trim set in green range (T/O)
14. GPS - Programmed and set.
15. Flight instruments - Check (BOTH) (Check pitch, roll, heading, and vertical speed indications and no flags.)
16. RMU - Set as required:
    a. UHF COMM - Set as required.
    b. VHF COMM - Set as required.
    c. Transponder - Set as required, mode to STBY.
    d. VHF NAV - Set
17. Altimeters - Set and check (BOTH)
18. ISS mode selector - As required.
19. Caution and warning panel - Check (BOTH)
20. Landing/taxi lights - As required.
21. PARKING BRAKE - Release

OVERSPEED GOVERNOR CHECK

Any fault discovered during this check is a reason for ground abort. Complete this check in a non-congested area. Monitor oil temperature, and attempt to park facing into the wind for extended ground operations.

1. Brakes - Hold as required
2. 2. PCL - IDLE
3. 3. PMU switch - OFF
4. 4. PCL - Advance to 100% NP (approximately 30% torque)
5. 5. PCL - Advance slightly and verify NP remains 100 ±2%
6. 6. PCL - IDLE
7. 7. PMU switch - NORM (Verify PMU FAIL light extinguishes.)

TAXI

When taxiing, it is important to make all turns at slow speeds while utilizing the inside wheel brakes as minimally as possible. The speed of the propeller (NP) while on the ground depends on various factors such as the position of the power control lever (PCL), ambient temperature and pressure, taxi speed, and wind velocity. To avoid entering the restricted range of NP, adjust the PCL setting by either increasing or decreasing it. Once the aircraft is in motion, setting the PCL to idle will generate enough thrust for taxiing.

1. Nose wheel steering - ON (Limit taxi speeds to the equivalent of a fast walk with nose wheel steering engaged.)
2. Brakes - Check (BOTH)
3. Heading and turn and slip indicators - Proper indications.

1.

BEFORE TAKEOFF

1. Speed brake - Retracted.
2. Flaps - TO
3. Trim - Set for takeoff
   (Set all three trim positions to indicate within the green ranges on the trim indicator.)
4. Fuel quantity and balance - Check
5. Engine instruments - Check
6. Amps - Verify +50 amps or less.
7. DEFOG switch - OFF.
8. Seat safety pin - Confirm removed and stowed (BOTH)
9. ISS mode selector - As required (Verify ISS mode selector lever is locked in desired detent)

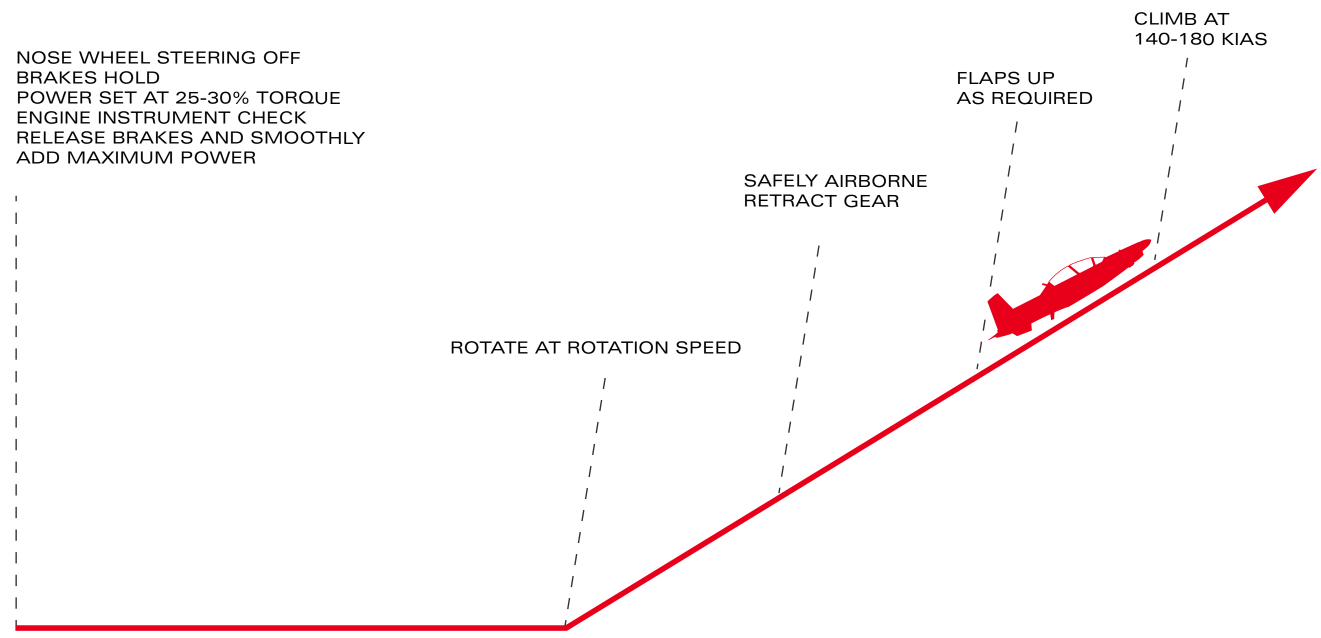
LINEUP CHECK

1. Caution and warning lights - Check (BOTH)
2. PROBES ANTI-ICE switch - ON Prolonged use of pitot and AOA heat while on the ground will damage the pitot and AOA heating elements.
3. Transponder - Mode to ALT
4. TAS STBY/NORM/TEST switch - NORM
5. Landing/taxi light - ON
6. Nose wheel steering - OFF

TAKEOFF

The illustration bleow shows the normal takeoff procedures.

NORMAL TAKEOFF



Normal Takeoff

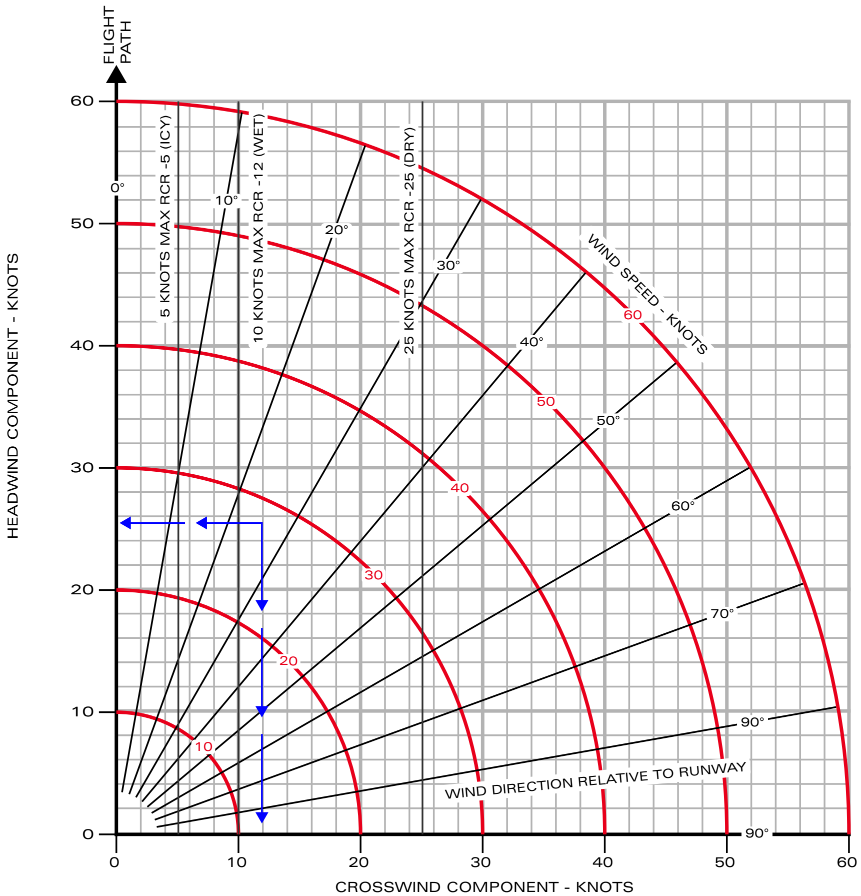
During lineup, it is important to ensure that the brakes are engaged, the nose wheel is centered, and the nose wheel steering is disengaged.

The pilot can then choose to either perform a static runup at 25-30% torque before releasing the brakes or proceed with a rolling takeoff.

Once the brakes are released, the power lever should be smoothly advanced to the maximum position while cross-checking the engine instruments.

It is expected that a slight amount of right rudder will be required during takeoff, even with the TAD engaged.

At the rotation speed, the pilot should initiate a nose-up attitude of 7-10° for rotation. In the presence of gusty winds, the rotation speed should be increased by half of the gust factor (up to 10 knots) as per the recommendations in *Typical Instrument (Non Radar) Approach on p.B2-9*] .



Takeoff and Landing Crosswind

CROSSWIND TAKEOFF

During crosswind conditions, the aircraft will naturally turn into the direction of the wind. To combat this tendency, the pilot can use the rudder and aileron controls. These controls become more effective as the aircraft's speed increases.

At the start of the takeoff roll, the pilot should use full aileron deflection and gradually reduce input as the speed increases, ensuring the wings remain level when lifting off the ground. It is important to be cautious and avoid causing the wings to dip too much during liftoff.

After taking off, the pilot should adjust for any drift caused by the crosswind.
The crosswind takeoff chart in the Appendix can be referred to for guidance.

INSTRUMENT TAKEOFF (ITO)

Please adhere to standard takeoff procedures. Make sure that the minimum climb gradient requirements are satisfied.

During instrument conditions, it is acceptable to deactivate the anti-collision/strobe lights, landing light, and taxi light if they prove to be distracting.

AFTER TAKEOFF

Begin by establishing a positive rate of climb, then proceed to retract the landing gear and raise the flaps as needed. When climbing out of the terminal area, adjust the pitch attitude as required to ascend and reach the desired climb airspeed, which should ideally be between 140 and 180 KIAS. Please note that the climb performance provided on the chart is based on a climb airspeed of 140 KIAS. However, if obstacle clearance or reducing noise are not concerns, it is recommended to climb at a speed of 160-180 KIAS as it will enhance visibility ahead. Additionally, adopting a lower pitch attitude may be beneficial for reducing the risk of disorientation when climbing in instrument meteorological conditions.

1. Gear - UP (BOTH)
2. Flaps - UP (as required) (BOTH)
    a. If the flaps are set to LDG and the gear is raised, the gear warning horn will sound and cannot be cancelled. Select flaps TO or UP to cancel the horn.
    b. To avoid excessive stick forces, trim nose down as aircraft accelerates to climb speed.

CLIMB (PASSING 10,000 FEET)

1. OBOGS - Check flow indicator for normal operation (BOTH)
2. DEFOG switch - As required.
3. Vent control lever - As required.
4. Pressurization system - Check

OPERATIONS CHECK

Perform the following checks at the start of the flight and occasionally throughout:

1. Hydraulic pressure - Check
2. Electrical systems - Check
3. Fuel quantity/balance - Check
4. OBOGS - Check flow indicator for normal operation (BOTH)
5. Engine instruments - Check
6. Pressurization - Check

PRE-STALLING, SPINNING, AND AEROBATIC CHECKS

1. Engine instruments - Check Verify caution and warning annunciators are extinguished.)
2. Fuel balance - Check less than 50 pounds.

DESCENT

The recommended procedure for descending during a flight is to adjust the power and configuration as needed (maintaining a speed of 200-250 knots) while descending at a rate of 4000 feet per minute. However, if the power is set to idle and the speed brake is extended, the descent rate will increase significantly to 8000-11,000 feet per minute.

1. Heading and attitude systems - Check (BOTH)
2. Altimeters - Set (BOTH)
3. DEFOG switch - As required.
4. Vent control lever - As required.

HOLDING

It is advised to maintain a speed of 120-150 KIAS in a clean configuration, but never slower than the maximum endurance angle of attack (8.8 units).

INSTRUMENT APPROACHES

See *Typical Instrument (Non Radar) Approach on p.B2-9* for a typical instrument approach. The aircraft is considered Category "B" for determination of instrument approach minimums.

PENETRATION DESCENT

To achieve a penetration descent, adjust the PCL as necessary to maintain a desired descent rate of 2000-4000 fpm. Maintain a speed of 200-250 KIAS and use the speed brake when needed.

LOW ALTITUDE APPROACH

Typically, when flying instrument approaches, it is recommended to maintain an airspeed range of 120-150 knots. As you approach the final approach fix, make sure to have the landing gear down and set the flaps to takeoff position, while gradually reducing your speed to at least 110 knots.

Once you have a visual of the landing field and have surpassed the minimum descent altitude, decision altitude, or decision height, you should further decrease your speed to 105 knots. Alternatively, you may choose to engage landing flaps and reduce your speed to 100 knots.

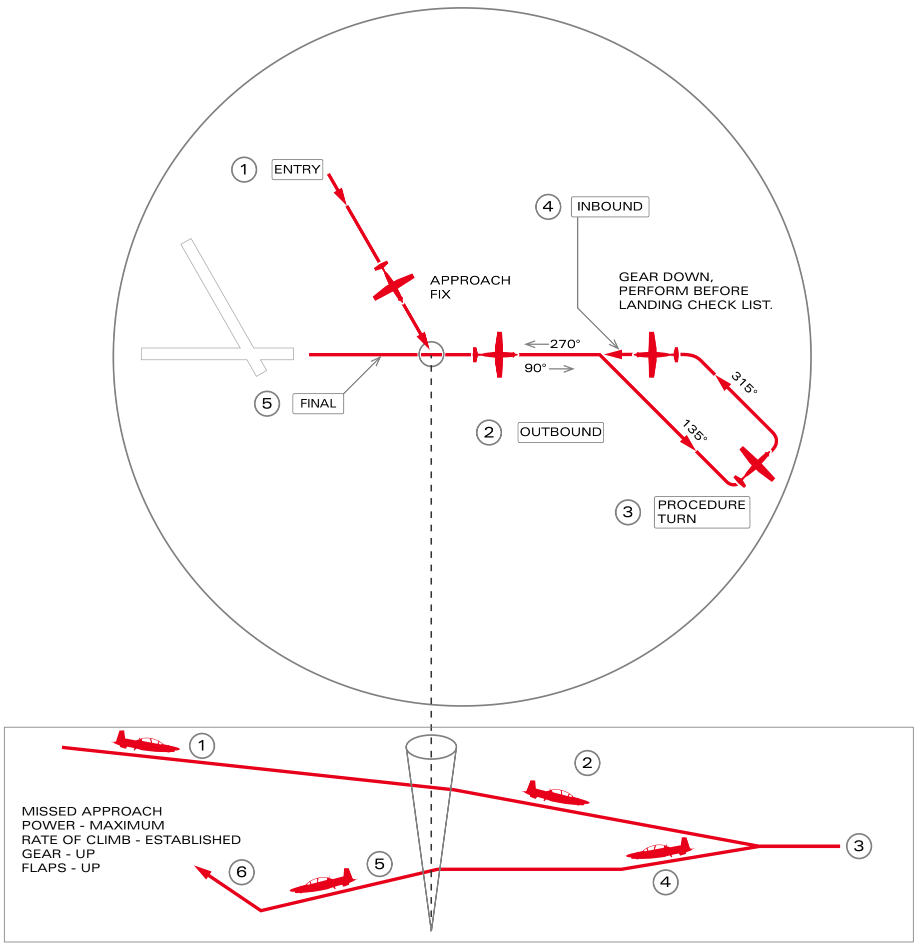
For GPS approaches, adhere to the mentioned airspeeds and configurations. For more guidance on GPS approach procedures, consult the KLN 900 User's Guide.

CIRCLING APPROACH

Gear down and flaps set to TO, the minimum recommended speed prior to final approach is 110 KIAS.

MISSED APPROACH

Gradually increase power to reach MAX power and retract the speed brake if it was previously extended. Adjust the aircraft's attitude to a nose high position of 10-15° and follow the air traffic control (ATC) missed approach procedure. If necessary, decrease power to avoid an excessively nose high attitude while flying in actual instrument weather conditions. Consult the After Takeoff checklist for further guidance. It's important to note that selecting maximum power will automatically retract the speed brake.



RECOMMENDED APPROACH AIRSPEED - KIAS	ENTRY (1)	OUTBOUND (2)	PROCEDURE TURN (3)	INBOUND (4)	FINAL (5)	MISSED APPROACH (6)
	AS DESIRED	120-150	120-150	120-150	100-120	120-150

NOTE

- THESE PROCEDURES ARE NOT INTENDED TO LIMIT THE PILOT'S PREROGATIVE TO ALTER AIRSPEEDS AND CONFIGURATIONS TO MEET EXISTING CONDITIONS.
- WHEN ON FINAL, THE PILOT HAS THE OPTION OF SELECTING LDG FLAPS AND SLOWING TO FINAL APPROACH SPEED.

Typical Instrument (Non Radar) Approach

BEFORE LANDING

1. DEFOG switch - OFF.
2. Engine instruments - Check.
3. Gear - DOWN (Check three green annunciators illuminated)
4. Brakes - Check, as required
   (Verify positive pressure by actuating toe brakes.)
5. Flaps - As required (BOTH)
6. Speed brake - Verify retracted.

GO AROUND/WAVEOFF

It is important to make the decision to go around or wave off as early as possible. The procedures for going around or waving off are the same as those for a missed approach, but a higher pitch attitude is allowed during climb out.
Please consult the After Takeoff checklist for more information.

NORMAL LANDING

Normal Landing Pattern (USN) on p.B2-10 and *Typical Overhead Pattern (USAF) on p.B2-11*

Prior to entering the traffic area, slow the aircraft to 200-250 KIAS in a clean configuration.

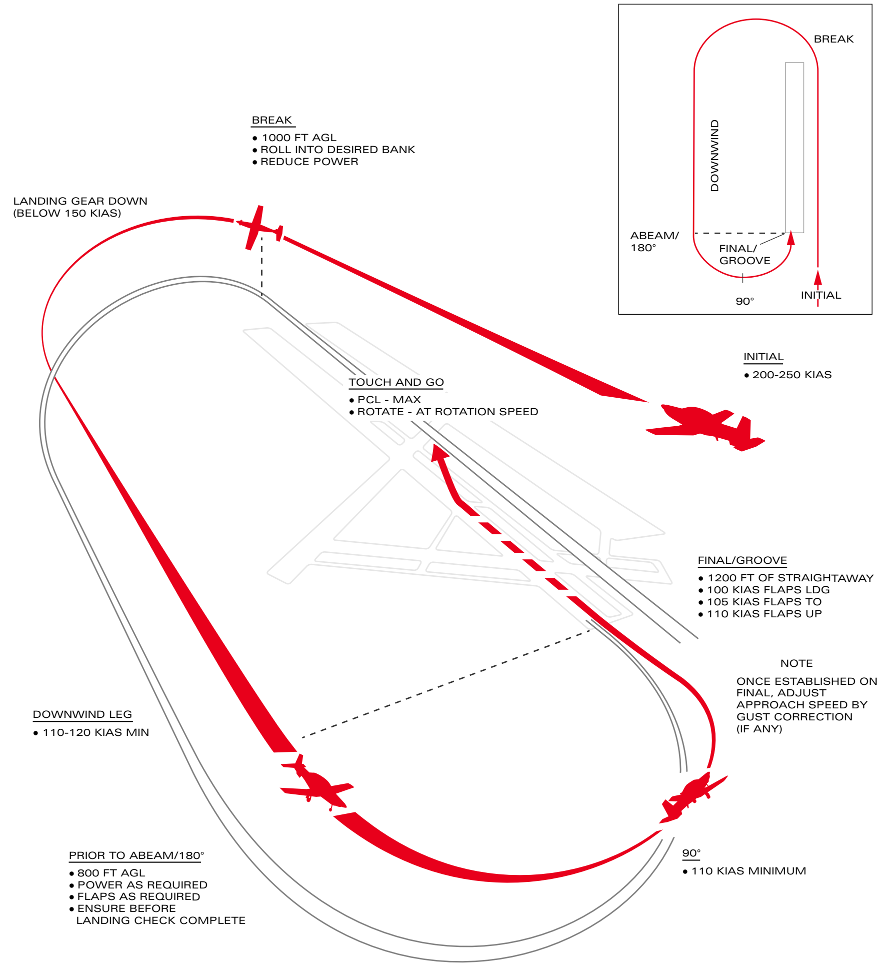
To start the landing procedure, adjust the flaps and trim the control forces. Coordinate the power lever and pitch attitude to maintain the correct airspeed and descent rate. Once the landing is guaranteed, reduce the power lever to idle. There might be a brief activation of the stick shaker right before touchdown. During the flare, the airspeed will decrease, and the touchdown will typically happen between 75 and 105 KIAS, depending on the flap setting.

When landing, gently bring the nose gear down onto the runway.

To alleviate nose wheel shimmy when the nose wheel touches the runway, exert up-backward pressure on the control stick to lighten the load on the nose wheel. Gradually release the pressure to regain contact between the nose wheel and the runway.

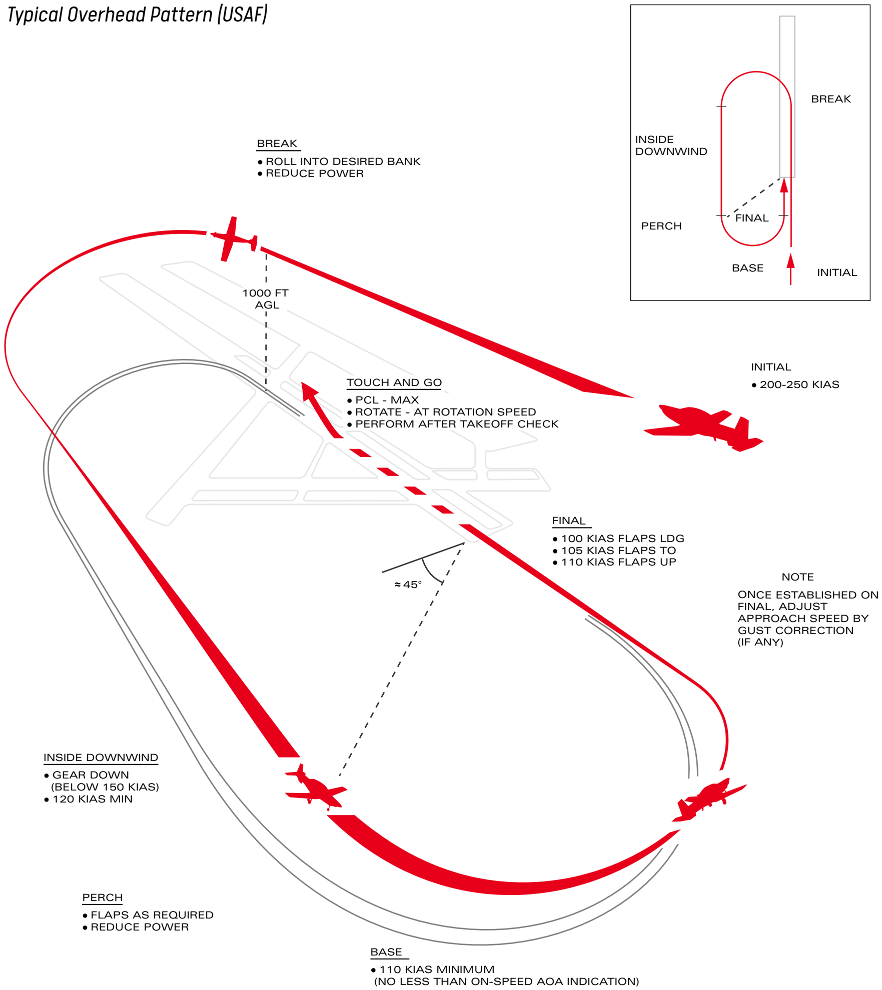
Utilize the rudder and ailerons to retain control over the direction of the aircraft. If necessary, apply brakes cautiously; however, refrain from using uneven brake force during the high-speed phase of landing rollout. Following touchdown, the N1 (engine speed) will automatically decrease from flight idle (67%) to ground idle (60%) in roughly 4 seconds.

Engage nose wheel steering as required once taxi speed is achieved.



Normal Landing Pattern (USN)

Typical Overhead Pattern (USAF)



TOUCH AND GO LANDING

Upon landing, gradually increase the power lever to its maximum position. Expect a slight need for right rudder as the torque rises. Rotate the aircraft when reaching the designated rotation speed. While staying in the pattern, it is permissible to keep the landing gear extended, but the pilot must adhere to the maximum speed for extended gear as stated in Section V. After becoming airborne, continue with the After Takeoff checklist.

CROSSWIND LANDING

To successfully execute a crosswind landing, you only need to make minor adjustments to your landing technique. While in the pattern, use the crabbing method to account for the crosswind component. When transitioning to the final approach, adopt a wing low position into the wind to counteract drifting and keep the aircraft aligned with the runway by using the rudder. Maintain the wing low position and rudder input during the flare phase.

GUSTY WIND LANDING

In windy conditions, it is advised to increase the landing threshold and touchdown speeds by 50% of the gust increment, but not exceeding a maximum increase of 10 knots. It is not recommended to use LDG flaps in such conditions.

ANGLE OF ATTACK (AOA) LANDING

During an Angle of Attack (AOA) landing, the normal landing procedure is followed while ensuring that the optimum AOA is maintained throughout the final approach turn. To achieve this, the aircraft needs to slow down to the optimum AOA on the downwind leg, indicated by the on-speed amber donut on the indexer, before reaching the perch/abeam position. After passing the perch/abeam position, the on-speed AOA must be maintained using pitch control, while a controlled descent rate is achieved with power adjustments. It is important to maintain an appropriate angle of bank and align the aircraft with the runway centerline. As the aircraft approaches the final leg, the pilot must coordinate stick and power inputs to touch down at the desired point while still maintaining the on-speed AOA. Lastly, the pilot should perform a smooth round out and execute a normal touchdown.

DOWNWIND

1. 150-200 KIAS
2. CLEAN

BASE

1. 120-150 KIAS
2. GEAR - AS REQUIRED
3. FLAPS - AS REQUIRED

FINAL

1. 100-120 KIAS
2. GEAR - DOWN
3. FLAPS - AS REQUIRED

MAXIMUM BRAKING

Braking effectiveness is maximized by applying steady pressure on the brakes. However, it can be challenging to consistently achieve the best braking action due to the limitations of the tire and brake system, especially at high speeds where the weight is reduced due to lift. To maximize braking potential, it is recommended to apply the brakes smoothly and gradually as the airspeed decreases. It is important to take great caution when braking above a speed of 80 KIAS, as locked brakes can be difficult to detect until it is too late. If any issues with maintaining control arise, braking should be immediately stopped and then cautiously resumed. The chances of achieving optimal braking action are significantly higher at speeds below 80 KIAS.

AFTER LANDING

1. ISS mode selector - SOLO (as required) (Verify ISS mode selector lever is locked in SOLO)
2. Flaps - UP
3. Trim interrupt button - Depress (Verify TRIM OFF and TAD OFF annunciators illuminate and TAD switch moves to OFF)
4. Trim - Set for takeoff.
5. Transponder - STBY
6. Standby attitude indicator - CAGE (BOTH)
7. TAS STBY/NORM/TEST switch - STBY
8. PROBES ANTI-ICE switch - OFF

FULL STOP/TAXI BACK CHECKLIST

1. Flaps - TO
2. Trim - Set for takeoff.
3. Transponder - STBY
4. PROBES ANTI-ICE switch - OFF
5. Fuel quantity and balance - Check
6. Engine instruments - Check
7. DEFOG switch - OFF.

ENGINE SHUTDOWN

1. PARKING BRAKE - Set
2. Landing and taxi light - OFF
3. AVIONICS MASTER switch - OFF
4. BLEED AIR INFLOW switch - OFF
5. RAM AIR FLOW switch - OFF
6. AIR COND switch - OFF
7. EVAP BLWR control - OFF (BOTH)
8. OBOGS - OFF (BOTH):
    a. OBOGS pressure lever - NORMAL
    b. OBOGS concentration lever - NORMAL
    c. OBOGS supply lever - OFF
9. PCL - IDLE >60 seconds, then OFF
10. Interior/exterior lights - OFF
11. PMU STATUS annunciator - Extinguished FDR light - Extinguished
12. FDR light - Extinguished
13. GEN, BAT, and AUX BAT switches - OFF
14. Gust lock - Engage (as required)

BEFORE LEAVING AIRCRAFT

1. PARKING BRAKE - As required (If wheel chocks have been installed or if the aircraft is tied down, release the parking brake.)
2. 2. CFS handle safety pins - Install (BOTH)
3. 3. ISS mode selector - SOLO (Verify ISS mode selector lever is locked in SOLO)
4. 4. Wheel chocks - Install as required

INTRODUCTION

The following section outlines the steps that should be taken in case of an emergency, to ensure the safety of the aircraft. It is important for pilots to use their judgment and make decisions based on the circumstances at hand. When faced with an airborne emergency, there are three key rules that all pilots should be familiar with:

1. Maintain control of the aircraft.
2. Evaluate the situation and take appropriate action.
3. Land as soon as it is safe to do so.

RESETTING A CIRCUIT BREAKER

To reset a circuit breaker means to restore it to its original closed position. When a circuit breaker is open, it is necessary to evaluate the seriousness of the emergency, the equipment that has been compromised, and the advantages of resetting or opening the circuit breaker. If it is possible to continue the mission or recover the aircraft safely without the affected equipment, it is not advisable to reset the circuit breaker.

GROUND EMERGENCIES

ABORT START PROCEDURE

If the AUTO start mode detects a failure to start or anticipates a dangerous hung or hot start, the PMU is programmed to stop the start sequence. However, if the rate of increase in internal turbine temperature (ITT) is expected to exceed 1000 °C (indicating a hot start), if the normal increase in N1 engine speed is halted (indicating a hung start), or if there is no rise in ITT within 10 seconds after observing fuel flow indications (indicating a failed start), the start process should be manually aborted.

1. PCL - OFF; or STARTER switch - AUTO/RESET
2. Perform Motoring Run Procedure

MOTORING RUN PROCEDURE

1. PCL - OFF
2. IGNITION switch - NORM
3. STARTER switch - MANUAL for 20 seconds

TAKEOFF EMERGENCIES

THE PILOT'S DECISION TO EITHER TAKEOFF OR ABORT IS INFLUENCED BY VARIOUS FACTORS. THESE FACTORS INCLUDE RUNWAY LENGTH AND CONDITION, TERMINAL WEATHER CONDITIONS, AND THE PRESENCE OF TRAFFIC IN THE AREA. FURTHERMORE, IF ANY SYSTEM EMERGENCY ARISES BEFORE LIFTOFF THAT COULD POTENTIALLY COMPROMISE THE SAFETY OF THE FLIGHT, THE TAKEOFF SHOULD BE CANCELLED.

ABORT

If an abort of the takeoff is required, focus on maintaining control of the aircraft, with particular emphasis on preserving its direction, and bring the aircraft to a stop on the available runway. To execute a takeoff abort, adhere to the following steps:

1. PCL - IDLE
2. BRAKES - AS REQUIRED

AIRCRAFT DEPARTS PREPARED SURFACE

If it seems probable that the aircraft will leave the prepared surface, follow the Emergency Engine Shutdown on The Ground procedure.

1. Abort

IF TAKEOFF IS CONTINUED:

2. Gear and flaps position - Do not change.
3. Straight-in approach - Execute.

ENGINE FAILURE AFTER TAKEOFF (SUFFICIENT RUNWAY REMAINING STRAIGHT AHEAD)

When an engine fails immediately after takeoff, it is an urgent situation that requires quick thinking and action from the pilot. The pilot will notice a complete loss of power and a rapid decrease in speed. To maintain a safe flying speed, the pilot should adjust the nose of the aircraft downward. If there is enough runway remaining, the best choice is to continue straight ahead and land. If that is not possible, the pilot must carefully evaluate the recovery options. It may be advisable to eject from the aircraft early on. When braking above 80 Knots Indicated Airspeed (KIAS), be aware that the brakes may be more sensitive. In any case, it is important to manage the aircraft's energy by using altitude, airspeed, and configuration wisely.

1. AIRSPEED - 110 KNOTS (MINIMUM)
2. PCL - AS REQUIRED
3. EMER LDG GR HANDLE - PULL (AS REQUIRED)
4. Flaps - As required.

IN-FLIGHT EMERGENCIES

ENGINE FAILURE DURING FLIGHT

If the engine fails, it is necessary to either make a landing or attempt an airstart. The amount of time available to perform these procedures will depend on the altitude at which the engine failure occurs.

Signs of engine failure or flameout at the initial stage include a decline in power and airspeed. There will also be a rapid decrease in N1 (a measure of rotational speed), torque, and ITT (interstage turbine temperature). Additionally, the propeller will start moving towards feather position due to the loss of oil pressure. Within approximately 5 seconds, N1 will display 0%, regardless of whether the gas generator core is still functioning. It is worth mentioning that N1 does not show speeds below 8%. Torque will also indicate 0%. While the propeller may still be turning, it will be at a reduced RPM as it begins to windmill towards feather position. Other secondary signs to watch out for include a significant drop in ITT and lower than normal oil pressure.

The GEN, FUEL PX, and OIL PX annunciators will illuminate, followed by the OBOGS FAIL annunciator. The PMU FAIL and CKPT ALT annunciators may illuminate.

If the engine spools down, there might not be enough hydraulic pressure to operate the gear and flaps. In this case, the gear and flaps will stay in the position they were last set in when the engine failed. If you try to operate the gear at the time of engine failure, it might show unsafe or in transit indications.

When faced with any malfunction at low altitude, the first response should be to trade excessive airspeed for altitude. Having a higher altitude gives you more clearance from the ground, a longer distance to glide to find a suitable landing spot, or more time to attempt an airstart.

If you need to perform an airstart or prepare for landing, it is important to follow these procedures. When your airspeed is above 150 knots, you should start by pulling up and initiating a zoom climb with a 2 G pull up until you reach a climb angle of 20 degrees. Continue this climb until you are approaching the desired glide airspeed (approximately 20 knots ahead of it), and then gently push the aircraft down with a force of 0 to +0.5 G to capture the desired glide airspeed.

However, if your airspeed is below 150 knots, a zoom climb will not provide many benefits. In this case, it is recommended that you decelerate to the desired glide airspeed while maintaining a constant altitude.

To give you an idea of the performance, zoom capability at 200 knots can result in an altitude gain between 600 and 900 feet. On the other hand, zoom capability at 250 knots can result in an altitude gain between 1170 and 1550 feet. The lower numbers are applicable to lighter aircraft at lower pressure altitudes, while the higher numbers are applicable to heavier aircraft at higher pressure altitudes. Additionally, if you perform the zoom to eject procedure, you can gain an additional 200 feet of altitude.

1. ZOOM/GLIDE - 125 KNOTS (MINIMUM)
2. PCL - OFF
3. INTERCEPT ELP
4. Airstart - Attempt if warranted.
5. FIREWALL SHUTOFF handle - Pull.
6. Execute Forced Landing

AIRSTART

This aircraft has three approved airstart procedures: PMU NORM, PMU OFF, and Immediate Airstart (PMU NORM). The type of airstart attempted depends on the status of the PMU. All airstarts require assistance from the starter. This procedure is appropriate when engine failure was not caused by fire or mechanical failure. Airstarts can be attempted at any altitude and airspeed, but they have only been tested at 20,000 feet MSL and below.

If there is extra airspeed, it is recommended to trade some of it for altitude to get more time to complete the AIRSTART procedures. It is important to attempt to restart immediately. The first critical step is to turn off the PCL, which will feather the propeller, reduce drag, and increase the plane's glide distance. If the PMU FAIL annunciator is not illuminated, attempt an airstart with the PMU in NORM mode. However, it is only recommended to use the PMU OFF (Manual) airstart if there is a malfunction with the PMU, as it will increase pilot workload by requiring manual fuel metering with the PCL during the start. If the airstart is successful, useful power will be available 40 seconds after engaging the starter.

Generally, before starting the engine in mid-air, adjust the trim of the aircraft to the desired airspeed and make sure you have enough altitude. When attempting an airstart, the increased drag will cause the aircraft to descend at a faster rate than normal. At the optimal glide speed of 125 KIAS, you can expect to lose about 1200 feet of altitude during an airstart attempt. It will take approximately 40 seconds to complete the starting sequence. The higher the altitude and the slower the airspeed, the higher the temperature of the ITT peak during startup. Throughout the starting sequence, the pilot should pay attention to fuel flow, ITT, and N1. Once the start is complete, it is crucial to switch the starter switch to NORM to activate the generator.

The primary airstart method for the PMU NORM is preferred because it is less affected by the speed at which the Power Control Lever (PCL) is moved, and it is expected to result in cooler engine starting at lower airspeeds. This procedure relies on the pilot correctly positioning the PCL and critical switches. If the PMU FAIL warning light is on, an airstart with the PMU OFF is necessary. Important steps in this starting procedure include setting the PMU switch to OFF and turning the ignition switch ON. The most crucial action for the pilot during the start is slowly and carefully moving the PCL while monitoring fuel flow, ITT (interstage turbine temperature), and N1 acceleration. Moving the PCL too quickly during the start can cause high ITT and potentially overheat the engine.

PMU NORM AIRSTART

If the PMU NORM procedure is followed for an airstart, it will be the simplest option. However, if the PMU FAIL is indicated, reference the PMU OFF procedure for the airstart.

1. 1. PCL - OFF
2. Confirm the position of the following:
    a. START, IGN, BOOST PUMP, and PMU circuit breakers (left front console) - In
    b. FIREWALL SHUTOFF handle - Down
3. BLEED AIR INFLOW switch - OFF
4. BOOST PUMP switch - ON
5. IGNITION switch - ON
6. STARTER switch - AUTO/RESET
7. PCL - IDLE, above 13% N1
8. Engine instruments - Monitor ITT, N1, and oil pressure

IF AIRSTART IS UNSUCCESSFUL:

9. PCL - OFF
10. FIREWALL SHUTOFF handle - Pull.
11. Execute Forced Landing

IF AIRSTART IS SUCCESSFUL:

12. PCL - As required after N1 reaches IDLE RPM (approximately 67% N1)
13. STARTER switch - NORM
14. GEN switch - Verify ON; reset if necessary.
15. IGNITION switch - NORM
16. BOOST PUMP switch - ARM
17. BLEED AIR INFLOW switch - NORM
18. OBOGS - As required.
19. PEL - Execute

PMU OFF AIRSTART

If the PMU malfunctions and the PMU FAIL annunciator is illuminated, perform an airstart with the PMU turned off. When the PMU is off, the igniters will not activate automatically and need to be manually selected.

You can start the engine even if the bleed air inflow switch is not in the OFF position, but rather in NORM or HI. However, starting ITT may be 40 °C hotter compared to when the bleed air inflow switch is OFF. To ensure there is positive fuel pressure during the start, turn the boost pump ON.

Each attempt at starting will result in an approximate loss of more than 1200 feet in altitude. The propeller will unfeather and reach operating RPM approximately 20 seconds after N1 reaches 45%. After 40 seconds from the engagement of the starter, useful power will be available, with a typical PCL advancement.

1. PCL - OFF
2. STARTER SWITCH - AUTO/RESET
3. PCL - IDLE, ABOVE 13% N1
4. Engine instruments - Monitor ITT, N1, and oil pressure
5. PCL - OFF
6. FIREWALL SHUTOFF handle - Pull.
7. Execute Forced Landing

   IF AIRSTART IS SUCCESSFUL:

8. PCL - As required after N1 reaches IDLE RPM (approximately 67% N1)
9. Confirm the position of the following:
    a. IGNITION switch - ON
    b. BOOST PUMP switch - ON
10. STARTER switch - NORM
11. BLEED AIR INFLOW switch - NORM
12. GEN switch - Verify ON; reset if necessary.
13. OBOGS - As required.
14. PEL - Execute

IMMEDIATE AIRSTART (PMU NORM)

In cases where there is an engine failure at low altitude with crucial thrust requirements, or when time and conditions do not allow for a complete airstart procedure, it is recommended to utilize the immediate airstart (PMU NORM) procedure.

1. PCL - OFF
2. STARTER SWITCH - AUTO/RESET
3. PCL - IDLE, ABOVE 13% N1
4. Engine instruments - Monitor ITT, N1, and oil pressure

IF AIRSTART IS UNSUCCESSFUL:

5. PCL - OFF
6. FIREWALL SHUTOFF handle - Pull.
7. Execute Forced Landing

IF AIRSTART IS SUCCESSFUL:

8. PCL - As required after N_1 reaches IDLE RPM (approximately 67% N_1)
9. Confirm the position of the following:
    a. IGNITION switch - ON
    b. BOOST PUMP switch - ON
10. STARTER switch - NORM
11. BLEED AIR INFLOW switch - NORM
12. GEN switch - Verify ON; reset if necessary.

COMPRESSOR STALLS

Compressor stalls can be recognized by a noticeable shift in engine sound (such as a loud explosion or misfire) or variations in torque, ITT, N1, and fuel consumption. Additionally, one may observe flames or smoke emanating from the exhaust pipes. In severe cases, a compressor stall may cause harm to the engine or even lead to its complete shutdown. Various factors can trigger compressor stalls, including issues with the compressor or turbine blades, disturbances in engine airflow, or malfunctions in the compressor bleed valve.

1. PCL - Slowly retard below stall threshold.
2. DEFOG switch - ON
3. PCL - Slowly advance (as required)

IF POWER IS SUFFICIENT FOR CONTINUED FLIGHT:

4. PEL - Execute

IF POWER IS INSUFFICIENT TO COMPLETE PEL:

5. PCL - OFF
6. FIREWALL SHUTOFF handle - Pull.
7. Execute Forced Landing

PMU FAILURE

If the PMU malfunctions and you want to reset it, follow this procedure. Signs of a malfunction include both the PMU FAIL and PMU STATUS indicators lighting up at the same time, and a potential sudden change in engine power as the fuel management unit switches to the default manual control setting. The automatic control of torque, ITT, and N1 will no longer work and must be controlled manually. The propeller governing, including the overspeed protection, will be handled by the mechanical overspeed governor.

If the PMU FAIL annunciator lights up, take the following actions:

1. PCL - Minimum practical for flight
2. PMU switch - OFF

TO RESET PMU:

3. IGN, START, and PMU circuit breakers left front console) - Check and reset if necessary.
4. PMU switch - NORM (Attempt second reset if necessary)

IF PMU RESET IS UNSUCCESSFUL:

5. PMU switch - OFF
6. Land as soon as practical

PMU FAULT

If the PMU STATUS light turns on and the PMU FAIL light is off, it means that the PMU has detected a system fault. However, the PMU will still stay operational and functioning.

ON GROUND:

1. PMU switch - OFF, then NORM

Before flying, verify the cause of the fault if the PMU STATUS indicator stays lit.

INFLIGHT:

A discrepancy in the weight on wheels switch has been detected by the PMU and a reset is not an option.

CHIP DETECTOR WARNING

If the CHIP annunciator light turns on, it means there could be metal contamination in the engine oil supply. If the contamination is serious, the engine might fail suddenly without any additional warning. When the CHIP light comes on, follow these steps:

1. Adjust the Power Control Lever (PCL) to the minimum setting required to reach the Essential Landing Point (ELP). Avoid unnecessary movement of the PCL.
2. Execute the Power Emergency Landing (PEL) procedure.

OIL SYSTEM MALFUNCTION OR LOW OIL PRESSURE

1. PCL - Minimum necessary to intercept ELP; avoid unnecessary PCL movement.
2. PEL - Execute

ELECTRICAL FAILURES

GENERATOR INOPERATIVE

If the generator stops working, it will also result in the systems powered by the generator bus being shut down (if the bus tie is open), as well as the battery charging being interrupted. If the generator fails and cannot be restarted, the electrical load should be decreased to maximize the battery power and prolong its endurance. The generator will not work if the starter switch is not in the NORM position. Therefore, it is necessary to check the position of the starter switch whenever the GEN annunciator light is on. If the GEN annunciator light comes on, the following steps should be taken:

1. STARTER switch - NORM (BOTH)
2. GEN switch - ON (front or back)
3. GEN RESET switch - Depress and hold for a minimum of 1 second.
4. GEN switch - OFF (BOTH)
5. BUS TIE switch - OPEN (BUS TIE and GEN BUS indicators on)
6. Land as soon as possible

GENERATOR BUS INOPERATIVE

If the CWS circuit breaker on the generator bus circuit breaker panel in the front cockpit is open or if there is a loss of the generator bus and its associated avionics buses, the GEN BUS annunciator will light up.

1. Discontinue this checklist and land as soon as practical.
2. BUS TIE switch - NORM
3. Land as soon as practical

The table below displays the cockpit items that will either remain functional or become non-functional when the generator bus is not working.

INOPERATIVE	OPERATIVE
EHSI	Battery Buses w/Bus Tie Closed
EFIS Control Panel (RCP)	Back-up UHF Comm
TAS and VSI	EFIS Control Panel (FCP)
Altimeter	GPS (FCP)
Primary Engine Data Display	UHF Comm
ENG SYS Display	Audio (including ICS, no aural warning)
Fuel Balance	EADI/EHSI (Composite Mode)
RMU	
VHF Comm/Nav/DME	
Transponder	
Air Conditioner	
Warning Tones	
Nose Wheel Steering	
Speed Brake	
Fire Detector #2	
TAD	
GPS (RCP)	
AOA/Pitot Heat	
ASI	

BATTERY BUS INOPERATIVE

The BAT BUS annunciator will light up in three scenarios: if the CWS circuit breaker on the battery bus circuit breaker panel in the front cockpit is opened, if there is an actual loss of the battery bus and its associated avionics buses, or if the current limiter on the battery bus side malfunctions. When the CWS circuit breaker is open, only the BAT BUS annunciator will be illuminated, while all other systems will function as normal. However, if the current limiter fails or if there is an actual bus failure, the BAT BUS annunciator will also be illuminated, accompanied by multiple failures of items on the battery bus, which will trigger the illumination of the related CWS annunciators (TRIM OFF, OIL PX, HYDR FL LO, PMU STATUS). The most noticeable failures in this situation will include the EADI, GPS, alternate engine display, and power off flags in the standby ADI, standby turn and slip indicator, and pressurization.

IF THE BAT BUS ANNUNCIATOR LIGHTS UP BUT THERE IS NO ACTUAL LOSS OF THE BATTERY BUS, INVESTIGATE THE CWS CIRCUIT BREAKER ON THE BATTERY BUS CIRCUIT BREAKER PANEL IN THE FRONT COCKPIT. IF THE CWS CIRCUIT BREAKER IS FOUND TO BE OPEN, REFRAIN FROM RESETTING IT.

1. Please cease using this checklist and land as soon as possible.

IF THE ILLUMINATED BAT BUS ANNUNCIATOR IS ACCOMPANIED BY OTHER INDICATIONS OF BATTERY BUS FAILURE OR THE CWS CIRCUIT BREAKER IS SET:

2. Descent below 18,000 ft MSL - Initiate (as required)
3. BUS TIE switch - OPEN
4. AUX BAT switch - ON
5. Backup UHF - ON
6. Land as soon as it is feasible.

Listed in the table are the cockpit items that will remain functional or non-functional in the event of an inoperative battery bus or inoperative bus tie with a depleted battery.

INOPERATIVE	OPERATIVE
Anti-Collision Light	RMU
Airstart Capability	Transponder
AOA	Generator Buses
All Trim and TAD	EADI/EHSI (composite mode)
Alternate Engine Data Display	VHF Navigation/DME
EFIS Control Panel (FCP)	TAS and VSI
EADI	EADI (composite mode)
Boost Pump	VHF Comm
Bleed Air Inflow	Primary Altitude ALT
Flap Control/Indications	Primary Airspeed ASI
Flood Light	AHRS/TAD
Flight Data Recorder	Air Conditioning
Instrument Light Control	Aural Warning
Intercommunication System	Primary ENG/SYS Display
Landing Light	AOA Heat
OIL PX Annunciators	AHRS/TAD
HYD FL LO Annunciator	Pitot Heat
Pressurization	Nose Wheel Steering
Taxi Light	Navigation Light
Utility Light	Trim Indicator
UHF Comm	Side Light Control
GPS (FCP and RCP)	**Aux Battery:**
Landing Gear Control/Indications	Turn and Slip Indicator
	Stby Airspeed Lighting
	Compass
	Backup UHF Comm
	Stby Attitude Indicator
	Stby Altitude Lighting

BUS TIE INOPERATIVE

In the event that the BUS TIE annunciator lights up while flying, it indicates that the battery bus and generator bus have been disconnected from the bus bar crosstie. If there are any other caution or warning signs, it is important to consult the relevant procedures. However, if no other signs occur, the generator bus will still function normally, and the items connected to the battery bus will continue to work if there is battery power available. To preserve the remaining battery power, it is advised to switch off any non-essential equipment connected to the battery bus.

1. BUS TIE switch - NORM
2. Land as soon as it is feasible.

BATTERY AND GENERATOR FAILURE

In the event of a generator failure and complete depletion of the main battery, this checklist assumes that the standby gages and their associated lighting, the fire detection system (FIRE 1 only), and the UHF radio (tuned by the backup UHF control head) will be the only operational instruments with auxiliary battery power.

Systems that will not be functional are:

- OBOGS
- ICS
- All electronic displays
- PMU
- Starter
- CWS except fire detection system (FIRE 1)
- Gear/flap indicators
- Probes anti-ice.
- Interior and exterior lighting, except standby instrument floodlighting
- ECS/pressurization
- VHF communications/navigation and GPS

1. Descent below 18,000 ft MSL - Initiate (as required)

IN THE EVENT OF BATTERY AND GENERATOR FAILURE, ENSURE THE COMPLETION OF THE FOLLOWING TASKS:

2. AUX BAT switch - ON
3. Land as soon as it is feasible.

AVIONICS FAILURES

ATTITUDE FAIL ON EADI WITH HDG ON EHSI (TOTAL ATTITUDE HEADING REFERENCE SYSTEM (AHRS) FAILURE)

> **NOTE: A total failure of the AHRS is indicated by ATTITUDE FAIL and an X over the rate of turn scale on the EADI and HDG on EHSI.**

1. AHRS circuit breaker (left front console) and AHRS/TAD circuit breaker (right front console) Pull.
2. AHRS circuit breaker (left front console) and AHRS/TAD circuit breaker (right front console) - Reset.

ATTITUDE FAIL AND X OVER RATE-OF-TURN SCALE

1. EHSI composite switch - Push if HDG not displayed.

HDG ON EHSI

1. AHRS mode control switch - Cycle between DG and SLVD

IF HDG ANNUNCIATION REMAINS:

2. EADI composite switch - Push if ATTITUDE FAIL not displayed.

CP ON EADI OR EHSI (EFIS CONTROL PANEL MALFUNCTION)

1. EFIS control panel - Verify functions.

DU ON EADI OR EHSI (DISPLAY UNIT MALFUNCTION)

1. Composite switch on unaffected display - Push

HOT OR FAN ON EADI OR EHSI (IMPENDING DISPLAY FAILURE)

1. EADI circuit breaker (left front/rear console) or EHSI circuit breaker (right front/rear console) - Pull, do not reset.
2. Composite switch on unaffected display - Push

BLANK EADI OR EHSI

1. EADI circuit breaker (left front/rear console) or EHSI circuit breaker (right front/rear console) - Check; reset if open.
2. Composite switch on unaffected display - Push

ADC FAIL, ADC A FAIL, OR ADC B FAIL ON AIR DATA DISPLAYS; VSI OR TCAS ON TA/VSI (TOTAL OR PARTIAL LOSS OF AIR DATA COMPUTER INFORMATION)

1. ADC circuit breaker (right front console) - Check; reset if open.

EDM FAIL, EDM A FAIL, OR EDM B FAIL ON PRIMARY, ALTERNATE, OR ENGINE/SYSTEMS EIDS (TOTAL OR PARTIAL LOSS OF ENGINE DATA MANAGER INFORMATION)

1. EDM circuit breakers (left/right front console) - Check; reset if open.

IF TOTAL EDM FAILURE:

2. Land as soon as practical

BLANK PRIMARY, ALTERNATE, OR ENGINE/SYSTEMS EID (DISPLAY FAILURE)

1. PRI ENG DIS or ENG SYS DIS circuit breaker (right front/rear console), or ALT ENG DIS (left front/rear console) - Check; reset if open.

RMU FAILURE

1. RMU circuit breaker (right front/rear console) - Check; reset if open.

IF RMU REMAINS INOPERATIVE:

2. Standby UHF radio - ON; tune as necessary.

AOA COMPUTER FAILURE

1. AOA circuit breaker (left front console) - Pull.
2. Land as soon as practical

FUEL SYSTEM FAILURES

LOW FUEL PRESSURE

If the engine fuel feed pressure falls below 10 psi and the boost pump does not engage automatically, the FUEL PX annunciator will turn on. If the engine fuel feed pressure is constantly or intermittently fluctuating at or below 10 psi, the boost pump will turn on and off repeatedly, causing the BOOST PUMP annunciator to turn on and off. These low-pressure situations may be the result of a fuel line blockage, failure of the low pressure pump, fuel leakage, malfunctioning low pressure switch, or failure of the oil scavenge pump. If any of these situations occur, perform the following steps:

1. BOOST PUMP switch - ON
2. PEL - Execute

FUEL IMBALANCE

The automatic fuel balancing system ensures that the fuel load in each wing remains within a 20-pound range. The amber FUEL BAL annunciator may illuminate if there is a malfunction in the auto balance system, such as a fuel probe or EDM failure, or if the fuel gauges show a difference of more than 30 pounds between the left and right tanks for over 2 minutes. To manually balance the fuel load, follow these steps:

1. Fuel gauges - Verify imbalance and check for fuel leaks.
2. FUEL BAL circuit breaker (right front console) - Check; reset if open. One reset attempt only
3. FUEL BAL switch - MAN/RESET (M FUEL BAL annunciator illuminates)
4. MANUAL FUEL BAL switch - To low tank
5. Fuel gages - Monitor
6. MANUAL FUEL BAL switch - OFF, when imbalance is corrected.
7. FUEL BAL switch - AUTO, if desired If the system is returned to auto balance, monitor for correct operation.

LOW FUEL LEVEL

Illumination of the L or R FUEL LO annunciator indicates that approximately 110 pounds (16 gallons) of usable fuel remains in the affected wing tank.

HYDRAULIC SYSTEM MALFUNCTIONS

The landing gear, flaps, speed brake, and nosewheel steering should not be used when the HYDR FL LO annunciator is on, and the hydraulic pressure is below 1800 psi or rapidly decreasing towards 0 psi. If the hydraulic pressure transmitter fails, the pressure reading will be abnormal, but the hydraulic systems should still function properly. When the EHYD PX LO annunciator is illuminated, the emergency landing gear and flap extension system should not be relied upon. If either the EHYD PX LO annunciator or the HYDR FL LO annunciator is on, or if the hydraulic pressure falls outside the normal range, the following steps should be taken:

1. Hydraulic pressure - Check
2. Airspeed - 150 KIAS or below
3. Landing gear handle - DOWN
4. Flaps - Extend (as required)
5. Land as soon as practical

LANDING EMERGENCIES

LANDING GEAR MALFUNCTION

Complete this checklist whenever the landing gear fails to indicate fully up when the gear handle is up, or fully down when the gear handle is down.

1. Airspeed - Remain below 150 KIAS
2. Gear handle - DOWN
3. LAMP test switch - Check
4. Hydraulic pressure - Check (if hydraulic pressure is below 1800 psi, execute Landing Gear Emergency Extension checklist)
5. LDG GR CONT (left front console), INST (left front console), and INST LT (left rear console) circuit breakers - Check in/reset
6. Gear handle - Cycle
7. Gear and gear door positions - Confirm (another aircraft or RSU/tower flyby if able)

IF ANY OF THE FOLLOWING CONDITIONS REMAIN, EXECUTE STEP 8:

8. Landing Gear Emergency Extension checklist - Execute

IF THE PRECEDING CONDITIONS DO NOT EXIST AND LANDING GEAR INDICATIONS REMAIN UNSAFE, EXECUTE STEP 9:

9. Landing with Unsafe Gear Indications checklist -Execute

LANDING GEAR EMERGENCY EXTENSION

1. Airspeed - Reduce to 150 KIAS or below.
2. Gear handle - DOWN
3. EMER LDG GR handle - Pull.
4. Landing gear down indicator lights - When the emergency extension system is utilized to lower the landing gear, the normal safe indications with electrical power include two green lights for the main gear, two red lights for the main gear doors, a green light for the nose gear, and a red light in the gear handle.
5. Flaps - As required.

LANDING WITH BLOWN MAIN TIRE

Identifying a blown main tire during landing can be challenging as the signs may not be immediately evident. The first signs could include a pull towards the failed tire or a rumble or shudder, which can be mistaken for nose wheel shimmy. In case of suspecting a blown main tire, it is advisable to keep the flaps at their current position. If you are aware of a blown tire before landing, it is recommended to approach straight and try to land on the side of the runway where the good tire is. If a tire blows while braking, initially the aircraft may veer away from the blown tire. To maintain control, use rudder, brakes, and nose wheel steering. It is important to be prepared for the possibility of the aircraft departing from the prepared surface.

LANDING WITHOUT BRAKES

In the event of a wheel brake failure of one wheel during landing, it is recommended to land on the side of the runway that aligns with the failed brake. Utilize the remaining brake and use the rudder/ailerons to assist with maintaining directional control.

ANNUNCIATOR CAUSE AND REFERENCE TABLE

Annunciator	Cause
RED (WARNING) ANNUNCIATORS	
BAT BUS	Battery bus inoperative
GEN BUS	Generator bus inoperative
PMU FAIL	PMU failure
GEN	Generator inoperative
CKPT PX	Cockpit over pressurization, pressure exceeds 3.9±0.1 psid
CANOPY	Canopy unlocked/unsafe
FUEL PX	Fuel pressure below 10 psi
OIL PX	Oil pressure at or below 15 psi, or oil pressure 15 to 40 psi for 5 seconds at idle / Oil pressure at or below 40 psi above idle
OBOGS FAIL	OBOGS system malfunction
CHIP	Engine chip detector indicates oil contamination
AMBER (CAUTION) ANNUNCIATORS	
CKPT ALT	Cockpit pressure altitude above 19,000 feet
DUCT TEMP	Environmental duct or defog duct above 300 °F
HYDR FL LO	Hydraulic reservoir fluid level below 55 cubic inches (1 qt)
BUS TIE	BUS TIE switch open, or bus tie inoperative
FUEL BAL	Fuel imbalance exceeds 30 pounds, or fuel probe or EDM fail
EHYD PX LO	Emergency hydraulic pressure at or below 2400 psi
OBOGS TEMP	OBOGS temperature above 200 °F
TAD FAIL	Rudder trim aid device failure
L FUEL LO	Left wing tank below 110 pounds usable fuel
R FUEL LO	Right wing tank below 110 pounds usable fuel
PMU STATUS	PMU has detected and accommodated a fault in-flight or WOW switch failure
OIL PX	Oil pressure 15 to 40 psi for 5 seconds at idle Oil pressure 40 to 90 psi for 10 seconds above idle

Annunciator	Cause
GREEN (ADVISORY) ANNUNCIATORS	
IGN SEL	Ignition on
M FUEL BAL	FUEL BAL switch in MANUAL position
ST READY	PCL positioned for auto start
BOOST PUMP	BOOST PUMP selected by switch, starter relay, or low-pressure switch
ANTI ICE	PROBES ANTI-ICE switch on
TAD OFF	Rudder trim aid device selected off
TRIM OFF	TRIM DISCONNECT switch activated
MAINTENANCE PANEL ANNUNCIATORS	
FAIL (Amber) FDR Annunciator	IDARS has failed; notify maintenance
MAINT (Green) FDR Annunciator	IDARS memory is 80% full; notify maintenance

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CRITICAL ACTION TABLE

Emergency Procedure	Steps to Prevent Loss of Aircraft
Abort Start Procedure	1. PCL - OFF; or STARTER switch - AUTO/RESET
Emergency Engine Shutdown (Ground)	1. PCL - OFF 2. FIREWALL SHUTOFF HANDLE - PULL
Abort	1. PCL - IDLE 2. BRAKES - AS REQUIRED
Engine Failure Immediately After Takeoff (Sufficient Runway Remaining Straight Ahead)	1. AIRSPEED - 110 KNOTS (MINIMUM) 2. PCL - AS REQUIRED 3. EMER LDG GR HANDLE - PULL (AS REQUIRED) 4. Flaps - As required
Engine Failure During Flight	1. ZOOM/GLIDE - 125 KNOTS (MINIMUM) 2. PCL - OFF 3. INTERCEPT ELP 4. Airstart - Attempt if warranted. **IF CONDITIONS DO NOT WARRANT AN AIRSTART:** 5. FIREWALL SHUTOFF handle - Pull. 6. FIREWALL SHUTOFF handle - Pull.
Immediate Airstart (PMU NORM)	1. PCL - OFF 2. STARTER SWITCH - AUTO/RESET 3. PCL - IDLE, ABOVE 13% N1 4. Engine instruments - Monitor ITT, N1, and oil pressure **IF AIRSTART IS UNSUCCESSFUL:** 5. PCL - OFF 6. FIREWALL SHUTOFF handle - Pull. 7. Execute Forced Landing or Eject (NOT SIMULATED)
Uncommanded Power Changes/Loss of Power/Uncommanded Propeller Feather	1. PCL - MID RANGE 2. PMU SWITCH - OFF 3. PROP SYS CIRCUIT BREAKER (left front console) - PULL IF NP BELOW 40% 4. PCL - As required. **IF POWER IS SUFFICIENT FOR CONTINUED FLIGHT:** 5. PEL - Execute **IF POWER IS INSUFFICIENT TO COMPLETE PEL:** 6. PROP SYS circuit breaker - Reset, as required. 7. PCL - OFF 8. FIREWALL SHUTOFF handle - Pull. 9. Execute Forced Landing or Eject (NOT SIMULATED)
Compressor Stalls	1. PCL - Slowly retard below stall threshold. 2. DEFOG switch - ON 3. PCL - Slowly advance (as required) **IF POWER IS SUFFICIENT FOR CONTINUED FLIGHT:** 4. PEL - Execute **IF POWER IS INSUFFICIENT TO COMPLETE PEL:** 5. PCL - OFF 6. FIREWALL SHUTOFF handle - Pull. 7. Execute Forced Landing or Eject (NOT SIMULATED)
Inadvertent Departure from Controlled Flight	1. PCL - IDLE 2. CONTROLS - NEUTRAL 3. ALTITUDE - CHECK 4. Recover from unusual attitude
Chip Detector Warning	1. PCL - Minimum necessary to intercept ELP; avoid unnecessary PCL movements. 2. PEL - Execute
Oil System Malfunction or Low Oil Pressure	1. PCL - Minimum necessary to intercept ELP; avoid unnecessary PCL movements. 2. PEL - Execute
Oil System Malfunction or Low Oil Pressure	**IF ONLY AMBER OIL PX ANNUCIATOR ILLUMINATES:** 1. Terminate Maneuver 2. Check oil pressure: if oil pressure is normal, continue operations. **IF RED OIL PX ANNUNCIATOR ILLUMINATES AND/OR AMBER OIL PX ANNUNCIATOR REMAINS ILLUMINATED FOR 5SECONDS:** 3. PCL - Minimum necessary to intercept ELP; avoid unnecessary PCL movements. 4. PEL - Execute
Forced Landing	1. Airspeed - 125 KIAS prior to extending landing gear. 2. EMER LDG GR handle - Pull (as required) 3. Airspeed - 120 KIAS minimum until intercepting final; 110 KIAS minimum on final 4. Flaps - As required
Precautionary Emergency Landing (PEL)	1. Turn to the nearest suitable field. 2. Climb or accelerate to intercept ELP. 3. Gear, flaps, speed brake - UP
Windshear Recovery	**IF WINDSHEAR IS ENCOUNTERED AT LOW ALTITUDE:** 1. Maintain configuration. 2. PCL - MAX 3. Attitude - Initially set 15 degrees nose high

INTRODUCTION

Operating limitations include limitations that must be observed for safe operation of the aircraft and engine.

CREW REQUIREMENT

The minimum crew requirement is one pilot. The aircraft shall be flown solo from the front cockpit only.

ENGINE INSTRUMENTATION UNIT MARKINGS

Engine operation is monitored by instrumentation that shows operating ranges/limits (*p. B4-5*).

The operating limitations are color coded on the instrument displays as follows:

Red markings indicate the limit above or below which continued operation is likely to cause damage or shorten operating life.

The green and white markings indicate the safe and normal range of operation.

The amber markings indicate the range where special attention should be given to the operation covered by the instrument.

GAUGE MARKING LOGIC AND DEFINITIONS

The engine and systems electronic information displays (EIDs) provide both analog scale (graphical gauge display) and digital counter presentation of engine and systems operating parameters. As limits are approached, reached and/or exceeded, the gauge and text presentations change color to alert the pilot. The text and gauge displays are synchronized to change colors simultaneously when the gauge display reaches a caution or warning limit.

System preset limits are represented on the gauge displays by a red radial, a thicker tick mark which shows the operating limit for that system.

When a warning limit is exceeded, the gages will display a red tail or red arc between the preset limit (red radial) and the present position of the pointer. The digital counter text display also changes to white text in a red box.

For select instruments (fuel level, oil temperature and pressure, and hydraulic pressure), the caution range is marked by an amber arc on the display. When the system enters the caution range, the digital counter text display changes to black text in an amber box.

BATTERY/STARTER LIMITATIONS

STARTING

BATTERY START LIMITATIONS

Do not attempt a battery powered ground start if the battery voltage is below 23.5 volts.

EXTERNAL POWER LIMITATIONS

Do not connect external power if battery voltage is below 22.0 volts.

STARTER LIMITATIONS

Starter duty cycle (start attempts and/or engine motoring) is limited to four 20-second cycles as follows:

- First - Motor 20 seconds then, 30-second cooling period.
- Second - Motor 20 seconds then, 2-minute cooling period.
- Third - Motor 20 seconds then, 5-minute cooling period.
- Fourth - Motor 20 seconds then, 30-minute cooling period

GENERATOR LIMITATIONS

Inflight - +50 to -2 AMPS

Ground/Inflight Voltage - 28.0 to 28.5 Volts

TEMPERATURE LIMITATIONS

Maximum IOAT for start is 80 °C.

PROPELLER LIMITATIONS

PROPELLER GROUND OPERATION LIMITATIONS

Sustained propeller operation on the ground between 62% and 80% NP is prohibited to prevent damage from ground resonance.

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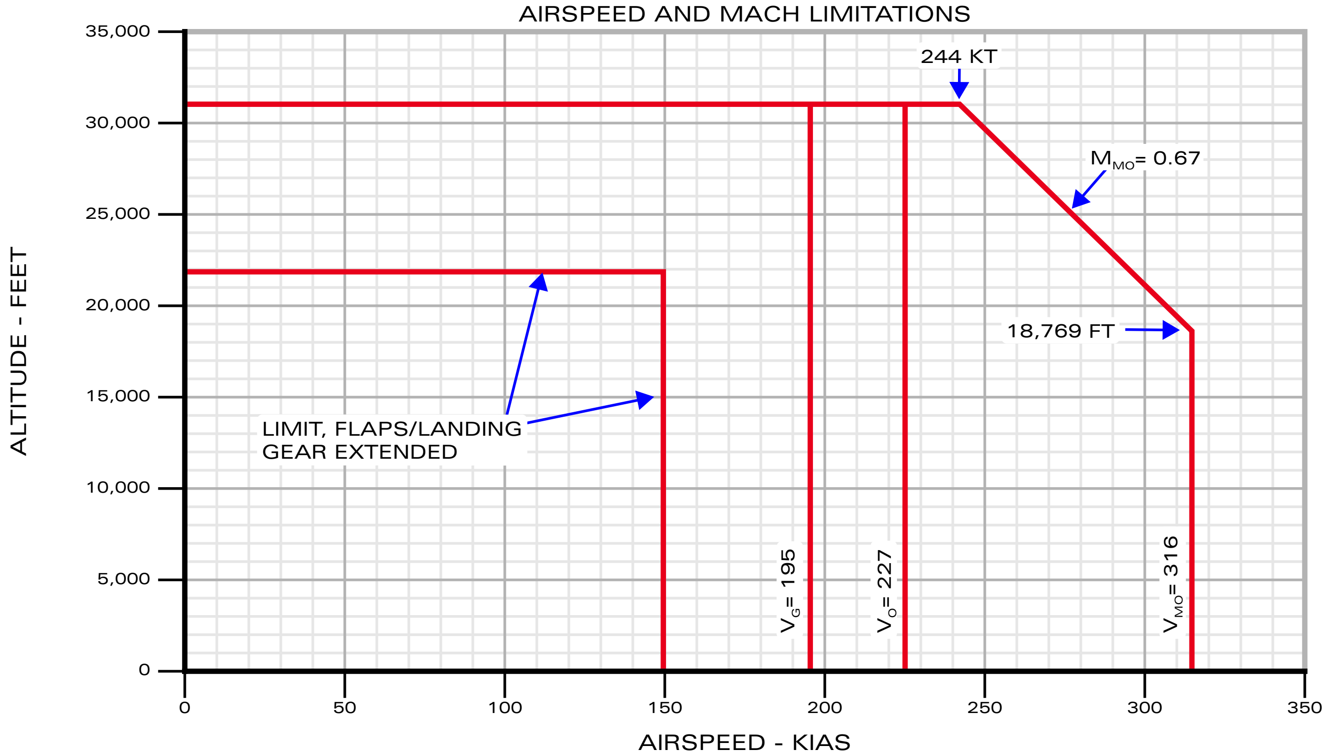
AIRSPEED AND MACH LIMITATIONS

MAXIMUM OPERATING AIRSPEED/MAXIMUM OPERATING MACH NUMBER (VMO/MMO)

Maximum operating airspeed (VMO) is not to be intentionally exceeded in any phase of flight (climb, cruise, descent, maneuvering). VMO is 316 KIAS up to and including 18,769 feet MSL. Maximum operating Mach number (MMO) is not to be intentionally exceeded in any phase of flight (climb, cruise, descent, maneuvering). Above 18,769 feet MSL, MMO is 0.67 indicated Mach number (IMN). The airspeed in KIAS which corresponds to MMO varies with altitude.



Airspeed and Mach Limitations

WING FLAPS LIMITATIONS

Maximum airspeed with the flaps extended (VFE) or during flap operation is 150 KIAS.

LANDING GEAR LIMITATIONS

Maximum airspeed with the landing gear extended (VLE) or during landing gear operation is 150 KIAS.

TURBULENT AIR PENETRATION SPEED LIMITATIONS (VG)

Maximum airspeed for flying through turbulence is 195 KIAS. Recommended airspeed in turbulent air is 180 KIAS.

MANEUVERING SPEED LIMITATIONS (VO)

Operating maneuvering speed (VO) is the speed above which full or abrupt control movements can result in structural damage to the aircraft. VO is 227 KIAS.

SLIP LIMITATIONS

Maximum airspeed for slips is 170 KIAS.

[See *Operating Flight Limits B6-21*]

FLIGHT MANEUVERING LIMITATIONS

TIME LIMITS

- Inverted flight - 15 seconds
- Intentional zero-G - 5 seconds

PROHIBITED MANEUVERS

- Inverted stalls
- Inverted spins
- Aggravated spins past two turns
- Spins with PCL above idle
- Spins with landing gear, flaps, or speed brake extended.
- Spins with PMU off
- Spins below 10,000 feet pressure altitude
- Spins above 22,000 feet pressure altitude
- Abrupt cross-controlled (snap) maneuvers
- Aerobatic maneuvers, spins, or stalls with a fuel imbalance greater than 50 pounds between wings
- Tail slides

See: *Weight and CG Diagram B6-17*

ACCELERATION LIMITATIONS

The operating limits are shown in *Operating Flight Limits on p.B6-21*.

SYMMETRIC

- Clean +7.0 to -3.5 G's
- Gear and flaps extended +2.5 to 0.0 G's

ASYMMETRIC (ROLLING G'S)

- Clean +4.7 to -1.0 G's
- Gear and flaps extended +2.0 to 0.0 G's
- For uncoordinated rolling maneuvers initiated at -1 G, the maximum bank angle change is 180 degrees.

CENTER OF GRAVITY LIMITATIONS (LANDING GEAR EXTENDED)

- The center of gravity limitations are shown in Figure 5-5. When a solo pilot weight (including gear) exceeds 260 pounds, when rear pilot weight (including gear) exceeds 260 pounds, when combined crew weight exceeds 500 pounds (with gear), when over wing refuelling is accomplished over 1100 pounds, or when baggage weight exceeds 10 pounds, the weight and balance of the aircraft shall be checked to determine that gross weight and CG limitations are not exceeded.
- Allowable forward CG limit up to 5212 pounds is 17.5% MAC (163.8 inches aft of datum)
- Allowable forward CG limit at 6200 pounds is 19.0% MAC (164.8 inches aft of datum)
- Allowable forward CG limit at 6500 pounds is 22.0% MAC (166.8 inches aft of datum)
- Allowable aft CG limit at all weights is 26.0% MAC (169.4 inches aft of datum)

> **NOTE**
> **The reference datum is located 16.46 inches forward of the tip of the propeller spinner.**

WEIGHT LIMITATIONS

- Maximum ramp weight - 6550 pounds
- Maximum takeoff weight - 6500 pounds
- Maximum landing weight - 6500 pounds
- Maximum zero fuel weight - 5500 pounds
- Maximum weight in baggage compartment - 80 pounds
- Maximum total weight of bags and publications on glareshield - 8.5 pounds

TAXI, TAKEOFF, AND LANDING LIMITATIONS

NOSE WHEEL STEERING LIMITATIONS

- Do not use nose wheel steering for takeoff or landing.

CANOPY DEFOG LIMITATIONS

- Canopy defog must be off for takeoff and landing.

LANDING LIMITATIONS

- Maximum rate of descent at touchdown is 600 feet per minute (3.7 Gs) when main tires are serviced to normal landing conditions pressure (185±5 psi).
- Maximum rate of descent at touchdown is 780 feet per minute (5.1 Gs) when main tires are serviced to maximum landing conditions pressure (225±5 psi).

WIND LIMITATIONS

The maximum crosswind component for takeoff is 25 knots for FLAPS TO and FLAPS UP settings. Takeoff with FLAPS LDG setting is not recommended with greater than 10 knots crosswind component. The maximum crosswind component for landing and touch and go is 25 knots for all flap settings.

The maximum permissible crosswind for a wet runway is 10 knots and for an icy runway is 5 knots.

The maximum tailwind component for takeoff is 10 knots.

ENROUTE LIMITATIONS

ICING

When operating in areas of visible moisture, the probes antiice switch shall be ON.

MISCELLANEOUS LIMITATIONS

RUNWAY SURFACE LIMITATIONS

The aircraft is cleared to operate on hard surfaced runways (concrete, tarmac, or similar) only.

ENGINE/SYSTEMS DISPLAYS

OIL TEMPERATURE (TEMP)

(ANALOG SCALE)

WHITE ARC	1-10 °C	SCALE
GREEN ARC	10-105 °C	NORMAL
AMBER ARC	105-110 °C	CAUTION
RED RADIAL	110 °C	MAXIMUM
RED TAIL	110 °C AND >	SCALE

(DIGITAL COUNTER)

WHITE TEXT	-40-105 °C	NORMAL
AMBER TEXT	106-115 °C	CAUTION
RED TEXT	-41 °C AND <	EXCEEDANCE
RED TEXT	111 °C AND >	EXCEEDANCE

OIL PRESSURE (PRESS)

(ANALOG SCALE)

RED TAIL	40 PSI AND <	EXCEEDANCE
WHITE ARC	0 - 40 PSI	SCALE
RED RADIAL	40 PSI	MINIMUM
AMBER ARC	40 - 90 PSI	CAUTION
GREEN ARC	90 - 120 PSI	NORMAL
WHITE ARC	120 - 200 PSI	SCALE
RED RADIAL	200 PSI	MAXIMUM

(DIGITAL COUNTER)

RED TEXT	39 PSI AND <	EXCEEDANCE
AMBER TEXT	40 - 89 PSI	CAUTION
WHITE TEXT	90 - 200 PSI	NORMAL
RED TEXT	201 PSI AND >	EXCEEDANCE

HYDRAULIC PRESSURE (HYDR PRESS)

(ANALOG SCALE)

AMBER ARC	1700 - 1800 PSI	CAUTION
WHITE ARC	1800 - 2880 PSI	SCALE
GREEN ARC	2880 - 3120 PSI	NORMAL
WHITE ARC	3120 - 3500 PSI	SCALE
AMBER ARC	3500 - 3600 PSI	CAUTION

(DIGITAL COUNTER)

AMBER TEXT	1790 PSI AND <	CAUTION
WHITE TEXT	1800 - 3500 PSI	NORMAL
AMBER TEXT	3510 PSI AND >	CAUTION

DC VOLTAGE (VOLTS)

(DIGITAL COUNTER)

AMBER TEXT	21.9 VDC AND <	CAUTION
WHITE TEXT	22.0 - 29.5 VDC	SCALE
AMBER TEXT	29.6 - 32.2 VDC	CAUTION
RED TEXT	32.3 VDC AND >	EXCEEDANCE

DC AMPERAGE (AMPS)

(DIGITAL COUNTER)

WHITE TEXT	ALL INDICATIONS	NORMAL

INTRODUCTION

The following section provides details about the aircraft's features during different stages of flight. Instead of focusing on system explanations or training methods, this information highlights unique aspects that may arise during mission-oriented operations of the aircraft. The flight characteristics outlined in this section are derived from real flight test data. If actual flight tests have not been conducted yet or analyses are still pending, the information will be labeled as projected data.

FLIGHT CONTROL SYSTEM

CONTROL SYSTEM FORCES

The aircraft is equipped with a flight control system that can be reversed. This means that the pilot can feel the aerodynamic forces on each control surface through a complex system of push rods, cables, and pulleys. To increase the force in the pitch axis, a bobweight and down spring are included in the elevator control system. The bobweight increases the force required for pitch as the G forces increase during maneuvers, while the down spring increases the force required for pitch around the trim speed during steady flight. During maneuvers, the pitch force is approximately 9 pounds per G for aft center of gravity and 12 pounds per G for forward center of gravity. As the airspeed increases, the lateral and directional control forces also increase in proportion to the control deflection.

TRIM SYSTEM

Throughout the entire range of flight for the aircraft, the three-axis electric trim system effectively adjusts the trim in each axis. The rate at which the trim adjusts remains constant regardless of the aircraft's airspeed. As the airspeed increases, the effectiveness of the trim system becomes more apparent. This is especially noticeable in the roll and yaw axes. To prevent the aircraft from being excessively trimmed at higher airspeeds, it is necessary to pulse the trim control.

When the center of gravity is located towards the front of the aircraft, a significant amount of upward pitch trim will be needed during the final approach speed with a 3-degree approach power. In this scenario, a force of up to 8 pounds may be necessary to maintain the approach speed when the power is set to IDLE during the final portion of the landing, while using full nose-up pitch trim.

On the other hand, when the center of gravity is towards the aft, the maximum operating speed will require almost full nose-down pitch trim. Roll trim changes remain consistent throughout the entire range of flight conditions as long as there is an even distribution of fuel. The aircraft's roll trim capability is sufficient for lateral trim, even when there is a maximum fuel imbalance of 50 pounds. Additionally, the directional trim system effectively trims the aircraft at all speeds within the flight envelope. However, when approaching speeds lower than or equal to those used for landing and with flaps positioned for landing, the aircraft requires full nose right trim at 100% torque.

TRIM AID SYSTEM

The trim aid computer determines the directional trim of the aircraft based on factors such as engine torque, indicated airspeed, pressure altitude, and pitch rate. However, it does not fully adjust the trim in the desired direction. Therefore, the pilot needs to make small adjustments to ensure that the aircraft remains coordinated and balanced in flight. During over-the-top aerobatic maneuvers, the pilot may experience some sensation in the rudder pedals as the system makes significant trim changes to accommodate the rapid changes in airspeed. Similarly, during touch-and-go landings or go-around maneuvers with low airspeeds, the pilot will receive feedback from the system due to the large power changes.

FLAP AND SPEED BRAKE CONTROLS

The split flaps can be used at speeds up to 150 KIAS without any issues. When the flaps are set to the take-off position, there is minimal change in pitch trim and no noticeable disturbance in the airflow up to 150 KIAS. However, when the flaps are lowered to the LDG position, there is a slight pitch up, but it can be easily controlled. As the speed increases in this configuration, both the aerodynamic and airframe buffeting become more noticeable, especially as the flap limit airspeed is reached.

On the other hand, when the speed brake is extended within the operating envelope, there is a slight tendency for the aircraft to pitch up, and this tendency becomes more pronounced as the speed increases. To compensate for this, there is a speed brake elevator trim interconnect that reduces the requirement for pitch trim change. When the speed brake is extended, the elevator is trimmed nose down, while during retraction, the mechanical linkage trims nose up. The pilot will feel a slight movement of the control stick during speed brake operation because of this trim change.

Approved Maneuvers	
Maneuver	**Recommended Entry Speed (KIAS)**
Inverted Flight	120 -140
Split S	180 - 200
Aileron Roll	180 - 220
Barrel Roll	200 -220
Clover Leaf	200 -220
Wingover/Lazy Eight	200 -220
Chandelle	200 -250
Cuban Eight	230 -250
Loop	230 -250
Immelmann	230 -250

FLAP/SPEED BRAKE INTERCONNECT

The flap/speed brake interconnect (lockout) mechanism bars the activation of the speed brake when the flaps are deployed. When the flaps are extended, attempting to retract the speed brake will be unsuccessful. Conversely, once the speed brake is extended, it will retract automatically if the flaps are set to anything other than the UP position.

NORMAL FLIGHT CHARACTERISTICS

NON-MANEUVERING FLIGHT CHARACTERISTICS

Throughout the entire range of flight, the aircraft demonstrates strong stability. As the airspeed increases, the reversible flight control system becomes more responsive. The control forces required during climb, cruise, and terminal area flying are minimal, regardless of the aircraft's speed. Even slight movements of the control stick can cause deviations in airspeed or altitude, even when the trim is adjusted.

> **NOTE: Power-induced slipstream effects worsen the light longitudinal forces. During the climb, it is necessary to regularly check the airspeed to avoid straying from the prescribed climbing speed. The controls for lateral and directional movement and the ability to maintain trim are easily influenced across the entire range of flight conditions. It is advisable to refrain from constantly trying to chase the slip/skid ball.**

AEROBATIC MANEUVERING FLIGHT CHARACTERISTICS

The table above lists approved aerobatic maneuvers and associated recommended entry speeds. The aircraft will accelerate rapidly with power in a dive. In a high-speed dive with an aggressive pull, it is possible to exceed structural limits if the power is not reduced.

ASYMMETRIC MANEUVERS

The aircraft's flight tests revealed that it tends to yaw when subjected to high roll rates. The strongest yawing tendency occurs during uncoordinated rolling pullouts performed at over 2 G. To minimize yaw in these uneven maneuvers, please adhere to the following guidelines.

- During asymmetric maneuvers, it is important to strive for consistent coordination of roll and yaw control inputs.
- For uncoordinated rolling pullouts with greater than +2 G, restrict the roll input to half of the lateral stick.
- When initiating uncoordinated rolling maneuvers at -1 G, keep the maximum change in bank angle to 180 degrees.

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GLIDE PERFORMANCE

There are several factors that have an impact on the performance of gliding. These factors include the airspeed, the configuration of the aircraft (including the landing gear and flaps), the angle of bank, and whether the flight is coordinated or uncoordinated. The maximum range power-off glide airspeed will change depending on the configuration of the aircraft. To optimize the power-off glide performance at any glide speed, it is recommended to have a feathered propeller and level wings while maintaining balanced and coordinated flight. In a clean configuration, the best glide speed is typically around 125 knots indicated airspeed (KIAS), resulting in a sink rate of 1350 feet per minute. However, with the landing gear down, flaps and speed brake retracted, the best glide speed decreases to approximately 105 KIAS with a sink rate of about 1500 feet per minute.

STALL CHARACTERISTICS

STALL WARNING

Each cockpit is equipped with a stick shaker that is triggered by the angle-of-attack system. This stick shaker alerts the pilot to an impending stall at least 5 knots before it occurs. The range of the artificial stall warning margin is between 5 to 10 knots before the stall in power-off, unaccelerated conditions. However, this margin generally increases in power-on and accelerated/turning stalls, regardless of the aircraft's configuration.

When performing power-off stalls in any configuration, a light aerodynamic buffet typically happens about 3 knots before the stall. This buffet serves as a natural warning. Additionally, a slight nose-down pitching motion may also occur. On the other hand, when entering a stall through accelerated turns, moderate buffet is experienced well before the stall happens.

During power-on stall entries, there is minimal noticeable natural buffet before the stall occurs. Pilots will observe a higher pitch attitude, light pressure on the control stick, and the requirement to use both right aileron and right rudder to maintain coordinated flight. If the engine torque is at 100%, the aircraft could reach a pitch attitude of 45° nose up when entering a wings-level stall.

STALLS

An upright, wings-level stall is characterized by a roll-off or wing-drop, along with an increased buffet. The chart on p. B6-18 provides the stall speeds when the engine is at idle power. Throughout the approach to stall and stall, all flight controls remain effective as normal. It is expected that the stall speed will decrease when power is applied.

During a wings-level stall with the engine off, there is usually a lateral roll-off to the right, occurring when the stick is fully pushed back. In a wings-level stall with the engine on, there is a tendency for the aircraft to roll to the left, induced by engine torque before reaching full aft stick.

Extending the landing gear does not significantly impact stall characteristics, but the roll-off tendency at stall is worsened when the flaps are extended. The stall characteristics are minimally affected by speed brake extension or fuel imbalance up to 50 pounds.

Inverted stalls have been performed in both the power off and power on configurations while in the cruise position. When stalled at either power setting, there are lighter forces on the ailerons and the nose tends to wander in yaw. There is no sudden loss of G-force, and there is minimal shaking or pitching motion as the stall is approached. However, the airspeed indicator will suddenly drop to zero in the later stages of the maneuver. In a power-off inverted stall, the nose slowly drops when the control stick is pushed forward. During an inverted stall with 100% torque, the aircraft will maintain a pitch attitude of approximately 30° nose up from the horizon when the stick is pushed fully forward.

ACCELERATED STALLS

The onset of an accelerated stall during a turning entry and increased G forces is signalled by noticeable vibrations in the aircraft structure before the stall occurs. These vibrations occur even before the stall happens at higher G conditions. However, when the G forces are below 2 G's, there may not be many noticeable vibrations before the stall occurs.

When the stall occurs during a turning entry, there is a moderately sudden lateral roll-off, either towards or away from the direction of the turn. The actual speed at which the stall occurs may vary slightly depending on whether the aircraft was in a left or right turn prior to the stall.

An accelerated stall caused by a rapid decrease in airspeed, or a pitch up also results in a similar lateral roll-off.

In accelerated stalls with G forces higher than 3, sustained strong vibrations can cause structural damage to the aircraft fuselage and tail. However, when accelerated stalls are initiated with G forces higher than 3, these strong vibrations do not continue beyond the time needed to recognize the accelerated stall.

STALL RECOVERY

The steps for stall recovery are as follows:

1. Lower the angle of attack by reducing back stick pressure or moving the stick gradually towards neutral or even forward of the trim position.
2. Adjust the power control lever (PCL) to maintain flying speed. Consider the effects on the engine power and apply aileron and rudder as needed to keep the wings level.
3. Use aileron and rudder control to ensure coordinated flight and keep the wings level throughout the recovery.
4. As the flying speed increases, gradually increase back pressure on the control stick to prevent altitude loss and return to level flight. Take care to avoid entering a secondary, accelerated stall during the recovery.

When recovering from a wings-level stall, the amount of altitude lost is typically under 100 feet if the power is applied promptly. If a power-on, accelerated, or inverted stall recovery is performed, even less altitude will be lost to regain flying speed. However, it is important to note that these types of stalls often result in an unusual attitude, which may require more altitude for recovery.

DEPARTURES/OUT-OF-CONTROL FLIGHT (OCF)

Out-of-control flight (OCF) or a departure refers to a situation in which the aircraft does not immediately and normally respond to the use of flight controls. OCF occurs when the aircraft experiences unpredictable movements around one or more axes, usually caused by a stalled condition where the inertial forces on the aircraft exceed the control authority of the aerodynamic controls (ailerons, elevator, and rudder). As a result, initial aircraft movements cannot be stopped by using flight controls, and the aircraft may move in the opposite direction of the applied control input. Certain control inputs may worsen these unpredictable movements. OCF typically occurs when a stall happens during accelerated or unbalanced (uncoordinated) flight conditions, or when imprecise or excessively aggressive control inputs are made. Generally, OCF can be categorized into three types: post stall gyrations, incipient spins, and steady-state spins.

POST STALL GYRATIONS

In a situation where an aircraft does not respond immediately and in a normal way, post stall gyrations refer to the movements of the aircraft immediately after a stall but before a spin begins. These gyrations can be recognized by unpredictable and often rapid movements in any direction, a sense that the controls are no longer effective or functioning correctly, an angle of attack that is either stalling or close to stalling, inconsistent airspeed readings, and random deflections of the turn needle. Post stall gyrations can occur when the aircraft is at a high airspeed after an accelerated stall or at a low airspeed after a normal stall. When occurring at high airspeed, the gyrations will quickly dissipate the aircraft's kinetic energy and put significant stress on its structure. When occurring at low airspeed, the forces on the aircraft surpass the capability of the aerodynamic controls, making the controls mostly ineffective until the aircraft gains enough speed to fly properly again.

INCIPIENT SPINS

The transition between a post stall gyration and a fully developed spin is referred to as an incipient spin. If precautions are not taken to recover the aircraft during the stall or post stall gyration, or if pro-spin controls are maintained, any stall can progress to an incipient spin. In this stage, the movements resemble a spin, with a sustained unsteady yaw rotation, but the aerodynamic and inertial forces are not yet balanced. Consequently, an incipient spin is characterized by fluctuations in pitch, roll, and yaw attitudes and rates. The nose attitude will alternate between the horizon and vertical (nose down), the yaw rate will approach the steady-state spin value, and the wings will rock around the steady-state spin value. An early-stage spin can be recognized by a back-and-forth spinning motion, a completely turned needle, a stop in the angle of attack, and an airspeed that is either increasing or decreasing towards a stable value. What you see visually may not accurately represent the actual spinning state and can create the mistaken belief of a stable spin. The initial spinning phase of the aircraft lasts for around two rotations. Intentional spin entries can cause this phase to be extended if the appropriate controls to encourage spinning are not applied correctly, possibly resulting in a spiral motion.

STEADY-STATE SPINS

Even though steady-state spins are classified as OCF (Outside Controlled Flight), this is because when a control input is applied in a specific axis, it does not immediately impact that same axis in the usual manner of control. For instance, if a right aileron input is made during a left spin, it will not halt the rolling rotation. In a typical steady-state spin, the approximate loss of altitude is around 4500 feet for a 6-turn spin.

DEPARTURE RECOVERY

To recover from unintentional loss of aircraft control, which includes sudden spinning and gyrations, it is crucial to quickly reduce power to IDLE and ensure flight controls are neutralized in all directions. It is important to remain patient and maintain neutral control positions, including visually confirming the control positions. This is essential because the aircraft's dynamics may hinder an immediate response to control inputs during any departure from normal flight.

If a steady-state spin has been confirmed, it is possible to recover by maintaining neutral controls. However, this method will result in a longer recovery time and a greater loss of altitude compared to using proper anti-spin control. Therefore, it is advised to neutralize the flight controls, confirm that power is at IDLE, and then apply the appropriate anti-spin control inputs for a prompt recovery from the spin.

SPIRALS

A spiral is a type of aircraft motion characterized by both rolling and yawing. It is often mistaken for a spin but differs in that it is not a steady state motion. During a spiral, the airspeed of the aircraft increases through 160 KIAS (knots indicated airspeed) and the motions are oscillatory, or back-and-forth.

A spiral can occur when the controls for spinning the aircraft (rudder or aft stick) are misapplied, such as not applying enough rudder or pulling back on the stick too much. It is important to quickly identify a spiral because the airspeed can increase rapidly while the nose of the aircraft is pointing downwards. If large control deflections are maintained as the speed increases, this can cause rapid and extreme movements and potentially stress the structure of the aircraft.

Attempting to use controls that counteract spinning (anti-spin controls) may not be effective in stopping the spiral and could worsen the situation. The best way to respond to a spiral is to neutralize the controls, meaning to return them to their original position, and reduce the power to the lowest level (IDLE) until the motion stops.

SPINS

To enter a spin, an aircraft must have both a stalled angle of attack and a sustained yaw rate. If either of these conditions is not met, the aircraft will not spin. When experiencing an upright stall, pilots can determine the angle of attack by referring to the angle-of-attack indicator or indirectly through the stick shaker. A good way to prevent a stall is to keep the angle of attack below the threshold that activates the stick shaker. To avoid entering a spin during both upright and inverted stalls, it is important to keep the aircraft in balanced flight with the slip ball centered, thus preventing the development of the necessary yaw rates.

SPIN CHARACTERISTICS

Spins can only be intentionally performed with certain conditions met. These include having the landing gear, flaps, and speed brake up, and the power at IDLE. To initiate a spin, the pilot must maintain full aft stick and apply full rudder in the desired direction at a speed of 80 knots indicated airspeed (KIAS).

ERECT SPINS

When entering idle power and performing erect spins, the aircraft will experience roll and yaw in the direction that the rudder is applied. This will result in a barrel roll maneuver that brings the aircraft to a nearly level attitude after completing the first turn. Once the initial turn is completed, the aircraft's nose will pitch approximately 60° below the horizon, and the pitch attitude will become oscillatory. After about three turns, the spin will reach a near steady-state condition. The rotation rate of the spin will stabilize at approximately 2 to 3 seconds per turn, and the aircraft will experience an altitude loss of 400 to 500 feet per turn. The angle of attack will be at least 18 degrees, and the airspeed will stabilize between 120 and 135 knots indicated airspeed (KIAS). The turn needle will be fully deflected in the direction of the spin. When performing spins to the left, the pilot may notice some differences in pitch attitude and the magnitude of pitch, roll, and yaw oscillations. Spins in either direction may exhibit roll and yaw oscillations after three turns, even when the ailerons are in a neutral position. It's important to note that the use of ailerons can have a significant impact on the characteristics of the spin.

PROGRESSIVE SPINS

The misapplication of recovery controls can lead to a progressive spin, where the aircraft spins in the opposite direction after reversing the rudder and maintaining full back stick. This type of spin is characterized by a noticeable increase in nose-down pitch attitude. The aircraft will continue to rotate in the original spin direction for approximately one and a half to two more turns, depending on the initial spin direction and center of gravity. The airspeed can increase up to 175 KIAS during the reversal. If the pilot continues to hold full back stick and opposite rudder, the aircraft will enter a steady-state spin in the opposite direction. If a progressive spin occurs accidentally, the best way to recover is by following the published departure/OCF procedure.

AGGRAVATED SPINS

An aggravated spin occurs when recovery controls are applied incorrectly. It happens when the rudder is kept in a pro-spin position while pushing the control stick forward past its neutral position. This causes an immediate increase in the aircraft's nose-down pitch and a significant increase in its roll rate. The pitch attitude will then decrease to around 70° nose down and the roll rate may reach up to 280° per second, although it will still have some slight oscillations. This maneuver can lead to disorientation. If you accidentally find yourself in an aggravated spin, the best way to recover is by following the published departure/OCF procedure.

INVERTED DEPARTURES/SPINS

Releasing the controls at a maximum power with the aircraft pitched at a 60° to 90° angle causes inverted spins. When the controls are released, the aircraft will roll to the left and reach a nearly inverted, nose-level position. There will be a slight pause before the aircraft enters a right spin, with the yaw rate increasing to 120° per second after completing two turns. These spins are flatter than erect spins and have small pitch oscillations around 30° nose down on average. The airspeed will show 40 knots and the angle of attack will be zero during the spin. The normal acceleration during this spin is usually -1.5 G. These spins have been performed with the aircraft loaded near or at the aft center of gravity limit. Additionally, inverted incipient spins have also been achieved by stalling the aircraft in an inverted position at maximum power.

The primary force that initiates and maintains an inverted spin is high engine torque. By decreasing the throttle to IDLE within the first two rotations, the pilot can anticipate the spin ending without needing to employ recovery controls.

When trying to initiate an inverted spin from an inverted stall with idle power and neutral ailerons, it is common for the situation to worsen and transform into an inverted spiral in the direction of the applied rudder. This spiral leads to a sharp and rapid increase in airspeed while maintaining a steep nose-down position.

CONFIGURATION EFFECTS

Power seems to have an impact on the pitch attitude of the aircraft, causing it to become flatter in the erect position. When the power is at maximum, the nose of the aircraft rises above the horizon at the end of the first spin turn. However, reducing the power to IDLE causes the nose to pitch downward, with the spin stabilizing as described earlier for upright, idle power spins. Right power-on spins take longer to initiate compared to spins performed to the left, regardless of the aircraft's configuration, because of engine torque. If left aileron is applied during a stall, it generally prevents the aircraft from entering a right power-on spin. Instead, the aircraft will spiral if full power is maintained.

SPIN RECOVERY

ERECT SPIN RECOVERY

To recover from a spin, promptly move the control stick forward and apply rudder in the opposite direction of the turn needle deflection. As you do this, the pitch of the aircraft will increase, and the spin rate will initially worsen. It will require a push force of about 50 pounds to move the control stick forward significantly. Within one and a half rotations after applying controls, the spin rotation will suddenly stop, and the aircraft will be in a steep nose-down attitude.

At this point, neutralize the controls and smoothly pull up to prevent further loss of altitude and excessive build-up of airspeed. It should be noted that for every turn of a spin, expect to lose approximately 500 feet of altitude. Additionally, during a normal dive recovery, anticipate losing an additional 1500-2000 feet.

The procedure for recovering from an erect spin is as follows:

1. Gear, flaps, and speed brake - Retracted.
2. PCL - IDLE.
3. Rudder - Full opposite to turn needle deflection.
4. Control stick - Forward of neutral with ailerons neutral.
5. Smoothly recover to level flight after spin rotation stops.

INVERTED SPIN RECOVERY

The aircraft will recover in less than a full rotation after applying the inverted spin recovery controls. Consistent recovery will not happen if power is used during the recovery process. The initial recovery position will be in a nearly vertical dive. The recovery procedure is the same as for Erect Spin Recovery.

DIVE CHARACTERISTICS

ALTITUDE LOSS IN DIVE RECOVERY

The amount of altitude lost during a dive recovery depends on four separate factors: the angle at which the dive is initiated, the altitude at which the pullout begins, the speed of the aircraft at the start of the pullout, and the level of acceleration maintained during the pullout. These factors must be taken into account together when estimating the altitude needed to recover from a dive, as shown on p. B6-19 and p. B6-20. The dive recovery charts assume the aircraft being in straight and level flight and include a 3-second delay for pilot reaction time.

DIVE RECOVERY CHARTS

To calculate the decrease in altitude when recovering from a dive, refer to the charts as follows: Start by identifying whether a 4-G or 6-G pull out will be employed. For this example, we will use assume 4G and choose *Altitude Loss - 4G Pullout*.

Begin by locating the initial recovery altitude (the altitude at which the dive recovery is initiated), in this case, 20,000 feet. Then, move horizontally to the right to find the initial airspeed (200 KIAS). Next, trace down to find the initial dive angle (50°), and finally, move left to determine the altitude lost during the recovery (which in this case is 1600 feet). The dashed lines illustrated on both Figure 6-4 and Figure 6-5 indicate the limit for dive angle (the highest combination of altitude and airspeed that allows recovery from the specified dive angle without surpassing VMO/MMO during the recovery).

PERFORMANCE DATA

The flight performance charts offer enough information for planning before a flight and during the flight. These charts are based on the standard atmosphere conditions set by the international civil aviation organization (ICAO). If there are deviations from the standard temperature, the charts also consider the necessary atmospheric corrections. The charts provide details on climb, cruise, endurance, and descent performance, presented in drag index form. However, since the aircraft being considered does not have any external stores or additional loads, a drag configuration index of zero is used consistently in these charts.

All weight and fuel flow calculations are done using JP-8 fuel, which has a standard day density of 6.8 pounds per gallon. The densities of other fuel types can be found in the usable fuel table in Section I. When using alternate approved fuels at a specific PCL setting and/or %N1, it is possible to experience increased fuel flows. However, there is no noticeable impact on performance when using alternate fuels.

The charts are available for obtaining corrections for altimeter and airspeed position, outside air temperature, standard day, Mach number, and temperature conversion. Ground speed can be adjusted for wind by using TAS. Examples are included to demonstrate how to use the charts correctly. Each chart section will have a follow-through line to guide users on the appropriate order to use the charts.

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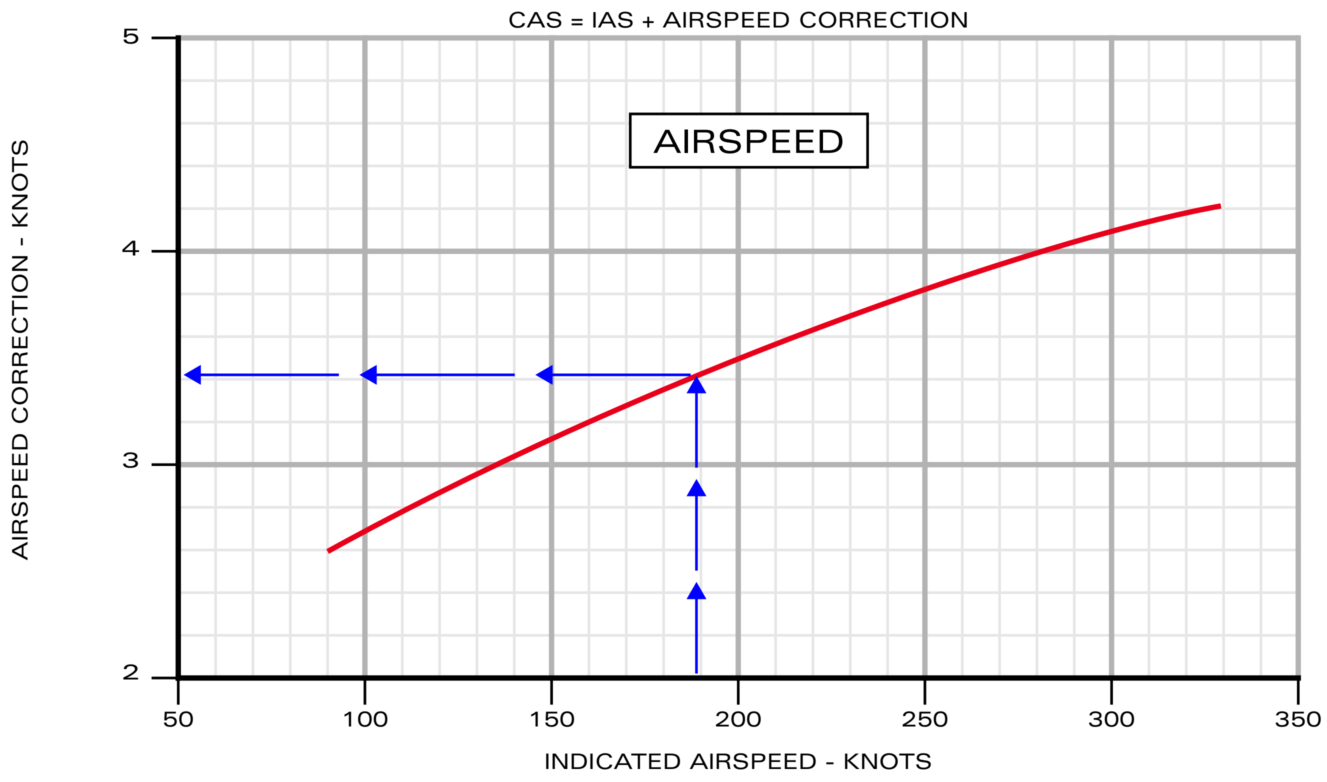
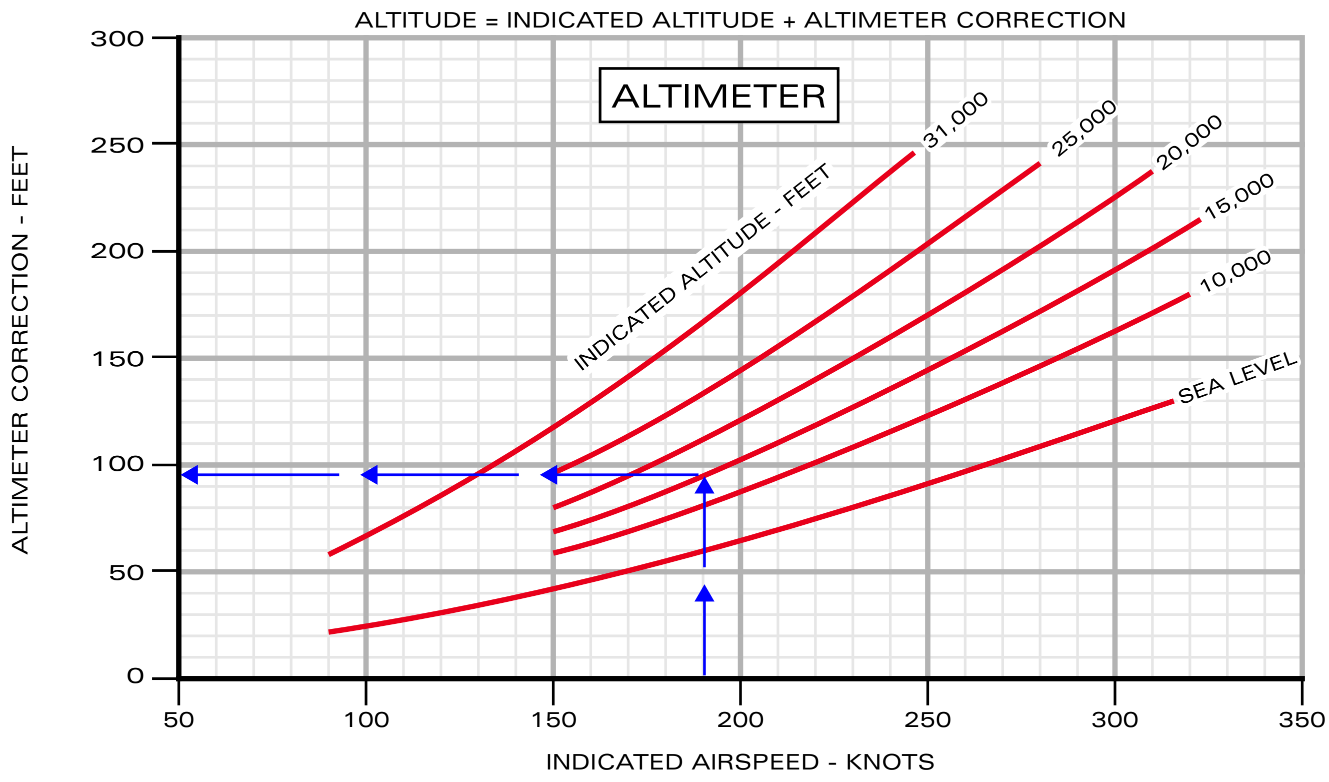
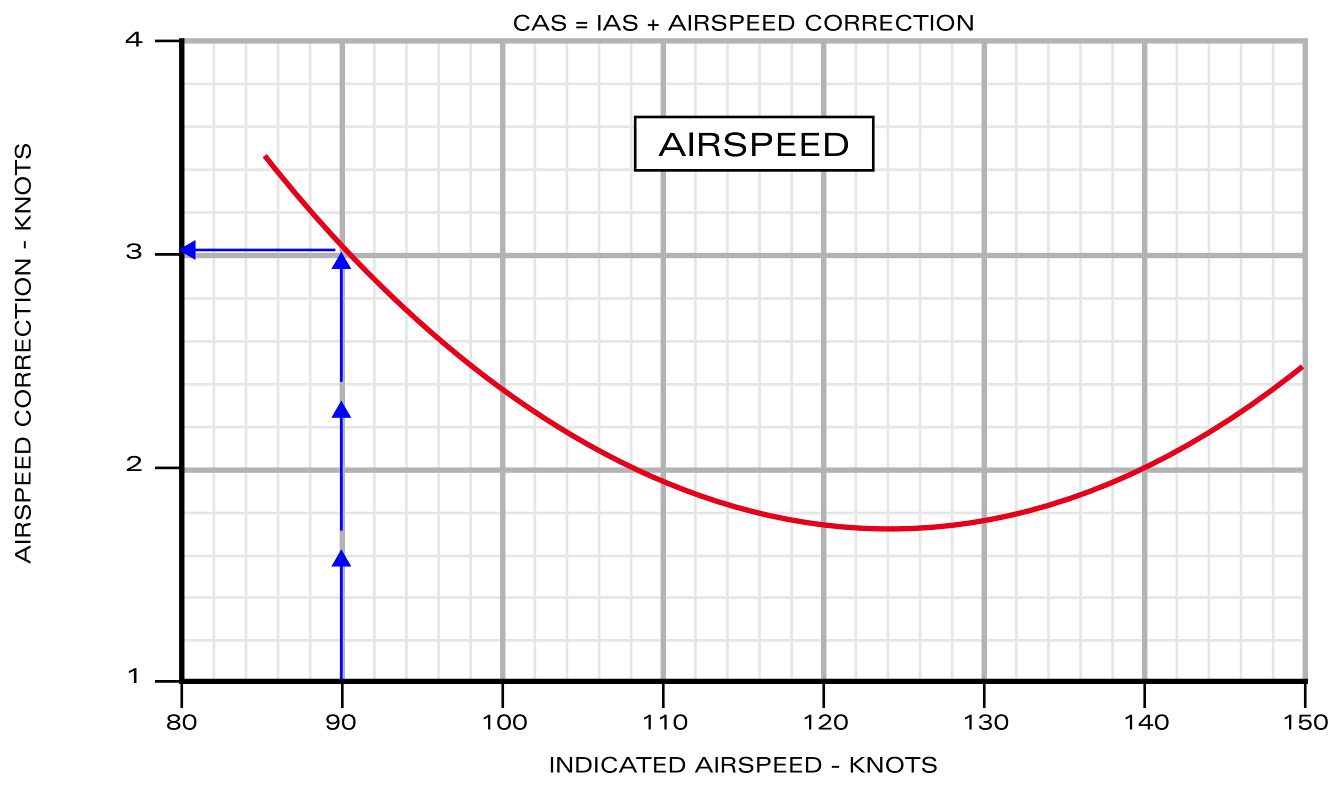
AIRSPEED/ALTIMETER CORRECTION

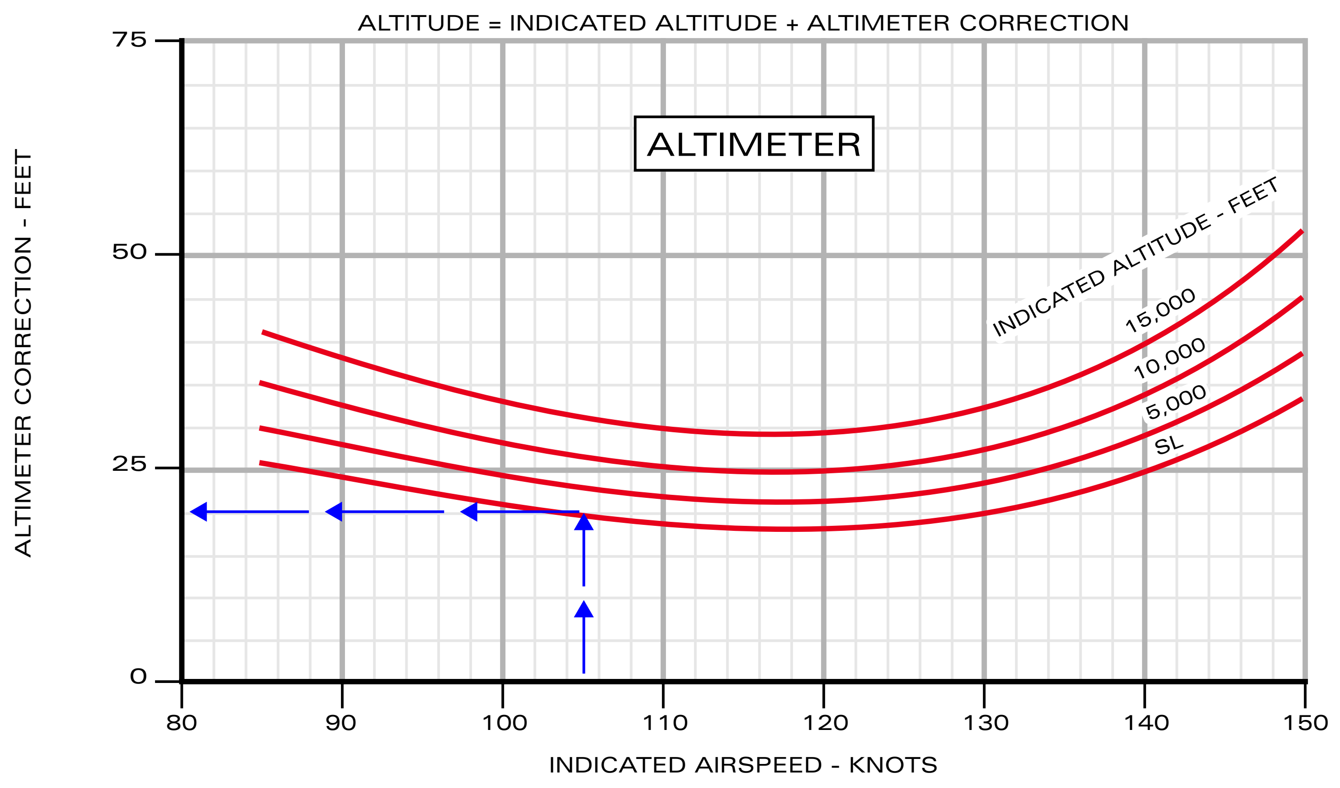
These charts are used for rectifying position, indicator, and sensing errors in airspeed and altimeter indications.





Airspeed/Altimeter Position Correction/Ship - Flaps UP





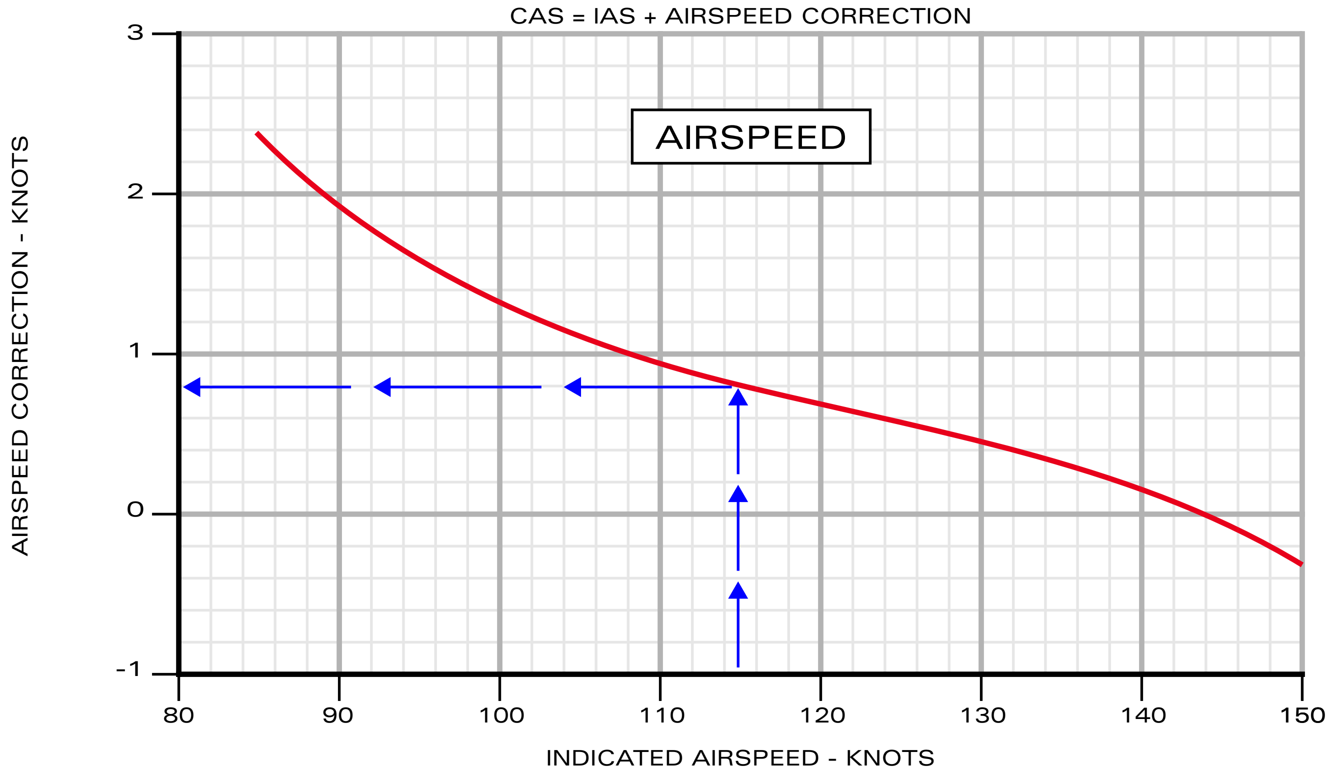
Airspeed/Altimeter Position Correction/Ship - Flaps TO

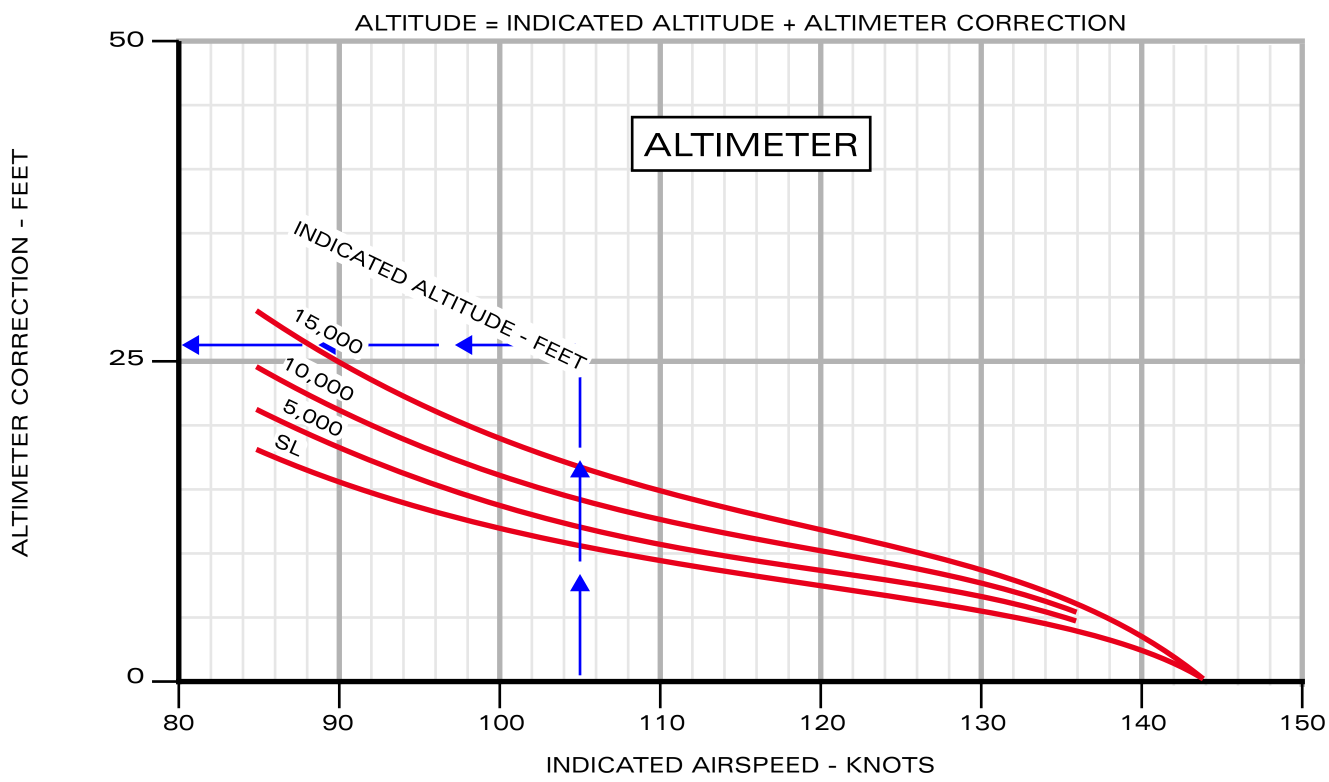
INDICATED AIRSPEED

The airspeed shown on the airspeed indicator is referred to as indicated airspeed (IAS).

The difference between the indicated airspeed and the actual airspeed due to the placement of the air data system's sensing components is known as position error (Δ Vpc).

For the purposes of these charts, it is assumed that there is no error in the airspeed indication.

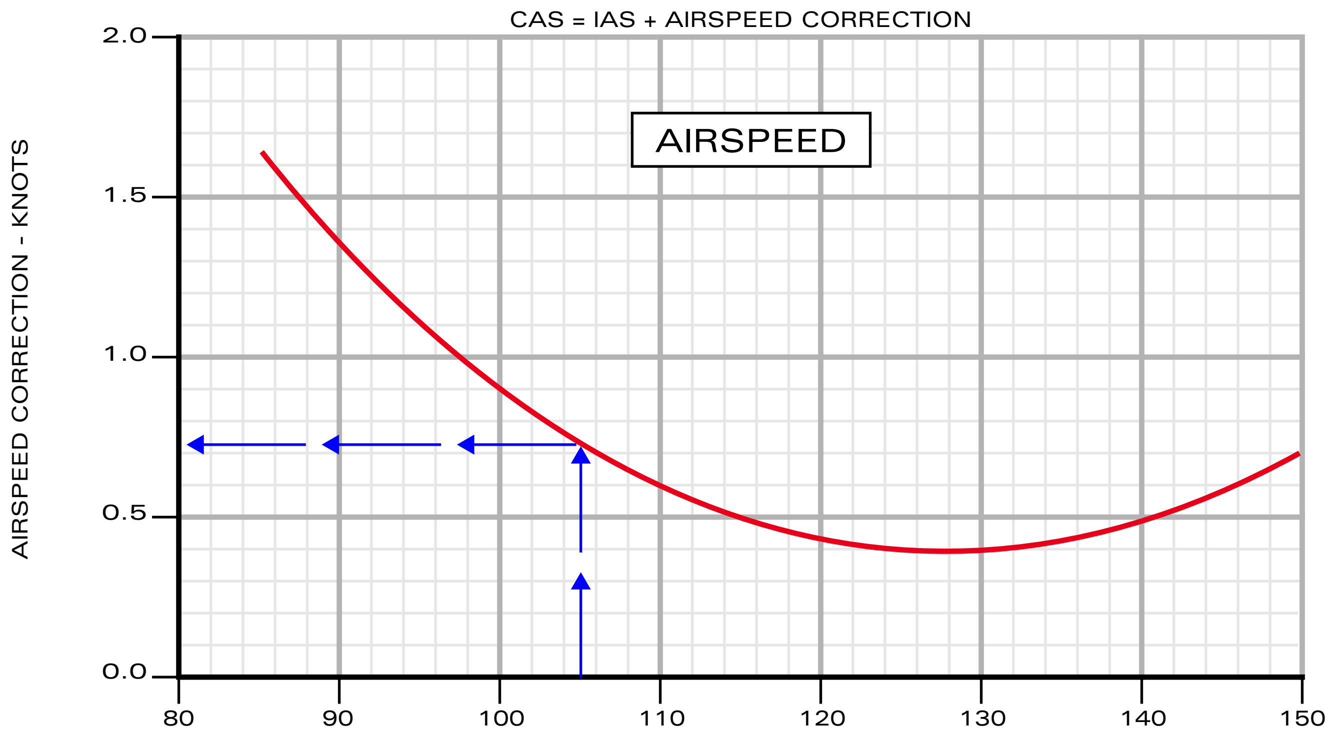


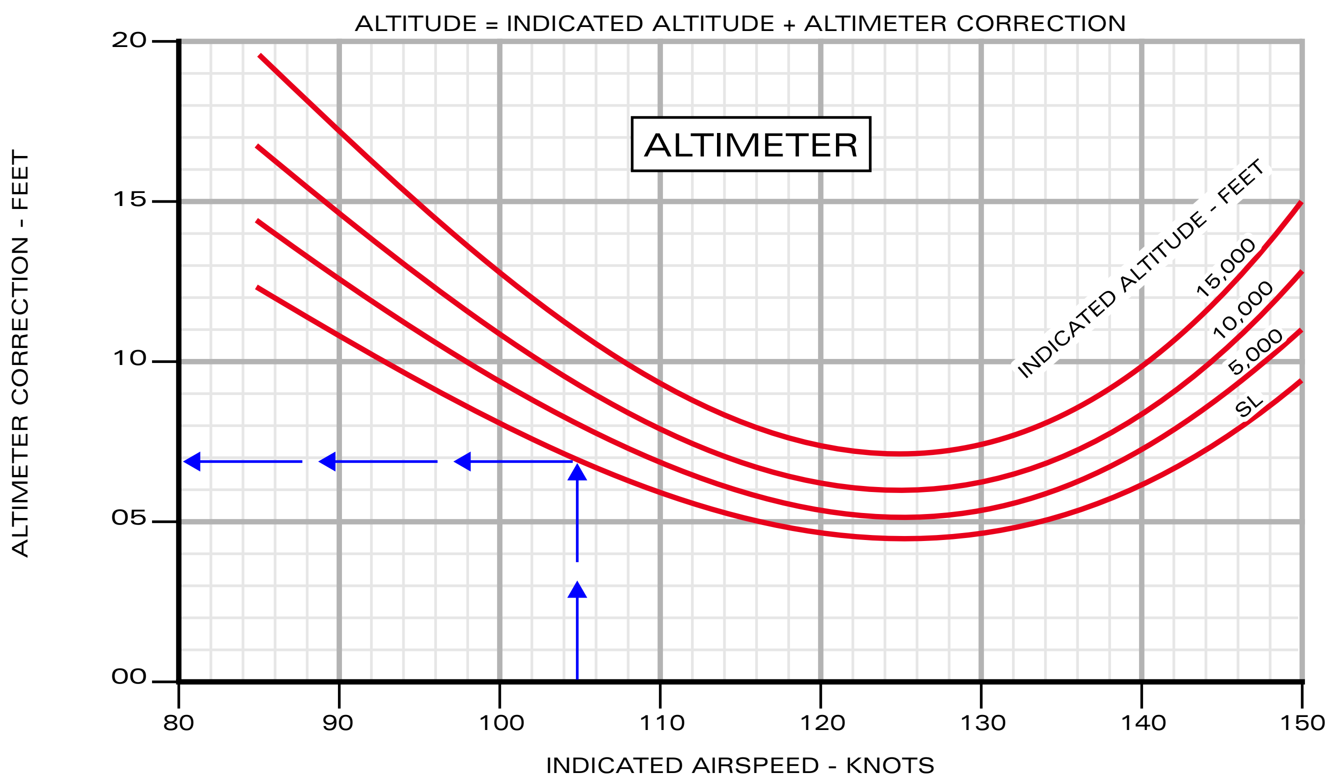


Airspeed/Altimeter Position Correction/Ship - Flaps LDG

CALIBRATED AIRSPEED

Calibrated Airspeed (CAS) is the Indicated Airspeed (IAS) adjusted for errors in both sensing and indicator. It can be calculated by adding the Speed Correction (Δ Vpc) to the IAS.

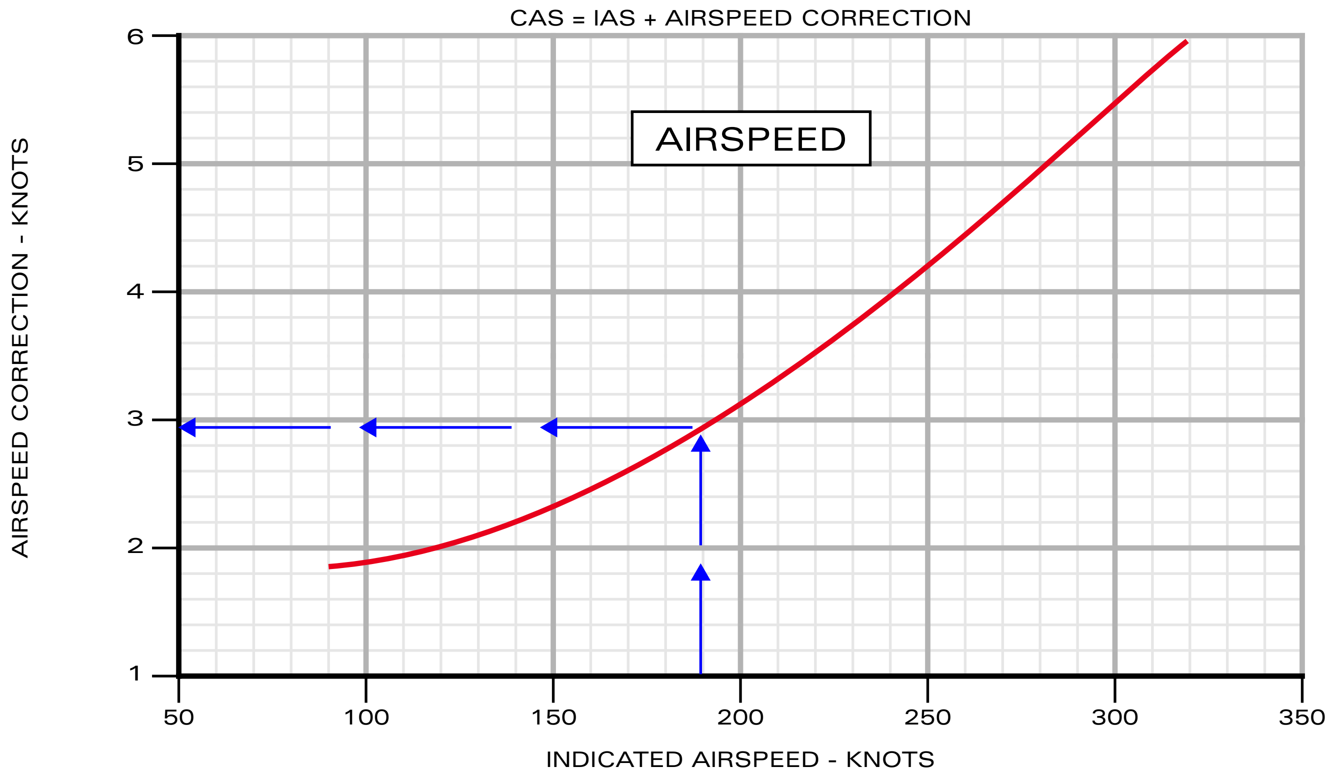


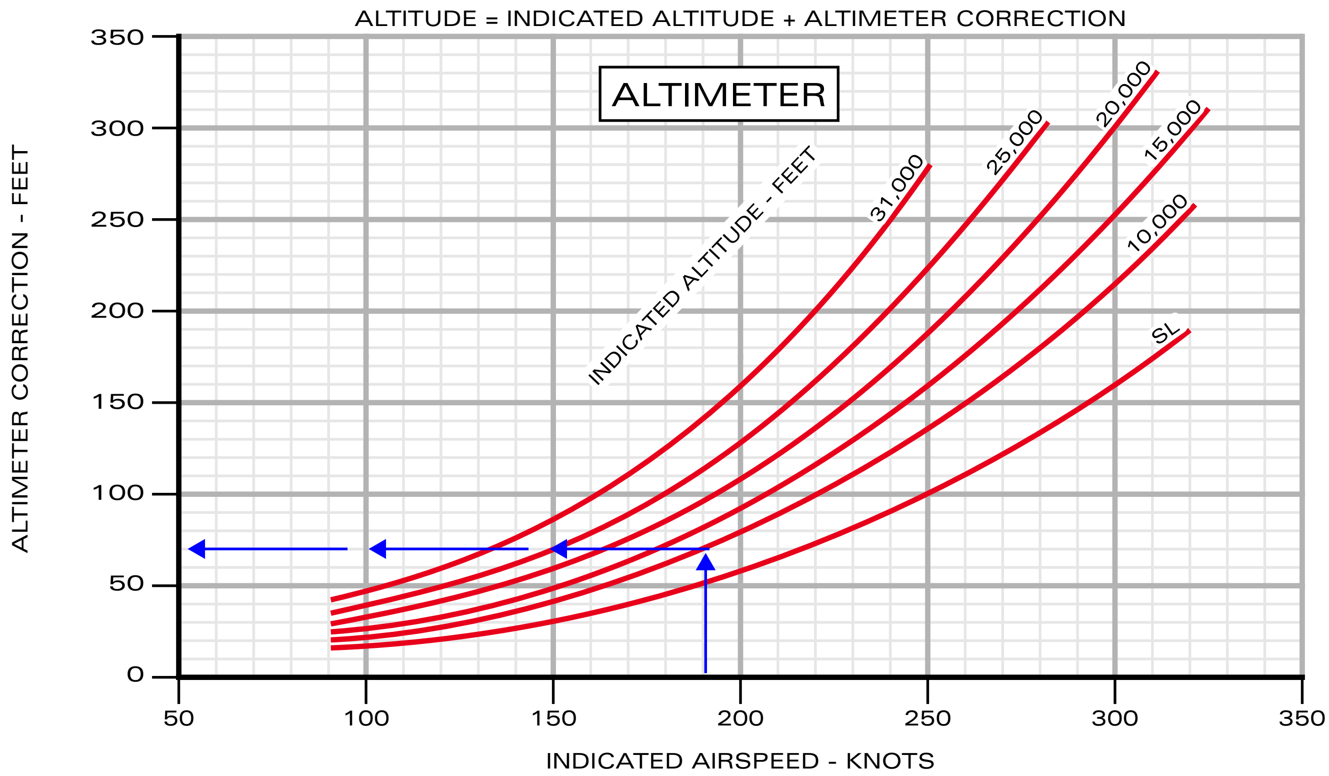


Airspeed/Altimeter Position Correction/Stby - Flaps UP

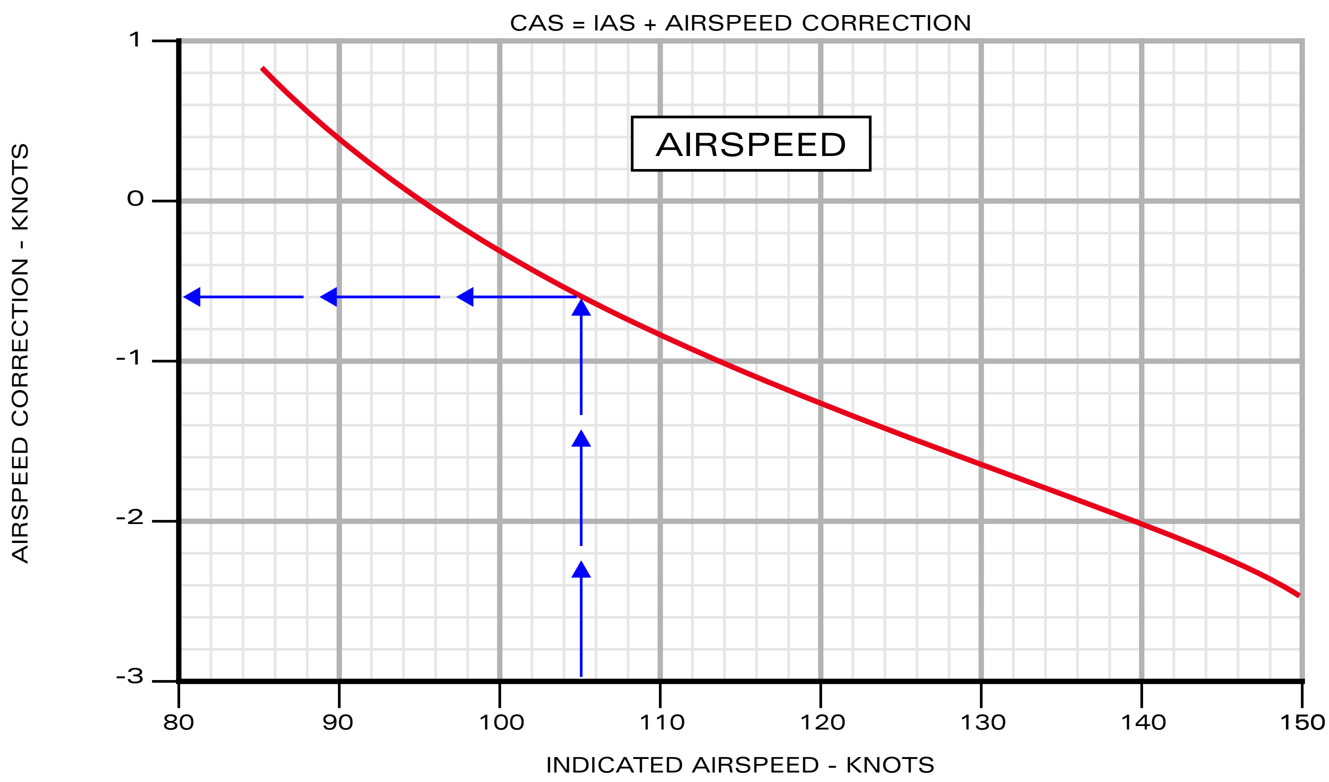
TRUE AIRSPEED

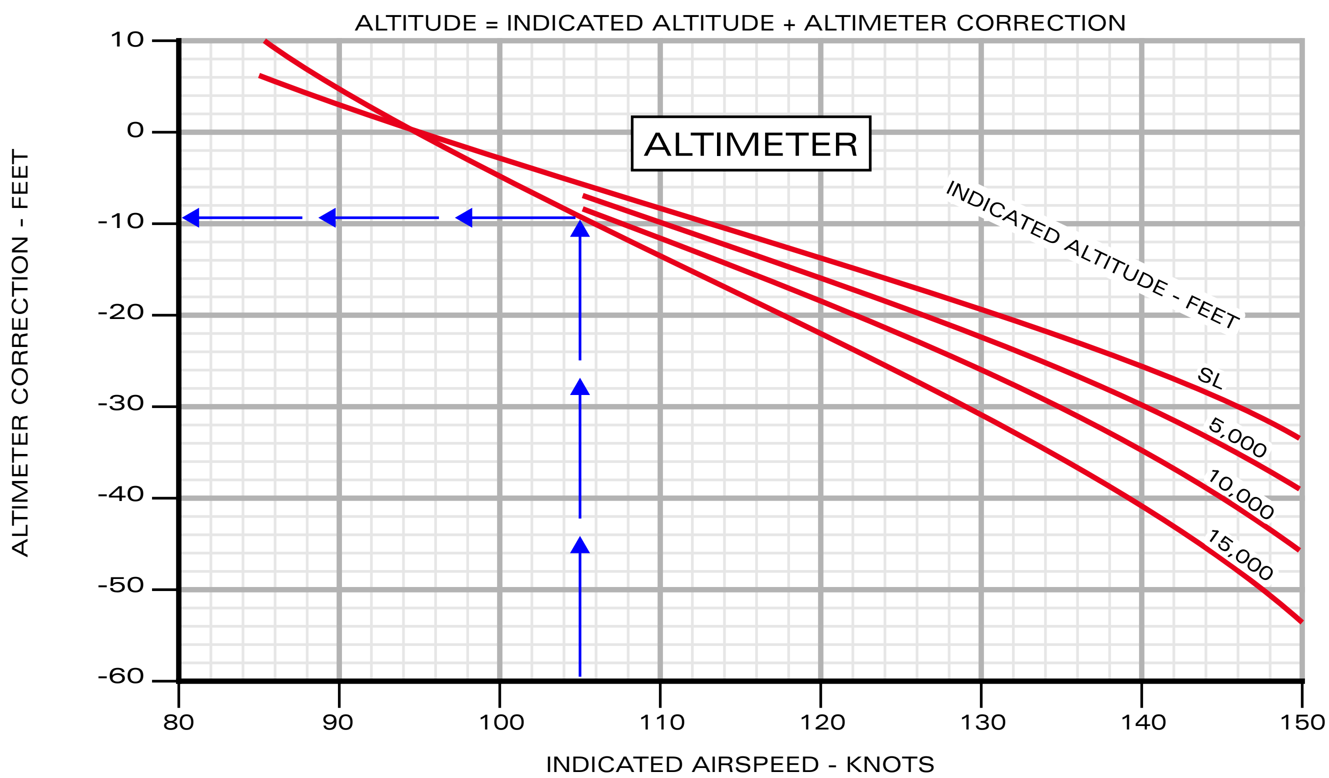
The True Airspeed (TAS) can be calculated by correcting the Equivalent Airspeed (EAS) for atmospheric density. This correction is done by using the ratio of ambient air density to standard day sea level air density, represented as sigma (σ). To determine the TAS, multiply the EAS by the reciprocal of the square root of sigma (1/√**σ**).





Airspeed/Altimeter Position Correction/Stby - Flaps TO



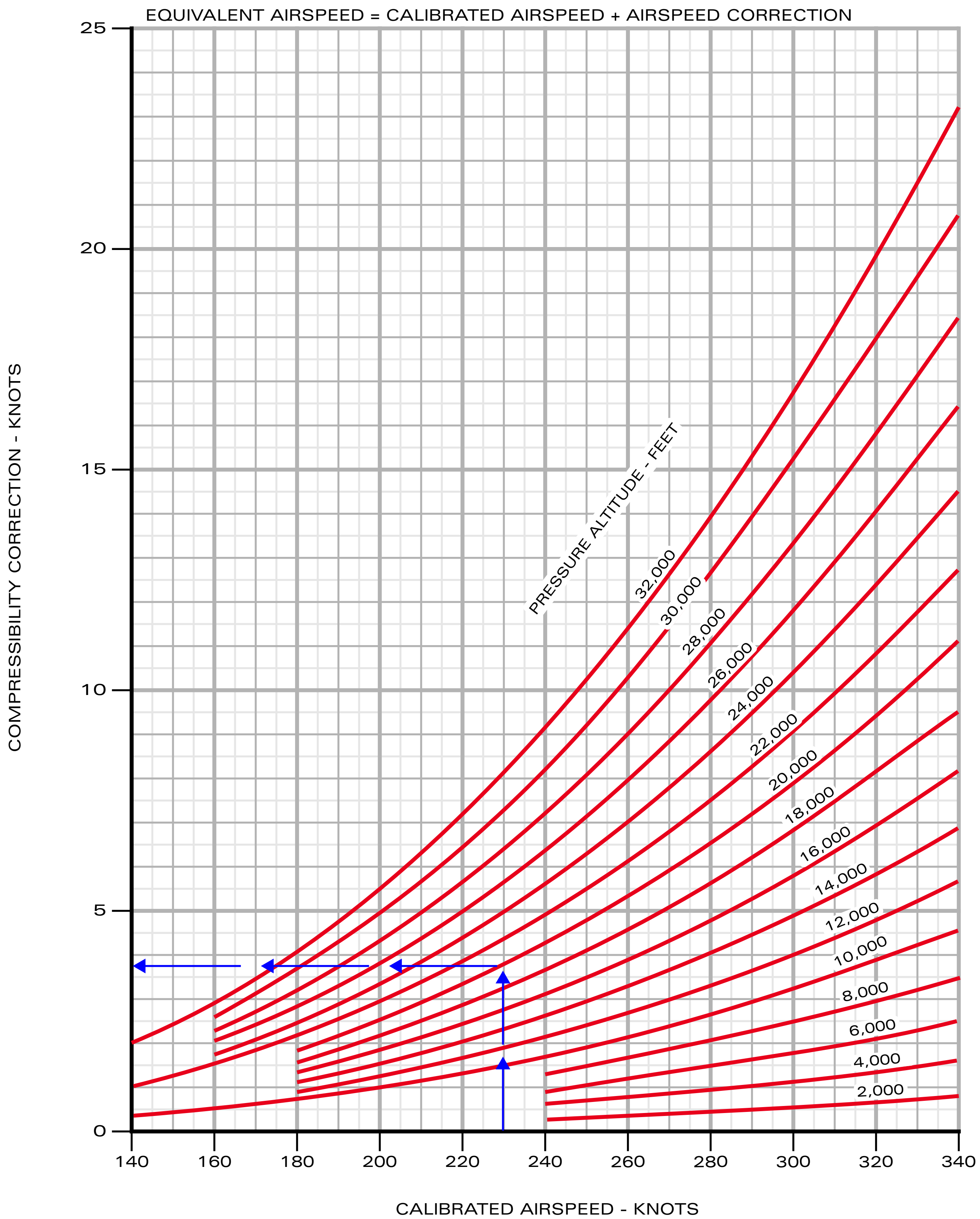


Airspeed/Altimeter Position Correction/Stby - Flaps LDG

COMPRESSIBILITY CORRECTION TO CAS

The purpose of this chart is to adjust calibrated airspeed (CAS) by considering the impact of compressibility, resulting in equivalent airspeed (EAS).

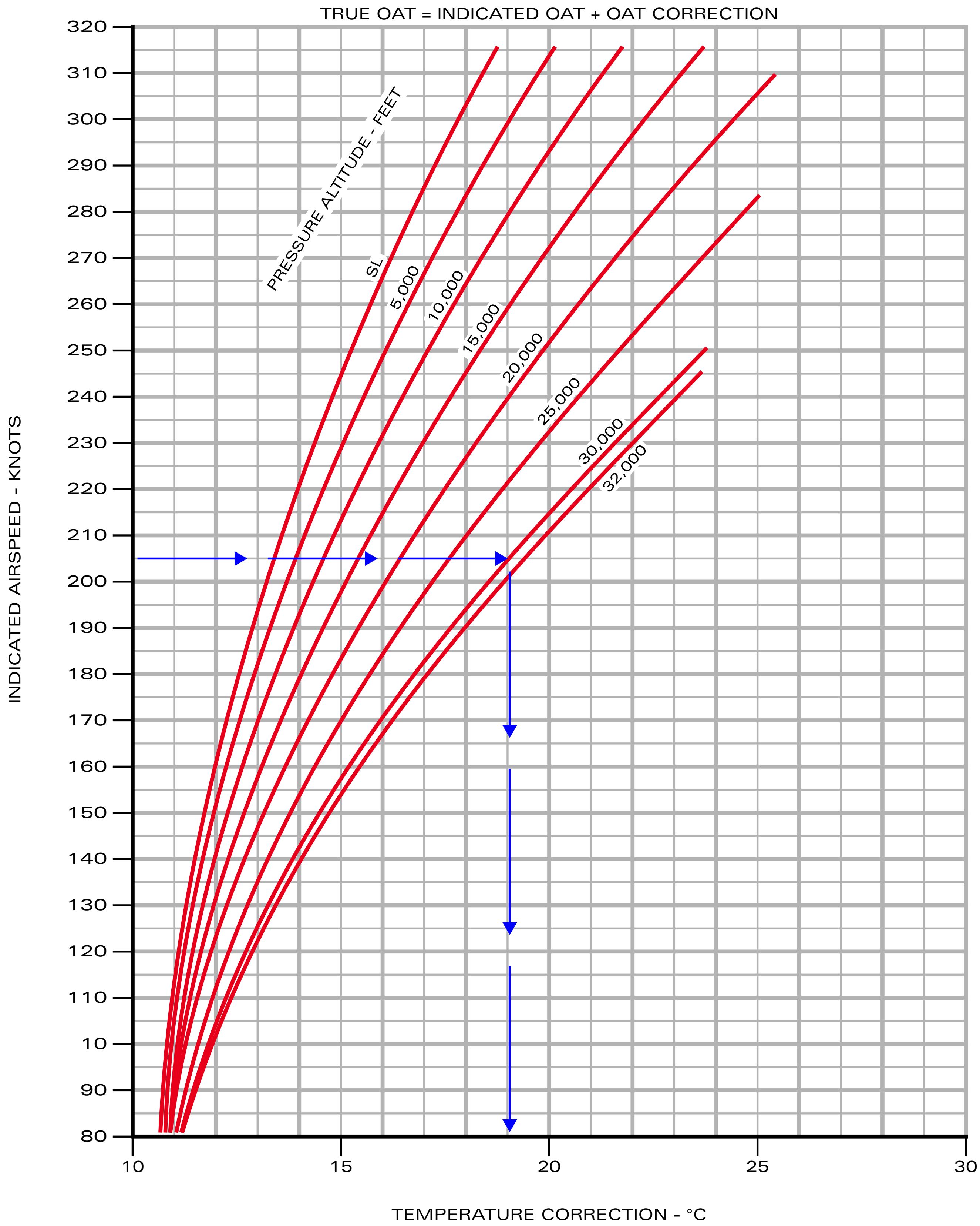
While compressibility correction is insignificant at lower speeds and altitudes, it can reach up to 10 knots at higher speeds and altitudes.



Compressibility Correction to CAS

IOAT CORRECTION

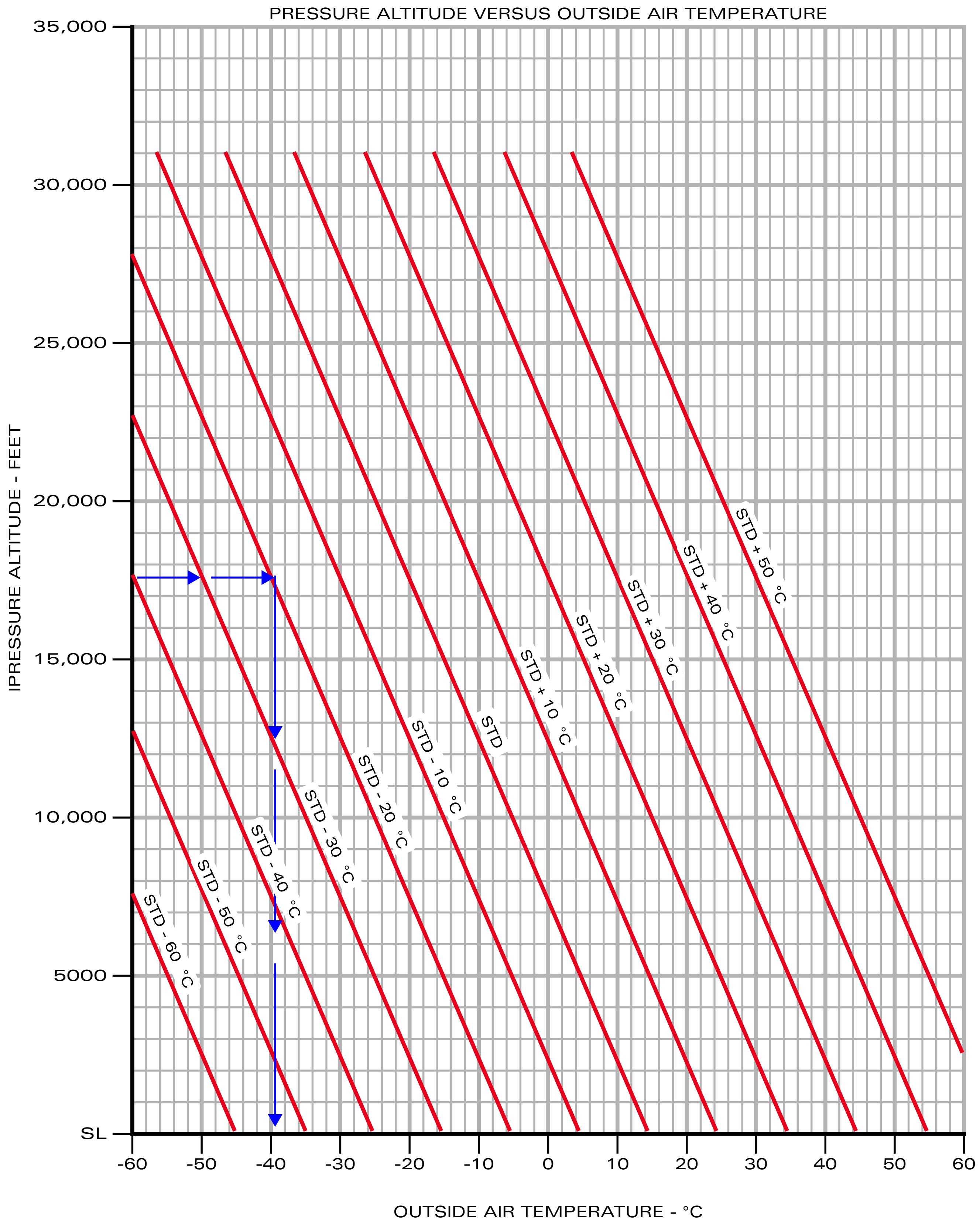
This chart can facilitate the conversion from indicated outside air temperature (IOAT) to outside air temperature (OAT).



IOAT Correction

STD CONVERSION

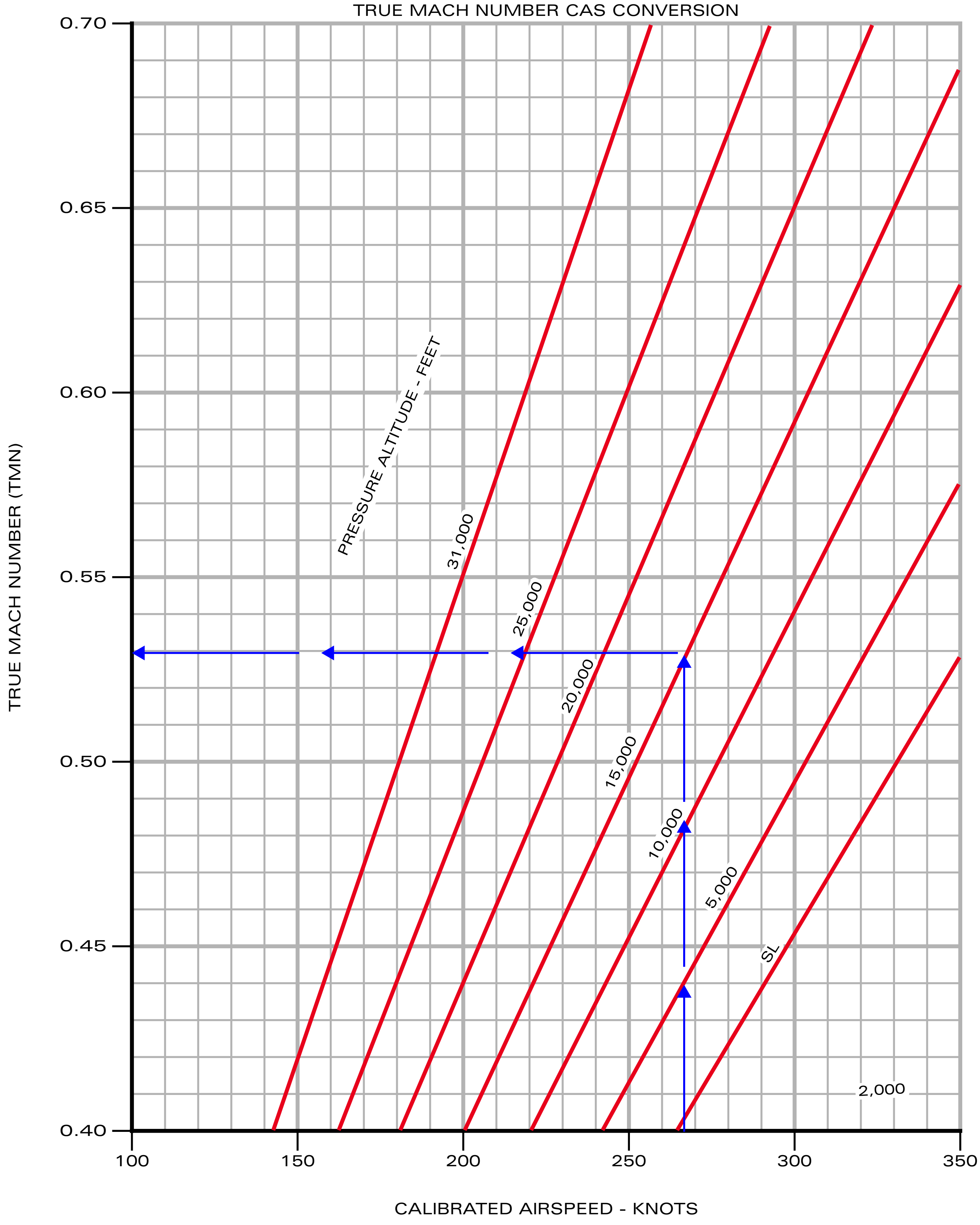
This chart can be utilized to determine pressure altitude or temperature if the STD difference and the other variable (altitude or temperature) are known.



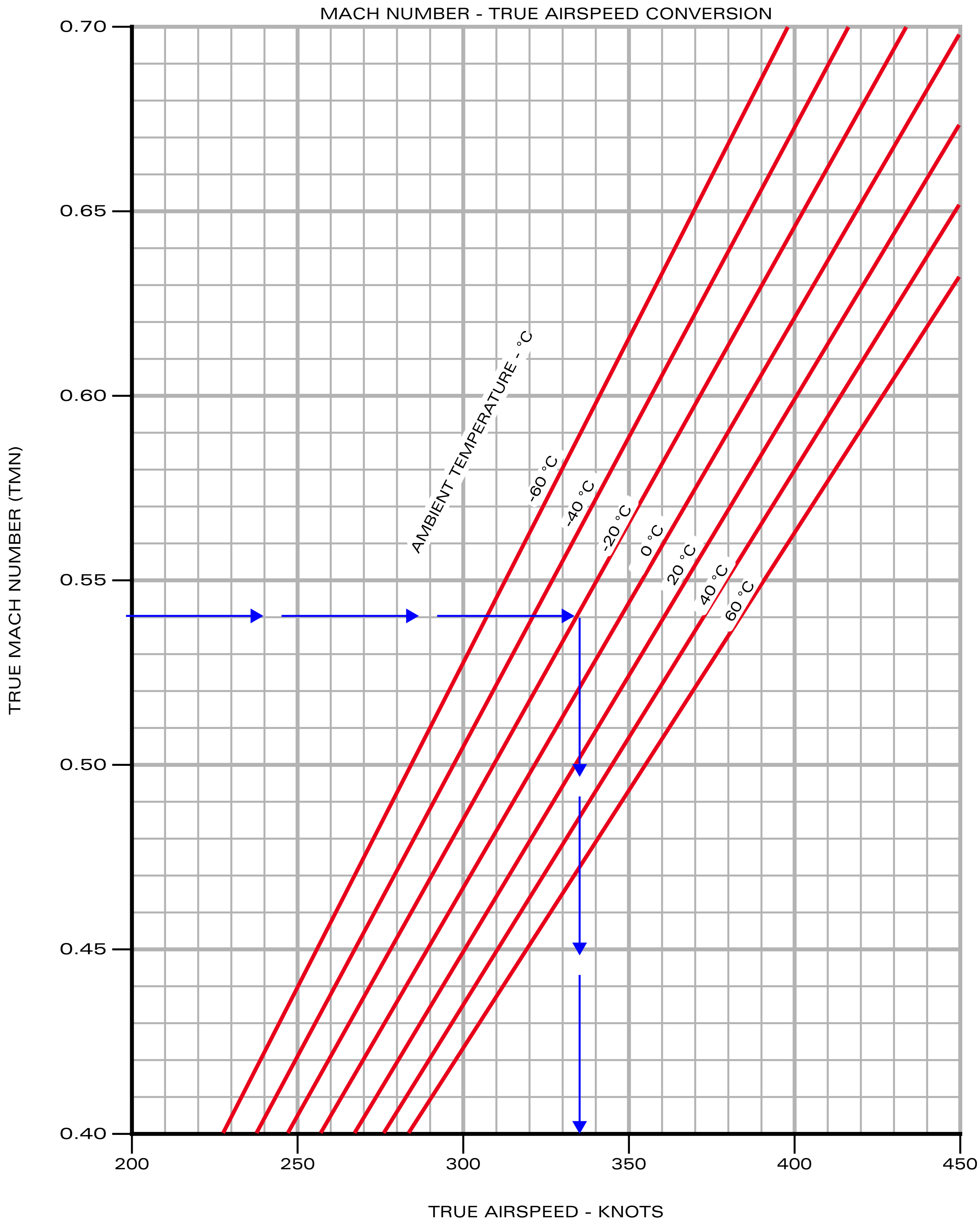
STD Conversion

MACH NUMBER CONVERSION

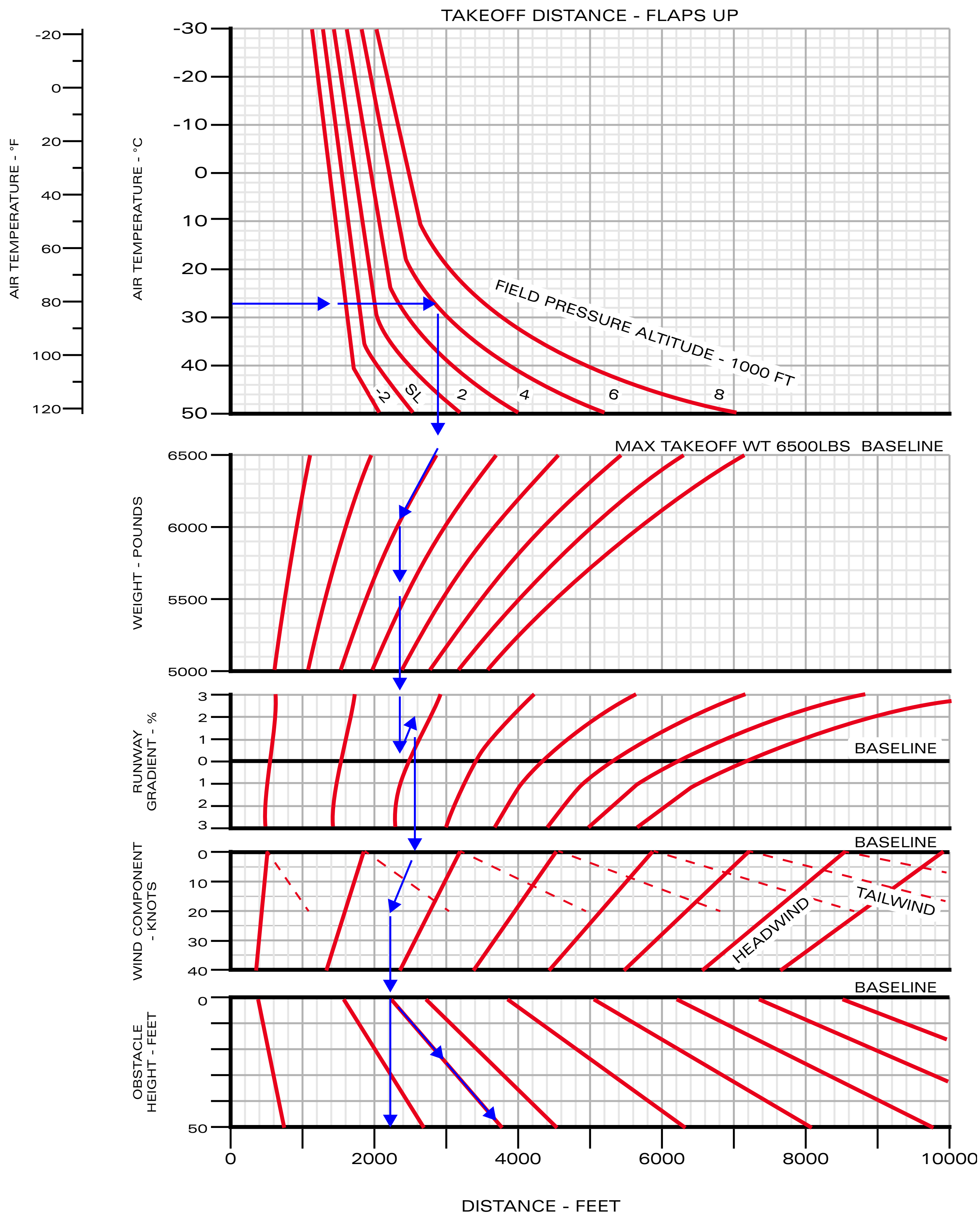
These two charts serve the purpose of converting from true Mach number to either calibrated airspeed (CAS) or true airspeed (TAS) respectively.



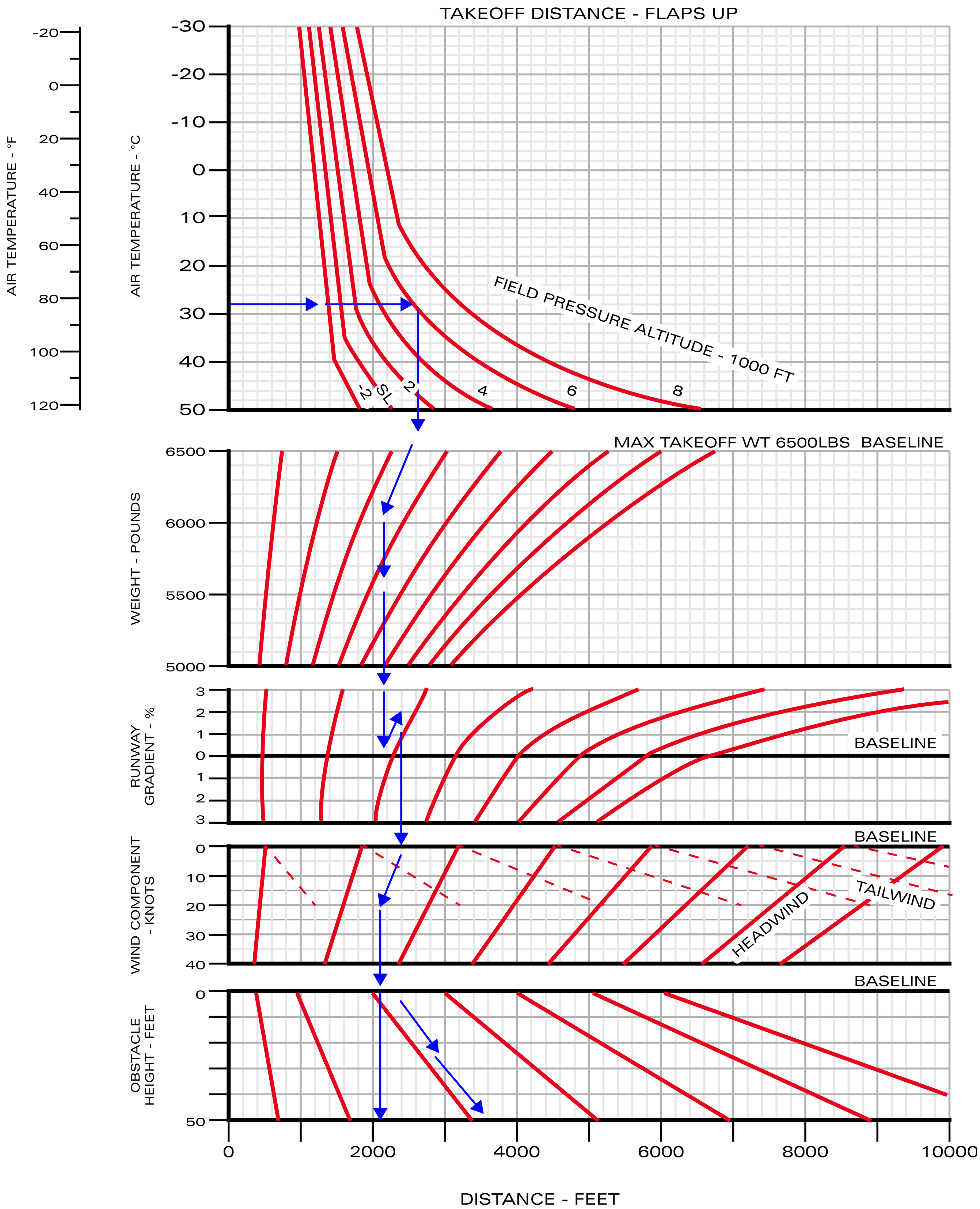
True Mach Number/CAS Conversion



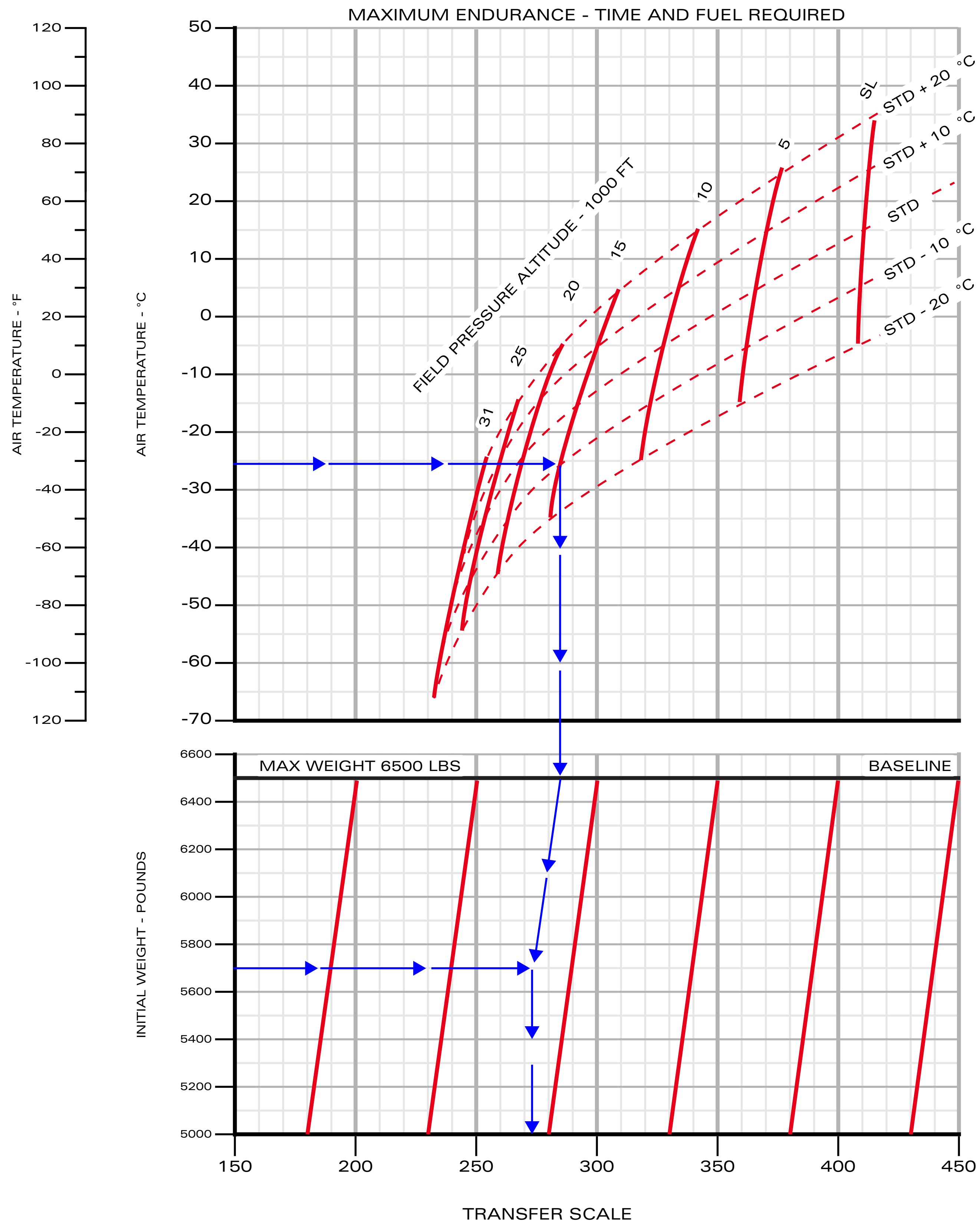
True Mach Number/TAS Conversion



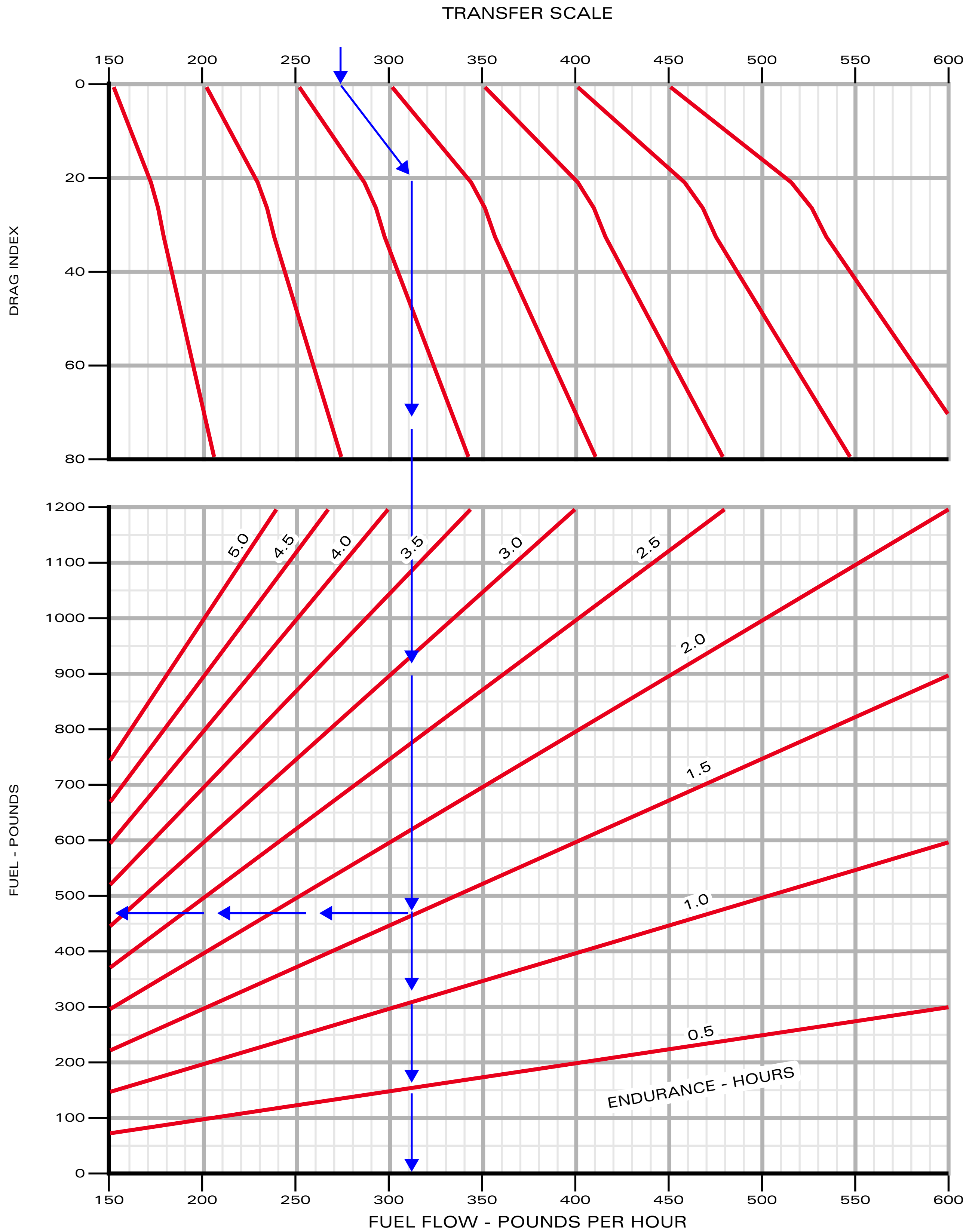
Takeoff Distance - Flaps UP



Takeoff Distance - Flaps TO



Maximum Endurance - Time and Fuel Required 1



Maximum Endurance - Time and Fuel Required 2

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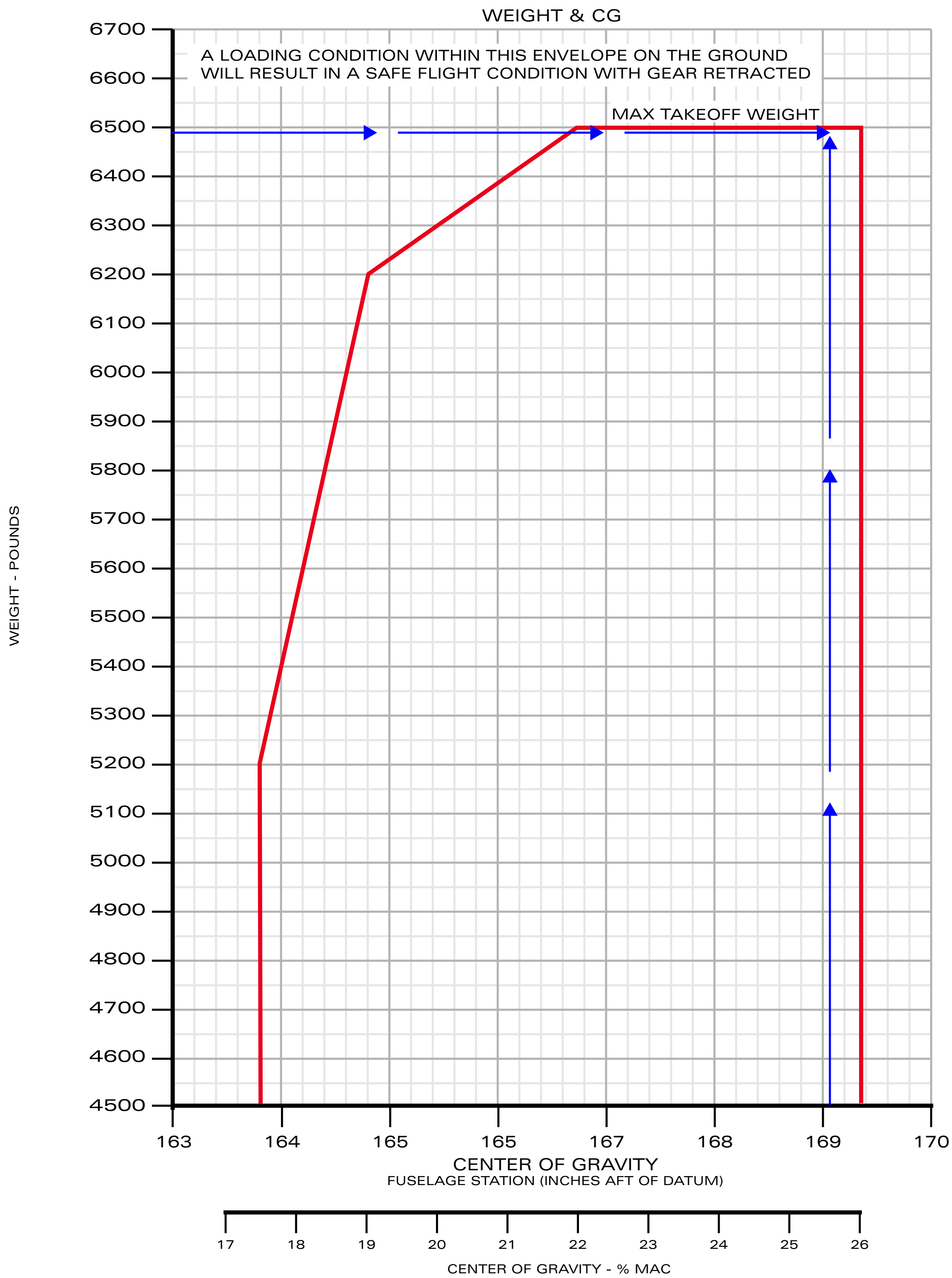
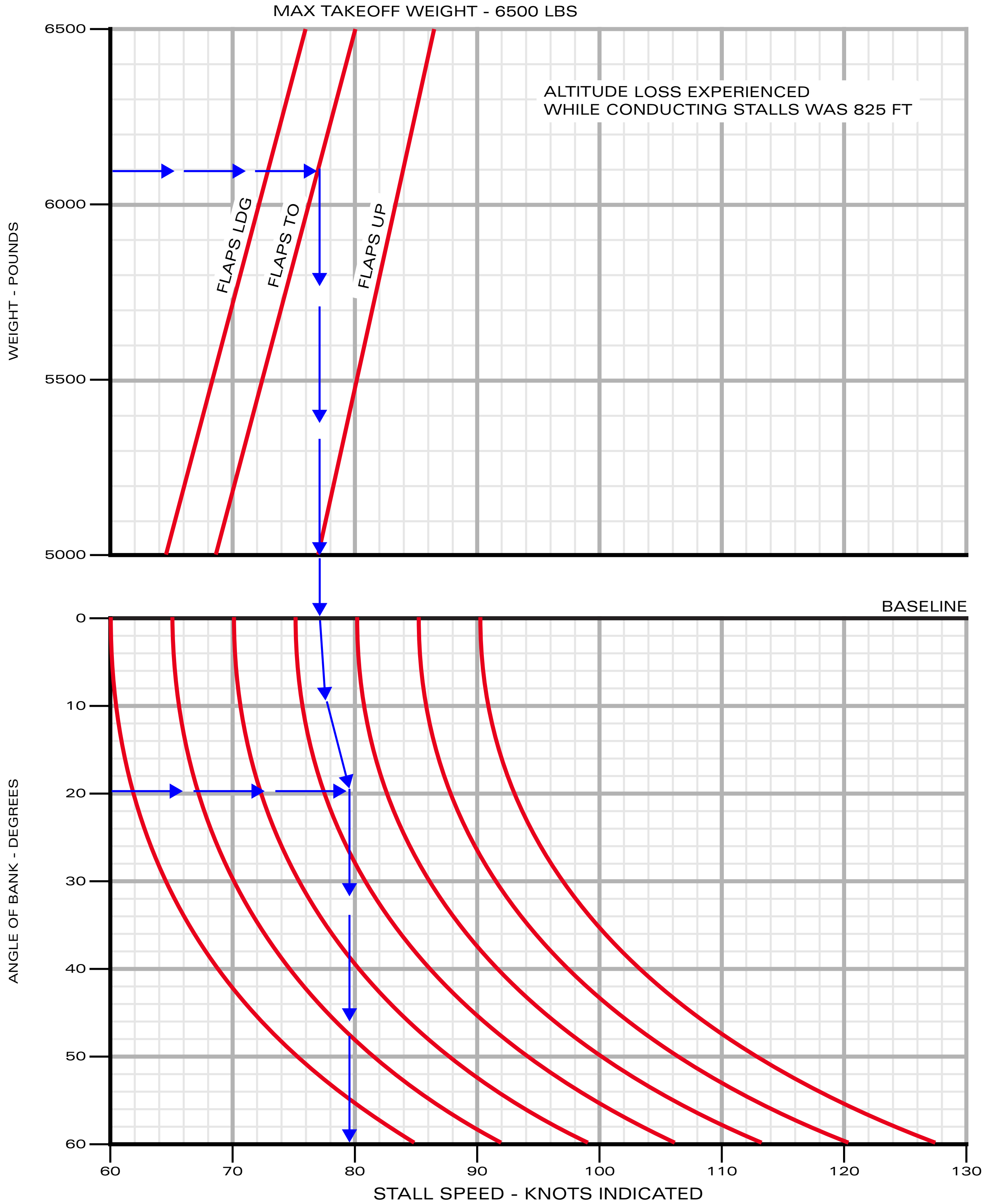
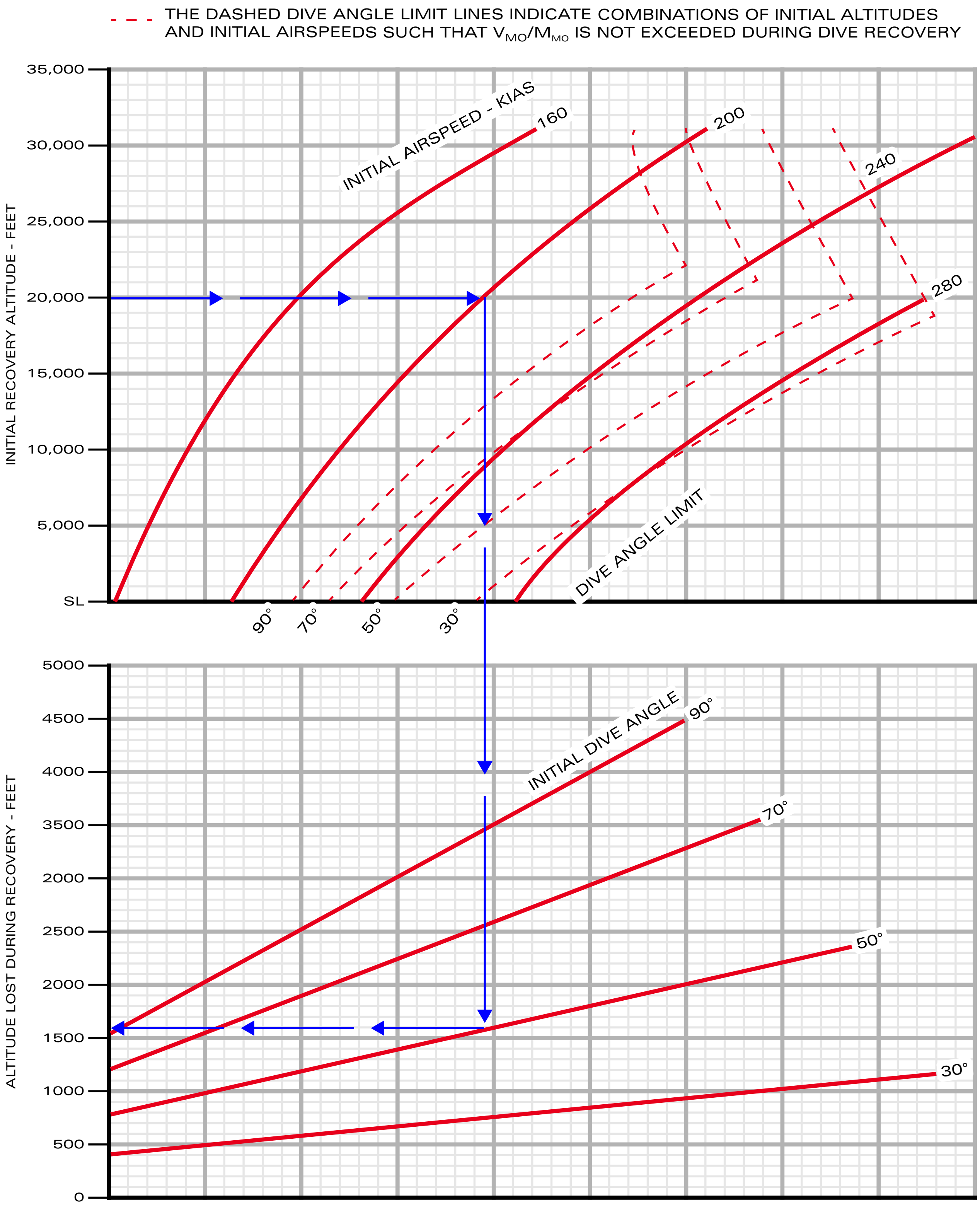


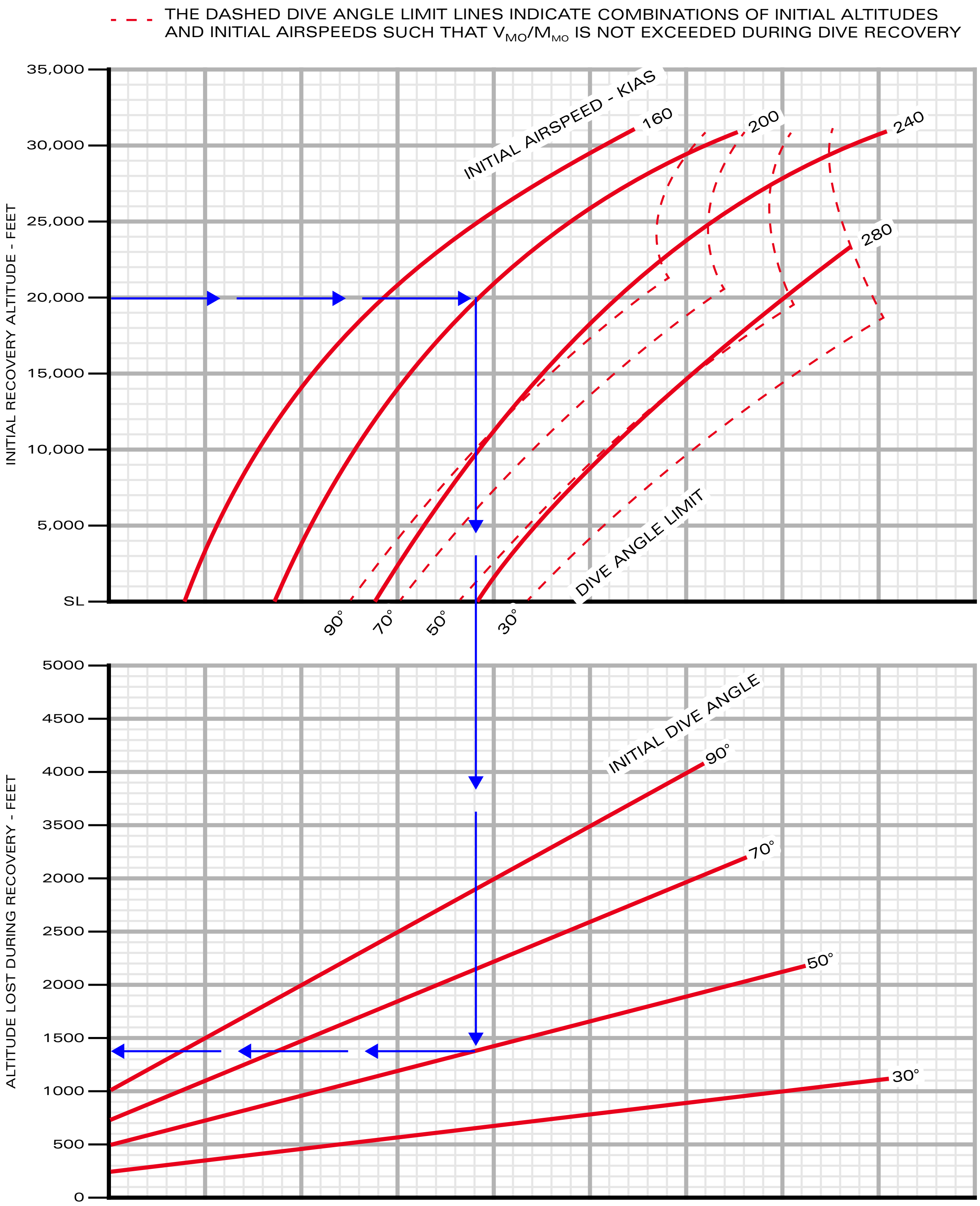
Weight and CG Diagram



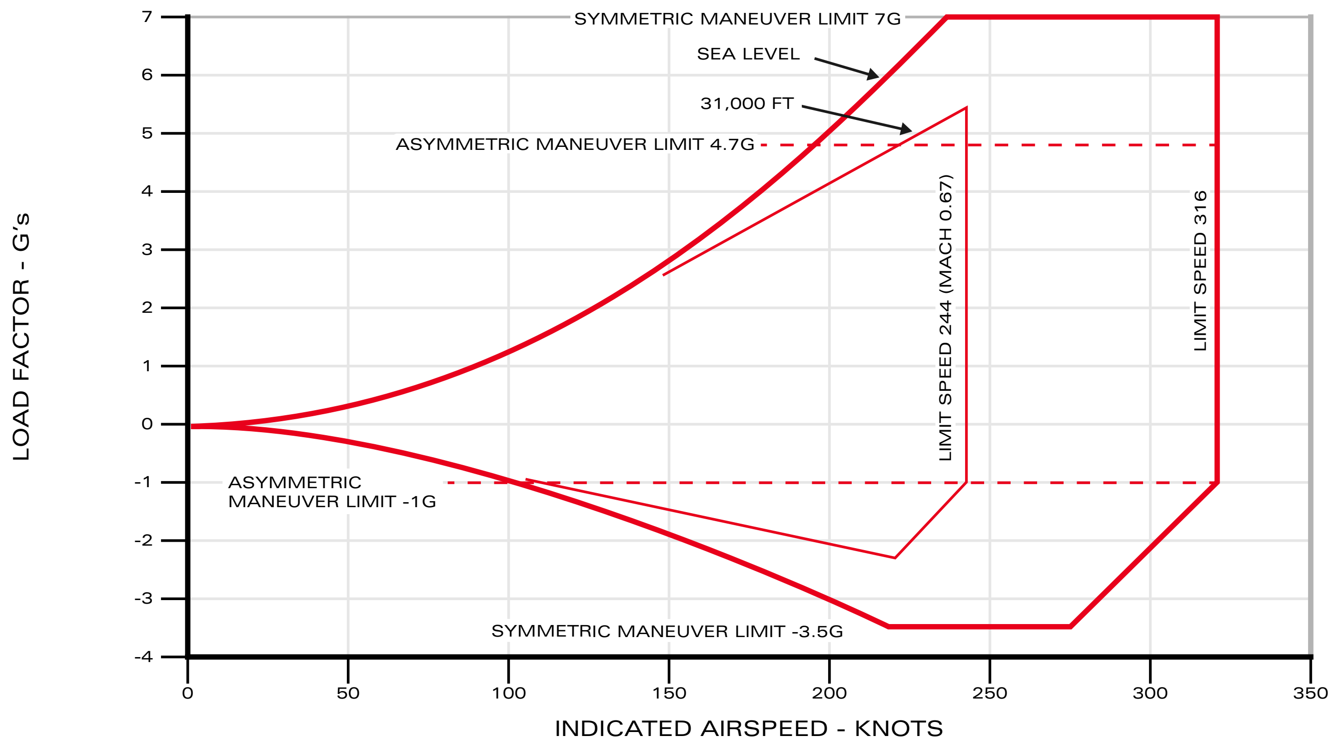
Indicated Stall Speeds - Idle Power



Altitude Loss - 4G Pullout



Altitude Loss - 6G Pullout



Operating Flight Limits

AIRSPEED TERMINOLOGY

CAS	Calibrated Airspeed - indicated airspeed corrected for position and instrument error.
EAS	Equivalent Airspeed - calibrated airspeed corrected for compressibility.
IAS	Indicated Airspeed - speed as shown on aircraft instruments which assumes no instrument error.
IMN	Indicated Mach Number
KCAS	Knots Calibrated Airspeed
KEAS	Knots Equivalent Airspeed
KIAS	Knots Indicated Airspeed
KT	Knot, Knots
KTAS	Knots True Airspeed
MACH NO	Ratio of TAS to local speed of sound
MMO, MMO	Maximum Mach Operating Speed
MPH, mph	Miles Per Hour
TAS	True Airspeed - calibrated airspeed corrected for altitude temperature, pressure and compressibility effects. Traffic Advisory System
VFE	Maximum Flap Extension Speed
VG	Turbulent Air Penetration Speed (Gust Speed) - maximum airspeed for flying through turbulence.
VLE	Maximum Landing Gear Extension Speed
VMO	Maximum Operation Speed - speed not to be exceeded in any phase of flight unless specifically authorized for flight test or pilot training. Vmo varies with altitude.
VR	Rotation Speed - speed at which aircraft rotation is initiated. Varies with weight, altitude, and temperature.
VO	Maneuvering Speed - maximum speed at which full control deflection will not overstress the aircraft.
VROT	Rotation Speed
VS	Power Off Stall Speed - minimum steady flight speed at which the aircraft is controllable.

POWER TERMINOLOGY

Maximum Power (MAX)	The amount of power available at PCL full forward. At this PCL position, the engine is rated to produce at least 1100 bshp and indicate 100% torque below critical altitude, at a maximum ITT not to exceed 820 °C on a standard day.
Maximum Climb Power (MCL)	The PCL position which yields an ITT 13 °C below observed maximum ITT at critical altitude, not to exceed 807 °C.
Maximum Cruise Power (MCR)	The PCL position which yields an ITT 40 °C below observed maximum ITT at critical altitude, not to exceed 780v °C.
RPM, rpm	Revolutions Per Minute
SHP, shp	Shaft Horsepower
Takeoff Power	Maximum Continuous Power

METEOROLOGICAL TERMINOLOGY

Altimeter Setting	Barometric pressure corrected to sea level.
BARO	Barometric Pressure
°C	Degrees Celsius / Centigrade
Density Altitude	When the temperature rises above the standard temperature for a given altitude, the density of the air is reduced and the density altitude increases. This affects aircraft aerodynamic performance in a way similar to flying at higher altitudes. Density altitude is the standard day altitude which corresponds to local altitude corrected for temperature.
°F	Degrees Fahrenheit
in. Hg	Inches of Mercury Indicated Pressure
Altitude	The number read from an altimeter when the barometric scale (Kollsman window) has been set to 29.92 in. Hg (1013 millibars).
ISA	International Standard Atmosphere - theoretical ideal atmosphere where the air is considered a perfect dry gas, the given temperature at sea level is 59 °F (15 °C), and the pressure at sea level is 29.92 in. Hg (1013 mb). mb Millibars
Pressure Altitude	Indicated pressure altitude corrected for altimeter error.
SL	Sea Level
Wind	Wind velocities recorded as variables on the charts and tables in this manual are considered to be headwind or tailwind components of the actual winds 50 feet above the runway surface (tower winds).

GRAPH AND TABULAR TERMINOLOGY

AGL	Above Ground Level
VX	Best Angle-of-Climb Speed - airspeed which delivers the greatest gain in altitude over the shortest possible horizontal distance with the gear and flaps retracted.
VY	Best Rate-of-Climb Speed - airspeed which delivers the greatest gain of altitude in the shortest possible time. Clean Configuration Gear, flaps, and speed brake retracted.
Demonstrated Crosswind	The maximum 90 degree crosswind component for which adequate control of the aircraft during takeoff and landing was demonstrated during certification tests.
Gradient	The ratio of the change in height to the horizontal distance (rise over run), usually expressed in percent.
Landing Weight	The weight of the aircraft at touchdown.
Maximum Zero Fuel Weight	The weight of the aircraft with all required equipment and full crew complement, without any fuel. Any weight above this value must be loaded as fuel.
MEA	Minimum Enroute Altitude.
Ramp Weight	The gross weight of the aircraft before engine start. Included is the takeoff weight and a fuel allowance for engine start, taxi, run-up, and takeoff ground roll to lift-off.
Route Segment	A part of a route. Each end of that part is identified by a geographic location or a point at which a definite radio fix can be established.
Service Ceiling	The altitude at which the maximum rate of climb is 100 feet per minute for existing aircraft weight.
Takeoff Weight	The weight of the aircraft at lift-off.

CONTROL AND INSTRUMENT TERMINOLOGY

Alternate Engine Data Display	The alternate engine display presents alternate torque, alternate N1, cockpit pressure altitude, cockpit differential pressure (delta P), fuel flow, left and right fuel quantity, and raw ITT.
AOA	Angle of Attack - the angle of attack system provides angle of attack information and stall warning for all combinations of weight and angle of bank.
EDM	Engine Data Manager - the engine data manager collects information regarding engine parameters and drives the engine related displays and engine related annunciators.
EID Engine/Systems Display	Electronic Instrument Display - the 3- inch digital displays which present engine, and air data to the pilot in each cockpit. The engine/systems display presents oil temperature, oil pressure, hydraulic system pressure, and generator volts and amps output.
ITT	Interstage Turbine Temperature - the temperature of the gases present between the compressor turbine and power turbine.
N1	Gas Generator Speed - speed of the gas generator section of the engine, expressed as a percentage with 104% representing maximum rated speed.
NP	Propeller RPM
PCL	Power Control Lever - the power control lever sets engine power and propeller thrust from idle to takeoff through the PMU and FMU.
PIU	Propeller Interface Unit - the propeller interface unit modulates engine oil pressure to the hydraulic propeller pitch change mechanism to set blade angle and prop RPM according to input from the PMU.
PMU	Power Management Unit - the power management unit monitors engine operating parameters, and schedules fuel delivery (via the FMU) and propeller settings (via the PIU) to generate the power requested by the pilot while remaining within operating limitations.
Primary Engine Data Display	The primary engine data display presents primary torque, propeller RPM, outside air temperature, primary N1, and primary ITT.
Torque Probe	The torque probe determines the engine torque output.

WEIGHT AND BALANCE TERMINOLOGY

Approved Loading Envelope	Those combinations of aircraft weight and center of gravity which define the limits beyond which loading is not approved.
Arm	The distance from the center of gravity of an object to a line about which moments are to be computed (the datum).
Basic Empty Weight	The aircraft weight with fixed ballast, unusable fuel, engine oil, engine coolant, hydraulic fluid, and in other respects as required by applicable standards.
CG	Center of Gravity - the point at which the weight of an object may be considered concentrated for weight and balance purposes.
CG Limits	The extremes of movement which the CG can have without making the aircraft unsafe to fly. The calculated CG of the loaded aircraft must be within these limits at takeoff, while in flight, and when landing.
Chord	A straight line connecting the leading and trailing edges of an airfoil.
Datum	A vertical plane perpendicular to the longitudinal axis of the aircraft, from which fore and aft (usually aft) measurements are made for weight and balance purposes.
Engine Oil	That portion of the engine oil which can be drained from the engine.
Landing Weight	The weight of the aircraft at touchdown.
Maximum Weight	The highest weight allowed by design, structural, performance or other limitations.
Maximum Zero Fuel Weight	The weight of the aircraft with all required equipment and full crew complement, without any usable fuel. Any weight above this value must be loaded as fuel.
MAC	Mean Aerodynamic Chord - the chord of an imaginary rectangular airfoil having the same pitching moments throughout the flight range as that of the actual wing. Effectively, the chord length of the wing at the point where the center of lift is located.
Moment	The weight of an object multiplied by the arm between the datum and the center of gravity of the object.
Standard	Weights corresponding to the aircraft as offered with seating and interior, avionics, accessories, fixed ballast, and other equipment specified by the manufacturer as composing a standard aircraft.
Station	The longitudinal distance from some point to the datum or zero fuselage station.
Takeoff Weight	The weight of the aircraft at lift off.
Unusable Fuel	The fuel remaining in all fuel tanks after consumption of usable fuel.
Usable Fuel	The portion of the total fuel load which is available for use as determined to be in accordance with all applicable regulatory standards.
Useful Load	The difference between the aircraft ramp weight and basic empty weight.

MISCELLANEOUS ABBREVIATIONS

@	At
A/C	Air Conditioning
ABS	Absolute
AC, ac	Alternating Current
ADC	Air Data Computer
ADIZ	Air Defense Identification Zone
ADS	Air Data System
AHRS	Attitude Heading Reference System
AHRU	Attitude Heading Reference Unit
ALT	Altitude or Altimeter
ALTM	Altimeter
AMLCD	Active Matrix Liquid Crystal Display
amp	Ampere
ANN	Annunciator
ANT	Antenna
AOA	Angle of Attack
APP	APPR Approach
APT	Airport
ARINC	Aeronautical Research Inc.
ARP	Airport Reference Point
ASI	Airspeed Indicator
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
ATR	Air Transport Radio
ATT	Attitude
AUT	Automatic or Autotune
AUX	Auxiliary
B/C	Back Course
BAT	Battery
BIT	Built In Test
BRG	Bearing
BRT	Brightness
CB	Circuit Breaker
CCW	Counterclockwise
CDI	Course Deviation Indicator
CFS	Canopy Fracturing System
CG, cg	Center of Gravity
CH	Channel
CLR	Clear
COM, COMM	Communication
CRS	Course
CW	Clockwise / Continuous Wave
CWS	Central Warning/Caution/Advisory and Annunciator System
DC, dc	Direct Current
DEG	Degree
DEV	Deviation
DF	Direction Finding
DH	Decision Height
DIS, DIST	Distance
DISPL	Display
DME	Distance Measuring Equipment
DME HLD, DMEH	DME Hold
DR	Dead Reckoning
DSABL	Disable
DTK	Desired Track
EADI	Electronic Attitude Director Indicator
EALT	Electronic Altimeter
EASI	Electronic Airspeed Indicator
ECS	Environmental Control System
EHSI	Electronic Horizontal Situation Indicator
ELP	Emergency Landing Pattern
EMI, emi	Electromagnetic Interference
ENT	Enter
EST	Estimated
ET	Elapsed Time
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
EVSI	Electronic Vertical Speed Indicator
FAF	Final Approach Fix
FDU	Flux Detector Unit
FLSC	Flexible Linear Shaped Charge
FLT PLN, FPL	Flight Plan
FMU	Fuel Management Unit
FP	Front Pilot or Fuel Probe
FPM, fpm	Feet Per Minute
FR	From or Frequency
FRT	Front
FT, ft	Foot or Feet
FWD, fwd	Forward
G	Acceleration of Gravity
GA, G/A	Go-Around
GC	Ground Crew
GCA	Ground Controlled Approach
GLS, GS	Glideslope
GMT	Greenwich Mean Time
GND	Ground
GPM	Gallons Per Minute
GPS	Global Positioning System
GPU	Ground Power Unit
GUARD	Guard Receiver or Guard Frequency (243 MHz)
HDG	Heading
HF	High Frequency
Hg	Mercury
HSI	Horizontal Situation Indicator
HYDR	Hydraulic or Hydraulics
Hz	Hertz
ICS	Intercomunication System
ID	Indicator or Ident
IDARS	Integrated Data Acquisition RecordingSystem
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
in.	Inch or Inches
INT	Intersection
INV	Inverse or Invert
INVRT	Invert

ISS	Inter Seat Sequencer
L	Left
LAT	Latitude
LB(S), lb(s)	Pound(s)
LDG	Landing
LF	Low Frequency
LH	Left Hand
LOC	Localizer
LON	Longitude
M	Mach Number
MAC	Mean Aerodynamic Chord
MAG	Magnetic
MAN	Manual
MAP	Missed Approach Point
MDA	Minimum Descent Altitude
MDC	Mild Detonating Cord
MHz	Megahertz
MIC	Microphone
MIN	Minimum
MKR BCN, MB	Marker Beacon
MM	Middle Marker
MOR	Manual Override Handle
MSG	Message
MSL, msl	Mean Sea Level
NAV	Navigation
NDB	Non Directional Beacon
NEG	Negative
NM	Nautical Mile or Nautical Miles
NO, No,	Number
NORM	Normal
OAT	Outside Air Temperature
OBOGS	On Board Oxygen Generating System
OCF	Out-of-Control Flight
OM	Outer Marker
PEL	Precautionary Emergency Landing
PF	Pilot Flying
PIT	Pitch
PMA	Permanent Magnet Alternator
PNF	Pilot Not Flying
POS	Position
pph	Pounds Per Hour
PSI, psi	Pounds Per Square Inch
Psid	Pounds Per Square Inch, Differential
Psig	Pounds Per Square Inch, Gauge
PWR	Power
R	Right
R/T	Receiver/Transmitter
RAD	Radial
RAIM	Receiver Autonomous Integrity Monitoring
RCR	Runway Condition Reading
RDR	Radar
REC	Receive or Receiver
RF	Radio Frequency
RH	Right Hand
RITT	Raw Inter Turbine Temperature
RMI	Radio Magnetic Indicator
RMT	Remote
RMU	Radio Management Unit
RNG	Range
RNWY	Runway
RP	Rear Pilot
RPT	Reporting Altitude or Reporting Point or Repeat
SAT	Static Air Temperature
SEL	Select
SID	Standard Instrument Departure
SPD	Speed
SPR	Single Point Refueling
SQ	Squelch
SSK	Seat Survival Kit
Sta	Station
STAR	Standard Terminal Arrival Route
STBY	Standby
SUP	Supplemental
SYNC	Synchronize
SYS CTRL	System Control
TO, T/O	Takeoff
T/R	Transmit/Receive
TA	Traffic Advisory
TACAN	Tactical Air Navigation
TCN	TACAN or TACAN Receiver/Transmitter
TEMP	Temperature
TK	Track
TN	Tone
TRK	Track
TST	Test
TTG	Time-To-Go
UHF	Ultra High Frequency or UHF Comm Receiver/Transmitter
VAC, vac	Volts Alternating Current
VDC, vdc	Volts Direct Current
VFR	Visual Flight Rules
VHF	Very High Frequency or VHF Nav Receiver
VLF	Very Low Frequency
VMC	Visual Meteorological Conditions
VOR	VHF Omni-Directional Range
VORTAC	VHF Omni-Directional Range/ Tactical Navigation
VS	Vertical Speed
VSI	Vertical Speed Indicator
VVI	Vertical Velocity Indicator
WOW	Weight On Wheels
WPT	Waypoint
XFR	Transfer
XPDR	Transponder
XTK	Crosstrack
Z	Zulu Time

Q. How can I fix a 'specified filepath is too long' installer error?

A. This can be caused by "MSFS addon linker" type programs.
To remedy, you have a choice:

1. Disable the "add-on linker" program.
2. Modify your OS. Use the internet to find a solution that works with your system. There are a number of methods available and not all of them are guaranteed to resolve the issue. e.g. *Maximum Path Limitation*

Q. Some controls do not seem to work. Why?

A. Most controls that are specific to this aircraft MUST be programmed via the EFB tablet in the aircraft to function properly i.e, idle cutoff.

Q: I hear airflow noise when I turn OFF the air conditioner?

A: Bleed air is stopped with the air conditioning ON, and the cockpit is unpressurized. (Below 7500ft MSL), so this is the correct behavior.

Q: I tried to test the TAS and it failed?

A: Wait for the avionics to be fully booted up. There is a delay between the front and back VSI boot up time. If a TAS test is done too soon (before both VSI's are fully booted up) after turning on master avionics, it will fail.

Q: Why do the displays sometimes take so long to boot up?

A: As in the real aircraft, cold weather can make the displays take longer to boot up. This is modeled in our version.

Q: When I turn on the starter, I don't see the amp draw increase?

A: The is the correct behavior, the starter amp draw is not registered on this gage, however you will see a small drop in voltage.

Q: How do I "pop out" the displays?

A: Hold the right ALT key and left click on the display you would like to pop out.

Q: I can't silence the landing gear warning, why?

A: Per the real aircraft - gear warning horn cannot be silenced when either

A) flaps are at LDG, or
B) aircraft is on ground and gear handle is up.

The gear warning silence only works for the speed/throttle-based condition. It doesn't work for the flaps or WoW-based conditions.

Q: The glass reflections on the inside of the canopy look great but they can be distracting at night. Can I turn them off?

A: Yes indeed! Click a rear-view mirror to toggle the reflections on and off

Q: How do you check your hours in the T-6; is there a Hobbs meter?

A: You can see your total time by navigating to the **STA 4** page of the GPS unit.

TIPS AND TRICKS

Weight and Balance - Do NOT use the MSFS weight and balance system. This can cause undesired interactions. Instead use the tablet for weight and fuel loading.

Taxiing - NWS (Nose Wheel Steering) should be used for most ground taxi situations. If a sharp turn is desired, then use differential braking instead. After a landing the NWS should be turned on at a "safe taxi speed" between 20-40 knots.

Static takeoff - It can be tricky starting a takeoff roll from a non-moving position. To counter the left turning tendency, apply full engine torque before releasing the brake pedals. Anticipate the onset of torque on takeoff and counter with right rudder. This takes a little practice to get the proper feel for it.

Radio frequencies - In this vintage VHF comm radio the third decimal digit (1s kHz) is not shown but the radio tunes correctly. The current U.S. standard is 25 kHz spacing. There is a new standard of 8.33 spacing but this is not widely used yet, and this radio does not support it.

RADIO SHOWS/FREQ TUNED

.00 / .000

.02 / .025

.05 / .050

.07 / .075

.10 / .100

.12 / .125

etc.

In UHF the spacing is also 25 kHz so this same display correction is used.
(MSFS does not model UHF radios currently.)

DEFAULT SIMULATOR CONTROL MAPPINGS

AIRCRAFT	MSFS MAPPING
Control Column	ELEVATOR AXIS (reverse) AILERONS AXIS (reverse)
Power Control Lever	THROTTLE
Rudder	RUDDER AXIS (reverse)
Brakes	RIGHT BRAKE AXIS (reverse) LEFT BRAKE AXIS (reverse)
Altimeter	INCREASE ALTIMETER DECREASE ALTIMETER
Avionics master switch	TOGGLE AVIONICS MASTER AVIONICS MASTER 1 ON AVIONICS MASTER 1 OFF
Anti-collision light switch	TOGGLE STROBES STROBES ON STROBES OFF
BAT switch	TOGGLE MASTER BATTERY MASTER BATTERY ON MASTER BATTERY OFF
Bleed air switch	TOGGLE ENGINE BLEED AIR SOURCE
EFIS course knob	INCREASE VOR1 OBS DECREASE VOR1 OBS
EFIS heading knob	INCREASE HEADING BUG DECREASE HEADING BUG
ELT	TOGGLE ELT ELT ON ELT OFF
Engine start switch	SET STARTERS
G-Force indicator	RESET G-FORCE INDICATOR
Instrument lights	SET PANEL LIGHTS PANEL LIGHTS ON PANEL LIGHTS OFF
Flaps	INCREASE FLAPS DECREASE FLAPS
Flood lights	TOGGLE CABIN LIGHTS CABIN LIGHTS ON CABIN LIGHTS OFF
Landing gear	TOGGLE LANDING GEAR GEAR UP GEAR DOWN

Landing light switch	TOGGLE LANDING LIGHTS LANDING LIGHTS ON LANDING LIGHTS OFF
Master caution light	TOGGLE MASTER CAUTION MASTER CAUTION ON MASTER CAUTION OFF
Master generator switch	TOGGLE MASTER ALTERNATOR ALTERNATOR ON ALTERNATOR OFF
Master warning light	TOGGLE MASTER WARNING MASTER WARNING ON MASTER WARNING OFF
Landing light switch	TOGGLE LANDING LIGHTS LANDING LIGHTS ON LANDING LIGHTS OFF
Master caution light	TOGGLE MASTER CAUTION MASTER CAUTION ON MASTER CAUTION OFF
Master generator switch	TOGGLE MASTER ALTERNATOR ALTERNATOR ON ALTERNATOR OFF
Master warning light	TOGGLE MASTER WARNING MASTER WARNING ON MASTER WARNING OFF
Landing light switch	TOGGLE LANDING LIGHTS LANDING LIGHTS ON LANDING LIGHTS OFF
Master caution light	TOGGLE MASTER CAUTION MASTER CAUTION ON MASTER CAUTION OFF
Nav light switch	TOGGLE NAV LIGHTS NAV LIGHTS ON NAV LIGHTS OFF
Parking brake	TOGGLE PARKING BRAKES
Probes anti ice switch	TOGGLE PITOT HEAT PITOT HEAT ON PITOT HEAT OFF
Speed brake	EXTEND SPOILERS RETRACT SPOILERS TOGGLE SPOILERS
Strobe lights	TOGGLE STROBES STROBES ON STROBES OFF
Taxi light switch	TAXI LIGHTS ON TAXI LIGHTS OFF

CREDITS

TESTERS

Venom
Vampire
Waka172RG
DISCO
CannonousCrash
Timothy Swindle aka azflyboy
KCGB
Tim-HH
JJBZ

BLACKBIRD TEAM

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SOUND DESIGN

SimAcoustics

SPECIAL THANKS

Theyoyomaster

T-6A ADV

BLACKBIRD SIMULATIONS