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Textron Aviation

CE-560XL Operating Manual Excerpts



Operating Manual

Citation *Excel*

SERIAL 560XL -5001 THRU -5500



Member of GAMA

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CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

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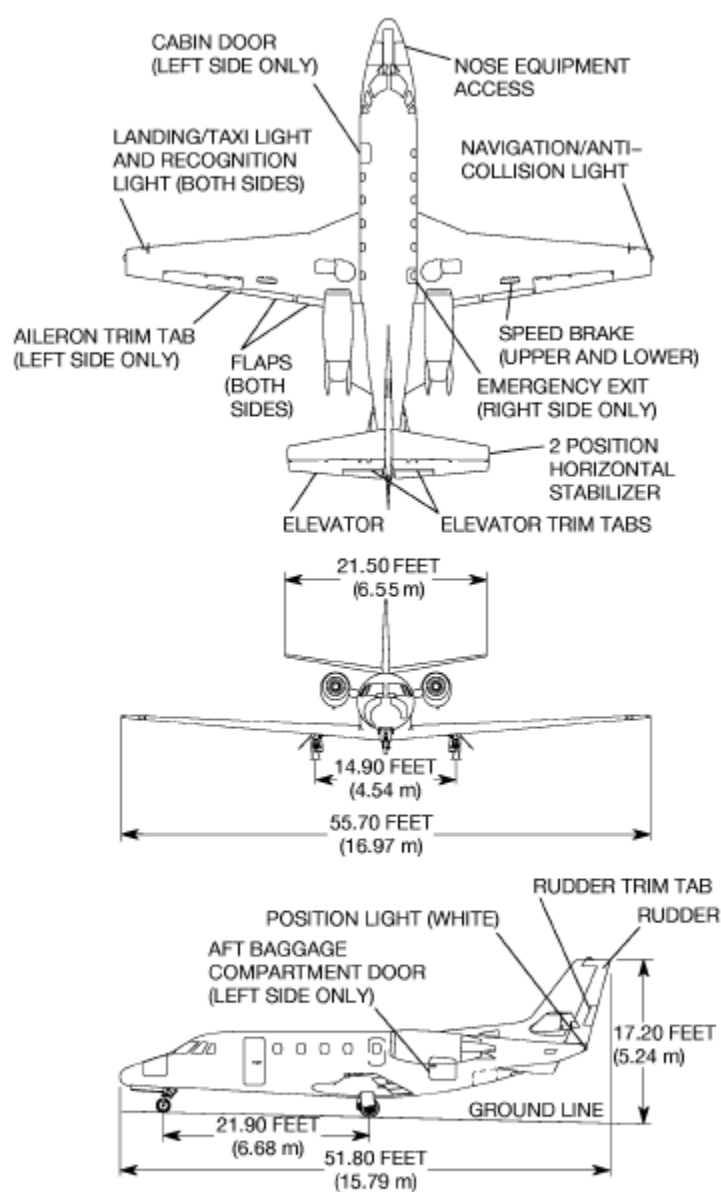
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AIRPLANE THREE VIEW

A95109



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Figure 1-2*

PNEUMATIC

GENERAL

An air bottle which provides for emergency extension of the landing gear and/or emergency braking is located on the left side of the forward pressure bulkhead. The bottle is properly serviced at 1500-2000 PSI and can be checked on preflight by a gauge visible in the left side of the nose avionics compartment. A relief valve on the bottle will rupture at 4000 PSI if the bottle becomes overpressurized.

The bottle has outlets to the vent line, the gear auxiliary extension line, and the brake air pressure line. In normal system configuration the landing gear auxiliary extension line is connected to the vent line through the position of the control valve.

Emergency braking is controlled through a manually operated three-way pressure regulating valve. Air from the bottle is connected directly to the inlet port of the valve by the brake air pressure line. The outlet port is connected to the brakes and, when the emergency brake handle is in NORMAL position, is vented to an exhaust line. When the emergency brakes are applied, the vent is closed, the inlet port opens and high pressure air is applied to the brakes. Releasing the emergency brake handle opens the vent, relieving pressure. This allows modulation of the system to obtain the desired braking force. Each time the handle is cycled some air pressure is vented overboard, reducing the emergency bottle supply.

FLIGHT CONTROLS

GENERAL

All aerodynamic controls, with the exception of the flaps, speed brakes and two-position stabilizer are mechanically actuated by cables. The ailerons, elevator and rudder have trimmed control surfaces and cockpit trim position indicators. Flaps are hydraulically powered and can be operated to 15° at 200 KIAS or below and 35° (full travel) at 175 KIAS or below. Spoiler-type speed brakes are hydraulically actuated and electrically controlled and can be extended throughout the flight envelope.

AILERONS AND TRIM TAB

The ailerons provide excellent lateral control throughout the entire operating envelope. Full range of travel is 19°, +1 or -1° up and 15°, +1 or -1° down. One trim tab, located on the left aileron, is mechanically controlled by a knob on the center pedestal. An indicator on the pedestal shows the amount of trim selected in relation to a neutral position. Full travel of the tab is 20°, +2 or -2° up and down.

ELEVATORS AND TRIM TABS

Elevator control is mechanical through four cable assemblies. Full elevator travel is through a range of 19°, +1 or -0° up, to 15°, +1 or -1° down. Elevator trim tabs installed on each elevator can be positioned electrically or mechanically through cockpit trim tab actuators. Full travel of the tabs is 5°, +1 or -1° up and 15°, +1 or -1° down. An elevator trim wheel on the pedestal provides manual trim control. A trim switch, located on the left side of the pilot's control wheel, controls an electric trim motor which in turn positions the elevator tabs. The copilot's trim switch is located on the right side of the copilot's control wheel. The pilot's trim switch has priority and will interrupt and override the copilot's control. If the electric trim malfunctions, it can be overridden by the manual trim system, or momentarily disabled by pressing the AP/TRIM DISC switch on the pilot's or copilot's yoke.

HYDRAULIC GENERAL

The Excel utilizes a phosphate ester-based open center concept to operate the landing gear, flaps, speedbrakes, two-position horizontal stabilizer and the thrust reversers. A separate independent system is used for the main wheel antiskid/power brake system.

In the open center system, fluid continually circulates between the hydraulic lines and the reservoir at a pressure of approximately 60 PSI. This very low pressure greatly reduces the quantity of hydraulic fluid required in the reservoir because there is minimum fluid heat buildup. Low pump wear and low system leakage rates are additional benefits of the open center system.

RESERVOIR

The fluid for the system is contained in an hydraulic bootstrap reservoir located in the aft tailcone area. The reservoir contains an external tapered-piston rod and housing, and the piston extends or retracts based on fluid level in the system. Markings on the piston rod housing indicate refill, full and overfill levels. Any time the fluid level drops below the refill position, the tapered rod will activate a microswitch and cause the amber LO HYD LEVEL annunciator to illuminate. Servicing requires equipment capable of delivering hydraulic fluid under pressure. Bleeding or relieving an overfill condition is accomplished by opening a relief valve located on the reservoir (right hand wing root area). Relieved excessive fluid is drained overboard through the underbelly vent mast. Any internal leakage is collected and drained through an overboard vent line into the underbelly vent mast.

PUMPS

Hydraulic pressure is provided by two positive displacement engine-driven pumps, each mounted on the engine accessory case. Either pump is capable of supplying enough pressure to operate the gear, flaps, speedbrakes, two-position horizontal stabilizer and reversers. From each pump, hydraulic fluid is routed through filters and flow switch check valve assemblies to the bypass valve and relief valve. In the event that either pump output should drop to less than 0.45 gallons-per-minute, +0.10 or -0.10 gallons-per-minute (GPM), the respective LO HYD FLOW annunciator panel light will illuminate. The light will extinguish when pump output reaches a minimum of 1.33 GPM.

NORMAL OPERATION

When either the landing gear, flaps, speedbrakes, two-position horizontal stabilizer or thrust reversers are actuated, a bypass valve in the return line closes enabling the system to pressurize to 1500 PSI. At the same time, the respective control valve opens, allowing flow to go to the selected system. A relief valve which maintains system pressure at 1500 PSI is in parallel with the bypass valve. The relief valve cracks at 1350 PSI and is fully open at 1500 PSI. The HYD PRESS light illuminates on the annunciator panel any time the system is pressurized. Once the selected cycle is complete, the respective control valve closes, the bypass valve opens and the system reverts to the low pressure, open center state.

WHEEL BRAKES

The power brake and anti-skid system are designed independent of the main hydraulic system.

ACCUMULATOR AND RESERVOIR

The accumulator is located on the left side of the nose avionics compartment. It is precharged to 675 PSI, with all hydraulic fluid bled out to the reservoir. The reservoir is located on the forward side of the forward pressure bulkhead, and contains sight gauges to indicate fill levels.

BRAKE MASTER CYLINDERS

The pilot and copilot brake master cylinders are plumbed in series, but a check valve from input to output allows fluid to pass above 3 PSID, so the input signal at the control valve is the greater of either the pilot or the copilot's effort.

WHEEL BRAKES

Toe-actuated multiple disc carbon brakes are installed on the main gear wheels. Braking can be accomplished by either of two independent systems: the power brake hydraulic system or the back-up pneumatic system. Normal braking can be applied from either cockpit seat. The emergency brake control is installed under the left instrument panel only.

PARKING BRAKE VALVE

The parking brake is a part of the normal brake system and employs controllable check valves that can prevent the return of fluid after the brakes have been set. Parking brakes are set by depressing the toe brakes and pulling out the black parking brake handle located under the lower left side of the instrument panel. The parking brake should not be set if the brakes are very hot. This increases brake cool-down time due to decreased airflow, and may result in sufficient heat transfer from the brakes to cause the parking brake thermal relief valves to open or to melt the thermal relief plugs in the wheel, causing deflation of the tire.

DIGITAL ANTISKID SYSTEM

The antiskid system provides power assisted braking with skid protection. It is designed to provide maximum braking efficiency on all runway surfaces. The system consists of two wheel speed generators, power brake relay/antiskid valve, a digital control box, pressure and control switches and two indicator lights.

System operation is conventional with power braking available at all speeds while antiskid protection is available at speeds between 10 and 175 knots. The antiskid protection feature is designed to operate with maximum pilot brake applied pressure.

The wheel speed generator is bolted in the main gear axle with the drive shaft connected through a drive cap to the main wheel. As the wheel turns, the generator generates a signal for each wheel revolution that is sent to the control module as a variable frequency. The control module accepts the output of the left and right wheel speed generators independently and converts these signals to a direct current (DC) voltage directly proportional to wheel speed. Any significant variation between either wheel speed voltage produces an error signal that activates the power brake and antiskid valve which controls the amount of braking being applied against each wheel. At touchdown, the generator voltage reaches maximum as soon as the wheel spins up. As long as no skid occurs, the generator voltage follows wheel speed and the reference voltage follows the voltage of the generator. When excessive deceleration of a wheel occurs, generator voltage suddenly drops. An error signal is generated which energizes the servo valve segment of the power brake and antiskid valve.

WARNING AND TEST ANNUNCIATOR PANEL

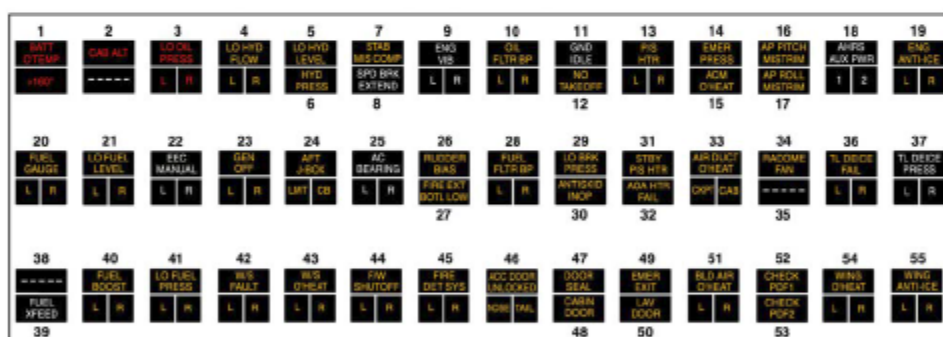
The annunciator panel is designed to provide the pilot with an easily interpreted display of both normal and abnormal system conditions. Two flashing master warning lights (MASTER WARNING RESET) are used in conjunction with the panel to ensure rapid recognition of any red annunciator light. In addition, the master warning light will flash if both amber GEN OFF lights should illuminate.

The master warning lights can be reset by pressing either light. Resetting the master warning light rearms the system so that it will function should another failure occur. The annunciator system is powered from the main direct current (DC) buses through the WARN LTS 1 and 2 circuit breakers on the left cockpit panel. All system light bulbs can be tested by placing the rotary TEST selector on the center pedestal to the ANNU position. This will illuminate all lights and cause the master warning lights to flash.

Burned out bulbs can be replaced by pushing in the light assemblies to the left and right of the failed bulb; then use a tool to remove the assembly with the burned out lamp. If the MASTER WARNING light illuminates in a steady mode, it indicates that there has been a loss of power to the annunciator panel from either the left or right DC electrical bus.

ANNUNCIATOR PANEL

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Figure 2-26

1. BATT O' TEMP

The red battery overtemperature light will flash and the master warning will flash if battery temperature exceeds 145°F. Pressing the master warning will cause the flashing annunciator to change to steady on and the master warning to extinguish.

MODEL 560XL

SECTION II AIRPLANE AND SYSTEMS

8. SPD BRK EXTEND

The white speed brake extend light advises that the left and right speed brakes are fully extended.

9. ENG VIB L / R

The white engine vibration light advises that the left and/or right engine vibration has exceeded prescribed limits.

10. OIL FLTR BP L / R

The amber oil filter bypass light flashes and the master caution illuminates to advise that bypass of the left and/or right oil filter is impending. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

11. GND IDLE

On the ground, the white ground idle light indicates the EEC is in ground idle mode (48% N_2).

In the air, the white annunciator flashes and the master caution illuminates when the EEC is in ground idle mode. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

Once the airplane has transitioned from flight to ground mode, the annunciator will illuminate steady 8 seconds after weight-on-wheels with the throttles at idle.

12. NO TAKEOFF

On the ground, the amber no takeoff annunciator will illuminate steadily if one or more of the following conditions exist: Flaps not within takeoff range (less than 7° or more than 15°), elevator out of trim for takeoff, horizontal stabilizer is out of takeoff position, or speed brakes are out of takeoff position.

As the throttles are advanced beyond climb setting, the no takeoff annunciator will flash and the master caution illuminate if one or more the following conditions exist: Flaps not within takeoff range (less than 7° or more than 15°), elevator out of trim for takeoff or horizontal stabilizer is out of takeoff position. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

13. P/S HTR L / R

On the ground, the amber pitot/static heater failure annunciator illuminates steady to indicate an inoperative heating element in the pitot-static system. In the air, the amber light flashes and the master caution illuminates steady to advise of an inoperative heating element. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

14. EMER PRESS

The amber emergency pressurization light flashes and the master caution illuminates to advise that emergency pressurization has been manually selected or automatically activated by an air cycle machine overheat. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

ENVIRONMENTAL CONTROL

Cabin pressurization utilizes bleed air from the engines and is conditioned by an air cycle machine (ACM). Temperature is controllable over a wide range and the system provides sufficient pressure to maintain a 6770-foot cabin at a cruise altitude of 45,000 feet. The oxygen system automatically supplies oxygen to the cockpit quick-donning masks and to the cabin dropout type masks in the event of excessive cabin altitude.

AVIONICS

The standard, factory-installed avionics package is the Primus 1000 Integrated Avionics System which includes dual altitude reporting mode S transponders, and incorporates the autopilot as well as a dual attitude and heading reference system (AHRS). Air traffic control and other communication is provided by two VHF transceivers, and dual audio amplifiers. Navigation equipment includes a digitally tuned ADF, dual DMEs, and dual VOR/localizer/glideslope/marker beacon receivers, all controlled by dual radio management units (RMU). A Universal UNS-1Csp flight management system with internal GPS sensor is installed on the center pedestal. Weather radar capability is provided by a Primus 880 Color Radar. The pilot's and copilot's positions are equipped with a dual electronic flight instrument system (EFIS), which has primary flight displays (PFD) for each pilot and a multifunction display (MFD) in the center instrument panel. A radio altimeter is provided, which presents its information on the EFIS PFD displays. An emergency locator beacon and a solid state cockpit voice recorder, which is equipped with an underwater locator beacon, and an airborne telephone are also installed as standard equipment.

A standby attitude/altitude/airspeed indicator and a mechanical horizontal situation indicator (HSI) are provided. The HSI provides redundant course deviation indicator/localizer and glideslope capability as well as standby heading capability. The standby flight display also has a short range navigation and approach capability. A high frequency communications radio, an airborne flight information system (AFIS), a B & D cabin display, a Magnastar phone and a Digital Flitefone are some of the available options.

CABIN DOOR

The passenger/crew entry door is located on the left side of the fuselage at the forward end of the passenger compartment. An inflatable rubber seal around the door opening provides pressure sealing. A secondary seal is installed to provide a backup in case of failure of the primary seal. If the primary seal should deflate, the cabin altitude may rise, but should stabilize at a slightly higher altitude. If the door seal should deflate, an amber annunciator DOOR SEAL on the annunciator panel will illuminate.

The door can be opened from either the inside or the outside of the airplane. The air stair door, when opened, serves as steps into the interior of the airplane. An amber CABIN DOOR indicating light on the annunciator panel will illuminate at any time the door is not closed and/or the locking pins are not properly engaged.

EMERGENCY EXIT DOOR

A removable emergency exit door is located on the right side of the fuselage at the aft end of the passenger compartment. The aft most right passenger compartment window is located in the door. The door is of the plug type and is installed or removed from inside the airplane. This exit is an alternate to the cabin door in the event of a crash landing and is the primary exit in a ditching situation. During emergency evacuation, the emergency exit door should be completely removed and thrown outside the airplane through its own open exit, to keep the escape route clear inside the cabin.

AUTOPILOT CONTROL PANEL

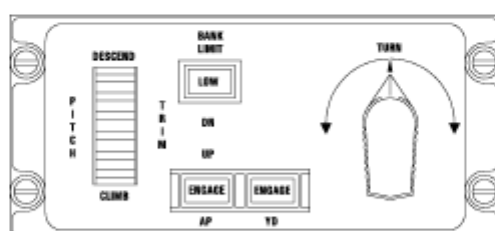
The autopilot control panel, mounted at the aft end of the pedestal, provides the means of engaging the autopilot and yaw damper, as well as manually controlling the autopilot through the turn knob and pitch wheel.

The autopilot (AP) engage switch is used to engage the autopilot and yaw damper. The yaw damper (YD) switch is used to engage and disengage the yaw damper without the autopilot. Use of the yaw damper while manually controlling the airplane aids in airplane stability and passenger comfort. The push-on push-off AP and YD switches are illuminated green when engaged. Pressing the AP switch when the autopilot is engaged will disengage the autopilot but leave the yaw damper engaged. Pressing the YD switch when both YD and AP are engaged will turn off both the yaw damper and the autopilot. The yaw damper and autopilot may also be disengaged with the red AP TRIM DISC button on the pilot's and copilot's control wheels. Pressing the go around (GA) button on either throttle will disconnect the autopilot and force the flight director into go around mode; the yaw damper will remain engaged. Additionally, the stick shaker will disengage the autopilot and yaw damper.

The pitch wheel allows manual pitch control of the airplane proportional to the rotation of the wheel and in the direction of wheel movement. Movement of the wheel also cancels any other previously selected vertical mode. The turn knob allows manual bank control of the airplane proportional to and in the direction of knob movement. Turns with a maximum bank angle of 30° can be performed with the turn knob. The turn knob must be in the center detent position before the autopilot can be engaged. Rotation of the turn knob out of detent cancels any other previously selected lateral mode.

AUTOPILOT CONTROL PANEL

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Figure 3-18

The elevator trim indicator shows an out of trim condition, in the direction indicated by illumination of UP or DN in the TRIM annunciator, when a sustained trim input is being applied to the elevator servo. The indicator should be OFF before engaging the autopilot. If the TRIM annunciator is illuminated and the autopilot must be disengaged, the pilot must be prepared for an out-of-trim condition in the annunciated direction.

FLIGHT CONTROLS

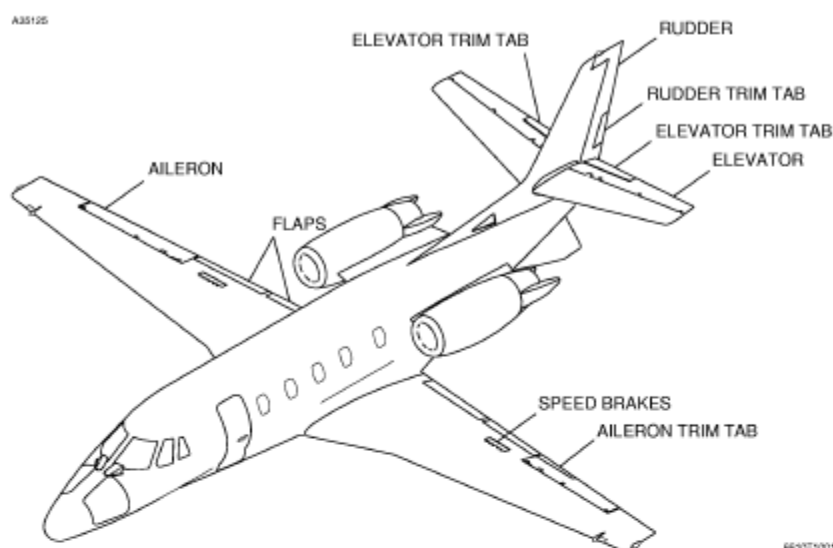


Figure 2-12

RUDDER AND TRIM TAB

The rudder is activated by dual left and right rudder pedals located just aft of the forward pressure bulkhead. Full rudder deflection is 22° , $+1$ or -0° either side of center. A single rudder trim is provided at the trailing edge. With the rudder in the trail position, the trim tab will deflect 11.5° , $+1$ or -1° left and right. The rudder trim is mechanically operated by the rudder trim wheel on the center pedestal. An indicator on the pedestal shows trim tab position relative to neutral. In addition to mechanical actuation, the rudder trim is servo-connected to follow assist in rudder movement. When the trailing edge of the rudder moves to the left, the rudder trim tab trailing edge will servo to the right, assisting in pushing the rudder trailing edge to the left. When the trailing edge of the rudder moves to the right, the rudder trim tab trailing edge will servo to the left, assisting in pushing the rudder trailing edge to the right.

RUDDER/AILERON INTERCONNECT

The interconnect operates in conjunction with the primary controls. When the pilot inputs a left rudder command through the pedals, the torsion bungee imposes a left roll torque to the aileron system. A left roll input likewise produces a left yaw response. Right inputs produce right responses.

RUDDER BIAS

The rudder bias system is designed to be automatically engaged upon the loss of one engine. A pneumatic actuator, powered by engine bleed air, will pull the rudder into a position that compensates for asymmetric thrust due to engine failure. This system is comprised of separated LH and RH actuated pneumatic systems plumbed into one dual acting cylinder. The pneumatic systems are balanced and do not affect rudder position when acting equally together. It is only in an unbalanced engine thrust condition that the rudder bias system delivers rudder assist to compensate for the resulting yaw.

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