CL-350

CL-350 TRAINING MANUAL

PRESSURIZATION 11

AIRCRAFT SYSTEMS

TRAINING MANUAL

LOFT.AERO

This page intentionally left blank

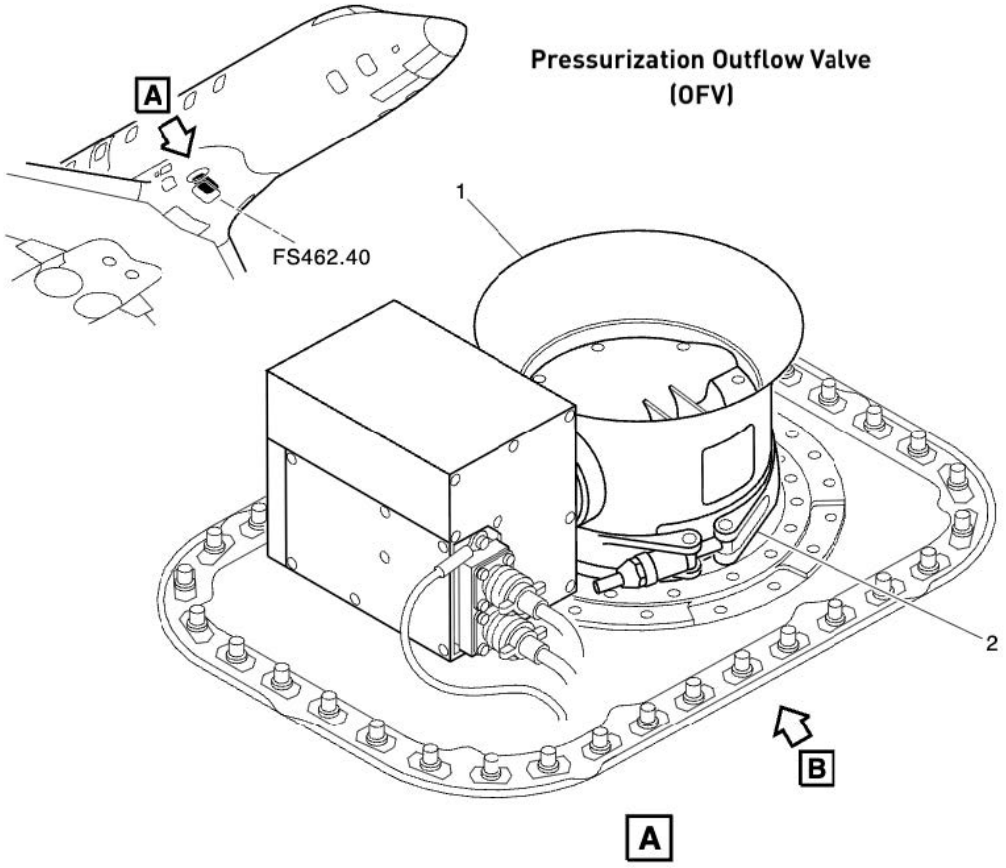
PRESSURIZATION

I. INTRODUCTION

The Challenger 350 pressurization system maintains a comfortable cabin environment throughout all phases of flight by precisely controlling the outflow of conditioned air through an electrically actuated outflow valve. The system operates through three independent control modes—two automatic modes managed by the dual-channel Integrated Air System Controllers (IASC) and one manual backup mode controlled through analog circuitry—ensuring redundancy and operational flexibility at all altitudes.

Two pneumatically operated safety valves provide independent overpressure and negative pressure protection regardless of the selected control mode, preventing cabin differential pressure from exceeding structural limits. During normal operations, the system automatically manages cabin altitude based on flight management system inputs, maintaining optimal pressure schedules that minimize passenger discomfort during climbs, cruise, and descents while adhering to physiological and structural limitations.

The design incorporates sophisticated control logic that handles special scenarios including high-altitude airport operations, emergency depressurization for smoke evacuation, and ditching sequences, with all system parameters continuously monitored and displayed through the EICAS to maintain complete crew situational awareness of cabin environment conditions.



A. SYSTEM SPECIFICATIONS

Pressurization System Main Specifications

Parameter	Value
System Type	Automatic and Manual pressure control
Outflow Valve	Single electrically actuated valve
Safety Valves	Two pneumatic on aft pressure bulkhead
Controllers	Two Integrated Air System Controllers (IASC)
Normal Cabin Altitude Limit	7,850 feet
Cabin Altitude Caution	8,500 feet (adjustable for high airports)
Cabin Altitude Warning	9,400 feet (adjustable for high airports)
Passenger Oxygen Deployment	Automatic at 14,000 feet cabin altitude
Emergency Depressurization Limit	14,000 ± 100 ft (AUTO), 14,500 ± 500 ft (MANUAL)
Ditching Function	Available in AUTO mode only (inhibited above 15,000 ft)

II. SYSTEM ARCHITECTURE

A. CONTROL PHILOSOPHY

- Three independent modes of operation ensure redundancy
- Automatic control through dual IASCs with auto-switchover capability
- Manual backup control through IASC 1 analog circuitry
- Independent pneumatic safety valve protection
- EICAS integration for continuous monitoring

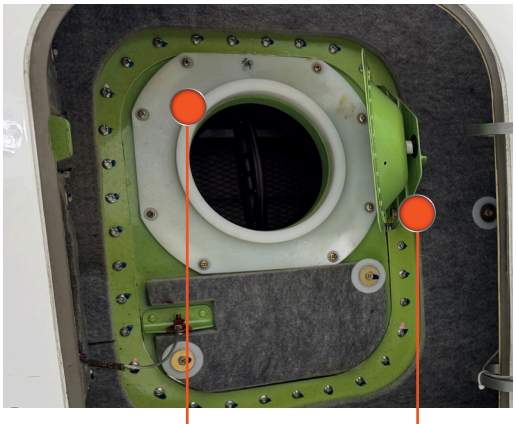
B. PRIMARY COMPONENTS

Integrated Air System Controllers (IASC):

- Two digital controllers for automatic operation
- Only one controller active at a time
- Standby controller automatically assumes control upon active controller failure
- IASC 1 normally active after power-up unless fault detected
- IASC 2 operates in standby mode

Outflow Valve:

- Electrically actuated with dual motor design
- Composite flow body with butterfly plate
- Two motors, one for automatic operation the other for manual operation

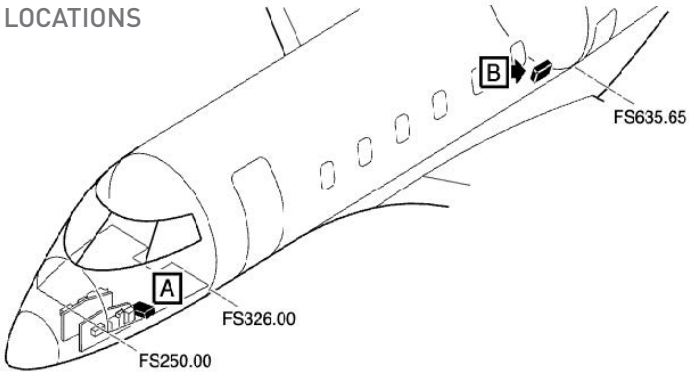


- Outflow Valve / Ditching Flapper
- One motor for manual operation
- Access panel forward of wing for maintenance

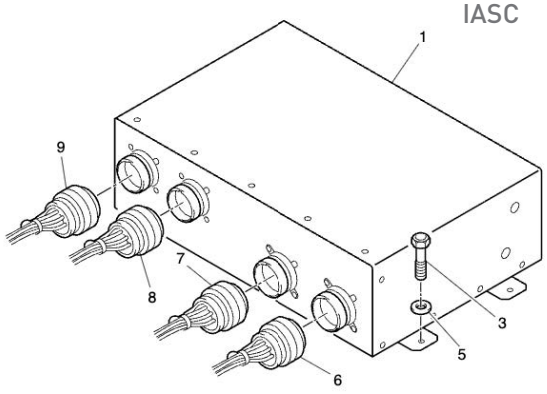
Safety Valves:

- Two pneumatically operated valves
- Located on aft pressure bulkhead
- Spring-loaded closed design
- Provide overpressure relief
- Provide negative pressure relief
- Operate independently of control mode

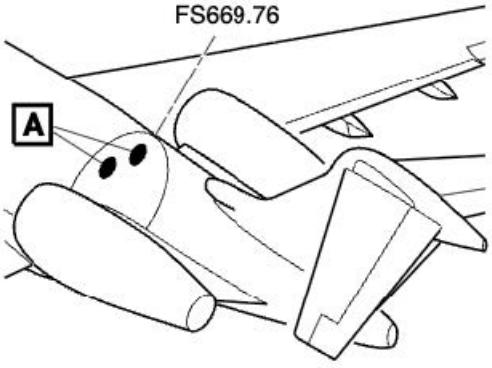
IASC LOCATIONS

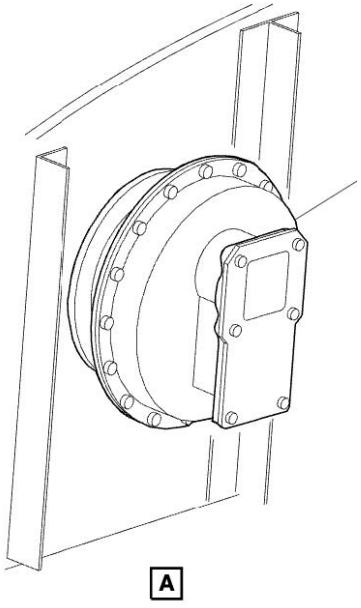


IASC



PRESSURIZATION SAFETY VALVES





III. AUTOMATIC PRESSURIZATION MODES

A. PRE-PRESSURIZATION MODE

- Activated on ground when thrust levers advanced for takeoff
- Cabin pressurized to 300 ft below actual field elevation
- Allows outflow valve to achieve controlling position before takeoff
- Eliminates noticeable pressure changes during takeoff

B. TAKEOFF AND RETURN TO BASE SEQUENCE

- Initiated when aircraft leaves the ground
- Maintains pre-pressurization altitude of 300 ft below field elevation

  Continues until:
    - Aircraft reaches 6,000 ft mean sea level (MSL), or differential from takeoff reached, or
    - 10 minutes elapsed
- If descent initiated, cabin altitude descends to takeoff altitude
- Landing field elevation does not require resetting

C. CLIMB MODE

- Cabin altitude programmed according to:
    - Selected landing elevation
    - Theoretical schedule of cabin vs. aircraft altitude
    - Cabin climb rate varies with aircraft climb rate
    - Typical cabin climb rate: 300-500 slfpm
    - Maximum cabin rate for light aircraft climbs: 635 slfpm
    - **NOTE:** For steep climbs above 25,000 ft with aircraft climb rates >6,000 fpm:
        - Cabin climb rate may exceed 635 slfpm normal limit
        - Recommended maximum aircraft climb rate: 6,000 fpm for comfort

D. CRUISE MODE

- Activated when:
    - Aircraft climb rate <500 slfpm for >10 seconds, or
    - Aircraft climbing at any rate above 25,000 ft
- Cabin altitude stabilized per pressure schedule

E. DESCENT MODE

- Cabin descent rate directly related to aircraft descent rate
- High-speed descent increases cabin descent rate based on:
    - Calculation of remaining flight time
    - Aircraft speed from Air Data Computer (ADC)

- Typical cabin descent rate: 300 slfpm
- Aircraft descent at 2,000 fpm → cabin descends at ~300 slfpm
- Aircraft descent >5,000 fpm → cabin descends at 750 slfpm
- Cabin descends until ~300 ft below selected landing elevation

F. DEPRESSURIZATION SEQUENCE ON GROUND

- After landing or aborted takeoff
- Cabin depressurizes at 500 slfpm to equalize cabin
- OFV moves to full open
- Remains full open while on ground

IV. MANUAL PRESSURIZATION MODE

A. SYSTEM CONTROL

- Activated by pressing MANUAL switch ON
- OFV controlled electrically through MAN RATE knob
- UP selection → increases cabin altitude
- DN selection → decreases cabin altitude
- Center position → maintains cabin altitude
- Maximum rate of change: 2,500 fpm

B. MANUAL OPERATION PROCEDURES

Before Takeoff:

- Note cabin altitude
- Start pre-pressurization by adjusting MAN RATE toward DN
- Recommended rate: -300 fpm
- If time permits before takeoff:
    - Upon reaching 300 ft below noted cabin altitude select cabin rate to zero
    - Allow cabin to stabilize (CAB RATE shows 0 FPM on ECS synoptic)
- If takeoff performed before pre-pressurization complete pressure bumps may occur

Takeoff and Climb:

- Cabin altitude may be selected as desired
- Monitor CAB ALT and CAB ΔP
- Make adjustments to keep delta P within limits:
    - +500 fpm to raise cabin altitude
    - -300 fpm to descend cabin altitude

Cruise:

- Cabin altitude selectable as desired
- Must observe limits for cabin altitude and delta P

Descent and Landing:

- Set desired cabin altitude to 300 ft below field elevation
- For initial descent steps: any comfortable rate
- For unrestricted descent:
    - Cabin rate should be proportional to aircraft descent time
    - Example: Aircraft at 27,000 ft with 3,000 fpm descent = 9 minutes to land
    - Divide difference between current cabin altitude and landing altitude by time
      NOTE: Monitor cabin delta P during descent
    - Keep delta P less than 1 psid (maximum for landing)

After Landing:

- Depressurize by adjusting MAN RATE toward UP
- Continue until field elevation attained

Pressurization Control Modes

Mode	Description
AUTO 1 (Normal)	IASC 1 Channel A controls outflow valve
AUTO 2 (Alternate)	IASC 2 Channel A controls outflow valve
MANUAL	Manual control via MAN DN/UP rocker switch
Rate Control (AUTO)	500 fpm climb, 300 fpm descent nominal
Rate Control (MANUAL)	Variable based on switch deflection
Pre-pressurization	-245 feet cabin altitude on ground
High Airport Mode	Adjusts alerts for field elevations above 7,850 feet

V. HIGH ALTITUDE AIRPORT OPERATIONS

Operating at airports situated above 7,850 feet presents unique challenges that extend beyond the typical considerations of density altitude and aircraft performance. At these elevations, the aircraft's pressurization system must alter its operating logic for both departure and arrival sequences, as this altitude marks the upper limit of normal cabin pressure scheduling.

During takeoff from these high-elevation fields, the pre-pressurization sequence maintains the cabin at 300 feet below field elevation rather than immediately climbing toward the standard cruise cabin altitude, while the system carefully manages the transition from ground operations through the initial climb phase.

Similarly, landing at these airports requires the pressurization controllers to reset warning and caution thresholds above their normal values with caution messages increasing to 650 feet and warning messages to 1,550 feet above landing field elevation to prevent nuisance alerts during approach.

A. LANDING SEQUENCES (FIELD ELEVATIONS >7,850 FT)

- No additional crew action required if landing elevation selected before takeoff
- Scheduled cabin altitude normally limited to 7,850 ft in flight
- Automatically reset to landing field pressure altitude
- **CABIN ALTITUDE** (C) normally at 8,500 ft
- **CABIN ALTITUDE** (W) normally at 9,400 ft
- Below 41,000 ft descent:
    - Thresholds increase as function of aircraft altitude and descent rate
    - **CABIN ALT WARN HIGH** (A) displayed informing crew of higher limits
    - **CABIN ALTITUDE** (C) increases to landing field +650 ft (max 14,300 ft)
    - **CABIN ALTITUDE** (W) increases to landing field +1,550 ft (max 14,300 ft)

B. TAKEOFF AND RETURN TO BASE SEQUENCES (FIELD ELEVATIONS >7,850 FT)

- System maintains pre-pressurization of 300 ft below takeoff altitude
- Maintained until aircraft reaches 6,000 ft AGL or 10 minutes elapsed
- Return to Base maintains pre-pressurization until landing to avoid cabin bumps
- Landing field elevation does not require resetting
- Caution and warning thresholds maintained at takeoff pressure altitude

C. CLIMB MODE (HIGH ALTITUDE OPERATIONS)

- Cabin altitude decreases at -500 slfpm toward 7,850 ft limit
- Thresholds decrease as function of aircraft altitude and climb rate
- Minimum -500 slfpm required for thresholds to reach normal values before 41,000 ft

D. CRUISE MODE (HIGH ALTITUDE OPERATIONS)

- Cabin altitude continues decreasing at -300 slfpm until 7,850 ft reached
- Warning threshold decreases at -300 fpm until 9,400 ft
- Caution threshold decreases at -300 fpm until 8,500 ft

E. LEVELING OFF DURING DESCENT

Above 41,000 ft:

- Cabin altitude remains at 7,850 ft
- Caution and Warning thresholds remain at 8,500 ft and 9,400 ft

Between 41,000 ft and 25,000 ft:

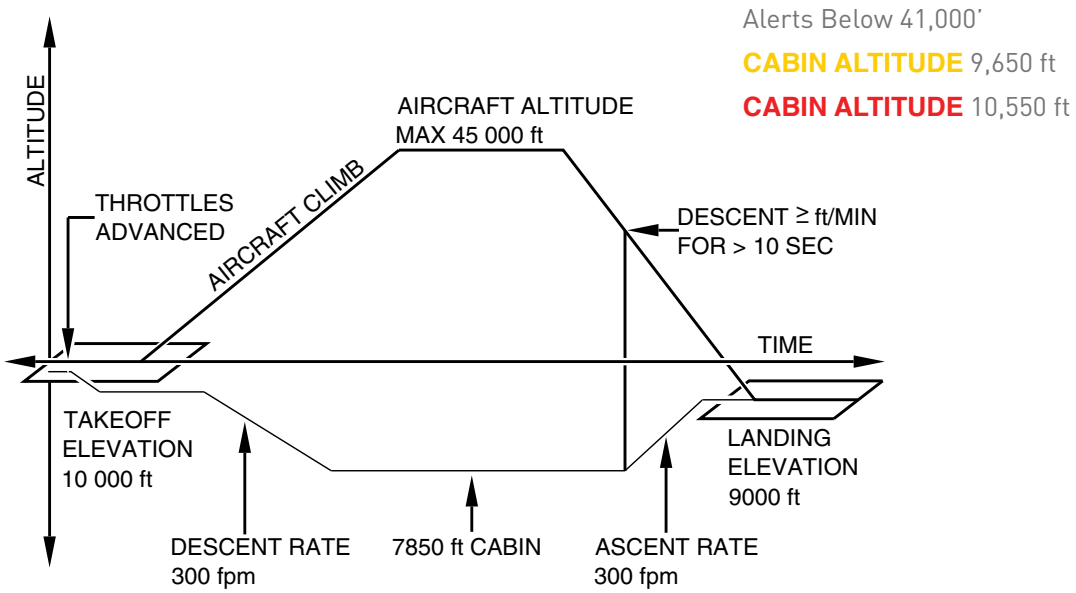
- Cabin altitude and thresholds level as function of aircraft altitude
- After 3 minutes: cabin descends at -300 slfpm toward 7,850 ft
- Thresholds also descend at -300 fpm until aircraft descent initiated

At or Below 25,000 ft:

- Cabin reaches landing field pressure altitude -300 ft
- Caution threshold: landing field +650 ft (max 14,300 ft)
- Warning threshold: landing field +1,550 ft (max 14,300 ft)

F. EXAMPLES

1. **Taking off from airfields above 7,850 ft and landing field elevations above 7,850 ft.**



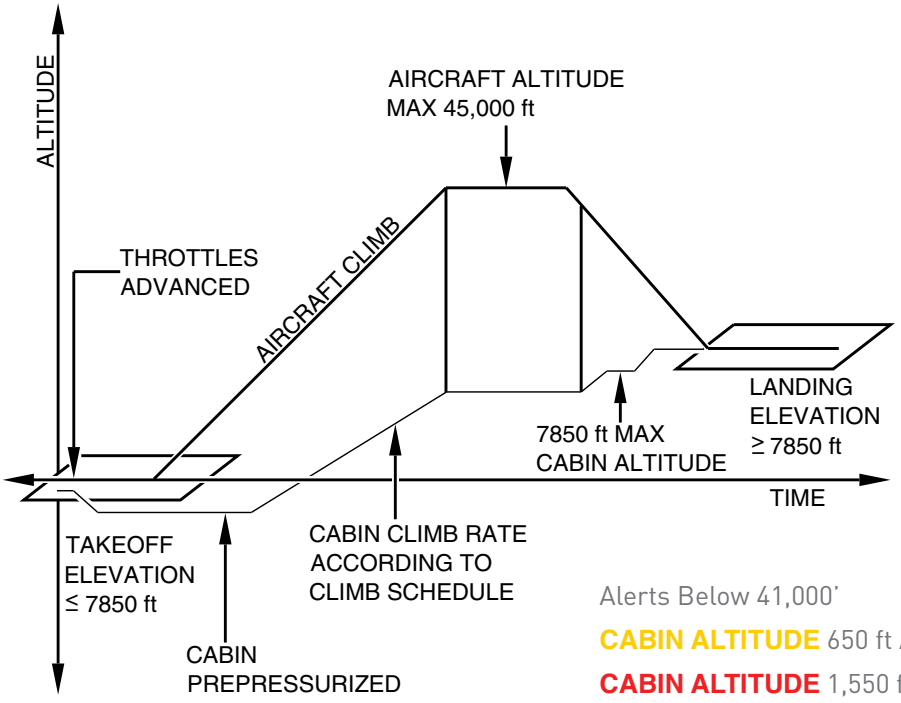
When departing from a field elevation of 10,000 feet, the automatic pressurization system initiates pre-pressurization as the thrust levers advance, establishing a cabin altitude of 9,700 feet (300 feet below field elevation) to eliminate pressure bumps during takeoff. This cabin altitude is maintained through liftoff and continues until the aircraft reaches either 6,000 feet above the departure field or 10 minutes has elapsed, whichever occurs first.

As the aircraft climbs above 16,000 feet MSL, the pressurization system transitions to climb mode, commanding the cabin to descend at a rate of 500 feet per minute toward the maximum normal cabin altitude limit of 7,850 feet. During the climb through 41,000 feet toward the cruising altitude of 45,000 feet, the cabin altitude stabilizes at 7,850 feet while the warning and caution thresholds simultaneously adjust downward, the caution threshold settling at 8,500 feet and the warning threshold at 9,400 feet.

When descent is initiated for landing at the 9,000-foot field elevation, the system automatically increases these thresholds as a function of aircraft altitude and descent rate, with the **CABIN ALT WARN HIGH** advisory alerting the crew to this adjustment. The cabin altitude gradually increases from 7,850 feet during the descent, ultimately stabilizing at approximately 8,700 feet (300 feet below the landing field elevation) to ensure a slightly pressurized landing that prevents uncomfortable pressure changes during touchdown.

Throughout this entire sequence, the cabin ascent and descent rates are carefully modulated at 300 to 500 feet per minute during normal operations, though these rates may increase to 750 feet per minute during rapid descents to ensure the cabin reaches the appropriate altitude before landing.

2. Taking off from airfields below 7,850 ft and landing field elevations above 7,850 ft.



Alerts Below 41,000'

CABIN ALTITUDE 650 ft Above Landing Elevation

CABIN ALTITUDE 1,550 ft Above Landing Elevation

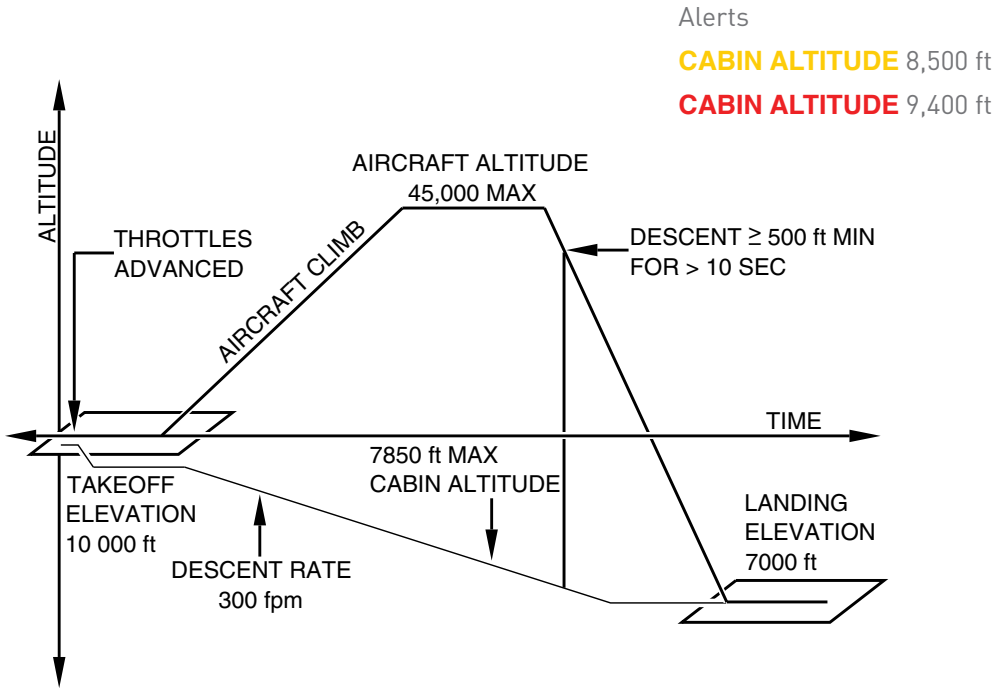
When departing from a field elevation below 7,850 feet, the automatic pressurization system follows the standard pre-pressurization sequence, establishing a cabin altitude 300 feet below the takeoff field elevation as thrust levers advance. After liftoff, this cabin altitude is maintained until the aircraft reaches 6,000 feet above the departure field or 10 minutes has elapsed.

As the aircraft enters climb mode, the cabin altitude increases according to the normal climb schedule at approximately 300 to 500 feet per minute, proportional to the aircraft's rate of climb. During cruise at 45,000 feet, the cabin altitude stabilizes at the maximum normal limit of 7,850 feet, with standard warning and caution thresholds set at 9,400 feet and 8,500 feet respectively.

The critical transition occurs when descent is initiated toward the landing field above 7,850 feet, at this point, the system recognizes that normal cabin altitude limits cannot be maintained for landing. As the aircraft descends through 41,000 feet, the automatic system begins increasing both the warning and caution thresholds as a function of aircraft altitude and descent rate, triggering the **CABIN ALT WARN HIGH** advisory message to alert the crew that these limits are being reset above normal values.

The cabin altitude, which had been maintained at 7,850 feet during cruise, now begins climbing at a controlled rate of approximately 300 feet per minute to reach the landing field pressure altitude minus 300 feet. By touchdown at the high-elevation destination, the caution threshold will have increased to 650 feet above landing field pressure altitude and the warning threshold to 1,550 feet above landing field pressure altitude (both limited to 14,300 feet maximum), ensuring the aircraft lands slightly pressurized while avoiding nuisance alerts during this transition from standard cruise altitudes to the elevated landing environment.

3. Taking off from airfields above 7,850 ft and landing field elevations less than 7,850 ft.



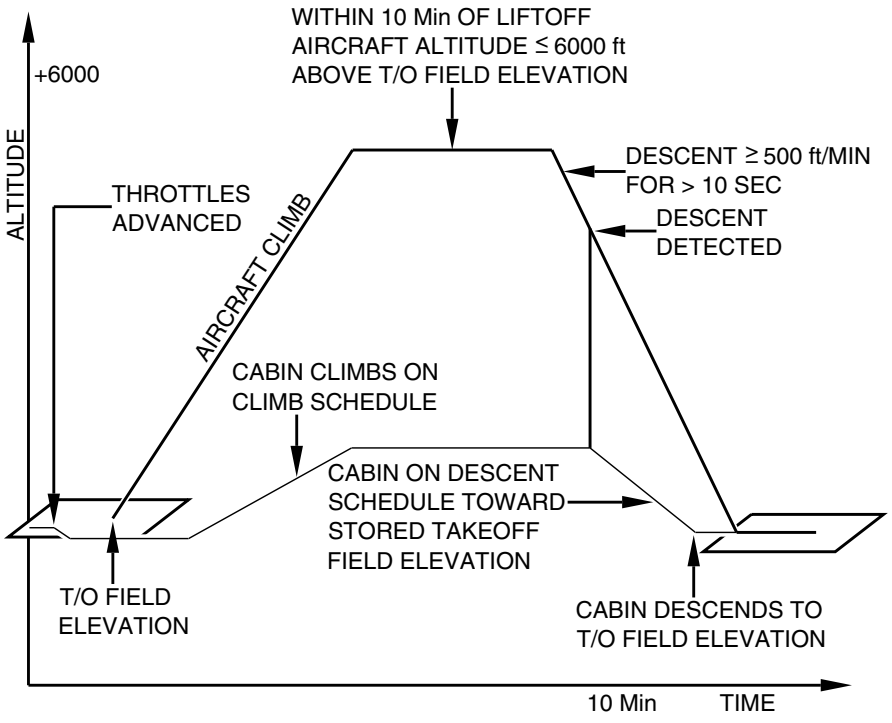
When departing from a field elevation above 7,850 feet, the automatic pressurization system establishes pre-pressurization at 300 feet below the high takeoff field elevation as thrust levers advance, maintaining this elevated cabin altitude through liftoff and until the aircraft reaches 6,000 feet above the departure field or 10 minutes has elapsed.

Once climb mode is initiated, the system recognizes that the destination field elevation is below 7,850 feet and begins reducing the cabin altitude at a rate of 500 feet per minute toward the standard maximum normal limit of 7,850 feet. As the aircraft continues climbing toward 45,000 feet, the cabin altitude steadily decreases from its high initial value, while the warning and caution thresholds simultaneously descend at a minimum rate of 500 feet per minute to ensure they reach their normal values, 8,500 feet for caution and 9,400 feet for warning, before the aircraft reaches 41,000 feet.

During cruise at 45,000 feet, the cabin altitude stabilizes at the normal 7,850 feet if it hasn't already reached this value, with the system potentially continuing a gradual descent at 300 feet per minute in cruise mode until this standard cabin altitude is achieved.

When descent is initiated toward the landing field below 7,850 feet, the pressurization system operates normally, with the cabin descending at approximately 300 feet per minute on the standard pressure schedule. The cabin ultimately stabilizes at 300 feet below the landing field elevation well before touchdown, providing a comfortable, slightly pressurized landing.

4. Takeoff and Return to Base



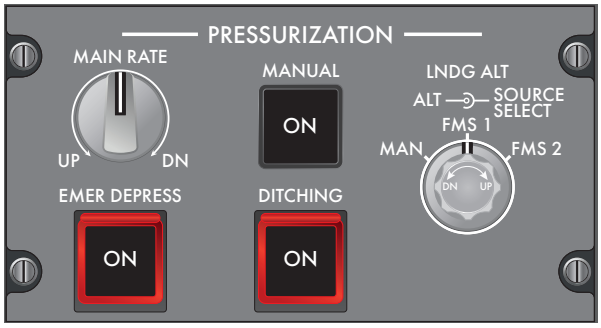
During a normal takeoff and return to base sequence, the automatic pressurization system employs a specialized logic designed to optimize comfort and eliminate the need for crew intervention if an immediate return becomes necessary. As thrust levers advance for takeoff, the system initiates pre-pressurization, establishing a cabin altitude 300 feet below the actual field elevation.

This pre-pressurization value is maintained through liftoff and continues as the aircraft climbs, held constant until either reaching 6,000 feet above the takeoff field elevation or 10 minutes has elapsed since brake release, whichever occurs first. The key advantage of this sequence becomes apparent if a return to the departure airport is required: when the aircraft initiates descent within this window, the pressurization system automatically recognizes the return to base scenario and commands the cabin to descend back toward the original takeoff field elevation, eliminating any need for the crew to reset the landing altitude selector.

The cabin remains slightly pressurized at the original pre-pressurization value, 300 feet below field elevation, throughout the approach and landing, preventing uncomfortable pressure bumps during touchdown while maintaining passenger comfort. This automated sequence ensures that whether dealing with a technical issue, weather consideration, or any other factor requiring an immediate return, the pressurization system automatically manages the cabin environment without requiring crew attention during what may already be a high-workload situation, allowing pilots to focus on the return procedure itself rather than manual pressurization management.

VI. CONTROLS AND INDICATIONS

A. PRESSURIZATION CONTROL PANEL



MAN RATE Knob:

- Controls cabin altitude rate of change in manual mode
- 12 o'clock position = 0 slfpm
- Rate adjustment range: -1,000 to +1,000 slfpm over 2/3 of knob travel
- Maximum rates at full travel: ±2,500 slfpm
- DN (counterclockwise) = cabin altitude decreases
- UP (clockwise) = cabin altitude increases

MANUAL Switch:

- Initiates manual control of pressurization system
- Illuminated ON when selected

LNDG ALT Knob:

- Two concentric knobs for landing field elevation selection
- Outer knob selections:
    - MAN: Enables inner knob control
    - FMS (single installation)
    - FMS 1 or FMS 2 (dual installation)
        - Inner knob: Sets landing altitude when MAN selected
        - FMS selection: Uses destination airport database

EMER DEPRESS Switch:

- Alternate-action switch with guard
- Used for smoke and fumes evacuation
- AUTO mode: Depressurizes at 2,500 slfpm to 14,000 ft ±100 ft or aircraft altitude
- MANUAL mode: Depressurizes at 3,000 slfpm to 14,500 ft ±500 ft or aircraft altitude
- **NOTE**: In manual mode, can also depressurize using MAN RATE to max UP

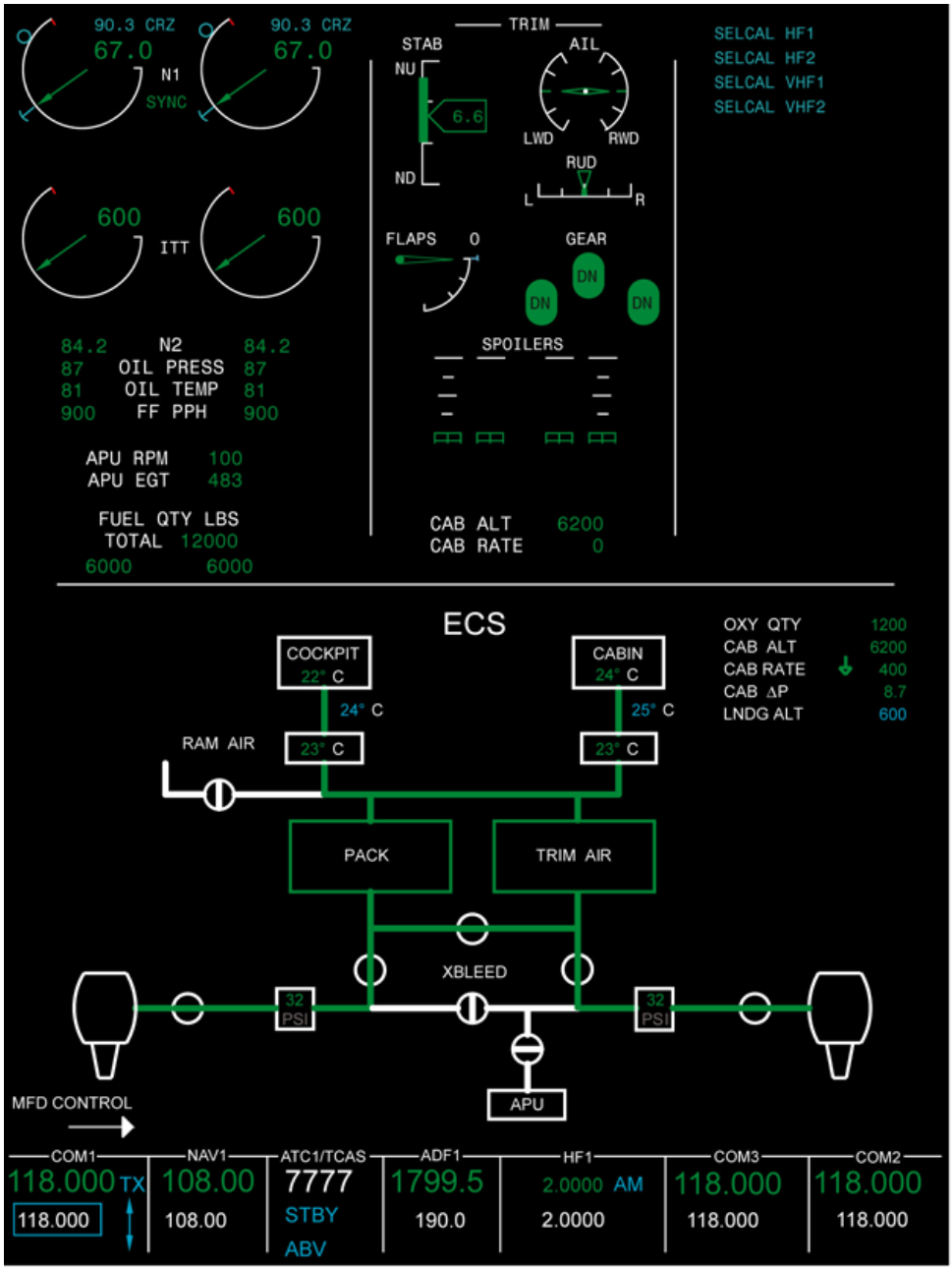
DITCHING Switch (Not available in manual mode):

- Depressurizes cabin
- Shuts off air conditioning
- Closes outflow valve for water landing
- Sequence activates automatically
- Inhibited above 15,000 ft
- To close outflow valve manually: MAN RATE to max DN

B. EICAS DISPLAYS

- CAB ALT displayed on pilot's MFD
- CAB RATE displayed on pilot's MFD
- Pressurization parameters on ECS synoptic
- Pressurization parameters on SUMMARY synoptic

ECS SYNOPTIC PAGE



VII. PRESSURIZATION SCHEDULES

A. AIRCRAFT 20501-20886

Climb and Cruise Schedule:

Pressurization Schedule - Aircraft 20501 to 20886 (Climb and Cruise)

Aircraft Altitude (ft)	Cabin Altitude (ft)	Cabin Delta P (PSID)
Sea Level	-245	0.1
5,000	294	2.3
10,000	816	4.2
15,000	1,379	5.7
20,000	2,091	6.9
25,000	2,984	7.7
30,000	4,111	8.3
35,000	5,612	8.5
40,000	6,827	8.7
45,000	7,850	8.8

Descent and Hold Schedule (<25,000 ft):

Pressurization Schedule - Aircraft 20501 to 20886 (Descent and Hold < 25,000 ft)

Aircraft Altitude (ft)	Cabin Altitude (ft)	Cabin Delta P (PSID)
Sea Level	-299	0.2
5,000	173	2.4
10,000	626	4.3
15,000	1,118	5.8
20,000	1,756	7.0
25,000	2,569	7.9
30,000	3,591	8.5
35,000	5,487	8.6
40,000	6,828	8.7
45,000	7,850	8.8

B. AIRCRAFT 20887-20999

Climb and Cruise Schedule:

Pressurization Schedule - Aircraft 20887 to 20999 (Climb and Cruise)

Aircraft Altitude (ft)	Cabin Altitude (ft)	Cabin Delta P (PSID)
Sea Level	-245	0.1
5,000	75	2.4
10,000	397	4.4
15,000	756	6.0
20,000	1,201	7.3
25,000	1,775	8.3
30,000	2,625	9.0
35,000	3,742	9.3
40,000	4,650	9.7
45,000	5,850	9.7

Descent and Hold Schedule (<25,000 ft):

Pressurization Schedule - Aircraft 20887 to 20999 (Descent and Hold < 25,000 ft)

Aircraft Altitude (ft)	Cabin Altitude (ft)	Cabin Delta P (PSID)
Sea Level	-299	0.2
5,000	23	2.5
10,000	349	4.4
15,000	712	6.0
20,000	1,161	7.3
25,000	1,726	8.3
30,000	2,445	9.1
35,000	3,423	9.5
40,000	4,572	9.7
45,000	5,850	9.7

VIII. EICAS MESSAGES

A. WARNING MESSAGES

WARNING MESSAGES

Immediate crew action required

Message	Meaning	Inhibits
CABIN ALTITUDE	The normal cabin altitude warning is at 9,400 ft. When a takeoff or landing is conducted above 7,850 ft, the warning is at the field elevation +1,550 ft, but limited to no higher than 14,300 ft	**TO/LAND**
CABIN DELTA P	For aircraft 20501-20886: The cabin differential pressure is greater than 9.2 psid or less than -0.5 psid. For aircraft 20887-20999: The cabin differential pressure is greater than 10.1 psid or less than -0.5 psid	**TO/LAND**
L (R) BLEED LEAK	A leak has been detected in the bleed air ducting downstream of the bleed valve	**TO/LAND**
PACK LEAK	A leak has been detected in the pack ducting	**TO/LAND**
TRIM AIR LEAK	A leak has been detected in the bleed air ducting downstream of the right flow control valve, up to the precooler crossover and up to the trim air check valve	**TO/LAND**
L (R) PYLON BLEED LEAK	A leak has been detected in the engine pylon or tail cone (before shut off valve)	**TO/LAND**

B. CAUTION MESSAGES

CAUTION MESSAGES

Timely crew awareness/action needed

Message	Meaning	Inhibits
AIR COND TEMP FAIL	The automatic temperature control system has failed	TO/LAND
AIR COND TEMP HIGH	Excessive air temperature has been sensed in the cabin or cockpit air distribution duct	TO/LAND
AUTO PRESS FAIL	Both automatic pressurization modes have failed	TO/LAND
L (R) BLEED FAIL	The affected engine bleed air valve has failed, or a temperature or pressure has exceeded limits, or the sensor has failed. Under certain low thrust conditions, there may be insufficient pressure to keep the bleed valve open	TO/LAND
L (R) BLEED LOOP FAIL	A failure (open or short circuit) has been detected in the bleed leak detection system	TO/LAND
CABIN ALTITUDE	Normal cabin altitude caution is 8,500 ft. During takeoff or landing above 7,850 ft, the caution is set to field altitude + 650 ft, with a maximum limit of 14,300 ft	TO/LAND
CABIN PRESS FAULT	Either the pressure sensor has failed or cabin altitude limiter function has failed	TO/LAND
DITCHING NOT AVAIL	The ditching switch has been selected ON with the pressurization switch in the manual mode	—
EQPT RACK TEMP HIGH	The temperature in either equipment rack is high	TO/LAND
OXYGEN QUANTITY LOW	Oxygen quantity is less than 700 liters	—
OXYGEN VALVE CLOSED	Oxygen bottle valve is closed or there is a miscompare on the electrical pneumatic actuating valve	—
PACK FAIL	A failure has been detected in the PACK system	TO/LAND
PACK LOOP FAIL	Both bleed air leak detection loops in the PACK have failed during the power up self test	TO/LAND
PACK TEMP HIGH	An overheat has been detected in the air conditioning PACK system	TO/LAND
PAX OXYGEN AUTO FAIL	Automatic oxygen mask deployment function has failed	—
TRIM AIR FAIL	A hot air regulating valve has failed	TO/LAND
TRIM AIR LOOP FAIL	The bleed air leak detection loops around the trim air ducting have failed	TO/LAND
XBLEED FAIL	The crossbleed valve has failed to move to the commanded position	TO/LAND

C. ADVISORY MESSAGES

ADVISORY MESSAGES

Crew awareness - no immediate action required

Message	Meaning	Inhibits
AIRCOND FAULT	A fault has been detected in the air conditioning system, or there has been a loss of temperature sensing	TO/LAND
BLEED LOOP FAULT	A fault has been detected in the bleed leak detection loop system and redundancy is lost	TO/LAND
L (R) BLEED FAULT	The bleed pressure data is invalid, or the affected flow control valve is failed closed	TO/LAND
CABIN ALT WARN HIGH	A high airport takeoff or landing has been initiated, and the pressurization system is in the automatic mode	—
EQPT RACK COOL FAULT	A fault has been detected in the avionics equipment rack cooling system	TO/LAND
MANUAL PRESS FAIL	The manual pressurization mode is not operational	TO/LAND
PACK COOL AIR FAIL	The ram air regulating valve supplying cooling air to the PACK heat exchanger has failed	TO/LAND
L (R) PYLON LOOP FAIL	A bleed leak detection loop in the respective pylon has failed	TO/LAND
RAM AIR FAIL	The RAM AIR ventilation valve has failed to move to the commanded position	TO/LAND

D. STATUS MESSAGES

STATUS MESSAGES	
Information only - no crew action required	
Message	**Meaning**
AIR COND MAN TEMP ON	The air conditioning temperature control is in manual mode
AIR SOURCE OFF	The AIR SOURCE switch is in the OFF position resulting in no conditioned air entering the cabin
BLEED OFF	The L, R, and APU BLEED switches are set to OFF
DITCHING ON	The DITCHING switch/indicator has been selected ON. This closes the flow control valves and commands the outflow valve open for 100 seconds after cabin differential pressure decreases below 1.595 psid. The outflow valve then closes
EMER DEPRESS ON	Emergency depressurization has been selected. Emergency depressurization commands the outflow valve open, but will attempt to limit the cabin altitude to approximately 15,000 ft
MANUAL PRESS ON	The MANUAL PRESSURIZATION mode has been selected
PACK ONLY	The AIR SOURCE switch is in the PACK ONLY position, resulting in all air conditioning bleed air being routed through the PACK
PAX OXYGEN OFF	The passenger oxygen switch has been selected OFF
PAX OXYGEN ON	Pressure has been detected in the passenger oxygen lines
RAM AIR ON	The RAM AIR switch has been selected ON, providing ram air ventilation
TRIM AIR ONLY	The AIR SOURCE switch is in the TRIM AIR ONLY position, resulting in all air conditioning bleed air being routed through the trim air system. The air will be warm
XBLEED OPEN	The crossbleed valve is open

NOTES

- All warning messages are accompanied by a triple chime (except CABIN ALTITUDE which has a "Cabin Altitude" voice warning)
- All caution messages are accompanied by a single chime
- "TO/LAND" indicates the message is inhibited during takeoff and landing phases
- "TO" indicates the message is inhibited during takeoff only
- L (R) notation indicates the message can appear for either left or right engine/system
- Cabin altitude warning and caution thresholds are automatically adjusted for high altitude airports

IX. CIRCUIT BREAKERS

Pressurization System Circuit Breakers

CB Name	Bus	Location
PRESS 1/PACK	LEFT ESS	CB1-D14
PRESS 2/TRIM	RIGHT MAIN	CB2-D14
RAM AIR/OFV PWR 1	RIGHT MAIN	CB4-D6
RAM AIR/OFV PWR 2	LEFT ESS	CB3-D6
ALT LIM/ECS XVLV PWR 1	RIGHT ESS	CB2-D13
ALT LIM/ECS XVLV PWR 2	LEFT ESS	CB1-D13
AUTO DEP THERAPTC	LEFT MAIN	CB3-D5
OXYGEN MAN DEP/IND	RIGHT ESS	CB4-D1

X. LIMITATIONS

A. DIFFERENTIAL PRESSURE LIMITATIONS

Pressurization Differential Pressure Limitations

Parameter	Limitation
Maximum Differential Pressure (20501-20886)	9.4 PSID
Maximum Differential Pressure (20887-22999)	10.1 PSID
Maximum Negative Differential Pressure	-0.5 PSID
Warning Differential Pressure (20501-20886)	9.2 PSID
Warning Differential Pressure (20887-22999)	10.1 PSID
Maximum Ground Differential Pressure (Taxi)	0.1 PSID
Maximum Landing Differential Pressure	1.0 PSID
Normal Operating Cabin Differential (20501-20886)	8.8 PSID
Normal Operating Cabin Differential (20887-22999)	9.7 PSID

B. SYSTEM LIMITATIONS

Pressurization System Limitations

Function	Limitation
Ditching Function Availability	Not available in manual mode
Ditching Function Altitude	Inhibited above 15,000 ft
Emergency Depressurization Target (AUTO)	14,000 ft ±100 ft
Emergency Depressurization Target (MANUAL)	14,500 ft ±500 ft

C. PRESSURIZATION ALTITUDE OPERATING LIMITATIONS

Pressurization Altitude Operating Limits

Condition	Maximum Altitude
Cabin Pressure Controller Fault	31,000 feet
Unpressurized Flight	9,000 feet
Trim Air Only Operation	35,000 feet
Ram Air Ventilation	10,000 feet
Emergency Descent Initiation	Above 14,000 feet cabin altitude
Window/Windshield Failure	15,000 feet (if cabin altitude uncontrollable), Reduce Delta P to 5.8 psid, leave icing as soon as possible

This page intentionally left blank

XI. PRESSURIZATION QUIZ

1. What are the three independent modes of operation for the pressurization system?

    A) Manual, Semi-automatic, Fully automatic
    B) Primary, Secondary, Emergency
    C) Two automatic modes (IASC), One manual mode
    D) IASC 1, IASC 2, Backup mode

2. What is the maximum positive differential pressure for aircraft 20887-22999?

    A) 9.4 psi
    B) 9.7 psi
    C) 10.1 psi
    D) 8.8 psi

3. At what cabin altitude does the CABIN ALTITUDE warning normally activate?

    A) 7,850 ft
    B) 8,500 ft
    C) 9,400 ft
    D) 14,300 ft

4. Where are the two safety valves located?

    A) Forward pressure bulkhead
    B) Aft pressure bulkhead
    C) Bottom of fuselage
    D) Wing root area

5. What is the pre-pressurization value during the pre-pressurization mode?

    A) 300 ft above field elevation
    B) 500 ft below field elevation
    C) 300 ft below field elevation
    D) Field elevation

6. During manual pressurization mode, what is the maximum rate of change?

    A) 1,000 fpm
    B) 2,000 fpm
    C) 2,500 fpm
    D) 3,000 fpm

7. What conditions activate cruise mode?

    A) Aircraft on ground with engines running
    B) Aircraft climb rate <500 slfpm for >10 seconds or climbing above 25,000 ft
    C) Aircraft descending below 10,000 ft
    D) Landing gear extended

8. What is the emergency depressurization rate in AUTO mode?

A) 2,000 slfpm
B) 2,500 slfpm
C) 3,000 slfpm
D) 3,500 slfpm

9. Above what altitude is the ditching function inhibited?

A) 10,000 ft
B) 14,000 ft
C) 15,000 ft
D) 20,000 ft

10. What is the maximum differential pressure allowed during landing?

A) 0.1 psi
B) 0.5 psi
C) 1.0 psi
D) 1.5 psi

11. Which IASC normally becomes active after power-up tests?

A) IASC 1
B) IASC 2
C) Both simultaneously
D) Neither until selected

12. Where is the outflow valve located?

A) Top of fuselage
B) Bottom of fuselage
C) Aft pressure bulkhead
D) Forward cargo compartment

13. What is the typical cabin climb rate during normal operations?

A) 100-200 slfpm
B) 300-500 slfpm
C) 600-800 slfpm
D) 1000-1200 slfpm

14. During high-speed descent with aircraft descending >5,000 fpm, what is the cabin descent rate?

A) 300 slfpm
B) 500 slfpm
C) 750 slfpm
D) 1,000 slfpm

15. What happens after landing in automatic mode?

A) Cabin maintains pressure
B) Cabin depressurizes at 500 slfpm, OFV goes full open
C) Cabin immediately equalizes
D) System switches to manual mode

16. For high altitude airport operations, what is the maximum cabin altitude caution threshold?

A) 8,500 ft
B) 9,400 ft
C) 14,300 ft
D) Landing field elevation +650 ft (max 14,300 ft)

17. What voice aural warning accompanies the CABIN ALTITUDE warning message?

A) "Altitude"
B) "Cabin Pressure"
C) "Cabin Altitude"
D) No voice warning

18. How many motors does the outflow valve actuator have?

A) One
B) Two
C) Three
D) Four

19. What is the maximum negative differential pressure limit?

A) -0.1 psi
B) -0.3 psi
C) -0.5 psi
D) -1.0 psi

20. In manual mode, what knob position maintains current cabin altitude?

A) Full DN
B) Full UP
C) Center (12 o'clock)
D) 3 o'clock position

This page intentionally left blank