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Airbus
A318/A319/A320/A321

ATA 51–57
Structures

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ATA 06 DIMENSIONS AND AREAS

06−00 GENERAL

Description

This chapter defines:

- Dimensions and Areas see 06−10
- Zoning see 06−20
- Stations see 06−30
- Access Provisions see 06−40

AIRCRAFT DIMENSIONS INTRODUCUTION

The dimensions are quoted in meters. Those measured from the static ground line correspond to the aircraft at its maximum ramp weight.

Fuselage:	A319 – 100	A320 – 200	A321-100/ 200
Overall Length	33.893 m 111.0204 ft	37.573 m 123.271 ft	44.507 m 146.0204 ft
Width	3.950 m 155.5118 ft		
Wings:	**A319**	**A320**	**A321**
Span	34.10 m (with Sharklets 35.80 m)		
Area	122.4 m^2 1317.50 ft^2		
Stabilizers:	**A319**	**A320**	**A321**
Area of THS	31 m^2 333.68 ft^2		
Area of Vertical Stabilizer	21.5 m^2 231.42 ft^2		
Height	11.75 m		11.76 m
Weights:	**A319**	**A320**	**A321**
max. TO Weight	68.000 kg	73.500 kg	83.000/89.000kg
max. Landing Weight	61.000 kg	64.500 kg	73.500/75.500kg
Empty Weight	35.400 kg	37.230 kg	47.500kg

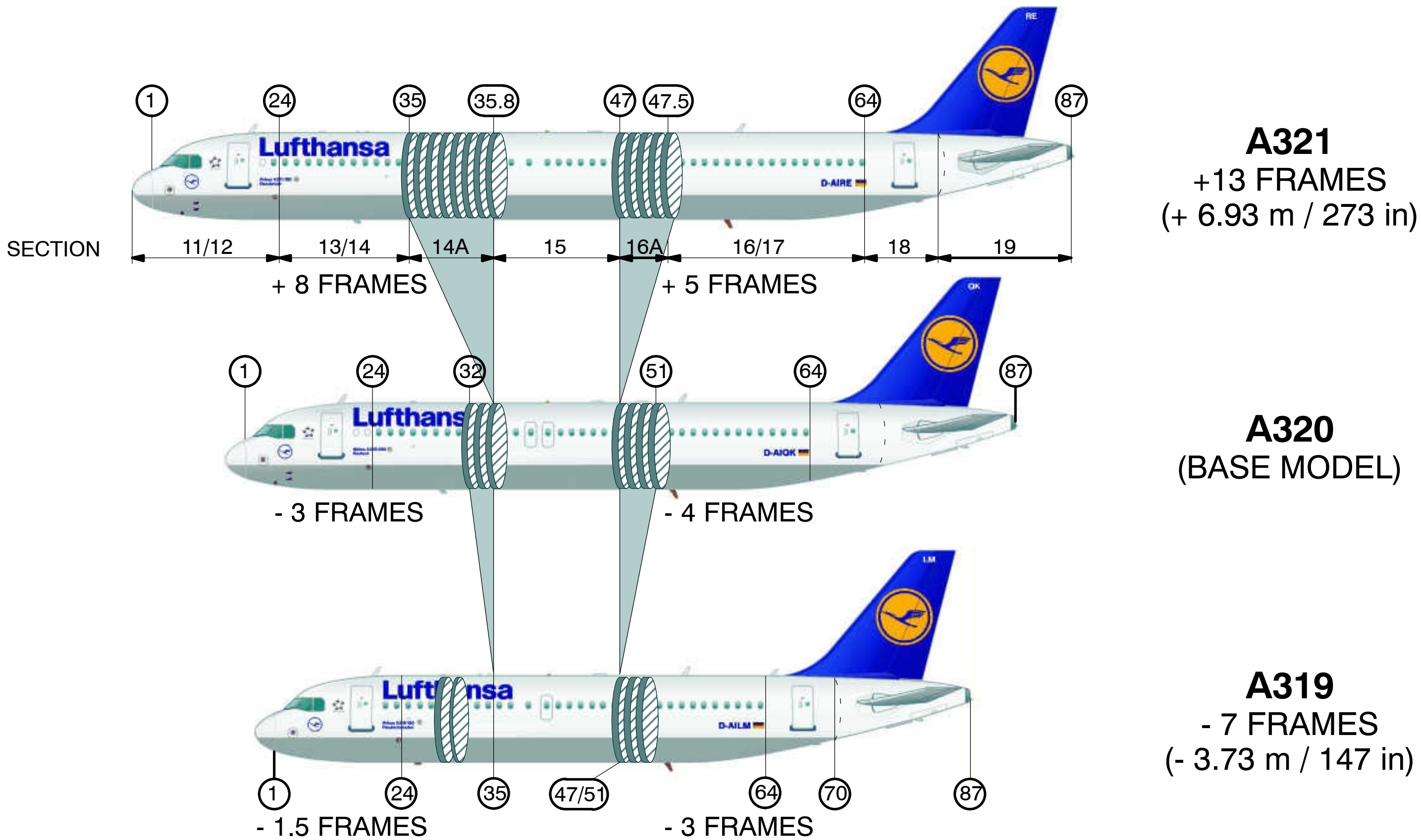


Figure 1 Dimensions General

REFERENCE AXIS

The structure elements are installed according to the following reference axes. The X axis in the longitudinal direction of the fuselage, the Y axis in the direction of the wing span and the Z axis in the vertical direction.

The cross section P presents a typical fuselage section at frame 47.

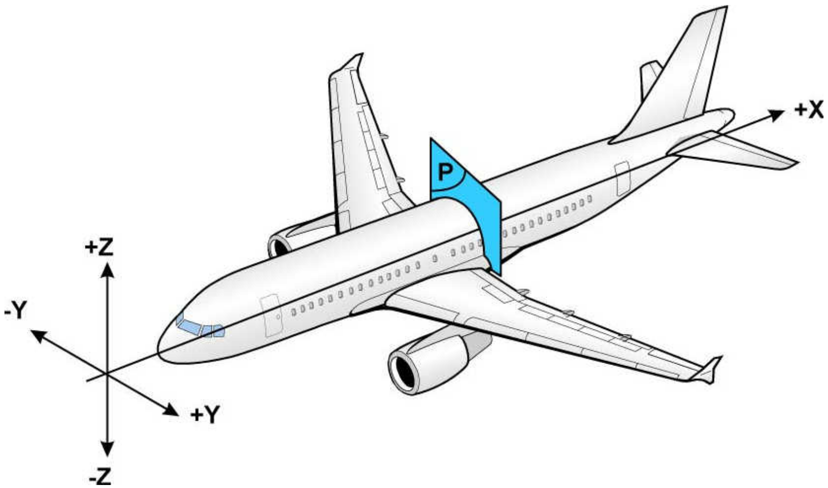
NOTE: Note: The reference (station 0) for all structural measurements for the X axis is set at 100 in (254 cm) forward of the A/C nose.

FUSELAGE DATUM LINES

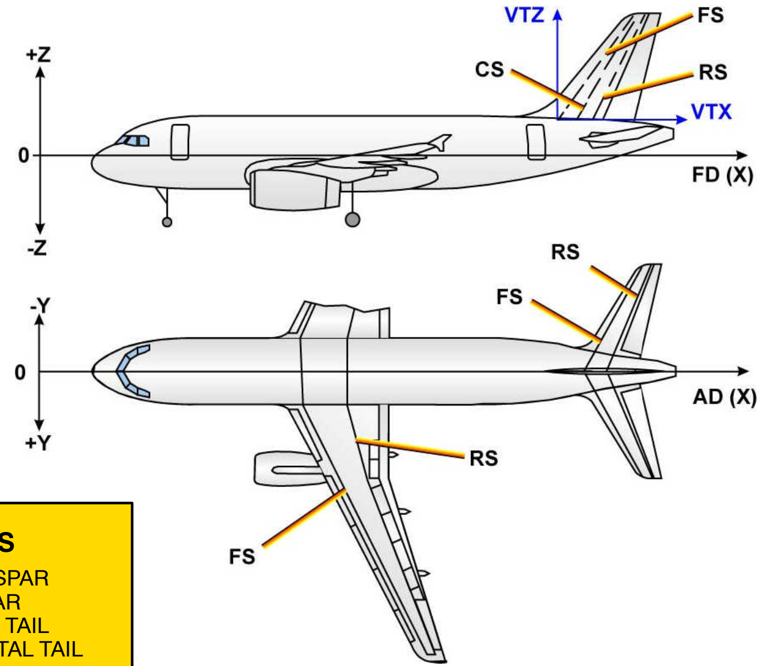
Coordinate System

for messurements and location of components within the fuselage of the A320 Familiy a metrical coordination system is in use. It exists of three a datum lines:

- **”X”** means length distances from **”X 0”** also called **“STA 0”.**
  It defines forward and aft distances from any point (STA) to **STA 0”**.
  STA 0 is 2540 mm forward of the radom.
- **”Y”** means lateral distsances from any point to the aircraft centerline.
  ”Y 0” is a vertical plane over the center line.
  ”+ Y” is a plane **left** hand from **”Y 0**” in flight direction.
  ”– Y” is a plane **right** hand from **” Y 0** ” in flight direction.
- **”Z”** means a horizontal distsance from any point to the aircraft centerline.
  ”Z 0” is a horizontal plane over the center line.
  ”+Z ” is a plane **above** the center line.
  ”– Z” is a plane **below** the center line.



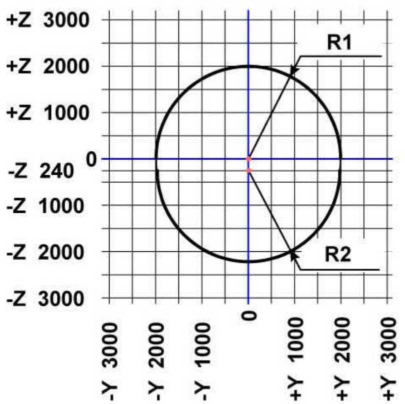
+X= AFT DISTANCE FROM STA "0"
+Y= LATERAL DIST FROM "AD"
LEFT SIDE
-Y= LATERAL DIST FROM "AD"
RIGHT SIDE
+Z= VERTICAL DIST FROM "FD" UP
-Z= VERTICAL DIST FROM "FD" DOWN



MAJOR AIRCRAFT REFERENCE AXIS

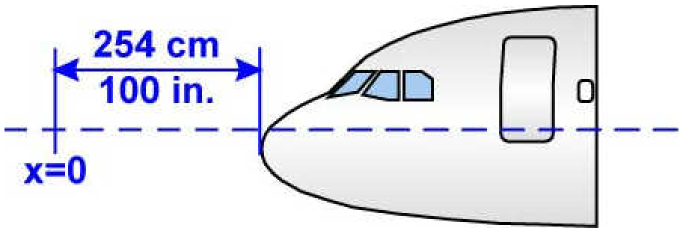
AD = AIRPLANE DATUM
FD = FUSELAGE DATUM
WD= WING DATUM
HHL = HORIZONTAL HINGE LINE
FS = FRONT SPAR
CS = CENTER SPAR
RS = REAR SPAR
VT = VERTICAL TAIL
HT = HORIZONTAL TAIL

CROSS SECTION P



R1	R2
1975	1926
77.76	75.83

MILLIMETER
INCH



REFERENCE PLANES

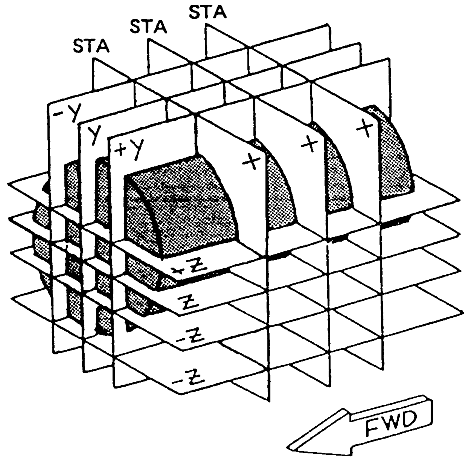


Figure 2 Fuselage Datum Lines

06–20 ZONING

MAJOR ZONES INTRODUCTION

Description

The aircraft is divided into zones as follows:

- the major zones,
- the major sub-zones
- the zones**.**

Major - Zones

Eight major zones are identified by the hundreds as follows:

- **100** Lower half of the fuselage to aft pressure bulkhead,
- **200** Upper half of the fuselage to aft pressure bulkhead,
- **300** Stabilizers,
- **400** Nacelles,
- **500** Left hand wing,
- **600** Right hand wing,
- **700** Landing gear,
- **800** Doors.

MAJOR SUB – ZONES

Description

Major sub-zones are identified through tenth digit of the three digit zone number. Numbering takes places within the major zone from:

- from front to rear and,
- from inboard to outboard, e. g. 210, 220 etc. except 190 are wing to body fairings.

ZONES

Description

A zone defines a certain position within a major sub-zone. They are identified through single digit numbering, counting from 0 to 9. Numbering within a major sub-zone happens as follow :

- from front to rear,
- from inboard to outboard,
- uneven numbers (e.g. 131, 211, etc.) identify the left hande side of the center line,
- even numbers (e. g. 142, 162, 264, etc.) identify the right hand side of the center line.

For Example: **162**

1 – major zone **100** identifies the range below center line.

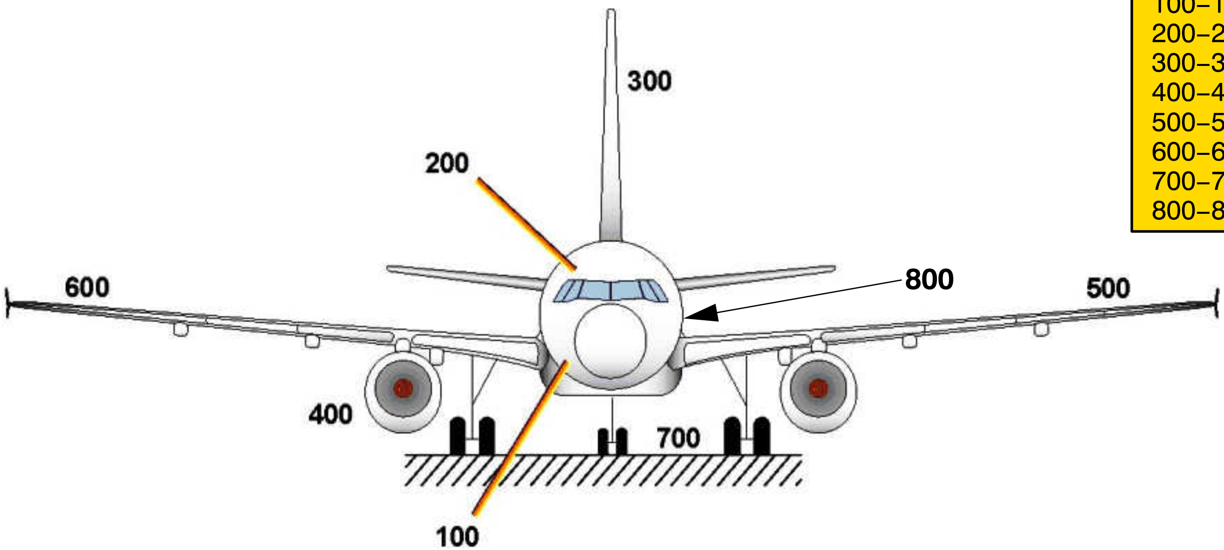
6 – major sub-zone **160** identifies the bulk cargo compartment.

2 – zone **162** identifies the forward, right hand part of the bulk cargo compartment.

NOTE: Wings, stabilizers and engine nacelles have similar major sub-zones and zones.

MAJOR ZONES

100–199:	LOWER HALF FUSELAGE
200–299:	UPPER HALF FUDELAGE
300–399:	STABILIZERS & FUSELAGE TAIL SECTION
400–499	PYLON & NACELLE
500–599:	LEFT WING
600–699:	RIGHT WING
700–799:	LANDING GEAR
800–899:	DOORS



LH AND (RH) SIDE FUSELAGE ZONES

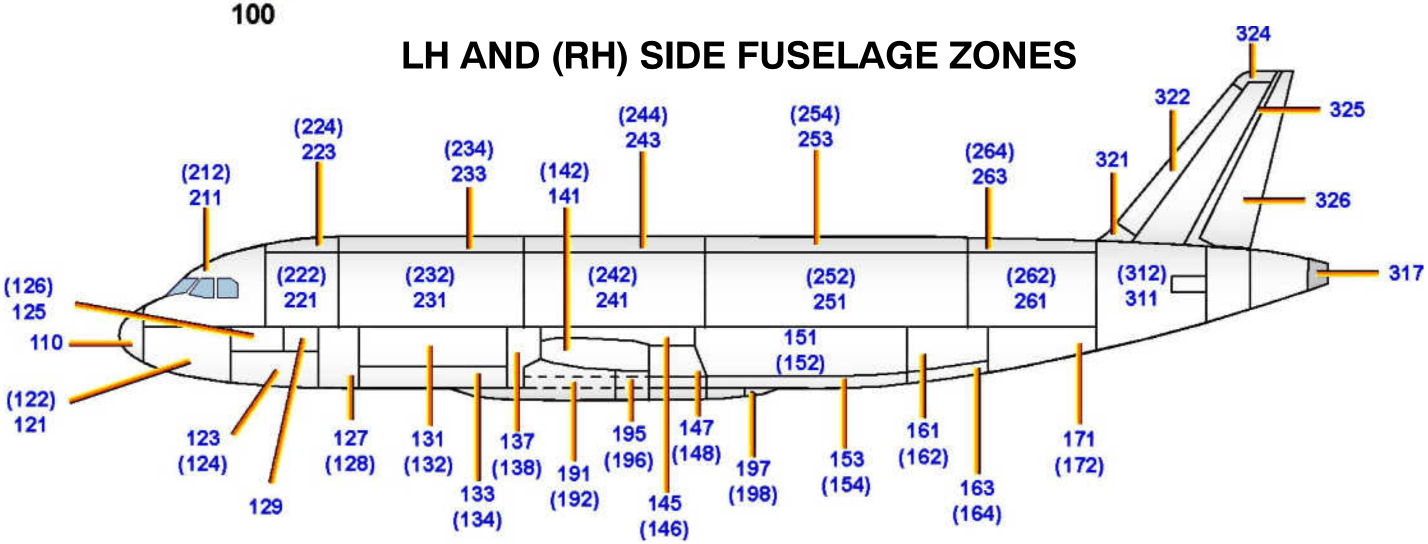


Figure 3 Major Zones

WING (UPPER SURFACE) AND HORIZONTAL STABILIZER

The 500 numbers identify the LH wing zones, while the 600 numbers identify the RH wing zones. The sub−zones 330 and 340 identify the LH and RH side of the horizontal stabilizer.

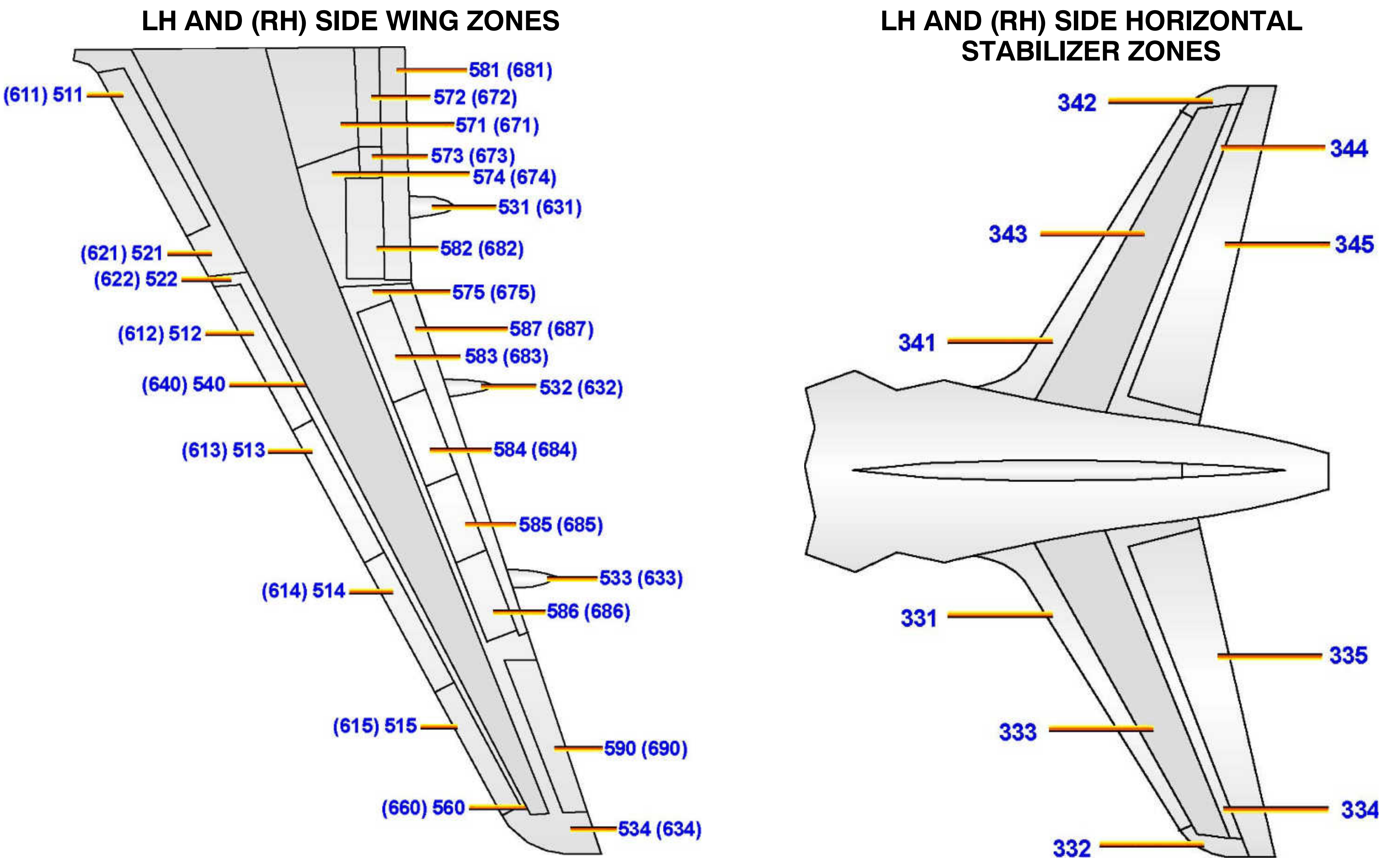


Figure 4 upper Wing & Horizontal Stabilizer Zone Numbers

WING (LOWER SURFACE), BELLY FAIRING AND LANDING GEAR

The sub−zone 710 identifies the NLG. The sub−zones 730 and 740 identify the LH and RH MLG.

The sub−zone 190 indicates the belly fairing. 734 and 744 are the MLG door zone numbers.

Access doors and panels are identified by the number of the zone in which the panel is installed followed by a two letter suffix.

These two letters are used to indicate the doors and panels.

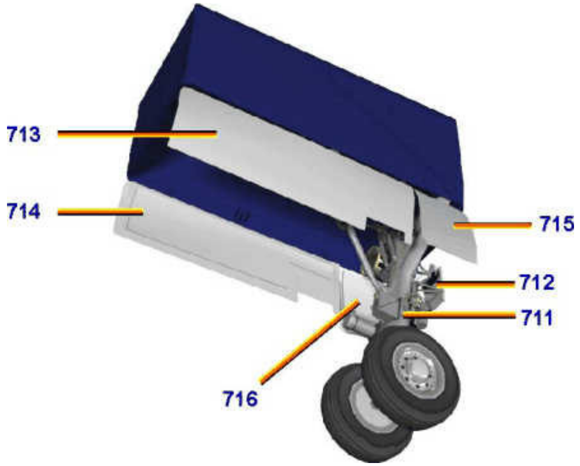
The first letter indicates which access door or panel it is, starting from the reference axis (A=first, B=second, ..., G=seventh, etc...).

The second letter indicates the access door or panel location:

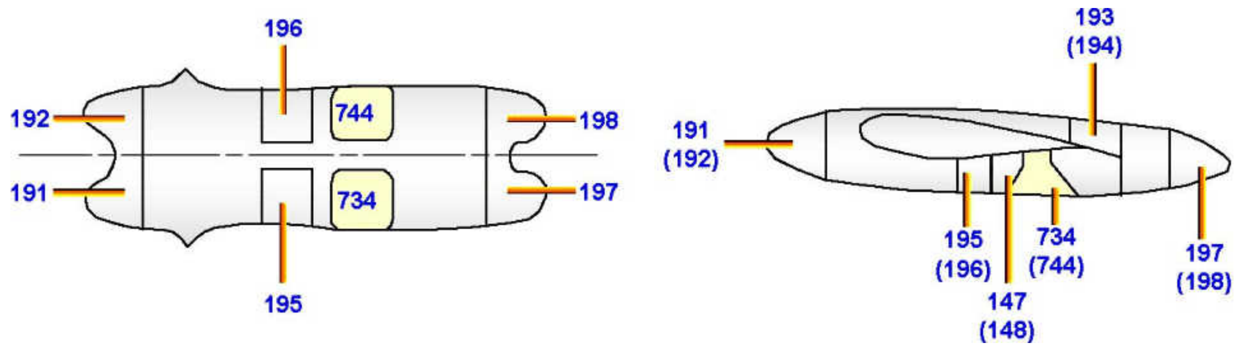
- T=top (upper) surface,
- B=bottom (lower) surface,
- R=right side,
- L=left side,
- Z=internal,
- F=floor panel,
- W=sidewall panel,
- C=ceiling panel.

On the grafic there is an example of access panels on the left wing lower surface.

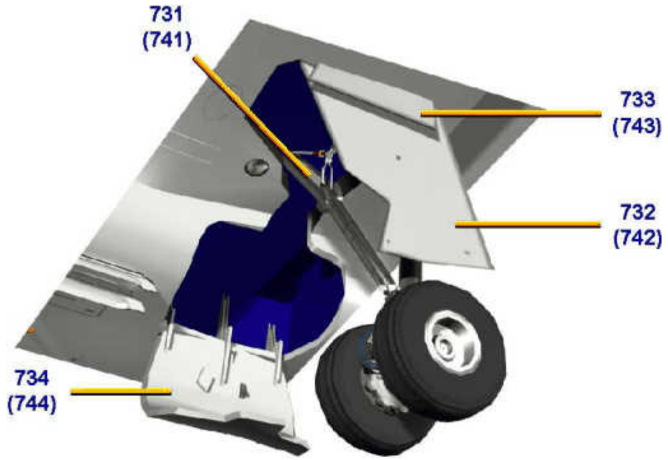
NOSE LANDING GEAR ZONES



BELLY FAIRING ZONES



LH AND (RH) MAIN LANDING GEAR ZONES



ACESS PANELS ON LEFT WING LOWER SURFACE

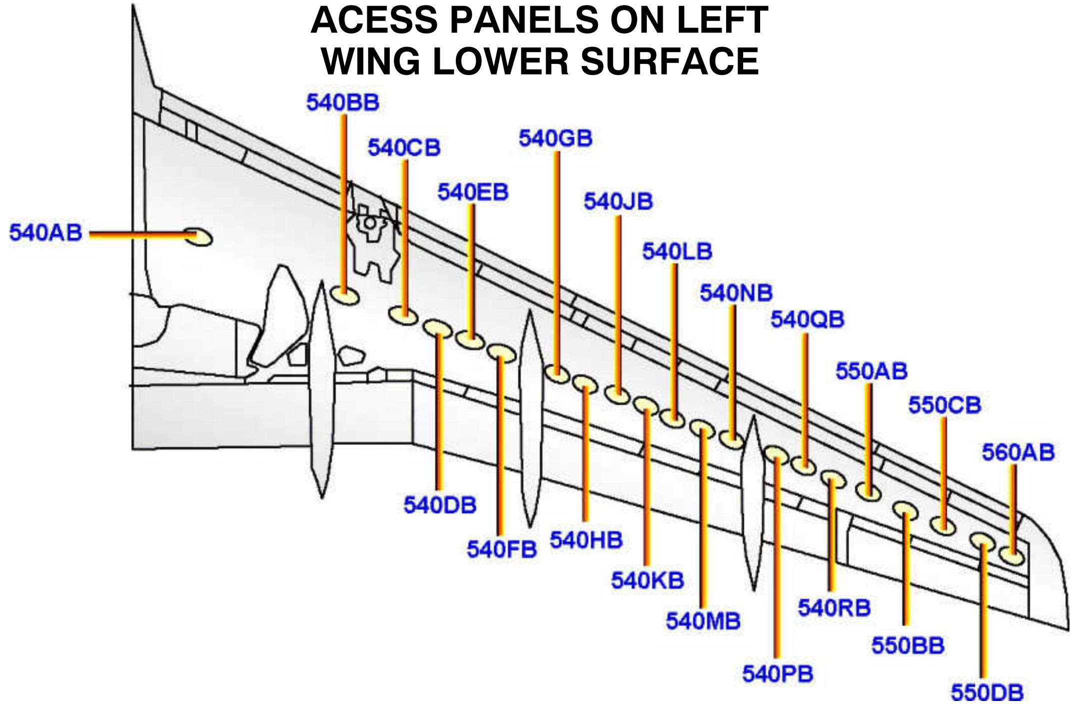


Figure 5 Lower Wing, Belly Fairing & Landing Gear Zone Numbers

NACELLE, PYLON, ENGINE

The difference between the LH and RH pylon and nacelle is made with the ten digits of the zone number 400.

The difference between the LH side and RH side is identified by the last digit (Tens digit: odd for the left and even for the right).

Within one engine, an odd zone number indicates the LH side and an even zone number indicates the RH side of the engine.

LH AND (RH) SIDE NACELLE AND PYLON ZONES

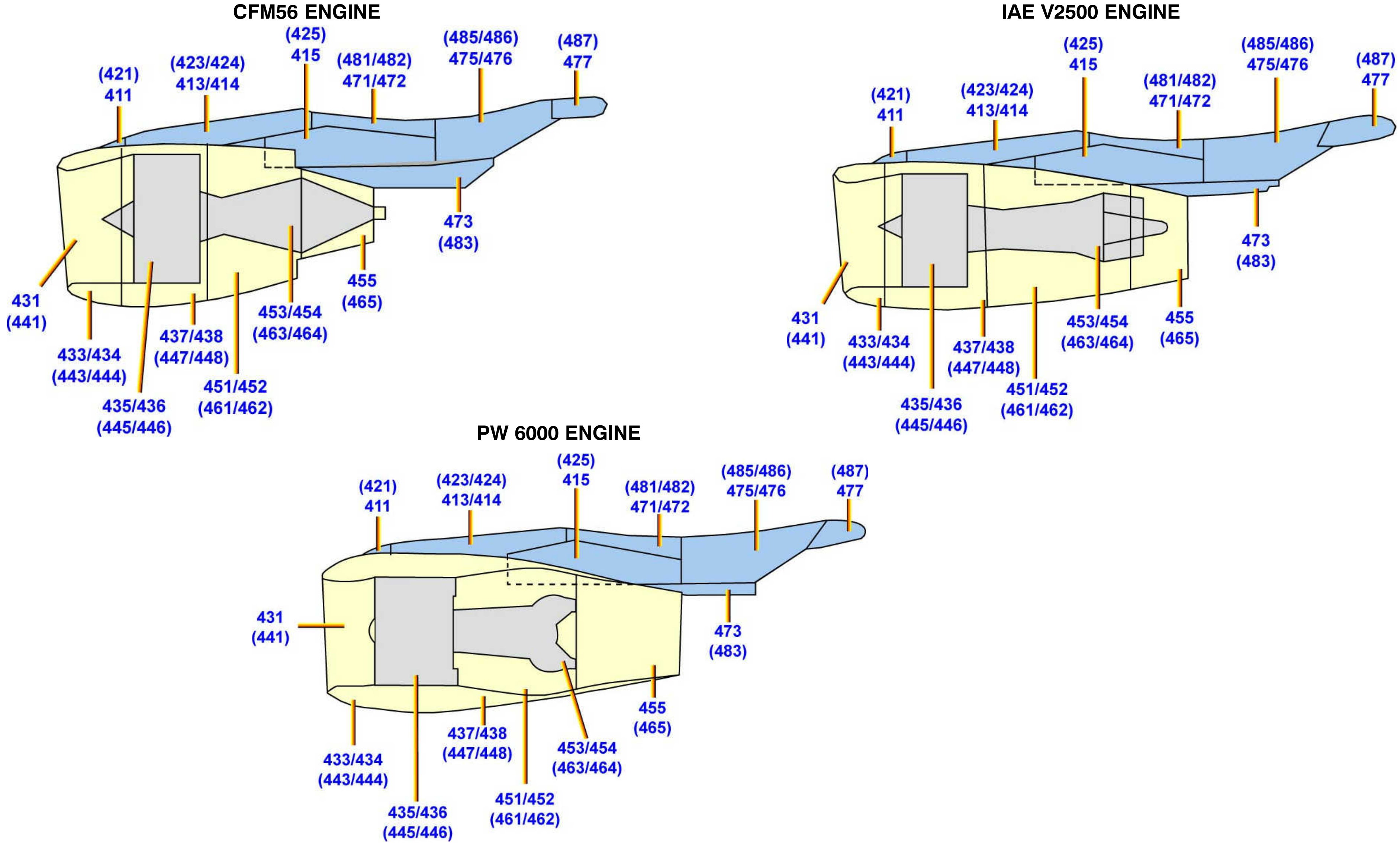


Figure 6 Nacelle, Pylon & Engine Zone Numbers

PASSENGER/CREW DOORS

The major zone 800 identifies the doors.

NOTE: The passenger/crew doors, cargo compartment doors, avionic compartment and landing gear doors are identified by the zone numbers, because each of these doors is a zone in itself.

LH AND (RH) DOOR ZONES

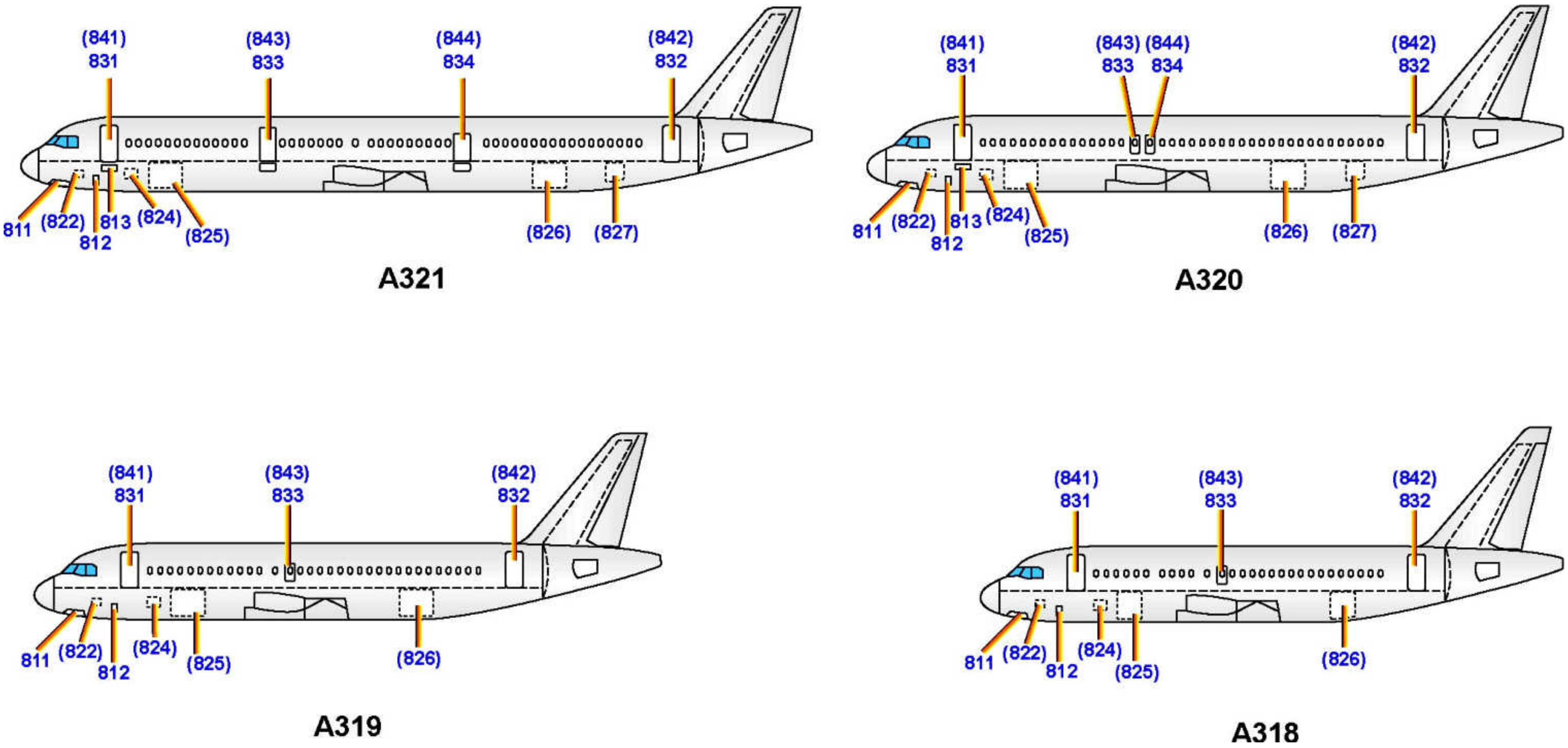


Figure 7 Door Zone Numbers

06–30 STATIONS

SECTION NUMBERS GENERAL DESCRIPTION

Description

This part gives informations about the sections, their related stations and frames or ribs.

Section numbers

The aircraft is divided into various sections for manufactoring reasons.

Each major part of the aircraft, corresponding to the production sharing receives a section number.

The fuselage section base number is 10. The fuselage is divided into various sections for manufacturing reasons.

The general wing section base number is 20.

The general tail plane section base number is 30.

The engine section base number is 40.

The L/G section base number is 50.

The general belly fairing section base number is 60.

- Fuselage 10 thru 19.1 (shown)
- Wing 20
- Vertical Stabilizer 30
- Horizontal Stabilizer 35
- Engine 40
- Landing Gear 50
- Belly Fairing 60

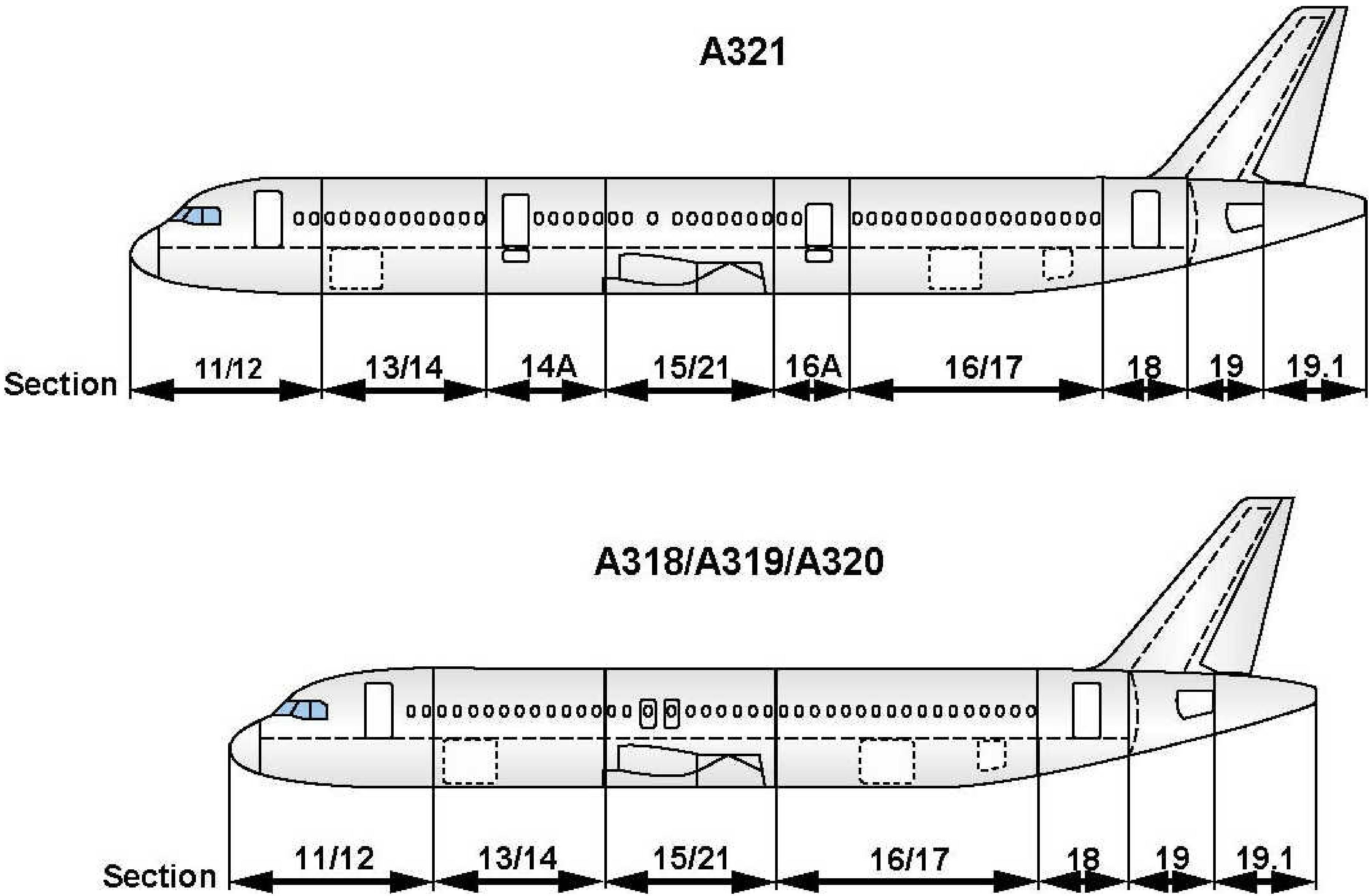


Figure 8 Section Reference Numbers

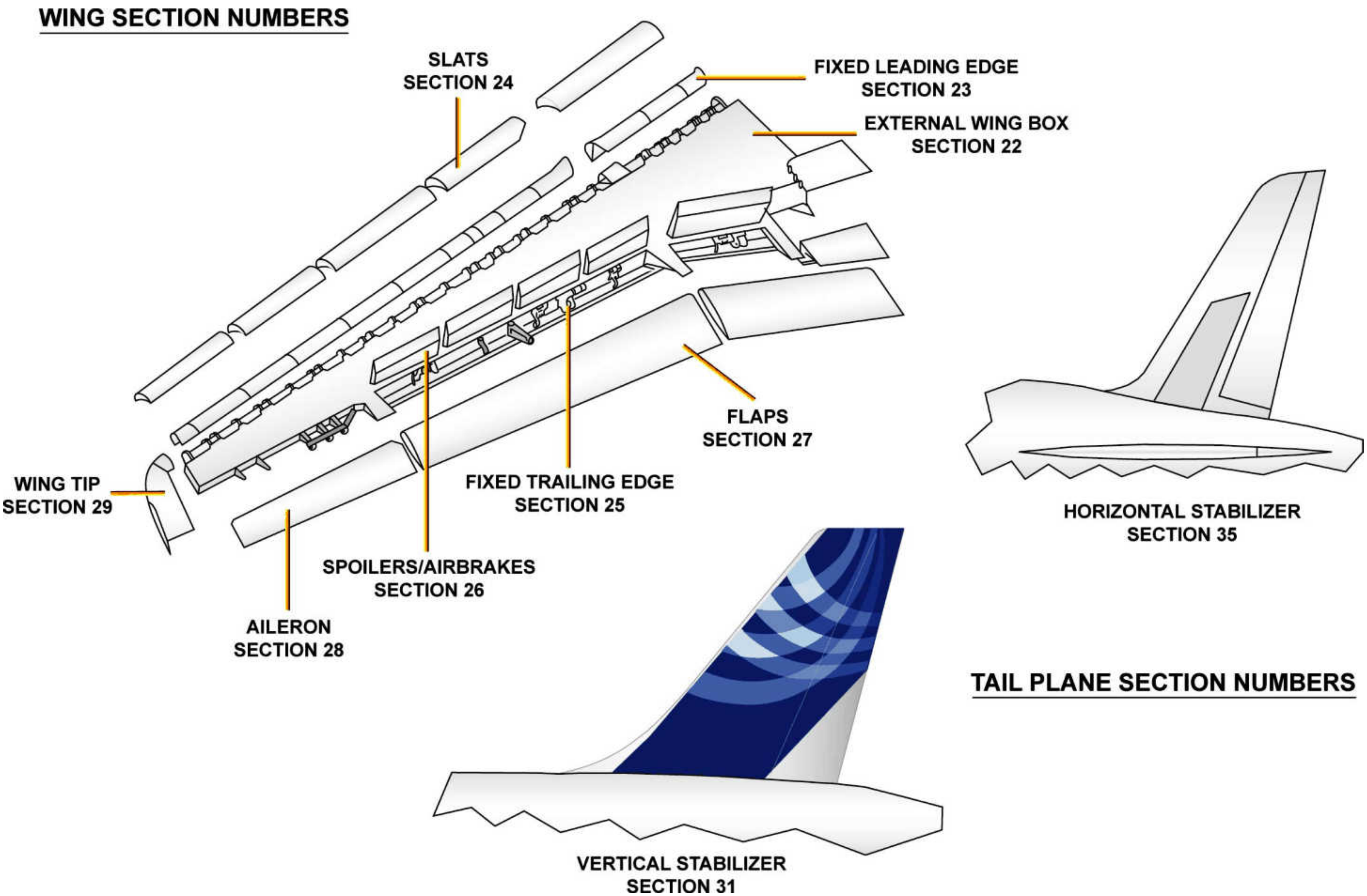


Figure 9 Wing And Tail Plane Sections

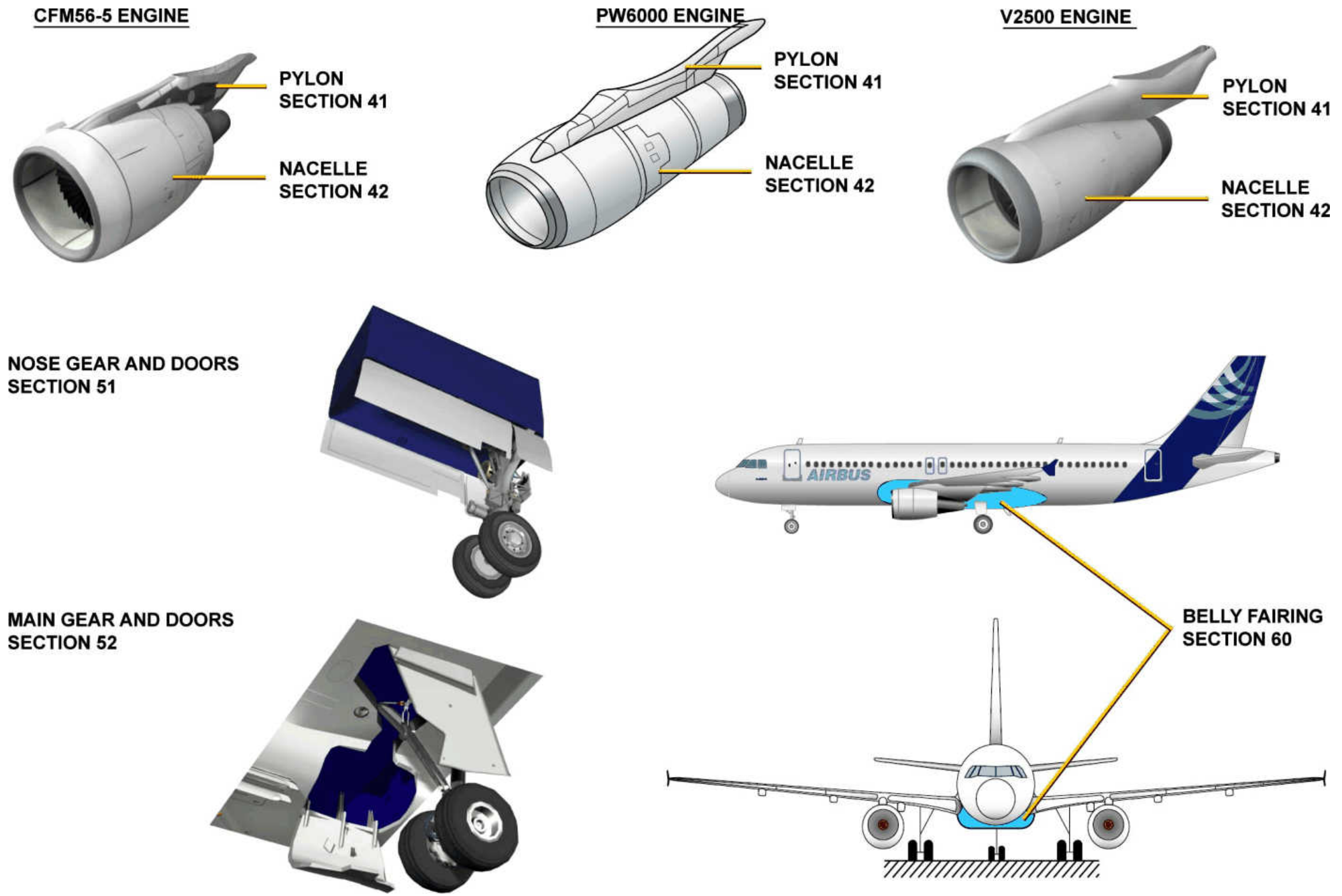


Figure 10 Engine, Landing Gear And Belly Fairing Stations

STATION NUMBERS GENERAL DESCRIPTION

FUSELAGE

The STAtion number is the distance in milimeters of a cross−section from a reference point. The station/frame numbers shown agree with the section boundaries.

Stations numbers (STA)

The station designation system is used to identify reference planes and points along those planes, providing a means of identifying the location of structure.

A station corresponds to a cross section (plane) for a given assembly group, as fuselage, engine nacelle, wing, vertical and horizontal stabilizer.

The sum of all stations gives a station diagram. Each station is a measured distance in millimeters, measured from a station point ”0”. For the Fuselage it is measured over the X − datum line, beginning 2540 millimeters in front of the radom. In addition the stations are supplemented by frame (FR) figures, e.g. STA 9500/FR 24.

Frames numbers (FR)

Frames been counted from the front bulk head to the aft within the fuselage. The distance between the frames are generally 530 millimeters (~21 inch).

In ranges of high loads (e.g. nose fwd fuselage) the distance is about 230 millimeters (~10 inch).

Depending on the frames the fuselage of A320/A319 has seven sections. The A321 has nine sections.

SECTION	DESIGNATION	STATIONS	FRAMES
11/12	Nose Fuselage	3340−9500	00−24
13/14	Forward Fuselage	9500−15367	24−35
15	Center Fuselage	15367−21361	35−47
16/17	Aft Fuselage	21361−30429	47−65
18	Aft Fuselage	30429−33655	65−70
19	Forward Tailcone	33655−36617	70−77
19.1	Aft Tailcone	36655−40113	77−87

Additional Sections A321

SECTION	DESIGNATION	STATIONS	FRAMES
14A	Forward Fuselage	15367−19634	35−35.8
16A	Rear Fuselage	5629−28296	47−47.5

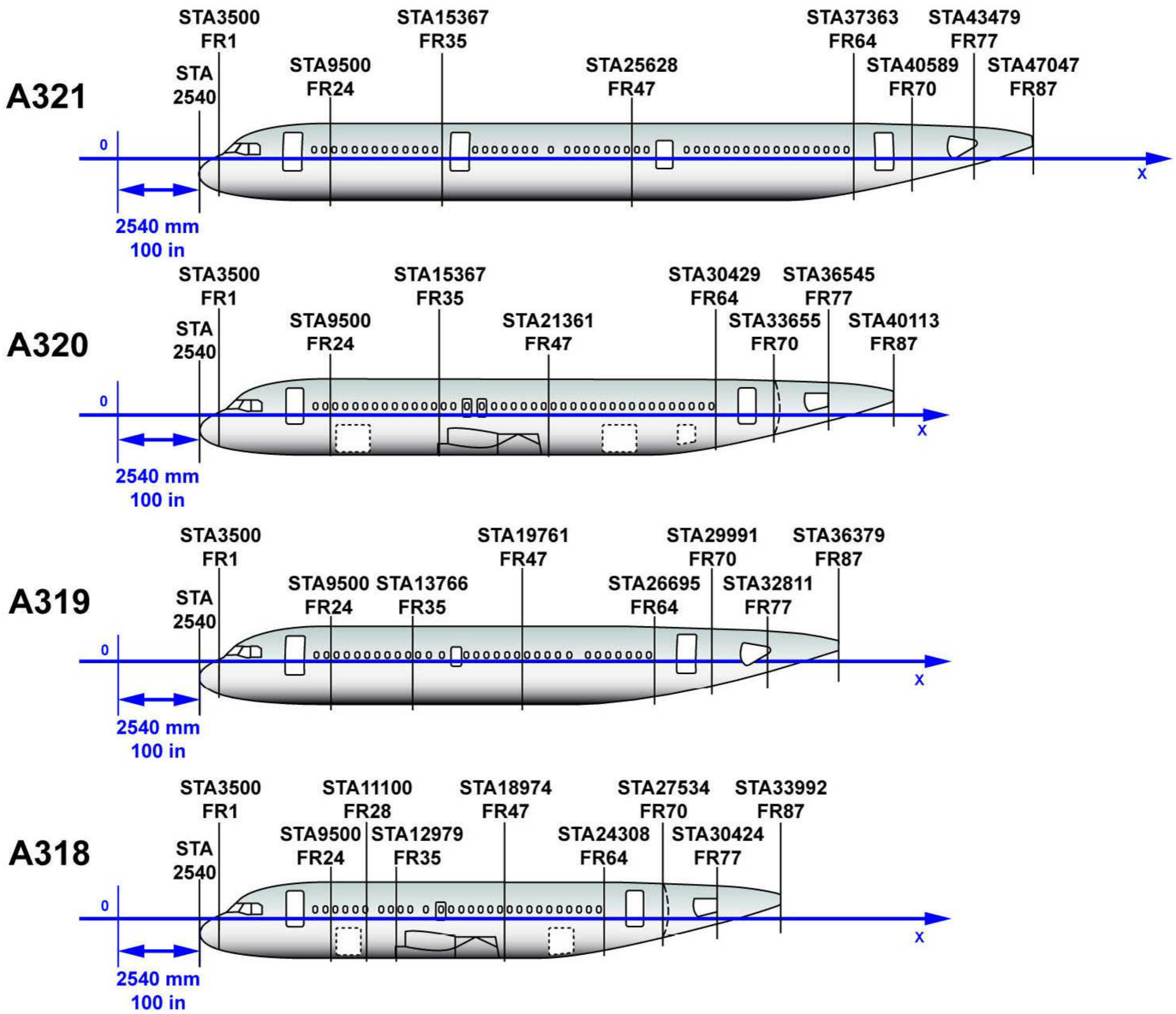


Figure 11 Fuselage Stations

VERTICAL STABILIZER

For the vertical stabilizer the reference station is Z=0 at the vertical Z-axis.

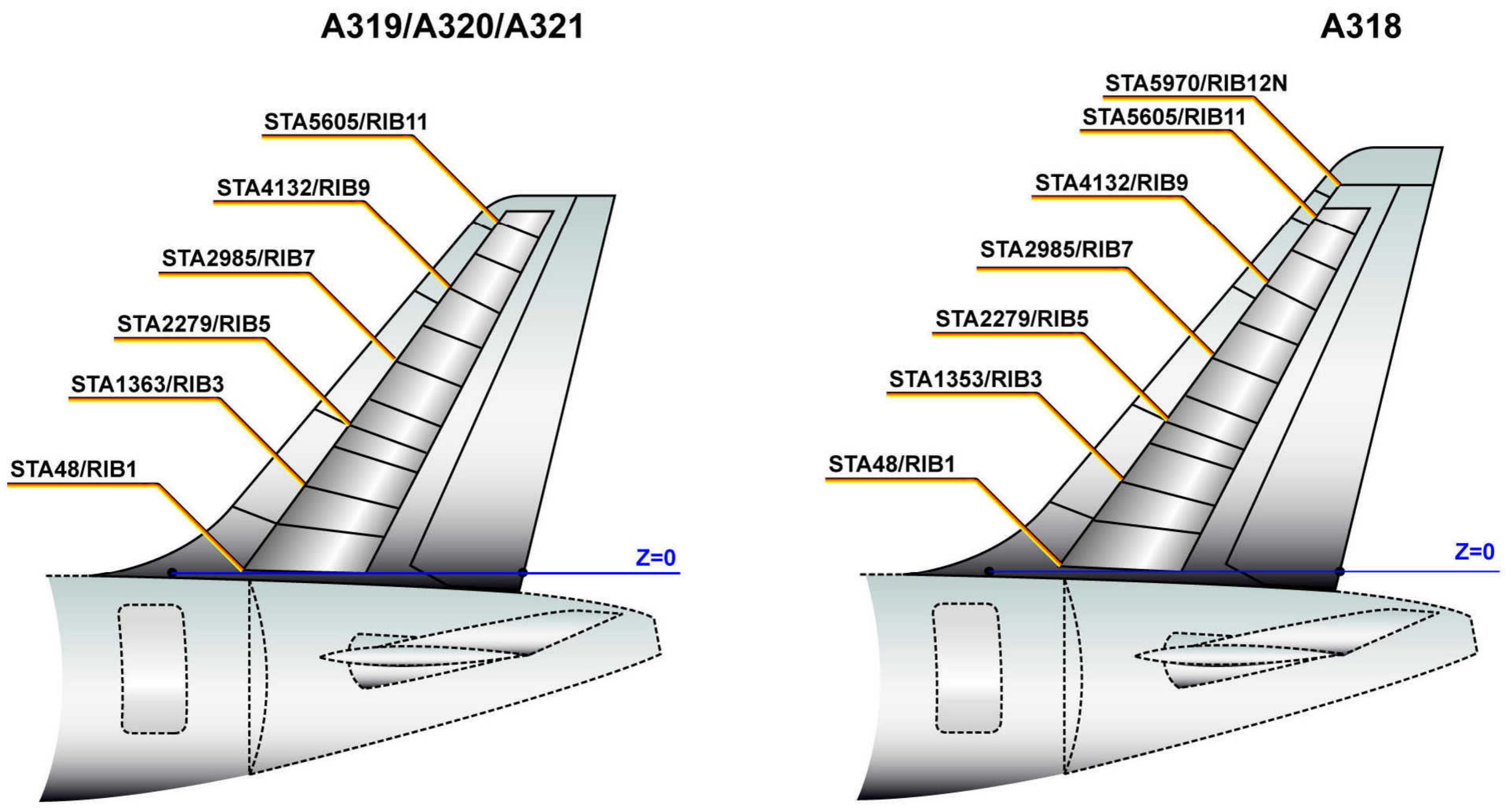


Figure 12 Vertical Stabilizer Stations

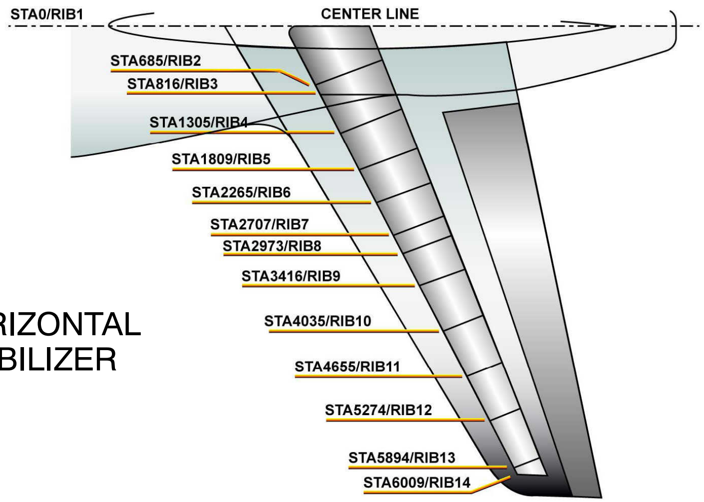
HORIZONTAL STABILIZER, ENGINE AND WING

For the horizontal stabilizer the reference station is y=0 at the A/C Y axis.

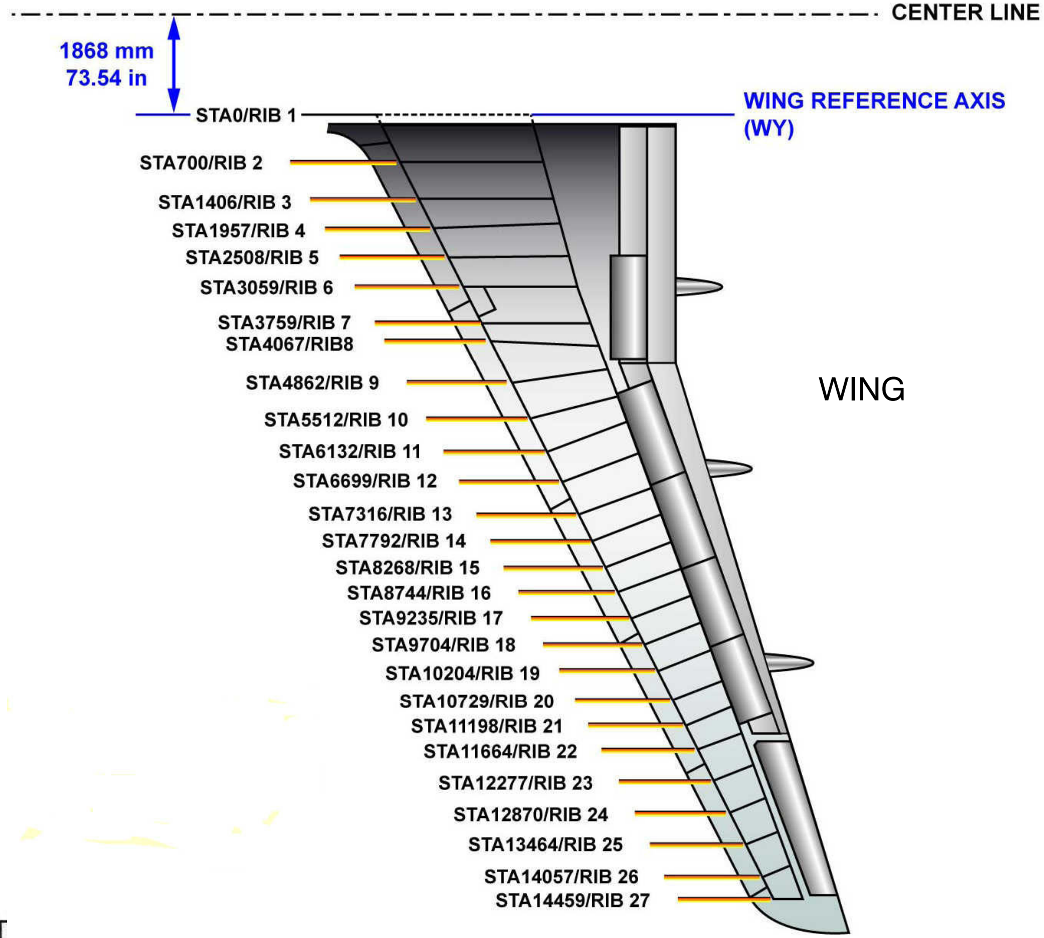
For the wings, the reference station is the wing reference axis (WY). WY is located at 1868 mm (73.54 in) from the A/C X axis.

For the engines, station numbers are different depending on the version.

HORIZONTAL STABILIZER



LH HORIZONTAL STABILIZER SHOWN, RH SIMILAR



WING

STATION REFERENCES GIVEN, APPLY TO THE INTERSECTION OF THE RIB WITH THE DATUM LINE OF THE FRONT SPAR, MEASURED AT 90 DEG TO RIB 1

LH WING SHOWN, RH SIMILAR

ENGINES

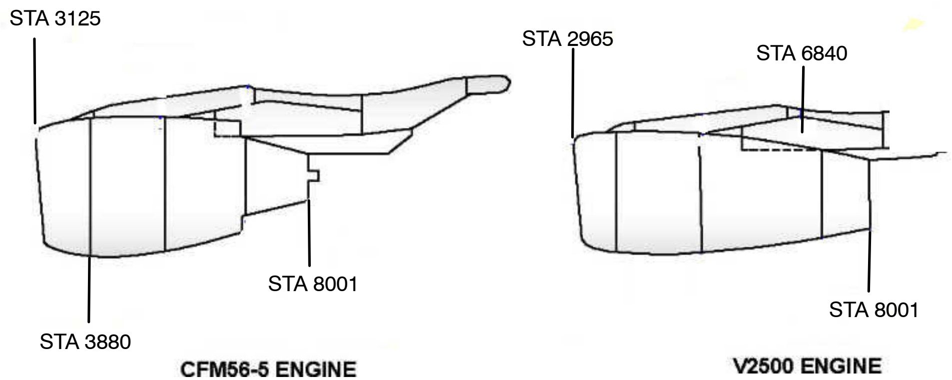


Figure 13 Horizontal Stabilizer, Engine And Wing Stations

06−40 ACCESS

ACCESS PANELS AND DOORS INTRODUCTION

Description

All access panels and doors are provided with an identification system.

The identification code exitst of three figure to identify the zone and two letters to clarify the position:

- The first or identification letter identifies the door (panel) in a logical sequence, i. e.
  - from the inside to the outside, or
  - from the forward to aft.
- The first identification letter is an ”A” for each zone.
- The second or location letter, gives the location of the door (panel) on the aircraft zone if necessary.

Location letters are:

- **T** Top (upper surface)**,**
- **B** Bottom (lower surface)**,**
- **L** Left,
- **R** Right**,**
- **Z** Internal**,**
- **F** Floor Panel**,**
- **W** Sidewall panel**,**
- **C** Ceiling Panel.

EXAMPLE: 1 2 1 A L

MAJOR ZONE 100
MAJOR SUB ZONE 120
ZONE 121
ALPHABETIC DOOR SEQUENCE
LEFT (Location)

In case all letters of the alphabet have been used, panels are identified as follows:

- the letter ”A” is still the identification letter
- location letters than are
  - **U** Top (upper surface)**,**
  - **D** Bottom (lower surface)**,**
  - **P** Left**,**
  - **S** Right,
  - **G** Floor panel**,**
  - **X** Sidewall panel**,**
  - **Y** Ceiling panel

NOTE: The letters I and O are not used.

The cabin passenger/crew doors, cargo compartment and main landing gear doors are only identified by the zone number, since each of these doors is a zone in itself.

Doors along the aircraft center line have the left side zone number.

For more rules see AMM 06−40−00

EXAMPLE: Panel 121AL

ZONE	SUFFIX	FUSELAGE POSITION
121	AL	Forward fuselage, lower half, first panel in zone 121 bottom. (access to External Power Panel)

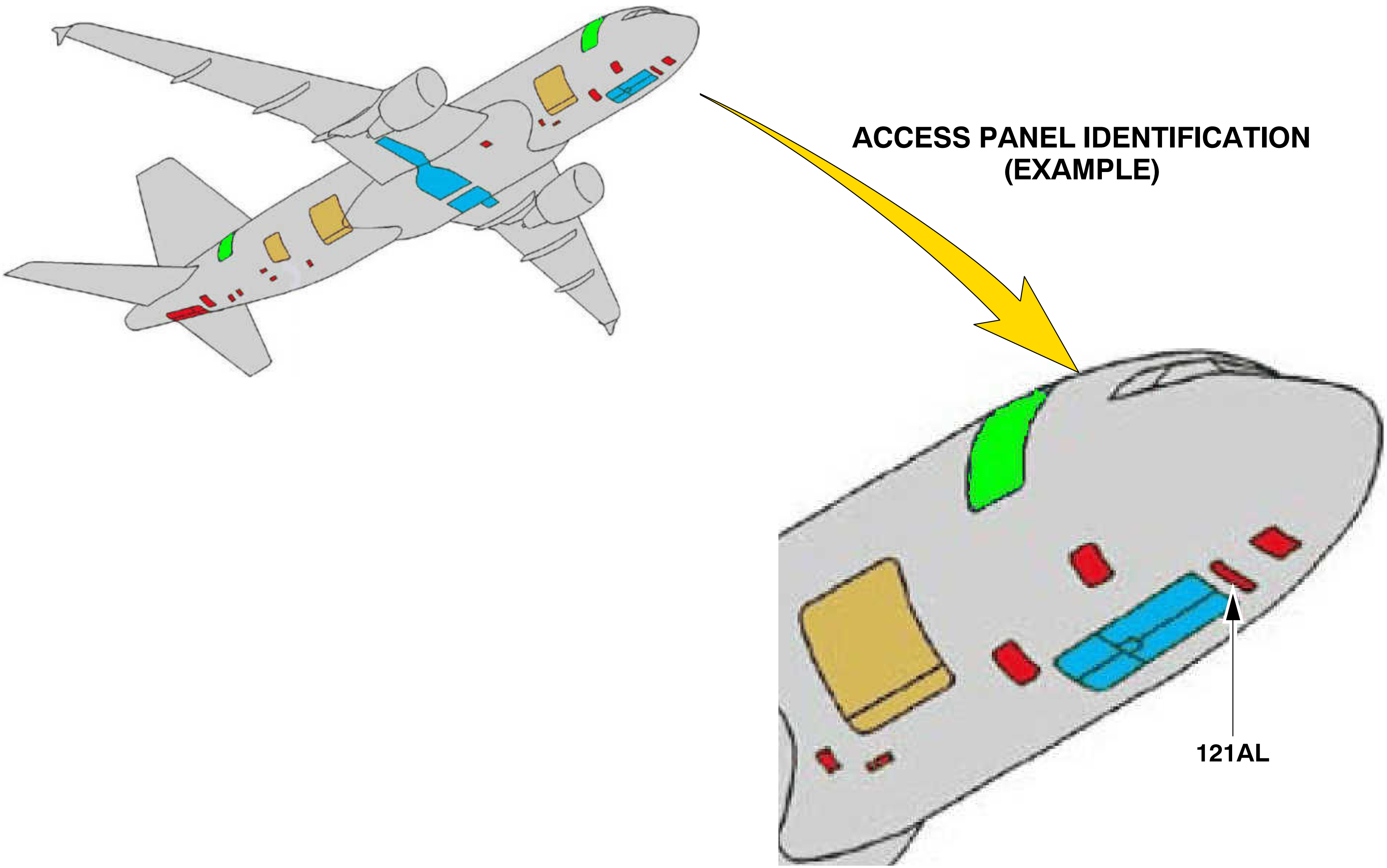


Figure 14 Example Access External Power Panel

ATA 51 STRUCTURES

51–00 STANDARDS PRACTICES AND STRUCTURES – GENERAL

GENERAL DESCRIPTION

STRUCTURE ATA BREAKDOWN

The structure of the aircraft is broken down as follows:

- ATA 52 for the doors,
- ATA 53 for the fuselage,
- ATA 54 for the pylons,
- ATA 55 for the stabilizers,
- ATA 56 for the windows,
- ATA 57 for the wings.

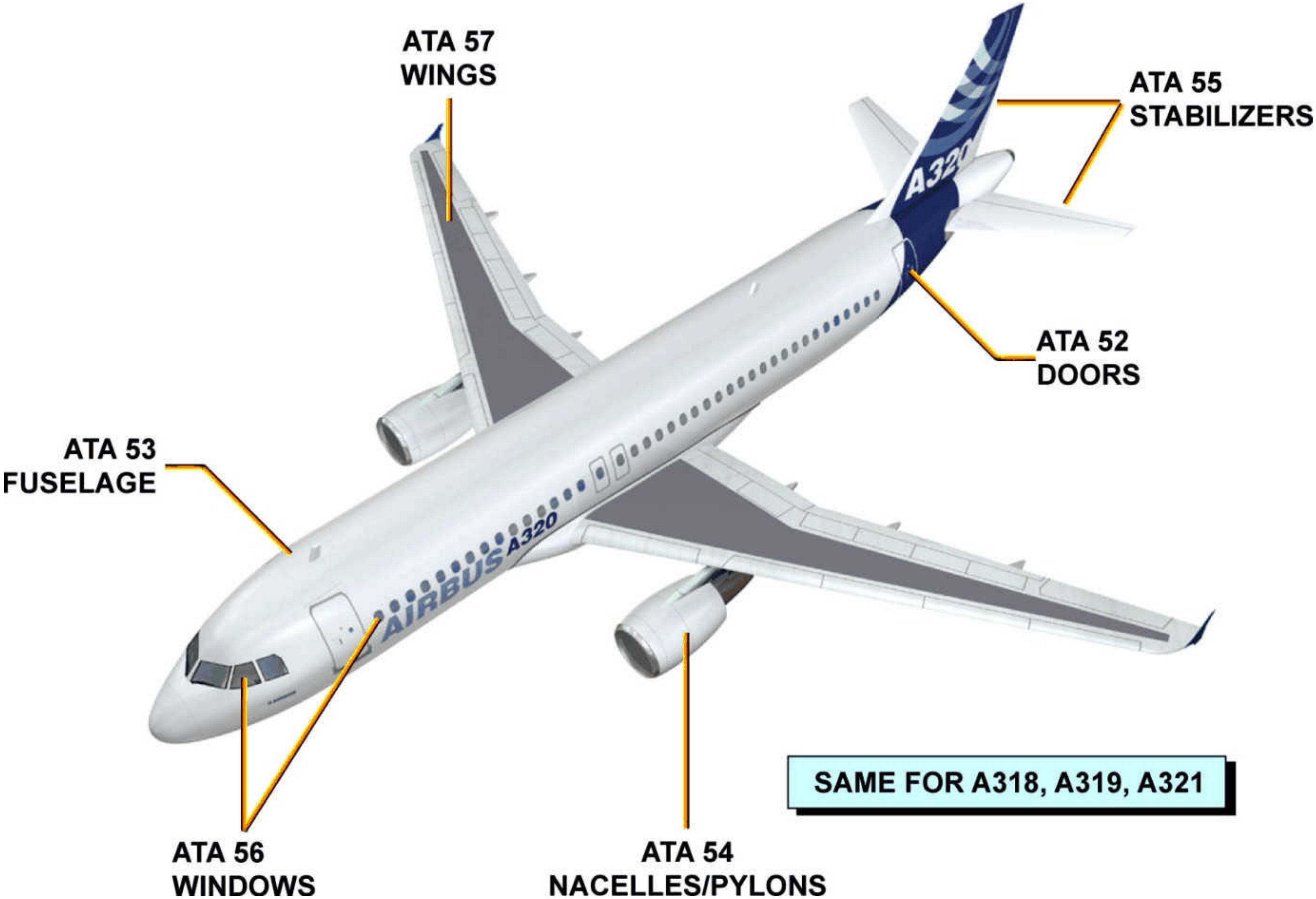


Figure 15 Structure ATA Breakdown

A320 FAMILY STRUCTURE INTRODUCTION

The A320 is a short/medium range twin engined subsonic commercial transport aircraft introduced as the first single aisle aircraft to the Airbus family.

The seating capacity varies between about 120 to 179 passengers. The A319 is smaler derivat with less passenger capacity and the A 321 is a lager derivat aircraft with more passenger capacity than the A320.

Airbus Industrie in Tolouse, France, designed and developed the A320 family.

Mainly six companys in six european countries, France, Great Britan, Germany, Belgium, Spain and Italy deliver certain parts which be flown by a ”Beluga” aircraft, especilaly designed for aircraft parts transportation, to be delivered to the A320 Airbus Industrie assembly line in Tolouse and to the Airbus Deutschland GmbH assembly line for A318, A319 and A321 in Hamburg, Germany.

Engines can be choosen from three suppliers, Commercial Fan Moteur International CFMI 56 series, International Aero Engine V2500 series and Pratt & Whitney 6000 series with different thrust settings which is a matter of aircraft type and performance demand.

STRUCTURAL PRINCIPLE

Description

The strucrure of the aircrafts are designed of the fail safe principle, what means, by a maximum of structure strength a minimum of weight.

Therefore the primary structure is mainly out of strongest Aluminium alloy beside some parts are made of steel and titan. In some parts of strong mechanical strength material with high fatigue resistance are installed.

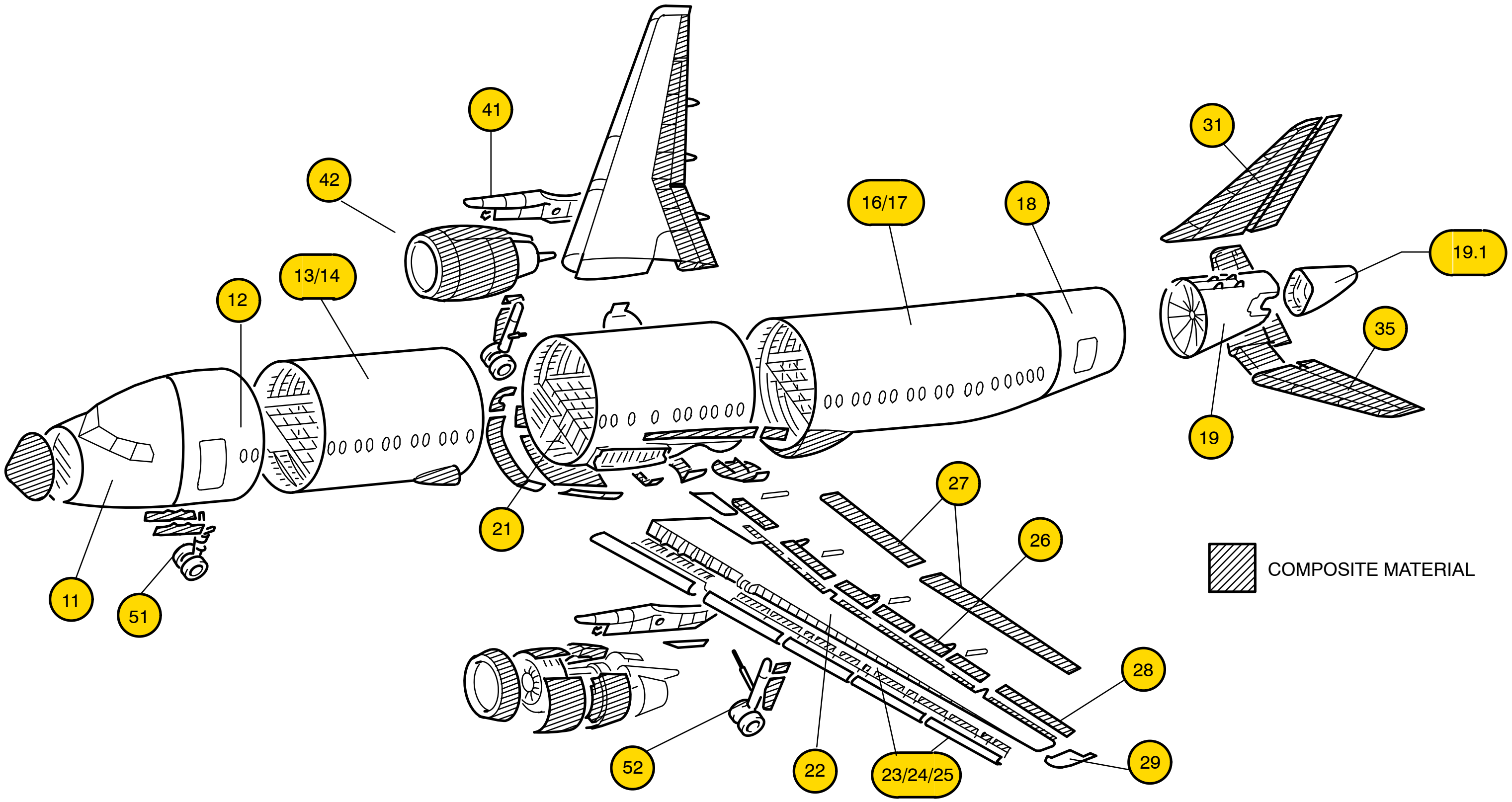
Some parts / components of primary and secondary structure are made of composide plastic to reduce further more the weight.

This plastics are:

- GFRP -> Glas Fiber Reinforced Plastic
- CFRP -> Carbon Fiber Reinforced Plastic
- AFRP -> Aramid Fiber Reinforced Plastic
- QFRP -> Quatz Fiber Reinforced Plastic
- ACFRP -> Aramid & Carbon Fiber Reinforced Plastic

Abbreviations used in this chapter:

- AFRP **A**ramid**f**iber **R**einforced **P**lastic
- CAA **C**hromic **A**cid **A**nodizing
- CCC **C**hemical **C**onversion **C**oating
- CFRP **C**arbonfiber **R**einforced **P**lastic
- CL **C**enter **L**ine
- FD **F**uselage **D**atum
- Fig **FIG**ure
- FR **FR**ame
- FWD **F**or**W**ar**D**
- GFRP **G**lass**F**iber **R**einforced **P**lastic
- LH **L**eft **H**and Side
- LONGN **LONG**ero**N**
- MAX **MAX**imum
- MID **MID**dle
- MIN **MIN**mum
- RH **R**ight–**H**and Side
- REF **REF**erence
- RPM **R**evolution **P**er **M**inute
- STA **STA**tion
- STD **ST**an**D**ard
- STRG **STR**in**G**er
- THS **T**rimmable **H**orizontal **S**tabilizer
- VERT **VERT**ical



SECTION	ATA REFERENCE	DESIGNATION
11/12	53–10–00	NOSE FORWARD FUSELAGE
13/24	53–20–00	FORWARD FUSELAGE
15	53–30–00	CENTER FUSELAGE
16/17	53–40–00	REAR FUSELAGE
18	53–40–00	REAR FUSELAGE
19	53–50–00	CONE / REAR FUSELAGE
19.1	53–50–00	CONE / REAR FUSELAGE
21	57–10–00	CENTER WING
22	57–20–00	OUTER WING

SECTION	ATA REFERENCE	DESIGNATION
23 / 24 / 25	57–40–00	FIXED AND MOVING LEADING EDGES
26	57–70–00	SPOILERS
27	57–52–00	INBOARD FLAP
27	57–53–00	OUTBOARD-FLAP
28	57–60–00	AILERONS
29	57–30–00	WING-TIP
31	55–30–00	VERTICAL STABILIZER

SECTION	ATA REFERENCE	DESIGNATION
31	55–40–00	RUDDER
35	55–10–00	HORIZONTAL STABILIZER
35	55–20–00	ELEVATOR
41	54–50–00	PYLONS
42	54–10–00	NACELLE SECTION
51	32–20–00	NOSE GEAR AND DOORS
52	32–10–00	MAIN GEAR AND DOORS

Figure 16 A320 Major Structual Components

STRUCTURE DESIGN PRINCIPLES

Four typical principles are used in the aircraft design:

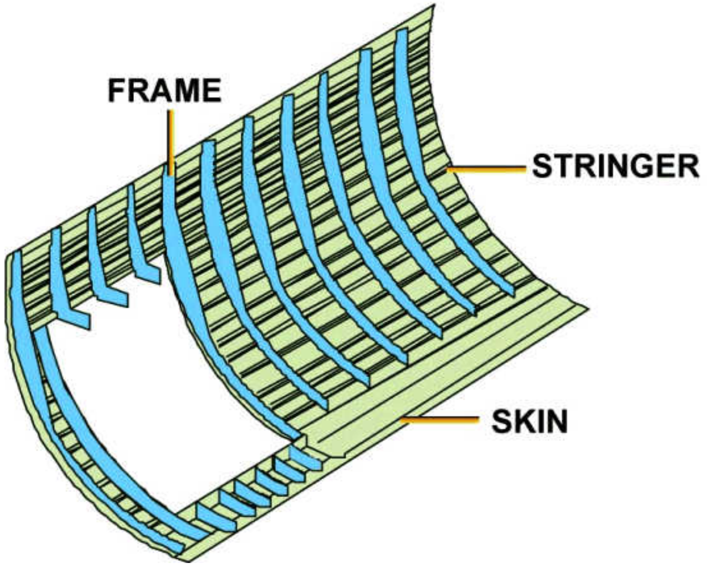
for the fuselage, the skin is attached to the frames and stiffened by stringers,

for the boxes, the skins stiffened with stiffeners are attached to spars and ribs,

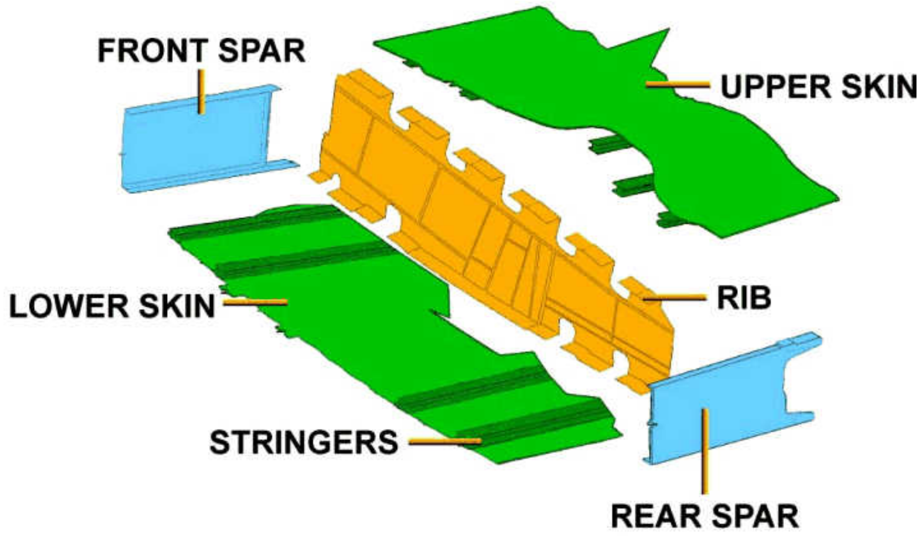
the composite parts could be monolithic or sandwich construction.

METALLIC

FUSELAGE STRUCTURE PRINCIPLE

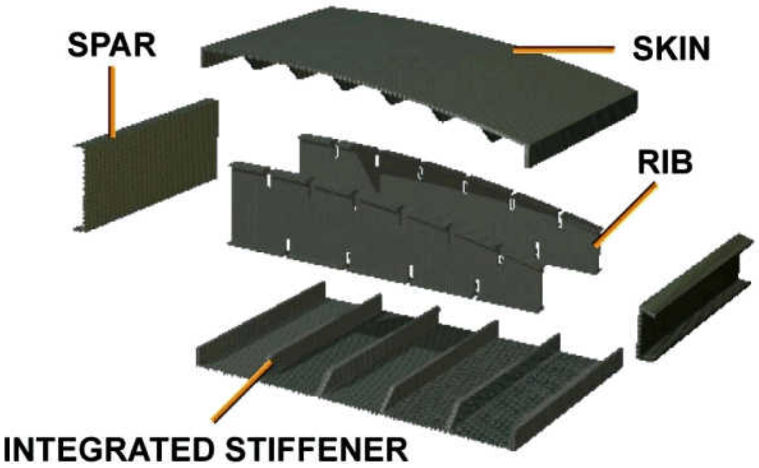


WINGBOX STRUCTURE PRINCIPLE



COMPOSITE

MONOLITHIC SKIN



SANDWICH PART STRUCTURE PRINCIPLE

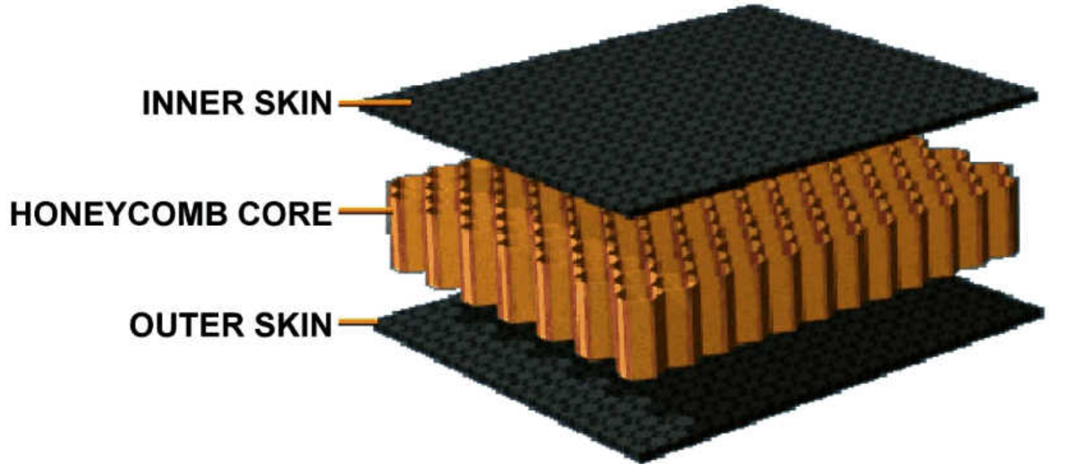


Figure 17 Structure Design Principles

STANDARD PRACTICES

Description

This chapter provides the instructions related to the standard practices applicable to the airframe, doors, wings, engine pylons and stabilizers.

These practices include:

- AMM 51–21–00 Protective Treatment,
- AMM 51–22–00 Corrosion Prevention,
- AMM 51–23–00 Coatings Aplication,
- AMM 51–24–00 Sealing General,
- AMM 51–70–00 Repairs,
- AMM 51–73–00 Repairs of Minor Damage,
- AMM 51–74–00 Repair of Corroded Areas,
- AMM 51–75–00 Paint Repair,
- AMM 51–76–00 Sealing Repair,
- AMM 51–77–00 Standard Composite Repairs,
- AMM 51–78–00 Cleaning Processes.

Composite Materials

To reduce the construction and components weight on A319/A320/A321 even more components been made out of composite materials so as horizontal stabibilizer, vertical stabilizer, fairings, panels, cowlings and flight controls.

Composite Materials

– Radome	– Fin main box and attachment lug
– NLG Doors	– Fin leading edge and tip
– Belly Fairing Panels	– Fin trailing edge panels
– MLG Doors	– Rudder and attachments
– Wing Leading Edge bottom access panels	– Tailplane main box
– MLG Wing bay top panel	– Tailplane leading edge
– Wing shroud box	– Tailplane trailing edge panels
– Wing trailing edge panels	– Tailplane pivot attachment lugs
– MLG – leg fairing doors	– Tailplane / Elevator attachment fittings
– Flap track fairings	– Elevator
– Inner and outer flaps	– Elevator hinge arms
– Spoilers and Airbrakes	– Tailplane / Fuselage fairings
– Aileron	– Cabin / Cargo floor panels
– Pylon to Wing fairing	– Cabin / Cargo compartments linigs
– Nacelle cowlings	

Protective Treatment (51–21–00)

The aircraft structure is given protection against corrosion and fluids.

Special attention is given to areas of high condensation and areas where different material touch. Three categorys of protection areas are seen:

- A areas in touch with air or humidity normally dry.
- B areas in touch with fuel.
- C areas in touch with hydr. fluid, grease, oil, water, waste or area bad to reach.

Corrosion Prevention (51–22–00)

Corrosion resistant materials and protective coatings are applied at the construction stage to obtain the maximum possible resistance to corrosion.

The removal of corrosion and subsequent maintenance have a direct effect on the operational safety and the in service capability of the aircraft. As protection is used CAA or CCC fore the al-alloy and wasch primer, primer and a top coat.

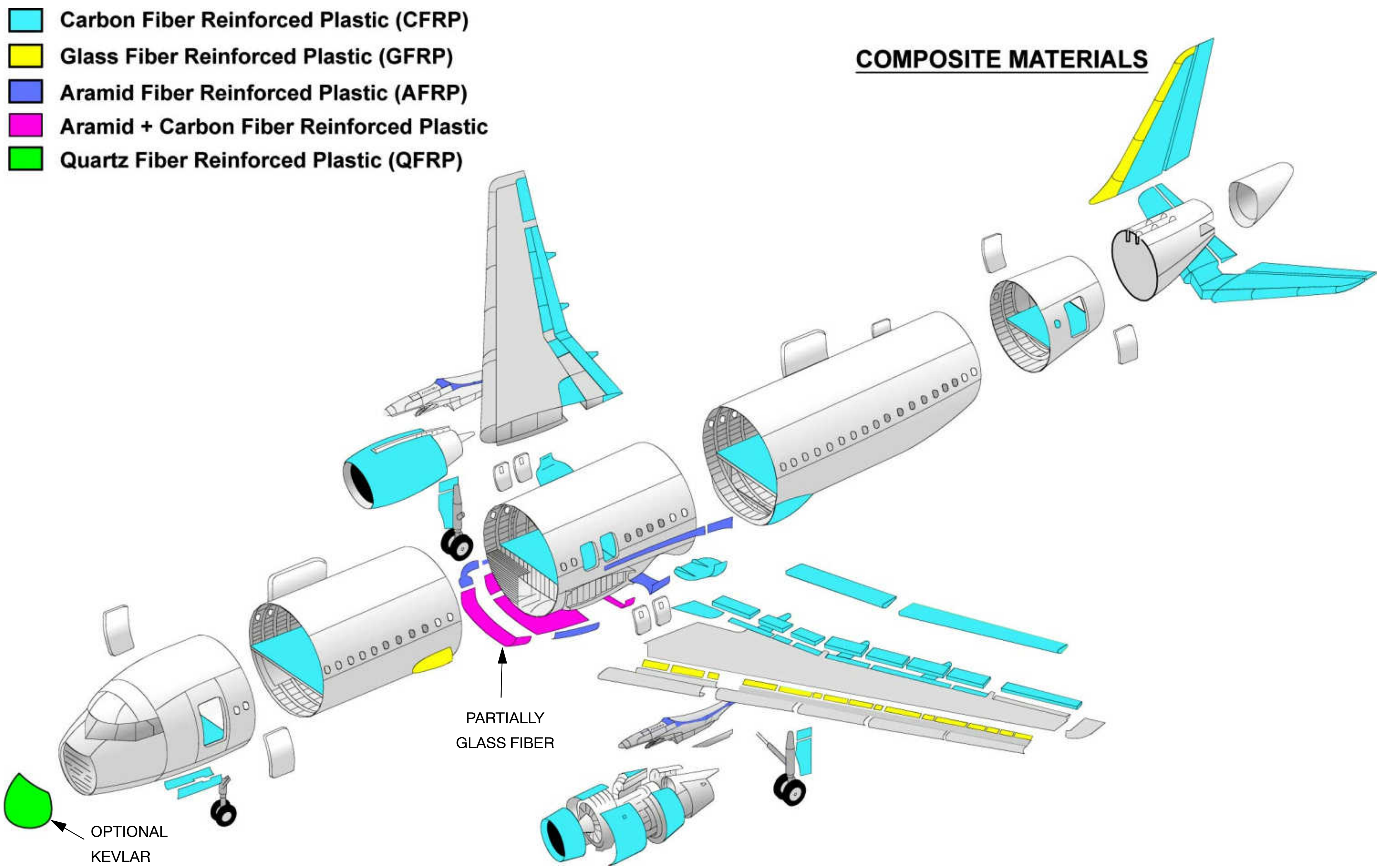


Figure 18 Composite Material Application

ATA 52 DOORS

52–00 DOORS - GENERAL

DOORS INTRODUCTION

DOORS STRUCTURES

The passenger/crew doors and the emergency exit doors are of same aluminum alloy design comprising skins, edge members, horizontal beams and vertical frames.

There are three cargo compartment doors installed on the right side of the fuselage. The forward and the aft cargo doors are also aluminum alloy structures consisting of skins, edge members, corner pieces, horizontal beams and vertical frames.

The bulk cargo door is of plug type design opening inside the fuselage. The primary structure comprise skins, edge members and horizontal beams both being made from aluminum alloy.

The main landing gear doors are located in the lower part of the center fuselage.

They have:

- two main doors, hinged to the two longitudinal boxes of the keel beam,
- two hinged door,
- and two leg fairing doors.

All doors are of composite construction, including carbon fiber skins.

The nose landing gear doors have two forward doors, two aft doors and one fixed door. The fixed door is made of aluminum alloy, the other doors are made of sandwich type CFRP composite

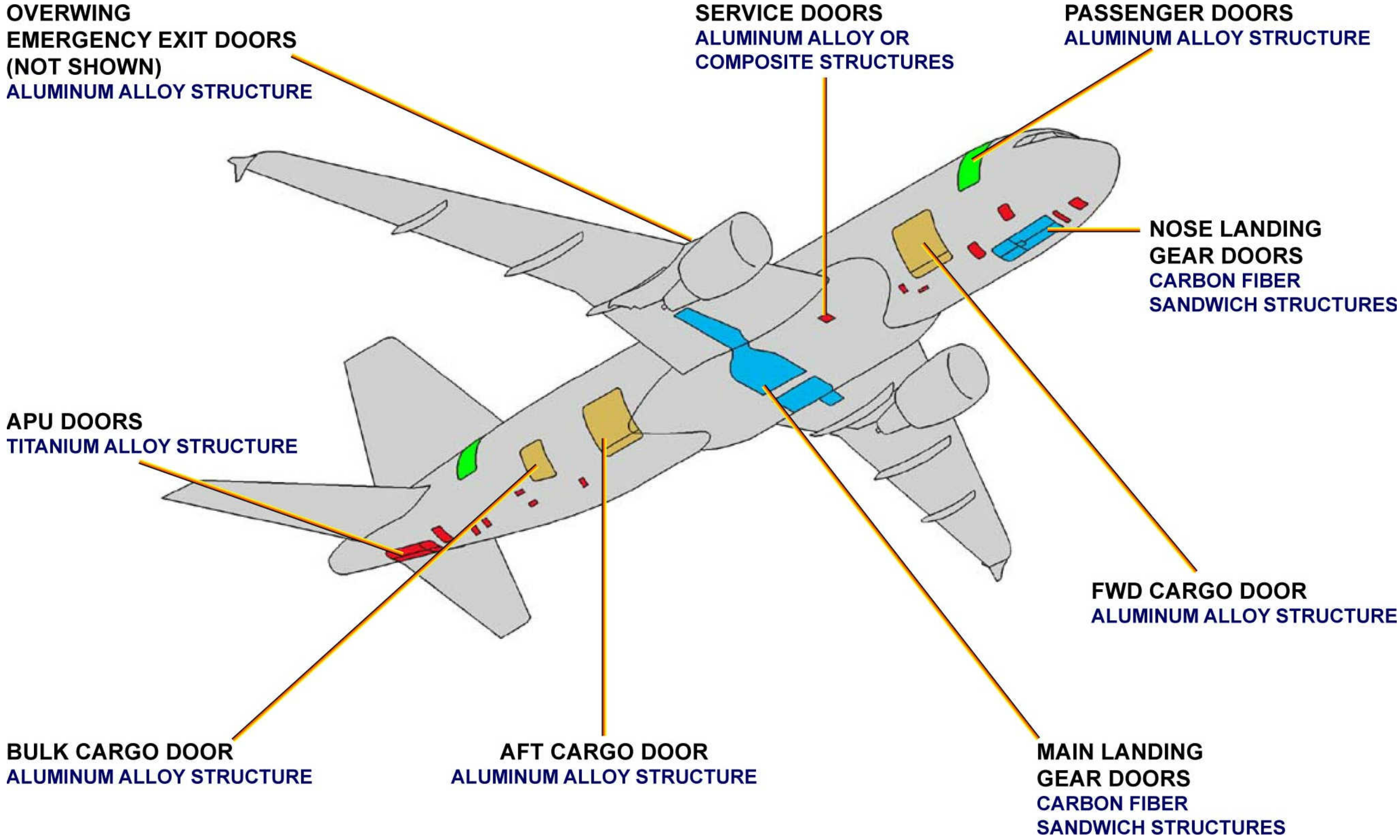


Figure 19 Doors Structures

DOORS GENERAL

Description and Operation

The aircrafts are designed with several doors to give a conveniened access to compartments for passengers, crew members, loading staff and maintenance reason. In the cabin all doors are designed that all passengers and crew members can leave the aircraft even without staircases, in case of emergency, safely in a defined time.

Passenger and Crew Doors

This aircraft has 4 entrances/emergency exits, called type 1 door, two doors of each fuselage side.

- This doors are plug type doors.

  That means under cabin differential pressure the doors will be pressed against fuselage mounted stop fittings to transfer the door pressure force to the fuselage structure.
- This doors can be opened from the inside as well as from the outside.
- All 4 doors will be used in case of emergency as emergency exits, therefore each door is equipped with an emergency-escape-slide.

Overwing Emergency Exits

Four exits called type 3, two on each side of the fuselage, designed as emergency exits only. These been used in an case of emergeny, to evacuate the passengers and crews in a definite time according to JAR / FAA regulations.

- This exits are **plug type** doors.

  This exits can be opened from the inside as well as from the outside.

  On each fuselage side during openig of the first exit via a mechanical system a slide will be released and inflated.

Forward and aft Cargo Compartment Doors

On the fuselage lower right hand side three cargo doors for belly cargo on and off loading are installed.

- Forward and aft cargo compartment door they are none plug type doors.

  Cabin pressure force will be transfered the latch mechanism.
- Bulk cargo compartment door

Forward and aft cargo compartment doors are equiped with an mechanical latch mechanism. The yellow hydraulic system is used to open and close the cargo doors. Opening and closing of the cargo compartment doors can be done from the outside only.

Bulk Cargo Compartment Door (Option)

Is the last cargo door on the right hand side of the fuselage.

- Is a **plug type** door
- When unlocked opens inside and swings to the compartment ceiling, where it is mechanicaly secured.
- The door can be unlocked and locked from the outside and inside.

A319 DOORS

In the pressurized area:

- 2 Cargo compartments doors
- 2 Overwing emergency exits
- 4 Passenger and crew doors or cabin doors useable as emergency exits
- 4 Doors to give access to the avionic compartments

A320 DOORS

In the pressurized area:

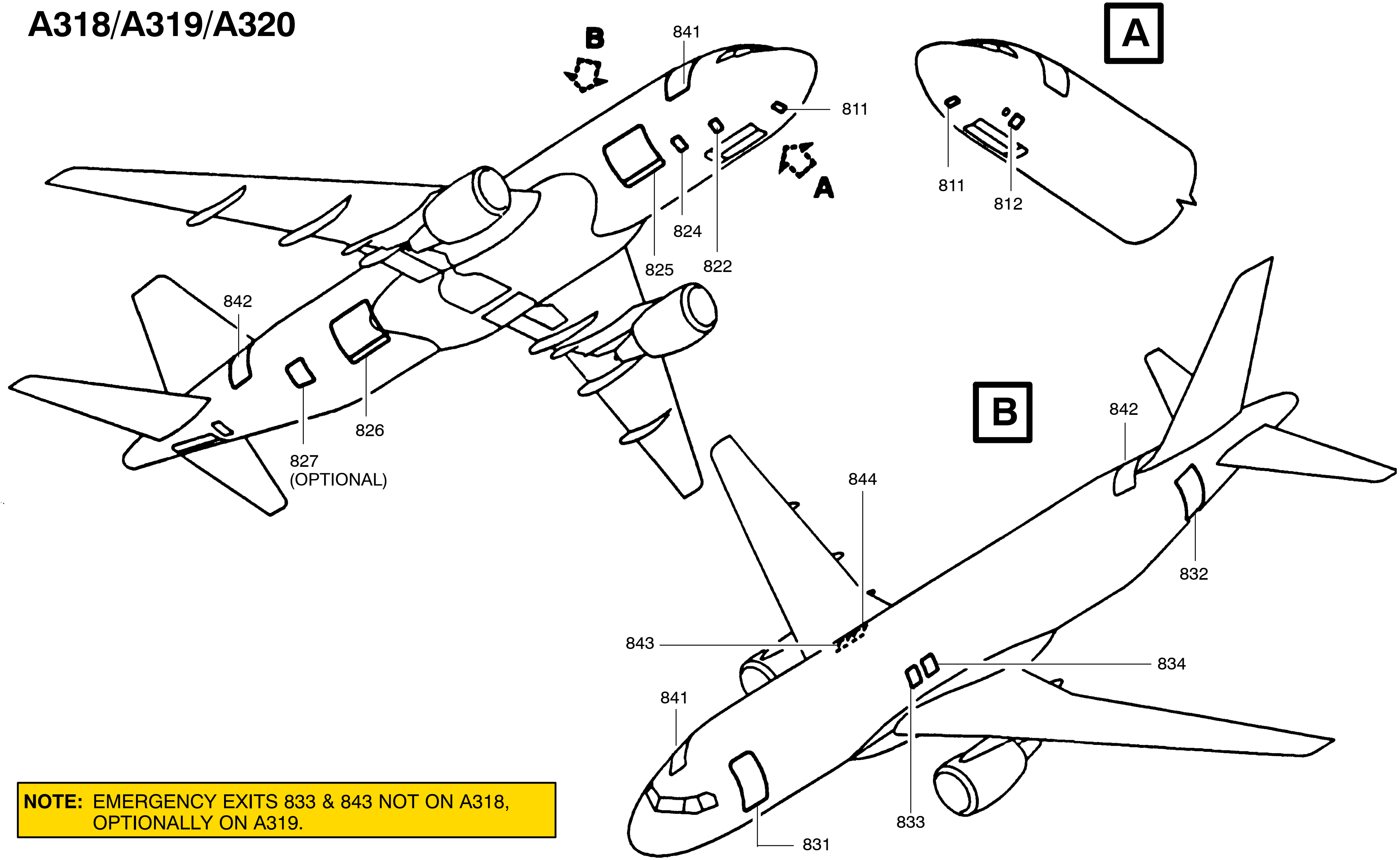
2 Cargo compartments doors
4 Overwing emergency exits. The 2 exits on each side are identical)

4 Passenger and crew doors or cabin doors usable as emergency exits

4 Doors to give access to the avionic compartments

Optional doors: 1 Entrance stairs door and 1 bulk cargo compartment door

A318/A319/A320



NOTE: EMERGENCY EXITS 833 & 843 NOT ON A318, OPTIONALLY ON A319.

Figure 20 A319/A320 Doors

A321 DOORS

In the pressurized area:

- 2 Cargo compartments doors,
- 4 emergency exits or cabin doors usable as emergency exits,
- 4 Passenger and crew doors or cabin doors usable as emergency,
- 4 Doors to give access to the avionic compartments.

Optional doors:

- 1 entrance stairs door and
- 1 bulk cargo compartment door.

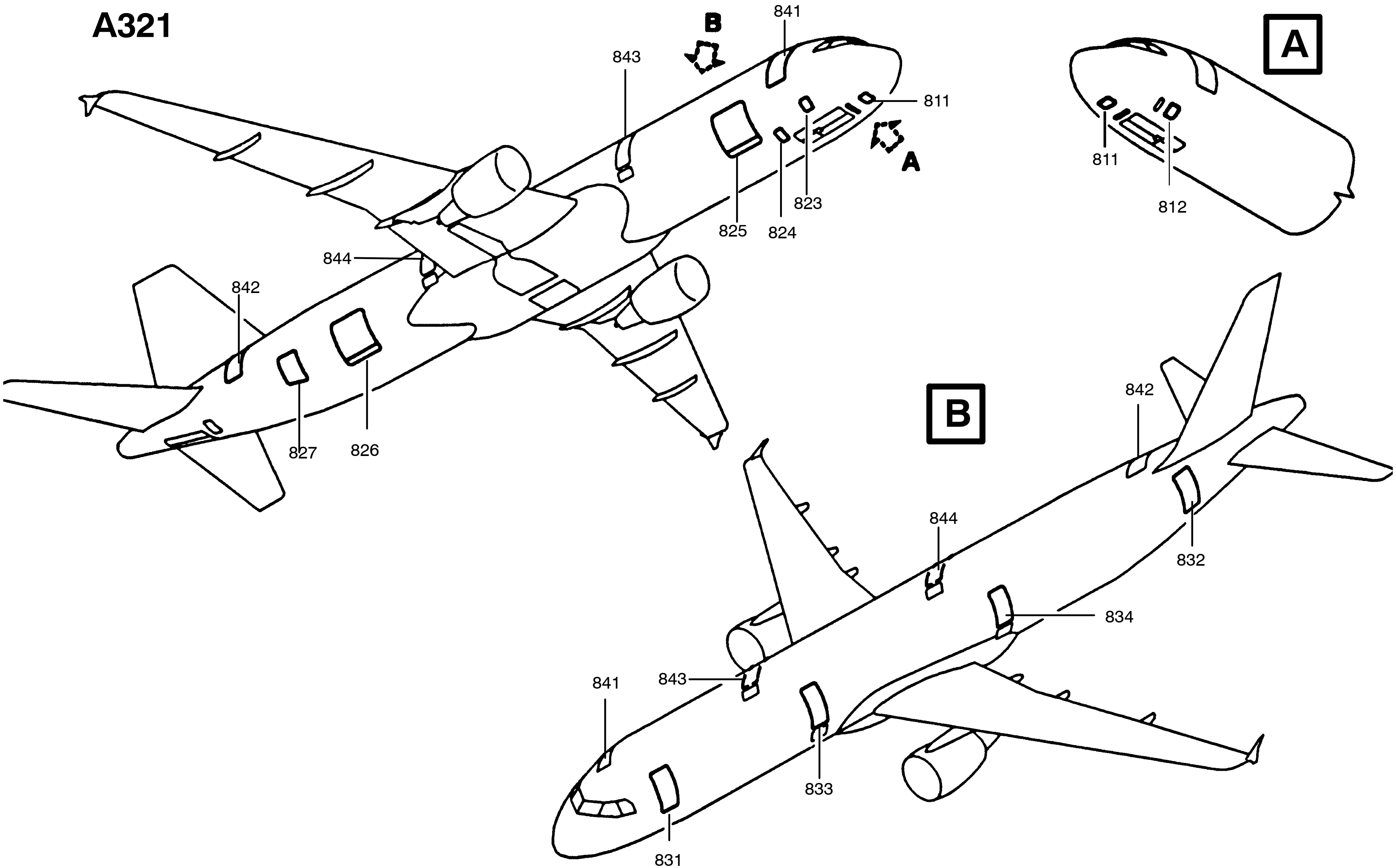


Figure 21 A321 Passenger, Crew and Service Doors

SERVICE & MAINTENANCE ACCESS

A319/A320/A321 Service and Maintenance Access

In the unpressurized areas:

- 1 Accessory compartment access door (312AR)
- 1 APU exhaust access fairing (317AL)
- 1 APU access door (315AL)
- 1 APU access door (316AR)
- 1 Maintenance door (314AR)
- 1 Aft lavatory service door (172AR)
- 1 External power receptacle (121AL)
- 1 FWD potable water service door (133AL)
- 1 MID potable water service door (192NB / A320 ONLY)
- 1 Aft potable water service door (171AL)
- 1 FWD cargo compartment door control panel door (134AR)
- 1 Aft cargo compartment door control panel door (154AR)
- 1 HP ground air connector door (191DB)
- 1 Conditioned air ground connector door (191CB)
- 1 Refuel and defuel panel door (192MB)

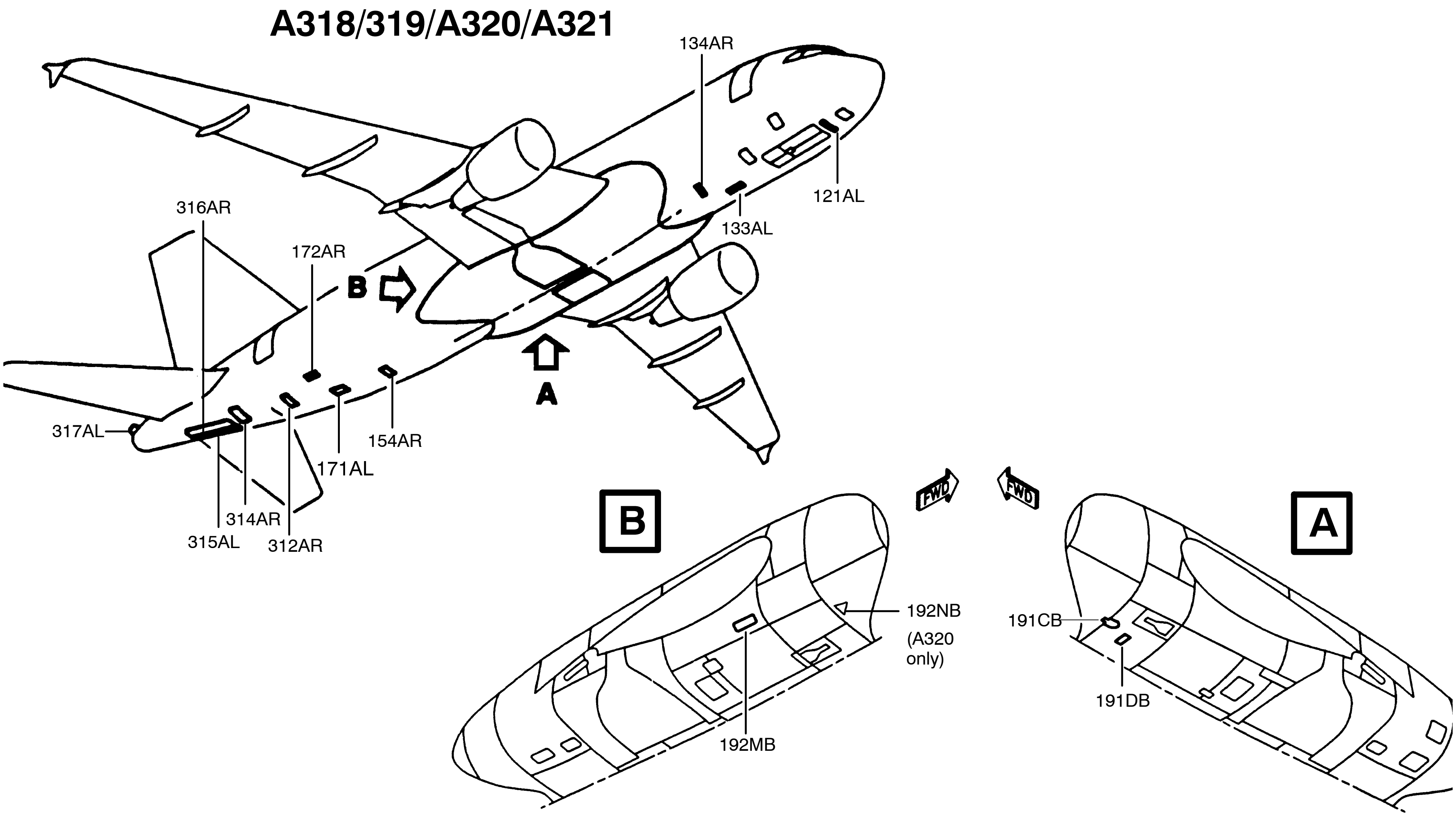


Figure 22 Service and Maintenance Doors/Panels

52–10 PASSENGER/CREW DOORS

INTRODUCTION

DESCRIPTION

The aircraft ist provided with four type 1 passenger/crew doors, two on the left side and two on the right side of the fuselage. The doors are of the fail safe plug type construction. During the unlock phase the doors move lightly inwards then upwards, they open outwards and move forwards parallel to the fuselage.

The closed door locking mechanism is controlled either with the inner or the outer control handle. In open position a door stay mechanism latches the door for safety reason.

All Passenger/Crew doors include an evacuation system. Which are escape slide or slide/raft equipment and with a release mechanism. The escape slide or slide/raft is controlled by an arming/disarming lever on the inner side. When the door is opened from the outside the escape slide or slide/raft release mechanism is disarmed automatically.

The door seal, installed on the inner side of the door outer skin, will be inflated by cabin air pressure to form a pressure tight seal to the fuselage when the door is closed and the cabin is pressurized.

Because all type 1 doors are similar, except for their geometry, this description is general and valid for all type 1 doors.

PASSENGER & CREW DOORS CONTROLS

1 Outer Control Handle

This handle allows the door to unlock and open and vise versa to close and lock the door. The inner control handle follows the outer handle movement.

If the Emergency Control Handle stays in ”ARMED” position and the door outer handle unlocks the door, the Emergency control Handle moves to ”DISARMED” position first.

2 Inner Control Handle

Operates the locking mechanism and movement of the door. When the handle is moved to ”OPEN” position, the locking shaft and the locking hook are withdrawn and moved inwards and down. The whole door panel is lifted.

3 Visual Locking Indicator

Is mechanically connected to the locking mechanism to show if the door is closed and locked ”LOCKED” in green, or not closed and locked ”UNLOCKED” in red.

4 Emergency Control Handle

Has two positions “ARMED“ and “DISARMED“. It is locked in disarmed, when the door is open.The emergency control handle is located far from the inner control handle

ARMED

When the door is unlocked with the inner control handle and moved upwards a gas bottle will be triggered and the door damper and ermergeny operation cylinder be filled with nitrogenium gas and the door swings outwards.

A girt bar, connected to the slide, is locked to the floor fittings. When the door is opened with the outer control handle, the emergrency control handle will be placed to disarmed position. To open the door with the inner control handle normally, the emergency control handle has to be placed to ”DISARMED”**,** otherwise the door opens automaticly after lifting of the door and the escape slide will be released and inflated.

DISARMED

The girt bar is withdrawn by the slide container. When the door is unlocked by the inner or outer control handle, and opened, the damper and ermergeny operation cylinder acts as a damper and the door opens normally until the door stay mechanism catches the support arm and holds open the door safely.

At Lufthansa position “ARMED“ is named “FLIGHT“, position “DISARMED“ is named “PARK“.

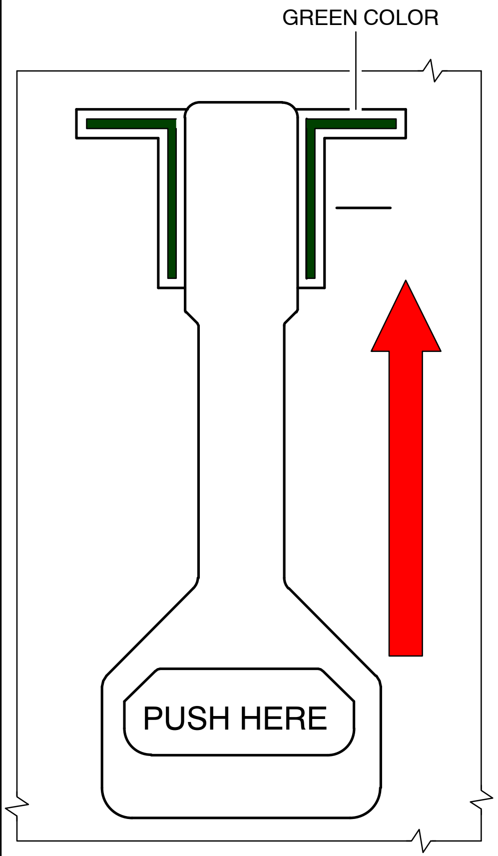
5 Release Button

To close the door, the release button of the door stay mechanism has to be pressed to unlatch the hold open mechanism.

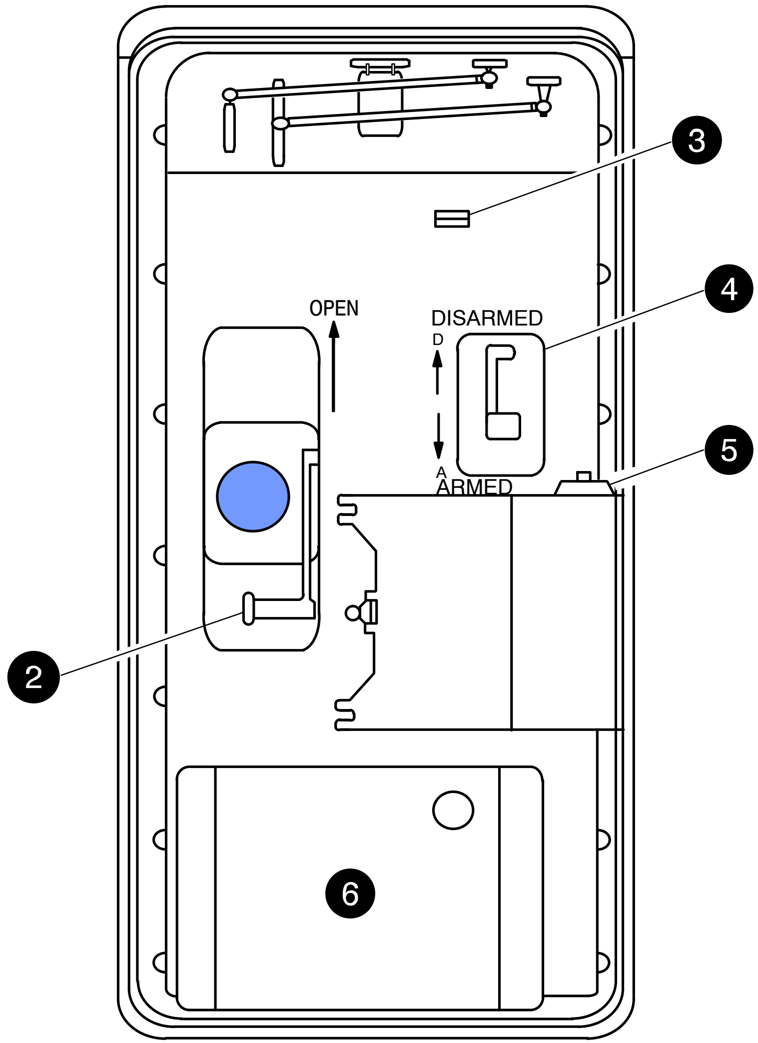
6 Emergency Escape Slide

All Passenger/Crew Doors are equiped with Emergency Escape Slides, stored in a door mounted container.

1 Outer Control Handle



Passenger Door Inside



Passenger Door Sideview

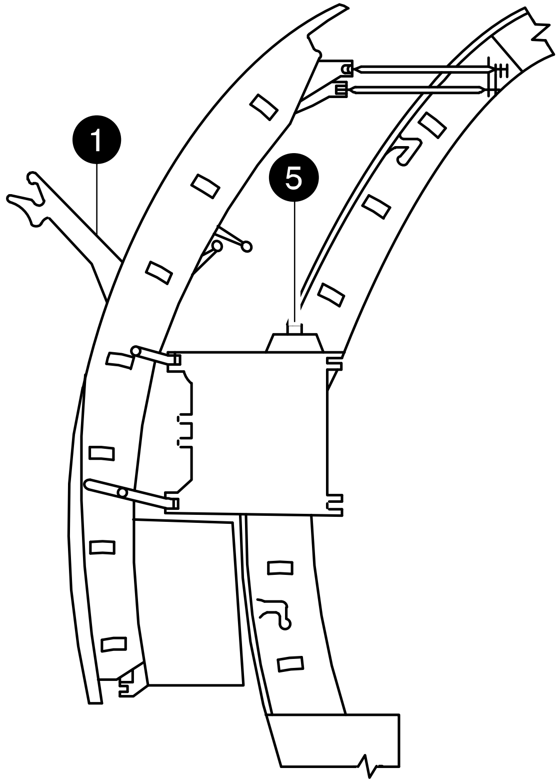


Figure 23 Passenger/Crew Door

PAX-DOOR GENERAL DESCRIPTION

PRECAUTIONS/WARNINGS

WARNING: Do not operate the door control handles inside or outsite if the red cabin pressure warning light in the door window is flashing:

In that case there is a cabin overpressure of more than 2.5 mb (0.037 psig) Residual pressure could cause the door to open with a sudden force and injure persons and/or damage the aircraft. Do not go near or open pressure sealed doors when the aircraft is pressurized. If you do you will cause explosive decompression kill or injury to persons and cause damage to the aircraft. Do not open the passenger / crew door if the wind speed is more than 65 knots.

CAUTION: Do not use the the inner control handle to push/pull the door. Use the inner control handle only to LOCK/UNLOCK the door. If you use this handle to push / pull the door, you can cause damage to the interlock mechanism hook.

Door Opening From The Inside (Normal Mode)

- The emergency handle must be in ”DISARMED”**,** position.

NOTE: If the inner control handle been turned with the emergency control handle in ”ARMED” position a white warning light in the window frame will illuminate. If a buzzer is installed (option) it will sound.

- Pulling off the inner control handle from its stow position and turn the handle until the stop position, following sequence starts:
  - The green “LOCKED“, visual indicator disapears and the red “UNLOCKED“ sign is visible.
  - The door been unlocked and lifted, high enough to pass the stop fittings.
- Use the assist handle and manually push the door outward. The door turns forward until it snaps in to the door stay mechanism.
- The force to lift the door has to be less than 16 daN (15.7 Kg).
- If there is no access platform/staircase in front of the door, put the safety barrier in position in the door frame.

Door Closing From The Inside

- Push the release button of the door stay mechanism, to open the latch mechanism.
- Pull and turn the door to the closed position.
- Pull and turn the inner control handle to the locked position, following sequence starts:
  - Lowering of the door.
  - Locking of the door.
  - For the visual locking indicator a green mark “LOCKED“ appears and the door is closed and locked.

Door Opening From The Outside

- Push the outer flap panel to grasp the outer control handle.
- Lift the handle to the green line.
- Door will be unlocked and lifted.
- Pull and swing the door to the full open position until the gust lock mechanism operates.

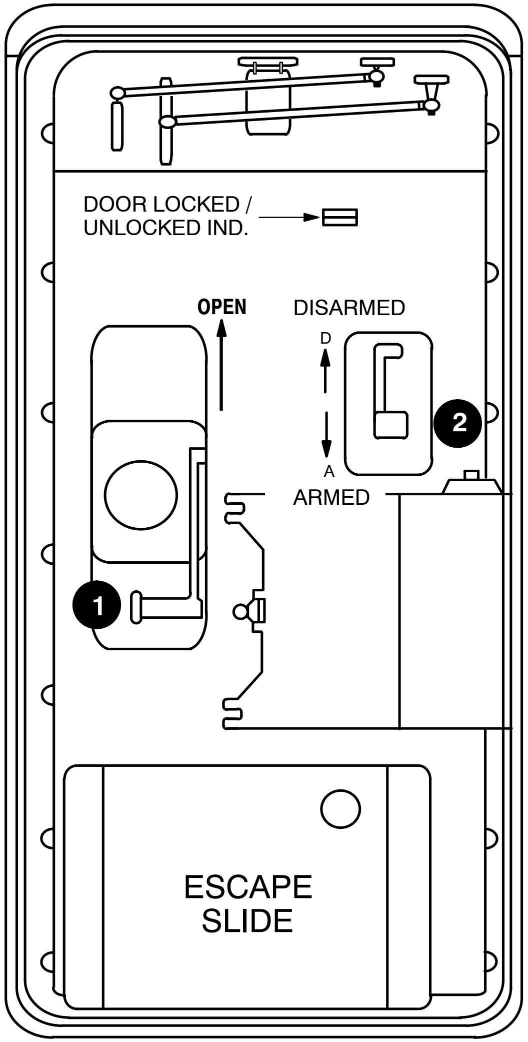
NOTE: If the emergency control handle stays in the ”ARMED” position, through the movement of the outer control handle it will be repositioned to ”DISARMED” position first.

Door Closing From The Outside

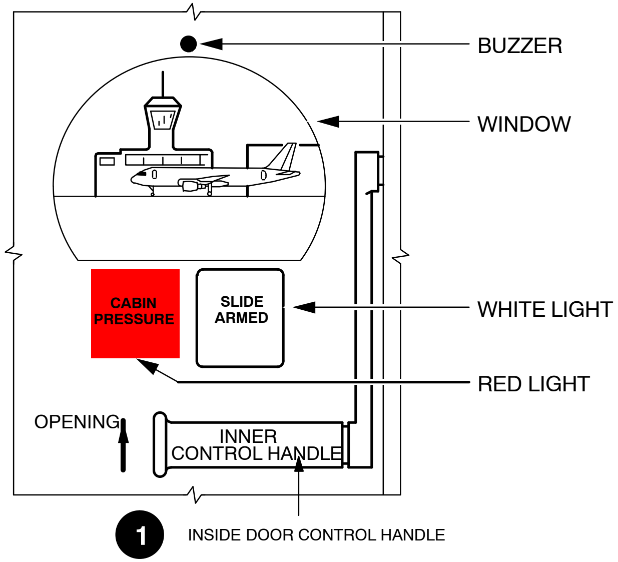
- Push the release button of the door stay mechanism, to open the latch mechanism.
- Pull and turn the door to the closed position.
- Pull and turn the outer control handle down to the closed position:
  - The handle will be stowed,
  - the door will lowered and locked.
- Make sure the handle is flush with the door contour.

NOTE: The ermergency control handle remains in ”DISARMED” position.

PASSENGER/CREW DOOR (INSIDE)



INDICTAION LIGHTS

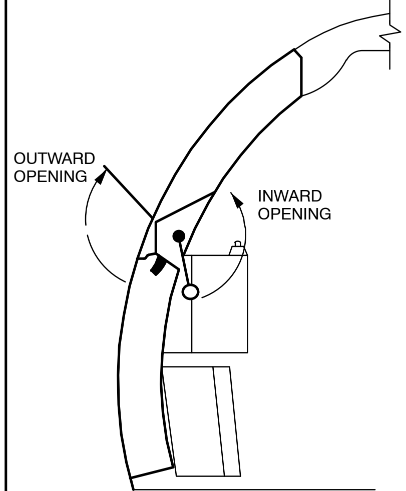


ILLUMINATES IF INNER CONTROLHANDLE IS OPERATED WHEN SLIDE IS ARMED
THE SLIDE ARMED INDICATION APPEARS IN BLACK.

FLASHES WHEN ONE OR BOTH ENGINES STOPPED DEPENDING ON SB STATUS. THE SLIDES ARE DISARMED AND THE CABIN DIFFERENTIAL PRESSURE IS ABOVE 2.5 mb (or hPa).

THE LIGHT IS ALSO VISIBLE FROM OUTSIDE THROUGH THE WINDOW.

OPENING INSIDE/OUTSIDE



EMERGENCY CONTROL HANDLE

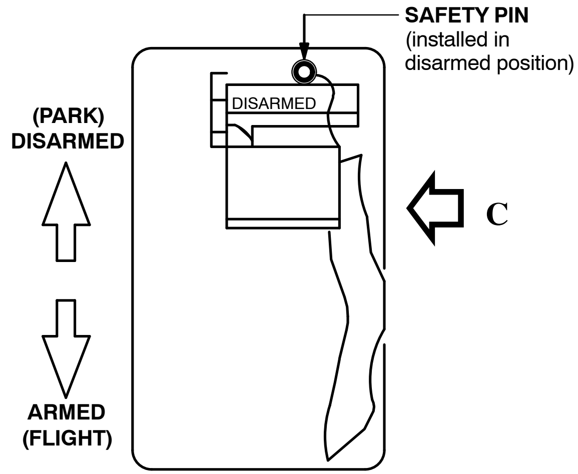


Figure 24 Passenger/Crew Door Operation

DOOR MECHANISM COMPONENT DESCRIPTION

DESCRIPTION

Two mechanism inside the door structure controls the locking of the door and the evacuation system.

Door Locking Mechanism

The door is locked by a hook. The hook is connected by a rod and bellcrank to the locking shaft, which is locked in an overcentered position. An arm on the locking shaft forms the visual locking indicator. A spring rod maintains the overcenterd position. In addition, a safety pin is provided to prevent any movement of the door which would result from a double mechanical failure in the locking mechanism and the lifting mechanism.

The lifting lever (lower connection link) lifts the door. The door moves upwards until it clears the stop fittings and then moves outwards.

An adjustable torsion bar spring compensates the weight of the door.

The door inner and outer control handles operates the door locking mechanism The shafts of these handles are coupled so that the outer control handle does not move when the door is lifted with inner control handle.

A lowering shaft acts via a rod on a locking hook and locks the gearbox with the door open. It is not possible to lower the door when it is in the open position out of its frame.

Door Indication (Electrical)

Two proximity sensors are installed for door open/closed indication. One proximity sensor is installed in the door frame, and is checking the position of the locking hook. An other proximity sensor is installed in the door, and is checking the position of the lockshaft. Both are necessary for door indication on ECAM/DOOR PAGE, where the door symbol apears in “GREEN“ and for door warning.

Emergency Escape Slide Release Mechanism

The emergency escape slide is installed on the bottom of the door. The slide is fastened to a girt bar. This girt bar can be locked by means of levers and fittings.

- Either to the fuselage in the emergency **(ARMED)** mode or
- to the door in the normal **(DISARMED)** mode.

The girt bar is moved via a push pull cable.

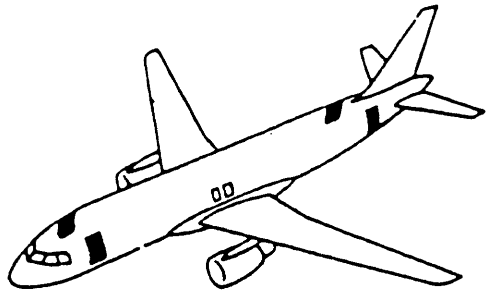
As well a lever is moved under the percussion lever of the damper/emergency cylinder in position “ARMED“.

When the outer control handle is operated, the release mechanism of the emergency escape slide returns to “DISARMED“ position first.

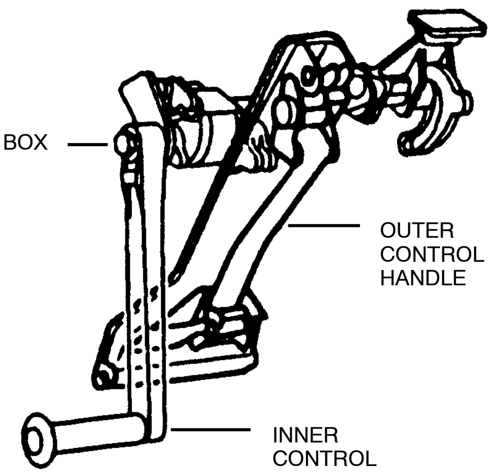
A locking unit, connected to the locking shaft, locks the emergency escape slide release mechanism in the disarmed position when the door is not fully closed and locked.

A visual indicator, installed at the forward end of the girt bar, used to see if the girt bar is attached to the floor. The indicator can be checked through a escape cover window (old version), the actual version has a floor mark.

One proximity sensor is installed in the door to check the armed/disarmed position. In armed position it is the white word “SLIDE“ indicated on ECAM/DOOR PAGE.



Gear Box



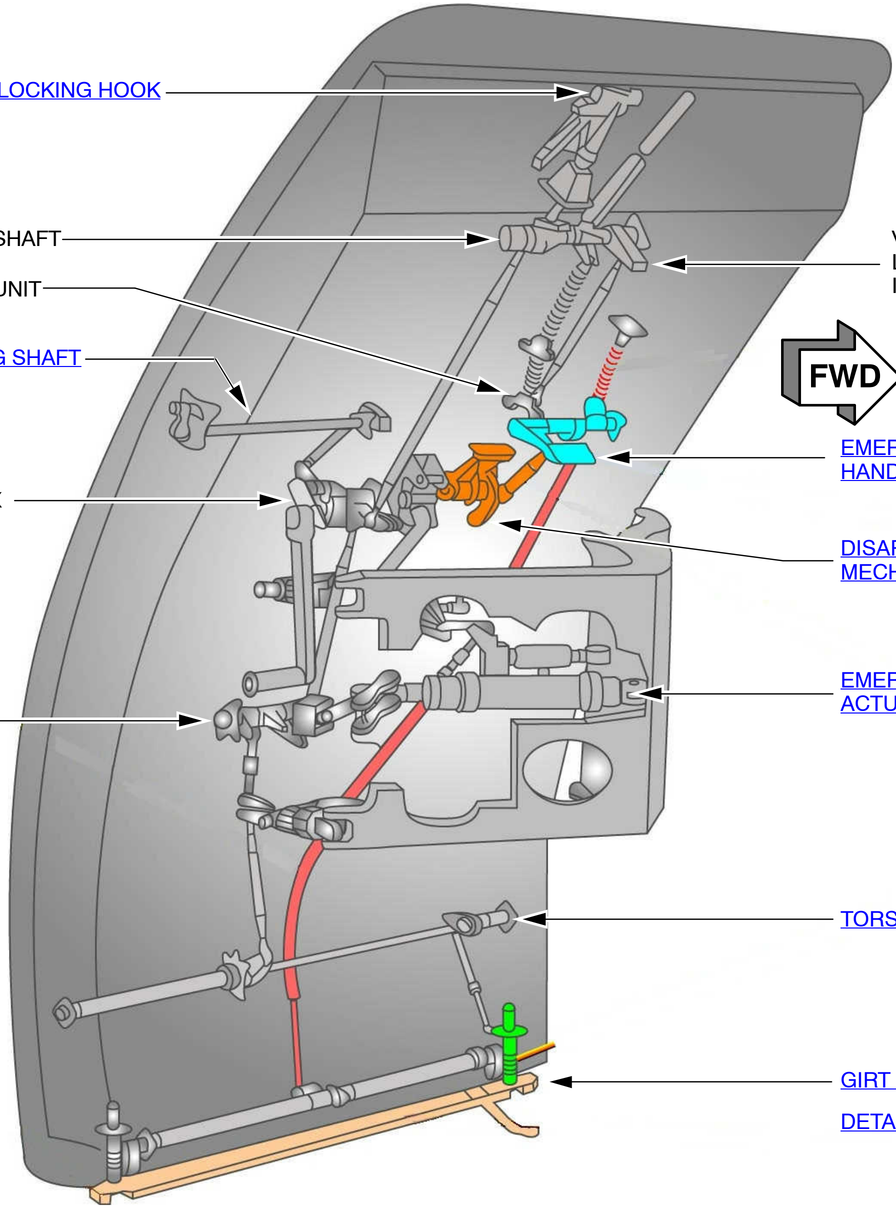


Figure 25 Control Mechanism Passenger/Crew Doors

DOOR SUSPENSION

Description and Operation

When the door is in the up position it moves outwards parallel to the fuselage. The door is supported by a support arm and maintained parallel to the fuselage by guide arms.

The door is attached to the support arm by means of upper and lower connecting links. The lower connecting link is the lifting lever.

A gust lock mechanism, installed in the support arm, locks the door in the fully open position.

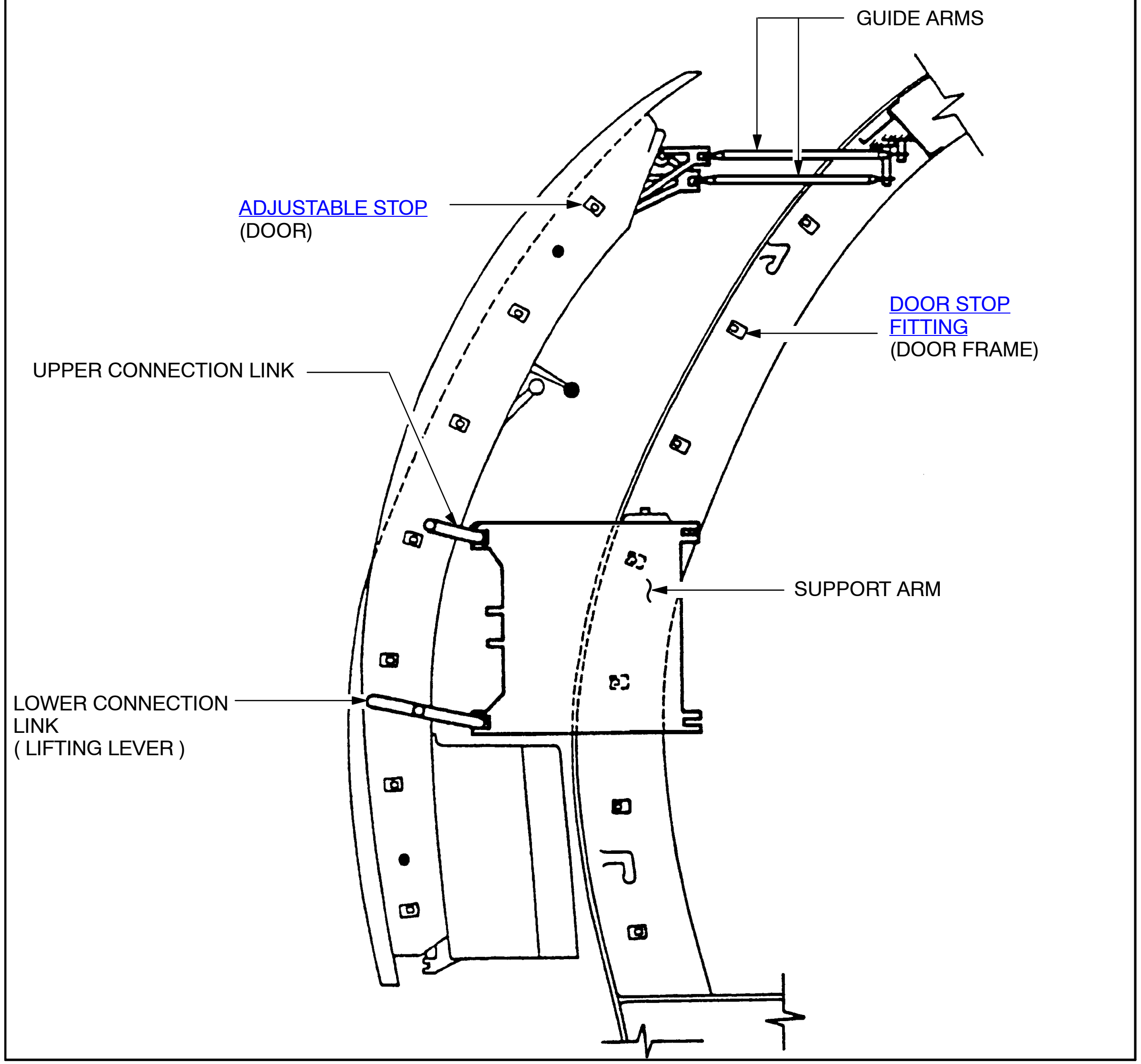
Door Stops Description

14 adjustable door stop fittings and their corresponding fittings on the fuselage frame, transfer the loads resulting from cabin pressure to the aircraft structure.

Door Seal

The door seal is one assy and installed around the door panel. It is blowen up by cabin pressure.

DOOR SUSPENSION



DOOR STOP (TYPICAL)

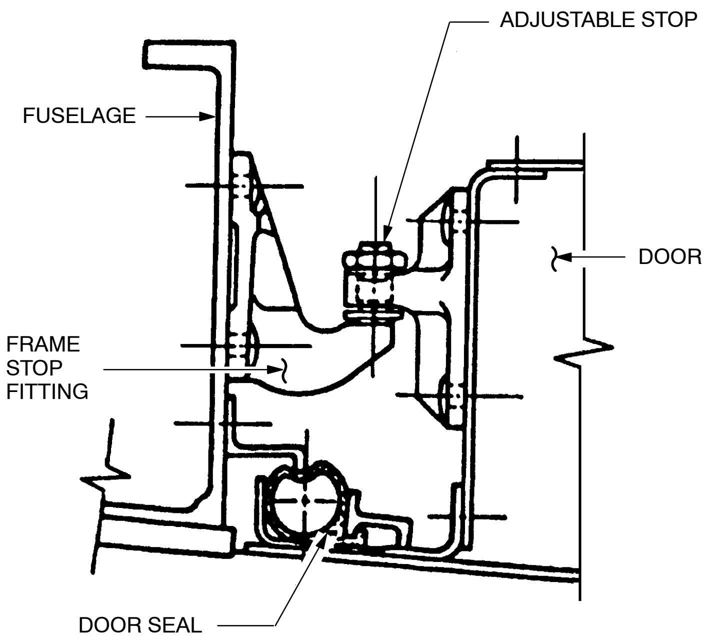


Figure 26 Door Suspension

DAMPER ACTUATOR/EMERGENCY CYLINDER DESCRIPTION

Description And Operation

The damper and emergency cylinder, installed on the support arm, damps door movement during opening/closing especially under abnormal conditions (heavy wind loads). Damping is effected by hydraulic fluid flowing from one chamber to an another chamber within the actuator through a restrictor.

The damper and emergency cylinder is also an emergency actuator and assists the opening of the door in an emergency condition (emergency control lever in ARMED position). This is effected by a chargeable gas cylinder. The gas which operates the actuator (cylinder) is released when the door moves upward, cause the pivoting stop lever to actuate the gas release lever (percussion mechanism), if the slide release system is armed.

The nitrogen bottle (cylinder) is filled with 120 bar (1.750 psig). This pressure can be checked on a pressure gage and can be refilled if necassary.

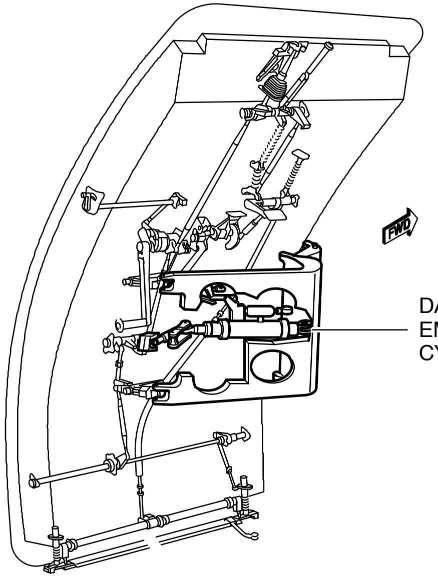
In case of emergency the door will be opened in 2 to 3 sec.

NOTE: After an emergency operation it is madatory to change the diaphragm, recharge the nitrogen and replace the shear pin.

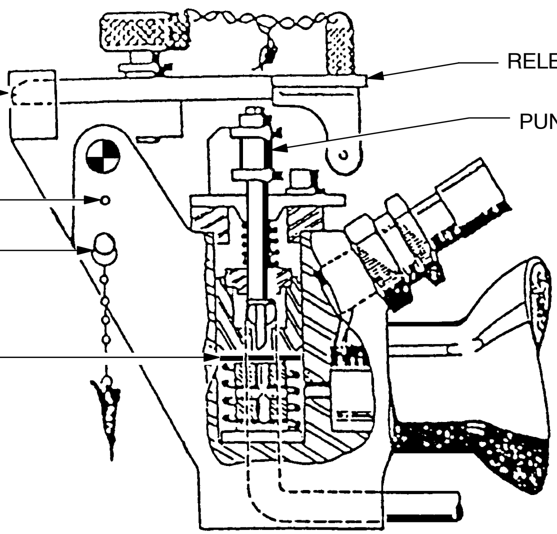
Please observe all debris of the diaphragm must be removed. The damping function is automatic at the end of the door travel (door open). It is possible to close the door again after a complete emergency opening. Due to maintenance reasons a safety pin has to be installed to avoid an uncontrolled system activation.

WARNING: THE SAFETY PIN MUST BE INSTALLED TO AVOID AN UNCONTROLLED ACTIVATION OF THE PERCUSSION SYSTEM. THE RELEASE LEVER MUST BE IN MAINTENANCE POSITION.

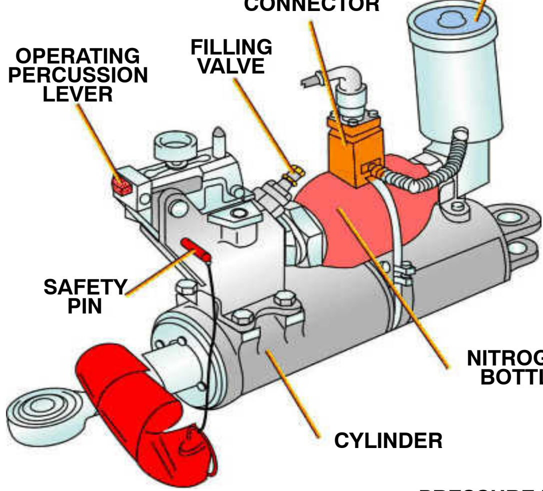
OPTIONALLY THE NITROGEN PRESSURE FROM DAMPER/ACTUATOR SYSTEM AND OF ESCAPE SLIDE INFLATION RESERVOIR CAN BE CHECKED AT THE CIDS (CABIN INTERCOMMUNICATION DATA SYSTEM).



Percussion Mechanism



Damper/Actuator



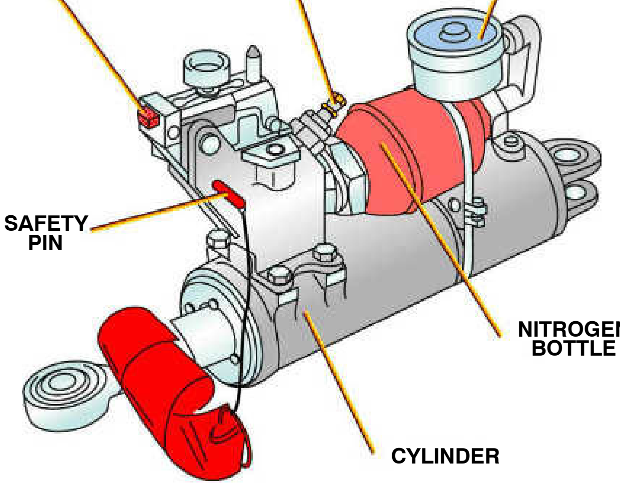


Figure 27 Damper Actuator / Emergency Cylinder

EMERGENCY ESCAPE SLIDE RELEASE MECHANISM

Description and Operation

The emergency escape slide is installed on the bottom of the door. The slide is fastened to a girt bar. This girt bar can be locked by means of levers and fittings.

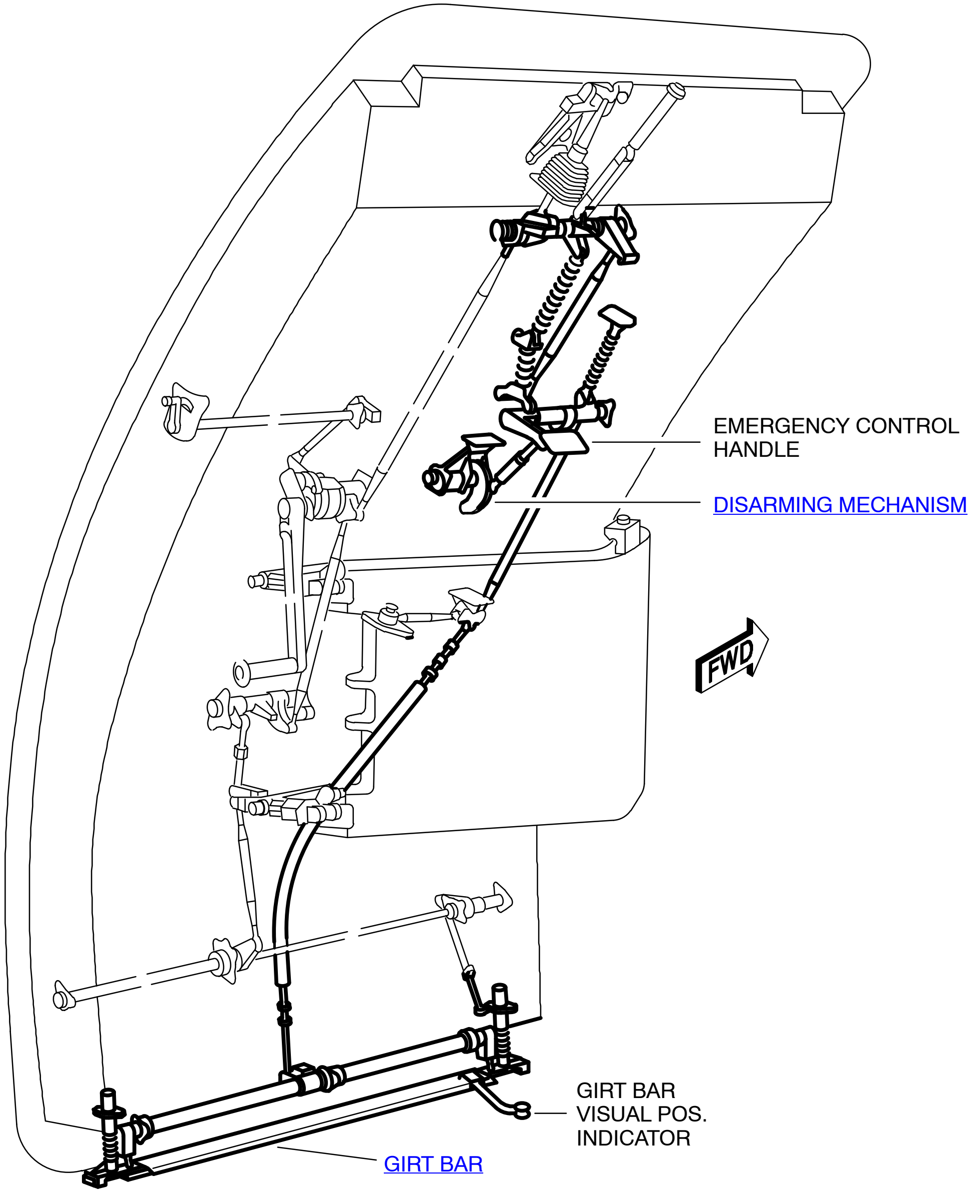
- Either to the fuselage in the emergency **(ARMED)** mode or
- to the door in the normal **(DISARMED)** mode.

The girt bar is moved via a push pull cable.

When the outer control handle is operated, the release mechanism of the emergency escape slide returns to DISARMED position first. A lever is moved under the percussion lever of the damper/emergency cylinder in position “ARMED“. A locking unit, connected to the locking shaft, locks the emergency escape slide release mechanism in disarmed position when the door is not fully closed and locked.

Indication

A visual indicator, installed at the forward end of the girt bar, is used to see that the girt bar is attached to the floor. The indicator can be checked on older versions through a escape cover window, newer versions have a floor mark.
The emergency control handle in ”ARMED” position a proximity switch is activated for the ECAM SYSTEM, where **SLIDE** in white appears on the door page.



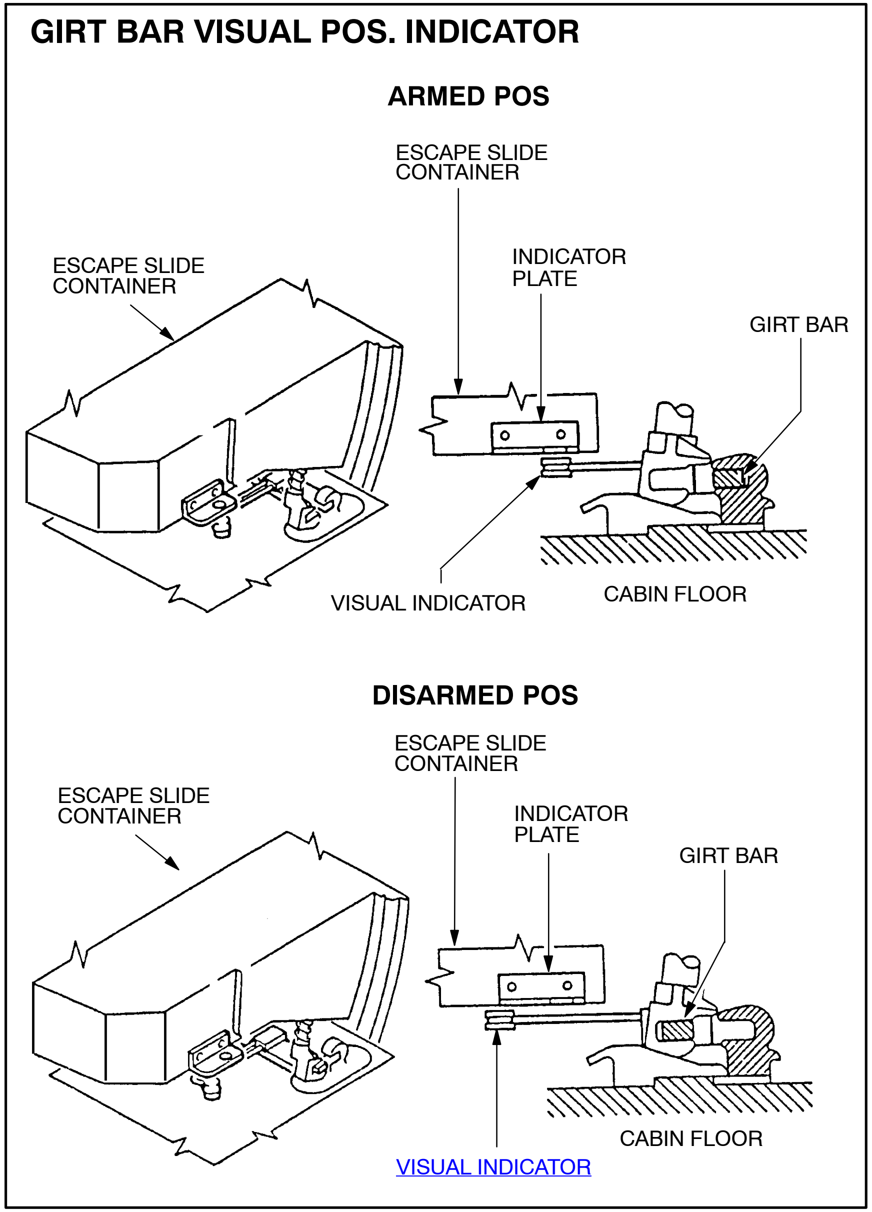


Figure 28 Emergency Slide Release Mechanism

52–20 EMERGENCY EXIT

EMERGENCY EXITS INTRODUCTION

GENERAL

The A318 and A319 have two overwing emergency exits (one on each side). The A319 can also have four overwing emergency exits optionally (two on each side).

The A320 has four overwing emergency exits (two on each side).

The A321 aircraft has four emergency exits doors (two on each side) located forward and aft of the wing.

On the A318, A319 and A320 aircraft, for emergency evacuation the exit can be opened from inside or outside the cabin to activate the evacuation system.

For normal operation, they are always armed.

To open the exit for maintenance work, authorized personnel must disarm it from inside the cabin.

The A321 exit can be opened from inside or outside.

These emergency exits are armed in flight but disarmed on ground.

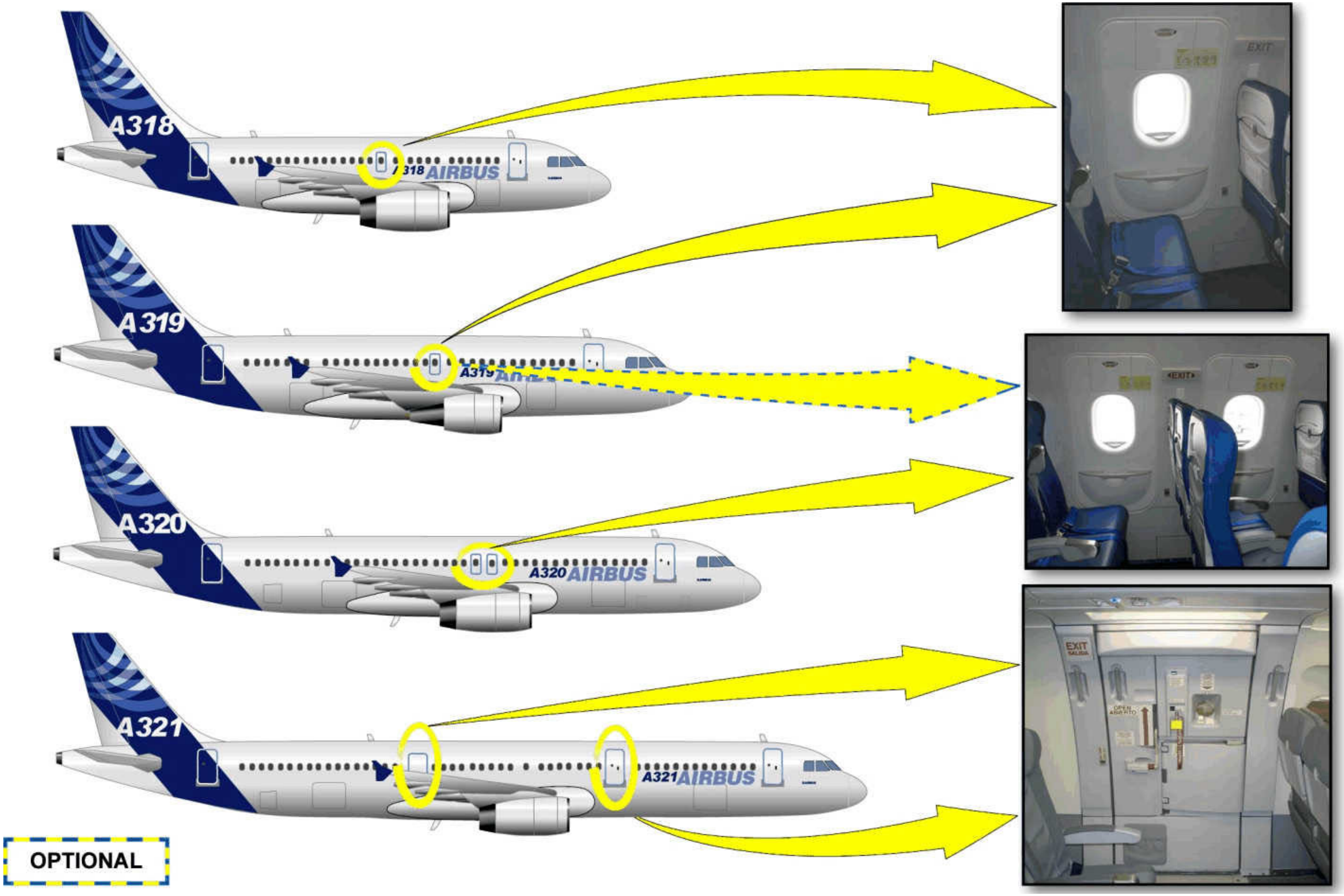


Figure 29 A320 Family Emergency Exits

EMERGENCY EXITS

In case of emergency to evacuate the passengers and crews, the cabin attendants can unlock the two FWD and AFT Passenger/Crew Doors manually.

The Passenger/Crew Doors open pneumatically. This operation releases and inflates the related escape slide on each door automatically.

Additional there are:

- **A318/A319** 2 overwing emergency exit hatches, one on each side.
- **A320** 4 overwing emergency exit hatches, two on each side.
- **A321** 4 additional Passenger Crew/Emergency Doors.

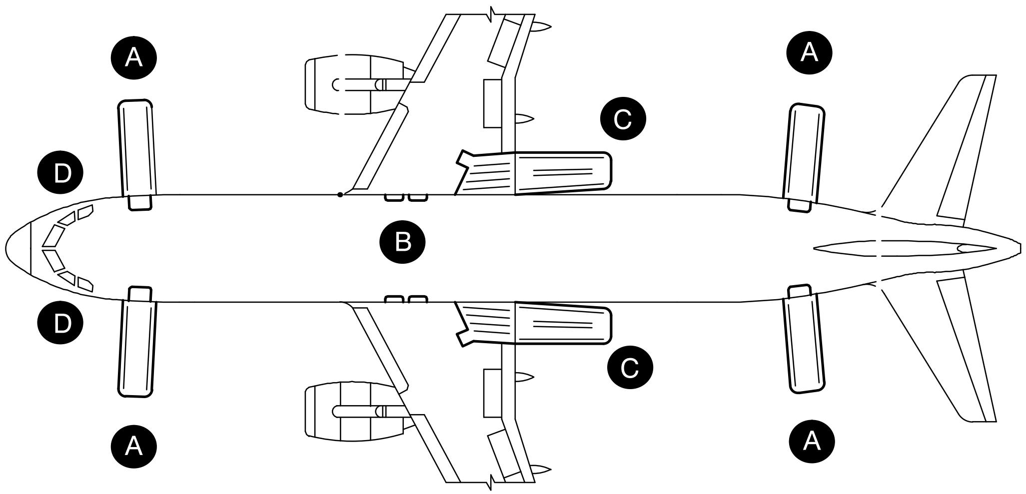
In the cockpit there are two sliding windows as emergency exits for the cockpit crew.

NOTE: Opionally the A319 is equipped with 4 overwing emergency exit hatches, two on each side.

A318/A319/320 SHOWN (FOR A321 SEE PAX/CREW DOORS)

ESCAPE SLIDE ARRANGEMENT

- **A** 32“ x 73“ EXIT WITH SINGLE LANE SLIDE or SLIDE RAFT
- **B** TYPE III OVERWING EXITS 20“ x 40“
- **C** DOUBLE LANE SLIDE
- **D** SLIDING WINDOW



DOUBLE LANE OFFWING SLIDE (TYPICAL)

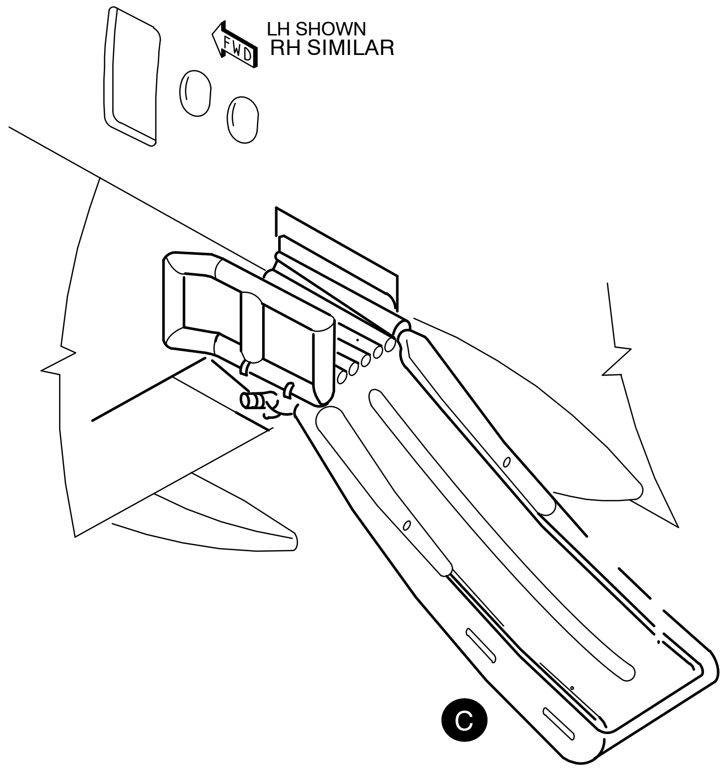


Figure 30 A318/A319/A320 Emergency Hatches

EMERGENCY EXIT HATCHES A318/A319/A320 DESCRIPTION

DESCRIPTION

Passengers/Crew can open the overwing emergency exit hatches manually. This operation releases and inflates the related off–wing escape slides in the wing to fuselage fairing. The emergency exit hatches are also of plug type construction. All exits have the same construction and function beside of left hand or right hand installation. They can be opened from in–and outside.

In a fuselage compartment close to the wing trailing edge, two double row escape slides are installed to give a way for passenger standing on the wing.

The escape slide will be activated on that fuselage side where the first exit hatch been opened.

It exists a mechanical connection between the emergency exit hatches and the release mechanism of the escape slides. The system is normaly in armed position.

In every emergency exit fuselage frame a red manual inflation handle can be used to release and inflate the escape slide, when the auto activation has refused. Access to the red handle is possible when the exit hatch is removed.

Removal Of The Emergency Exit Hatch From The Inside In “ARMED“ Mode

To get access to the hatch control handle, pull down the cover flap from the recess. When the cover flap is removed, a proximity switch is operated and gives two different warning signals.

One signal is sent to the ECAM system (Door indication and master caution light).

The other signal is sent to a visual warning in the cabin, to inform the attendants that one of the emergency exit hatches is not correctly closed.

Pull the hatch control handle down by means of the pull lever and hold the emergency exit hatch in position. This causes the spring–loaded linkage to fall down and engage the special bolt of the hatch control handle to block it.

Because of the shape of the emergency exit hatch, it will fall into the cabin if you do not hold it.

Carefully let the top of the hatch fall to the inner side so that it comes clear of the structure.

Take the lower handle of the lining with your free hand and pull the emergency exit hatch from the recess. The hook brackets disengage from their pivot fittings. Lift the emergency exit hatch and pull it away from the opening.

The release lever operates the slide release mechanism which inflates the emergency escape slide.

Removal Of The Emergency Exit Hatch From The Outside In “ARMED“ Mode

Push the flush panel of the hatch control handle to the inside of the handle frame.

This operation moves the handle down and releases the locking hooks. The handle moves the main cover flap to the open position.

Because of the shape of the emergency exit hatch, it falls into the cabin when the flush panel is pushed.

Push the emergency exit hatch away from the opening into the cabin.

The release lever operates the slide release mechanism which inflates the emergency escape slide.

Emergency Exit Hatches A318/319/320

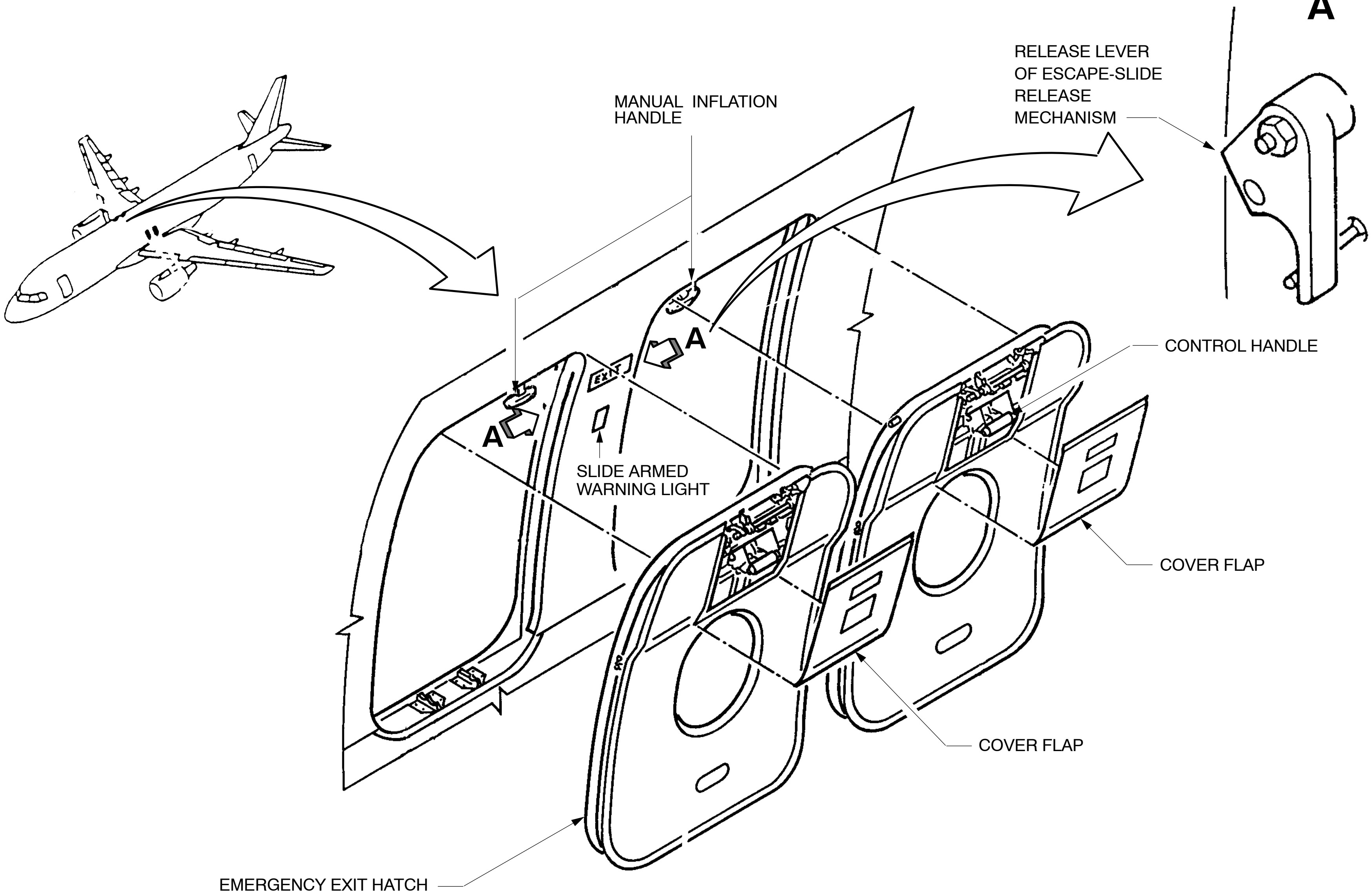


Figure 31 A318/A319/A320 Emergency Exit Hatches

LOCKING MECHANISM OF EXIT HATCHES

Description

The essential parts of the locking mechanism are:

- the locking shaft unit and
- the hatch control handle.

These parts are installed in the upper part of the exit hatch. The locking shaft unit includes the locking shaft with two locking hooks.

These hooks locks the exit hatch on to roller fittings in the exit hatch frame. A rod connects the control handle with the locking shaft unit.

Two safety springs keeps the control handle in up position (locked). After opening of the hatch a back lock lever keeps the handle in lower position.

The hatch control handle exists of pull lever and flush panel. If the handle pull lever moves downwards, the flush panel remains. If the flush panel is operated, the handle pull lever moves donwards and the locking shaft turns

Indication And Control Of The Release Mechanism

ARMED and DISARMED position of every latch pin are monitored by an proximity switch and displayed on ECAM. If the latch pin is retracted, the proximity switch sends a signal to the ECAM.

To prevent accidental operation of the hatch locking mechanism, the release warning system gives two different warning signals. One signal is sent to the ECAM system and the other gives a visual warning in the cabin

Removal Of The Emergency Exit Hatch From The Inside In “MAINTENANCE“ Mode

CAUTION: ONLY IF THE LATCH PIN IS IN DISARMED POSITION, THE EXIT HATCH CAN BE OPENED SAFELY WITHOUT RELEASING AND INFLATE THE ESCAPE SLIDE. MAKE CERTAIN BEFORE OPENING OF THE EMEGENCY HATCH, THAT THE SAFETY PIN OF THE INFLATION RESERVOIR IS INSTALLED. (AFT CARGO COMPARTMENT)

For the maintenance procedure only, open the cover flap to get access to the head of the latch pin. To release the latch pin, turn it a quarter turn counterclockwise. The spring of the latch pin extends and causes the latch pin to retract to the DISARMED position.

Pull the lever of the hatch control handle down and hold the emergency exit in position. This causes the spring–loaded back lock lever to fall down and engage the special bolt of the pull lever and blocks it.

The operation of the hatch control handle pull lever disengages the locking hooks from the upper roller fittings. Because of the shape of the emergency exit hatch, it will fall into the cabin if you do not hold it.

Carefully let the top of the hatch fall to the inner side so that it comes clear of the structure. When the emergency exit hatch moves inboard, the latch pin goes free of the escape slide mechanism release lever.

Take the lower handle of the lining with your free hand and pull the emergency exit hatch from the recess. The hook brackets disengage from their pivot fittings.

Lift the emergency exit hatch and pull it away from the opening.

For safety, install a rigging pin in the provision of the hatch frame. This prevents an accidental operation of the escape slide.

Installation Of The Emergency Exit Hatch

Make sure that the latch pin of the slide release mechanism is in the DISARMED position. If installed, remove the rigging pin from the hatch frame.

Take the emergency exit hatch and set it with the hook brackets on their pivot fitting. Push the bottom of the hatch into the opening so that the hook brackets engage in the pivot fitting.

Make sure that the lip of the hatch seal is not caught in the pivot fitting. Push the top of the hatch into the opening so that the stop profiles touch the hatch frame.

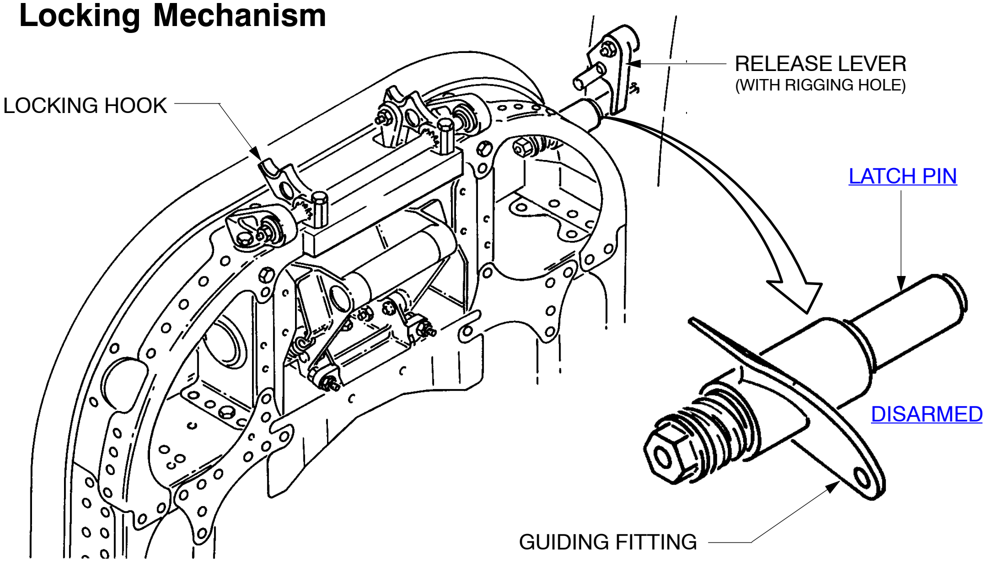
Hold the emergency exit hatch in this position until it is correctly locked. Lift the spring–loaded back lock lever to release the blockage of the pull lever. Then push the pull lever up until it is above the overcenter position.

This operation turns the locking shaft unit and the locking hooks engage in the upper roller fittings. Make sure that the emergency exit hatch is in the correct position and correctly locked.

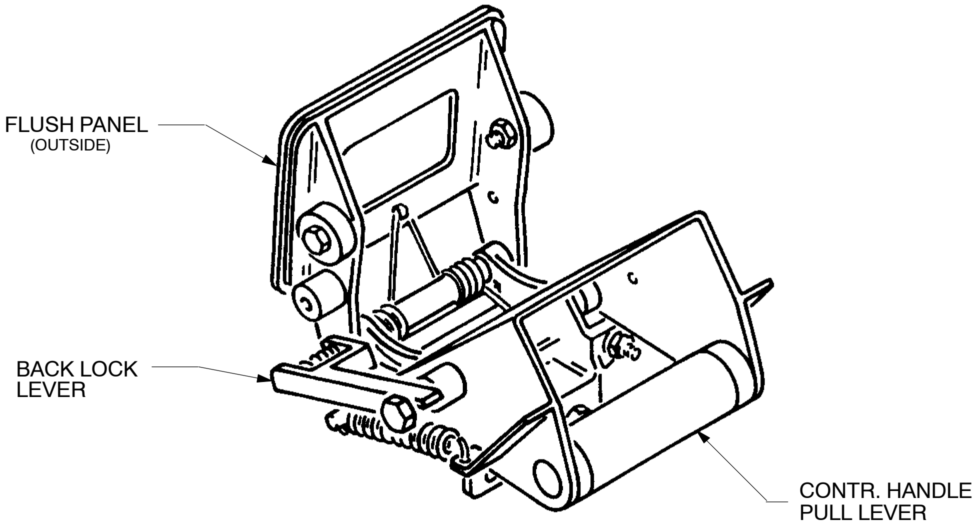
Lock the latch pin of the slide release mechanism in ARMED position (the related SLIDE ARMED light comes on).Install the cover flap of the latch control handle (the SLIDE ARMED light goes off)

Remove the safety pin from the Inflation Reservoir and close the Reservoir access panel.

Locking Mechanism



Hatch Control Handle



Inflation Reservoir (AFT Cargo Compartment)

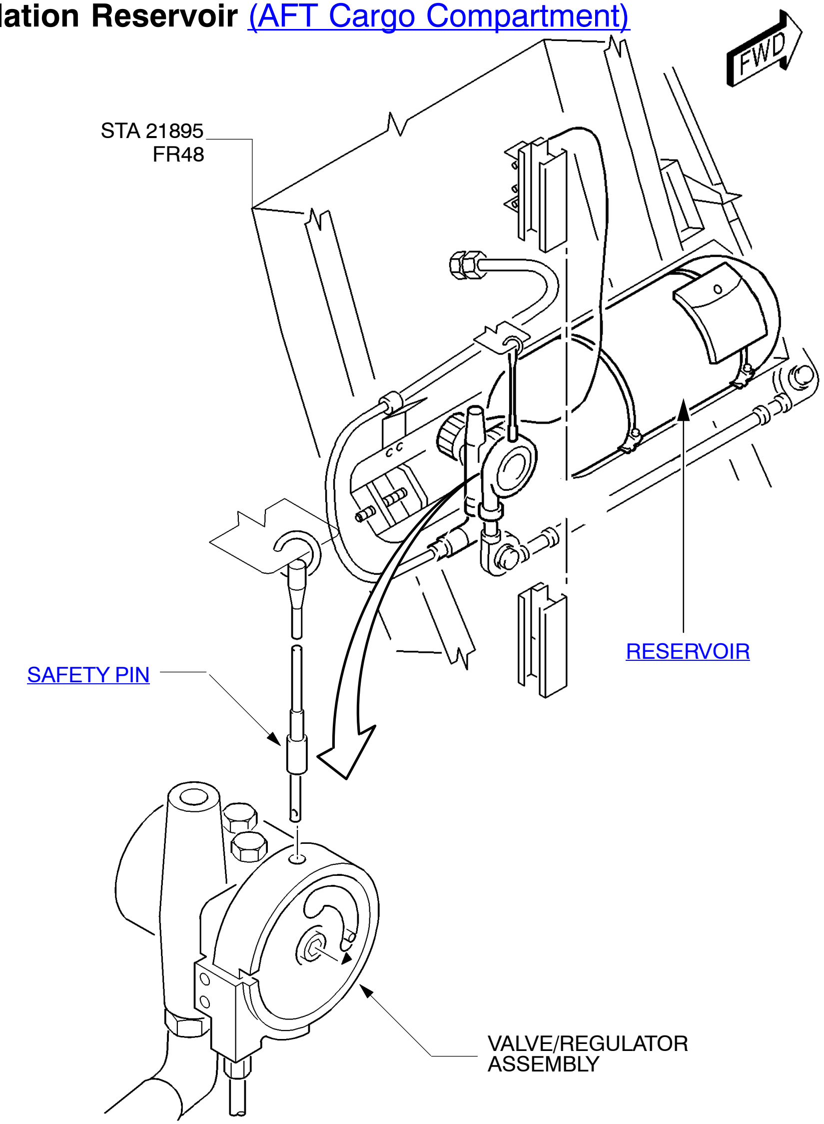
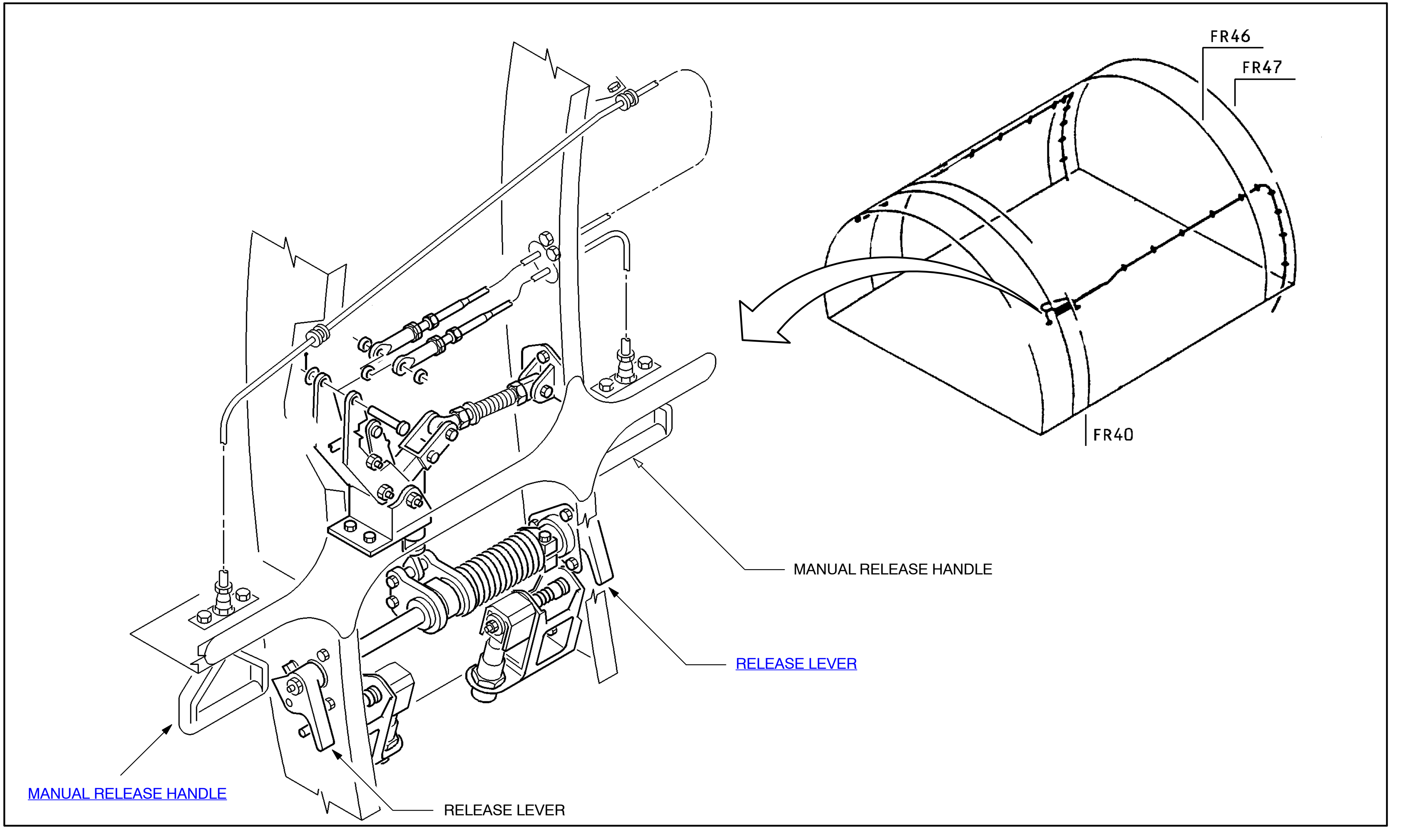
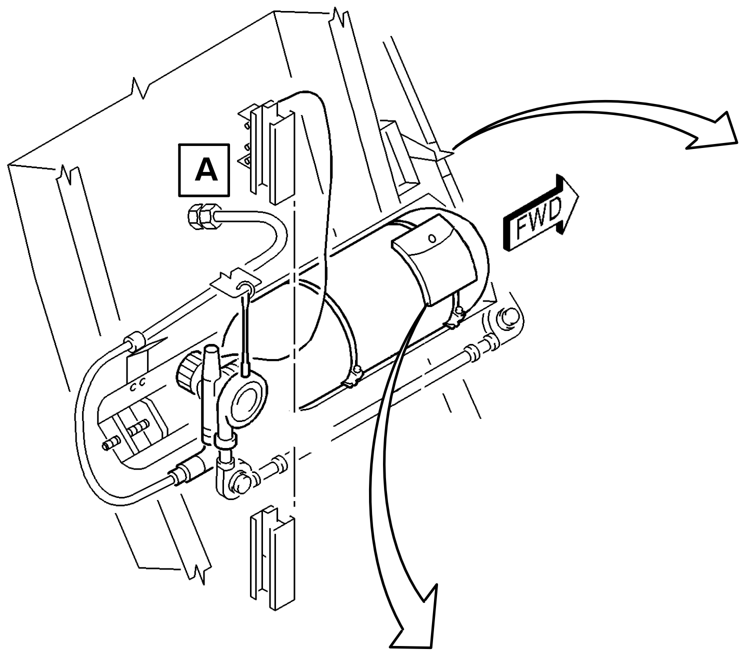


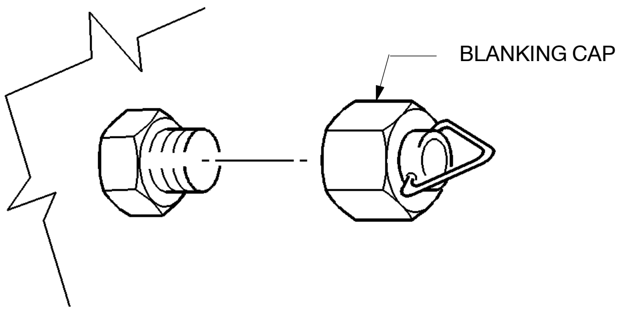
Figure 32 A318/A319/A320 Emergency Exit Hatches

SLIDE RELEASE MECHANISM





A **Inflation Reservoir Connection**



Test Tool/Flexible Control Cable

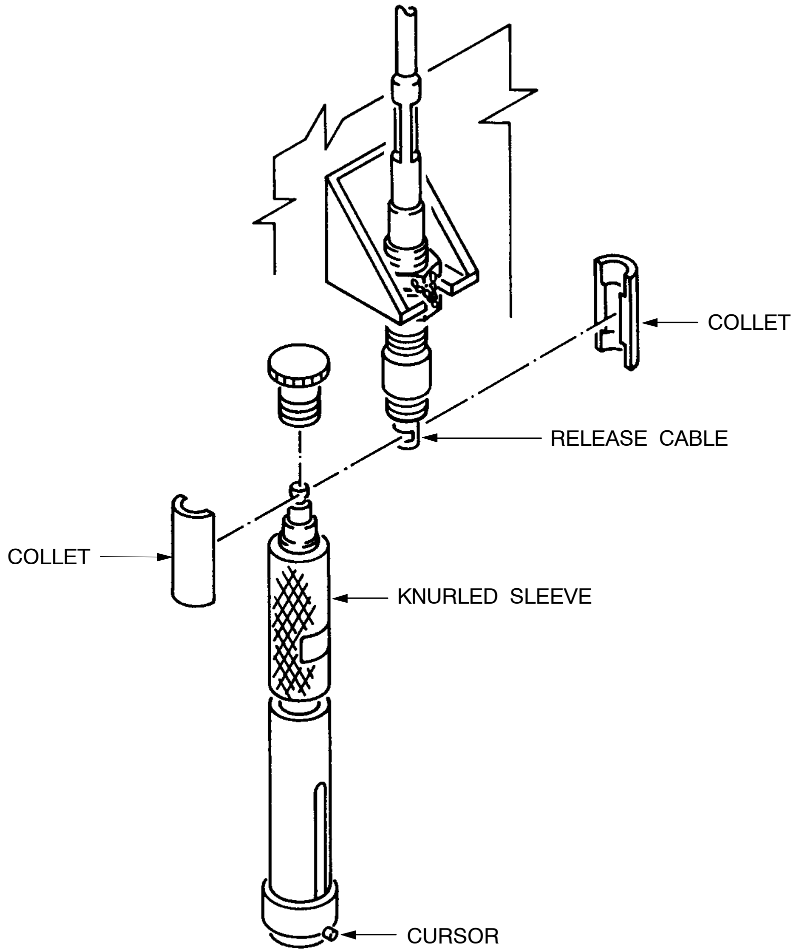


Figure 33 A318/A319/A320 Flexible Control Cable Test Tool

EMERGENCY EXIT DOORS A321 DESCRIPTION

Description

The aircraft ist provided with four type 1 emergency exit doors, two on the left side and two on the right side of the fuselage. The forward left door is higher than the other ones, and can be used as passenger door.

The doors are of the fail safe plug type construction. During the unlock phase the doors move lightly inwards then upwards, they open outwards and move forwards parallel to the fuselage.

The closed door locking mechanism is controlled either with inner or outer control handle. In open position a door stay mechanism latches the door for safety reason.

All emergency exit doors include an evacuation system. Which consists of a slide equipment and a releas mechanism. All this evacuation equipment is not installed on the door. See ATA 25.

The escape slide is controlled by an emergency control handle on the inner side. When the door is opened from the outside the escape slide release mechanism is disarmed automatically.

The door seal, installed on the inner side of the door outer skin, will be inflated by cabin air pressure to form a pressure tight seal to the fuselage when the door is closed and the cabin is pressurized.

Two proximity switches observe the emergency exit door position and on ECAM the position can be checked. One proximity switch observe the emergency control handle position and on ECAM the position can be checked.

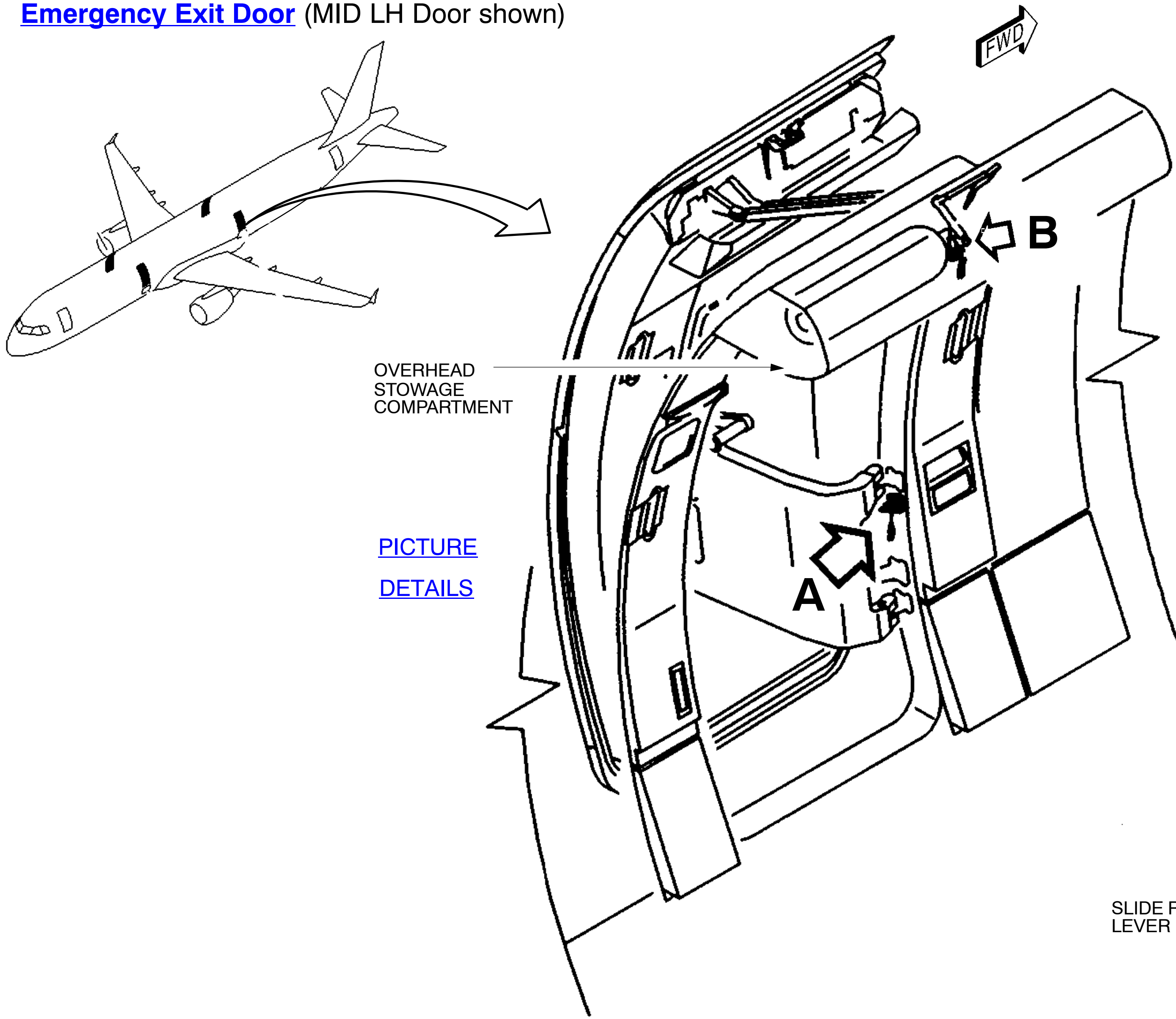
The forward left emergency exit door Z833 (referred to as 73” door) has the subsequent technical data:

- Size: 1854 x 762 mm (73.0 x 30.0 in.)
- Weight (without lining): 80.0 kg (176.4 lb)

The technical data of all other emergency exit doors (referred to as 60” door) are as follows:

- Size: 1524 x 762 mm (60.0 x 30.0 in.)
- Weight (without lining): 68.0 kg (150.0 lb)

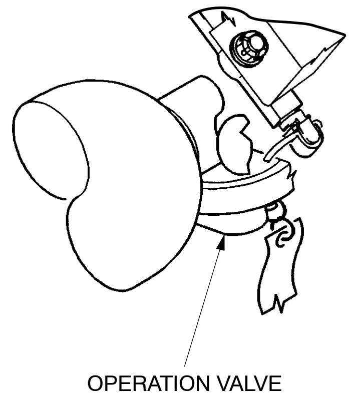
Emergency Exit Door (MID LH Door shown)



PICTURE

DETAILS

B INFLATION RESERVOIR



A SLIDE RELEASE MECHANISM

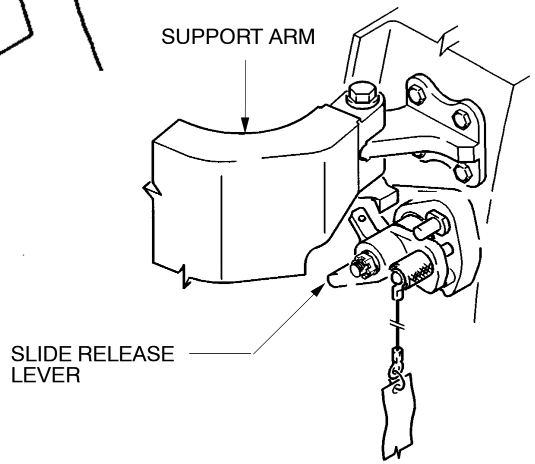


Figure 34 A321 Emergency Exit Doors

52-30 CARGO

CARGO DOORS INTRODUCTION

A320/A321 Description

There are three cargo compartment doors on the right side of the lower fuselage. They are referred to as FWD, AFT and BULK cargo compartment doors and give access to the related cargo compartment.

The FWD and AFT cargo compartment doors are equivalent but they are not interchangeable because of different electrical designations. They have a manual locking mechanism and open hydraulically away from the aircraft. It is only possible to open or close the FWD and AFT cargo compartment doors from the outer side.

The bulk cargo-compartment door also has a manual locking mechanism. It opens manually into the bulk cargo compartment and upwards. It is possible to open or close it from inside and outside. This door is optional.

A319 Description

There are two cargo compartment doors on the right side of the lower fuselage. They are referred to as FWD and AFT cargo compartment doors and give access to the related cargo compartment.

The FWD and AFT cargo compartment doors are equivalent but they are not interchangeable because of different structural design. They have a manual locking mechanism and open hydraulically away from the aircraft. It is only possible to open or close the FWD and AFT cargo compartment doors from the outer side.

FWD Cargo Compartment Door (Zone 825)

The FWD cargo compartment door is installed on the right side of the lower fuselage between FR24A and FR28. For more details refer to the subsequent chapters:

- FWD cargo comparment door,
- Electrical door control system,
- Door hydraulic system

The FWD cargo compartment door is made of sheet metal and machined parts. It is torsion resistant and safe to operate at wind speeds up to 60 knots. A manually operated locking mechanism is installed internally to keep the FWD cargo compartment door in the closed position.

The electrical door control system starts the electric pump of the yellow hydraulic system which pressurizes the door hydraulic system. The door hydraulic system operates the duplex door actuators to open or close the FWD cargo compartment door. If there is an electrical failure, it is possible to operate the FWD cargo compartment door with the handpump. The pressurization of the door hydraulic system does not occur when the locking mechanism is in the locked condition.

If the FWD cargo compartment door is not correctly closed, an electrical circuit sends a signal to the door warning system. This signal is send to the ECAM (Electronic Centralized Aircraft Monitoring) system and the MASTER CAUTION lights in the cockpit come on.

AFT Cargo Compartment Door (Zone 826)

The AFT cargo compartment door is installed on the right side of the lower fuselage between FR52A and FR56. For more details refer to the subsequent chapters:

- AFT cargo comparment Door
- Electrical door control system
- Door hydraulic system

The AFT cargo compartment door is almost the same as the FWD cargo compartment door.

BULK Cargo Compartment Door A320/A321 only (Zone 827)

The BULK cargo compartment door is installed on the right side of the lower fuselage between FR60 and FR62. For more details refer to the subsequent chapters:

- BULK cargo comparment door

The BULK cargo compartment door is a plug type door which is made of aluminum alloy components.

The operation of the control handle releases the locking mechanism of the BULK cargo compartment door. To open or close the BULK cargo compartment door, move it up or down manually.

An electrical circuit sends a signal to the door warning system when the BULK cargo door is not correctly closed. This signal is sent to the ECAM system and the MASTER CAUTION lights in the cockpit come on.

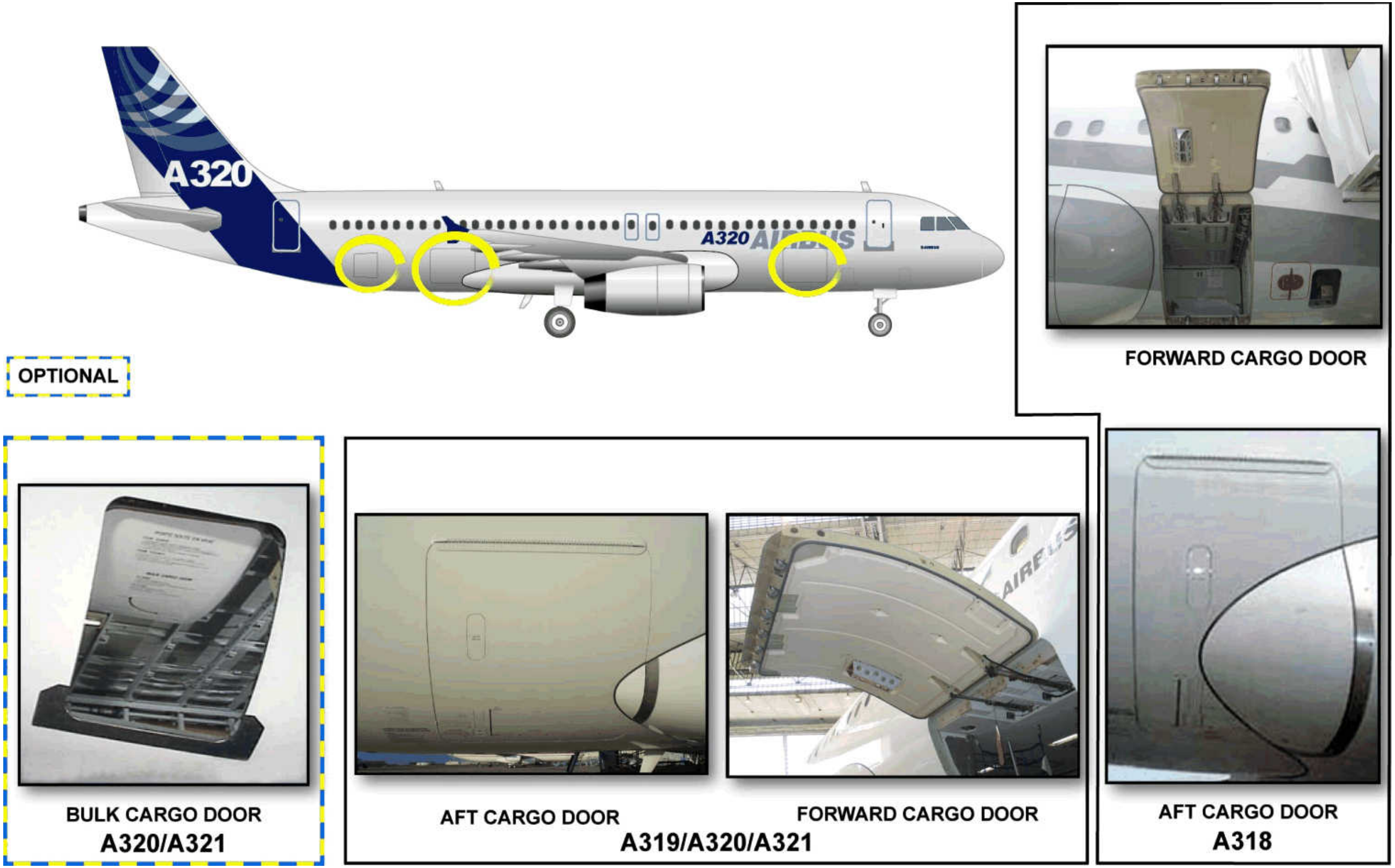


Figure 35 A320 Family Cargo Doors

CARGO COMPARTMENT DOORS PRESENTATION (CONFIG. 1)

Description And Operation

(FWD door described, AFT door is similar)

The FWD cargo compartment door (zone 825) opens hydraulically to the outer side and give access to the FWD cargo compartment. It is possible to operate the cargo door at wind speeds up to 60 knots.

The cargo door has a manually operated locking and safety mechanism which keeps it in the closed position and locks it.

The door to fuselage connection is of piano hinges and 6 locking hooks which transmits the load of the cargo door to the fuselage.

The locking hooks of the manually operated locking mechanism keep each cargo door in the closed position. The cams of the safety mechanism engage with the locking hooks when the cargo doors are correctly locked.

When the cargo doors are locked, the door seal makes the related cargo compartment pressure tight. To balance the difference in pressure on the ground and in the cargo compartments, there is a vent door in each cargo door.

This spring loaded vent door opens inboard and remains in this position until the cargo door is correctly locked.

To show this condition there are indication windows in the access panel of each cargo door. The green mark on each safety cam shows that the safety mechanism safety shaft locks each locking unit in its latched position. The red marks show that the locking units are not locked and satisfactory.

The interlock mechanism blocks the locking mechanism locking-shaft in the unlocked position when the cargo door is not closed. Then the locking handle is not movable and the locking hooks stay in the lifted position.

The door actuators use hydraulic pressure from the door hydraulic system to open and close the cargo doors (yellow hydr. system). They have an internal locking mechanism to keep the cargo doors safely in the fully open position.

The proximity switches of the door warning system (circuit WV) monitor the closed and locked condition of the cargo door. They send a signal via the LGCIU 1 to the ECAM (Electronic Centralized Aircraft Monitoring) system when a cargo door is not locked. Then the master caution lights in the cockpit come on and the data is shown on the DOOR page of the ECAM display.

The external indications which show that a cargo door is not correctly locked and latched are:

- the vent door stays in open position,
- the locking handle stays away from the outer contour of the cargo door,
- the red mark of each safety cam is in view through the indication windows.

The AFT cargo door has one fairing more attached to the outer skin.

Door Structure

The primary structure has vertical and horizontal edge members, fairings, longitudinal beams, frames, and an inner and outer skin. These formed and milled components are made from aluminum alloy and riveted together with a sealant compound to make a corrosion resistant cargo door. The sealant compound between the skin and the edge members makes sure that the primary structure is pressure tight.

To prevent corrosion, all components have a surface protection of chromic acid anodizing plus epoxy primer and a polyurethane top coat.

The lower, milled ends of each door frame have provisions for the installation of the locking and safety mechanism. An access panel covers the lower part of the cargo door.

The outer skin has cutouts for the vent door and for the installation of the three hoisting lugs.

The actuator attachment fitting is attached with screws to the inboard side of the frames FR25A and FR26A.

For the attachment of the door seal, the related retainers are riveted at the edge members around the cargo doors.

On the inner skin there are provisions to attach the fire protection lining with quick release fasteners.

In the corners of the door beams and door frames, there are gaps to drain condensed water. Two drain valves are installed on the lowest beam of the pressure tight structure and drain this water over board. Some drain holes are added in the critical areas of the internal structure which is painted with a water repellent agent.

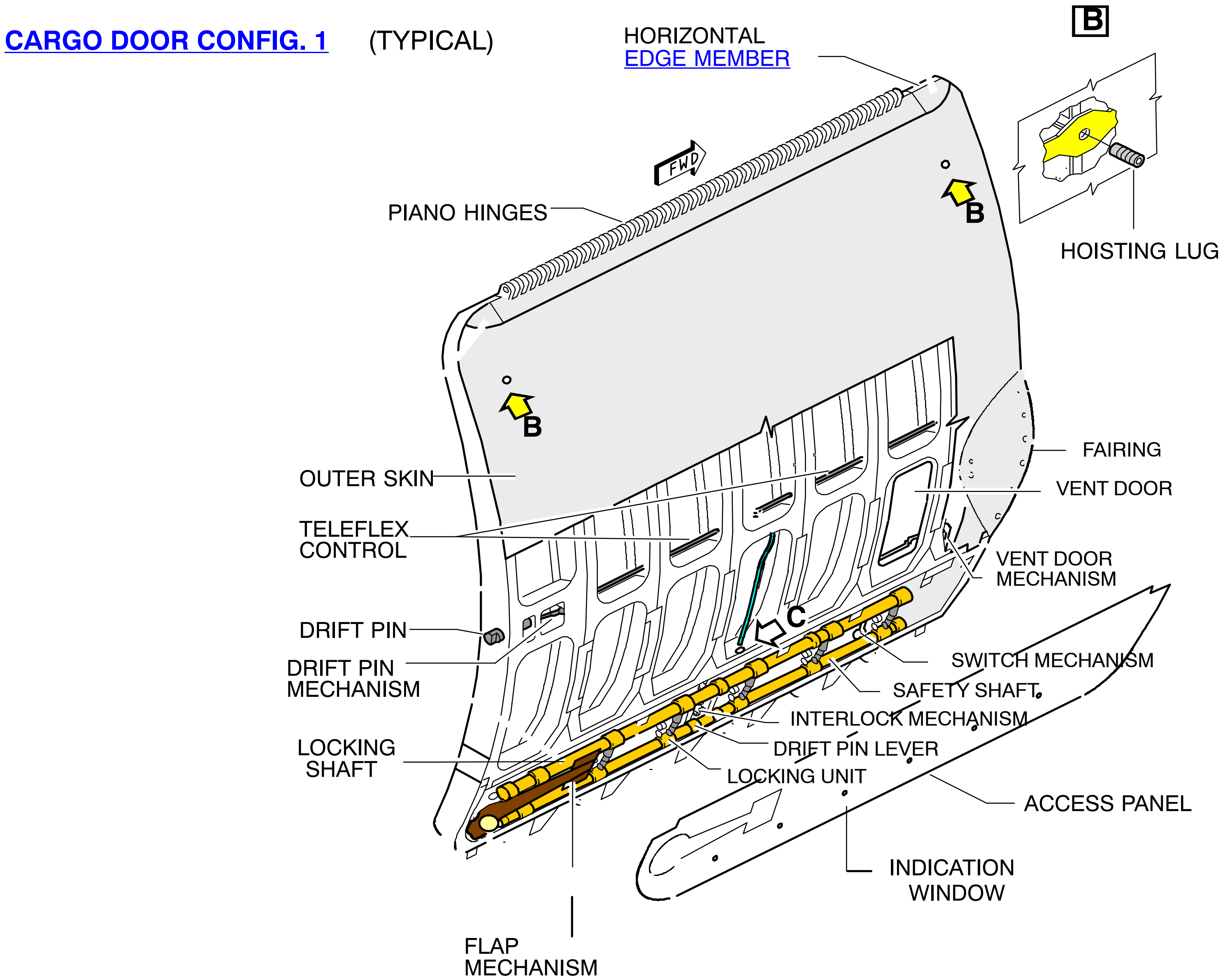


Figure 36 Cargo Doors Config 1

CARGO DOOR FUNCTIONAL OPERATION (CONFIG. 1)

CARGO DOOR MECHANISM

The cargo door mechanism includes the subsequent components:

- the locking handle with flap mechanism,
- the safety mechanism with vent door and related mechanism,
- the drift pin mechanism,
- the locking handle with interlock mechanism.

Locking Handle With Flap Mechanism

The locking handle is installed between FR28 and FR27. To lock the cargo door correctly, the locking handle must be :

- in the horizontal position (LOCKED position),
- in the recess of the handle flap.

Parts of the locking handle are the lever mechanism, the handle bearing and the handle spring. The lever mechanism operates the safety mechanism when the locking handle is pulled from the recess. The special cam (part of the lever mechanism) prevents the inboard movement of the locking handle when it is not in the horizontal position. The limit lever of the lever mechanism stops the travel of the locking lever. The handle bearing operates the locking mechanism when the locking handle is turned to the UNLOCKED position.

The handle spring keeps the lever mechanism in the overcenter position when the locking handle is in the recess. In this position, the target on the end of the locking handle operates the proximity sensor 28WV. The flap mechanism includes the spring-loaded handle flap and the linkage with the related hook.

The inboard movement of the handle flap operates the linkage to disengage the hook from the locking handle. The hook safeties the locking handle when it is pushed in the recess of the handle flap.

Safety Mechanism With Vent Door Mechanism

The safety mechanism is installed parallel to and below the locking mechanism in the lower part of the cargo door. The primary task of this mechanism is to tell the operator that the locking mechanism is correctly latched.

The safety mechanism includes the subsequent components:

- the safety/locking shaft which has a link rod, six safety cams with a red and green mark, two drift pin levers and a vent door lever,
- the vent door mechanism which opens and closes the vent door.

The link rod connects the lever mechanism with the link lever to transmit the move ment of the locking handle to the safety shaft. The safety cams then engage with, or disengage from, the recess of the locking hooks.

The engaged safety cams prevent the operation of the locking hooks. Then, the operator can see the **green** mark on each safety cam through the indication windows of the access panel. When the operator can see a **red** mark in the indication windows, then the safety cams are disengaged from the locking hook.A connection rod transmits the movement of the safety shaft to the drive shaft of the gear box. The output shaft of the gear box operates the drawbar which opens or closes the vent door.

Switch Mechanism

The switch mechanism is installed in the lower part of the cargo doors. This mechanism includes the target lever with the related target and the link assy.

The target lever is attached on the support fitting which is riveted on the frame structure. The upper fork end of the link assy is installed on the lever of the drive shaft and its lower fork end on the target lever. The link assy transmits the movement of the drive shaft to the target lever.The target moves to or away from the proximity sensor which is installed below the door sill of the fuselage.

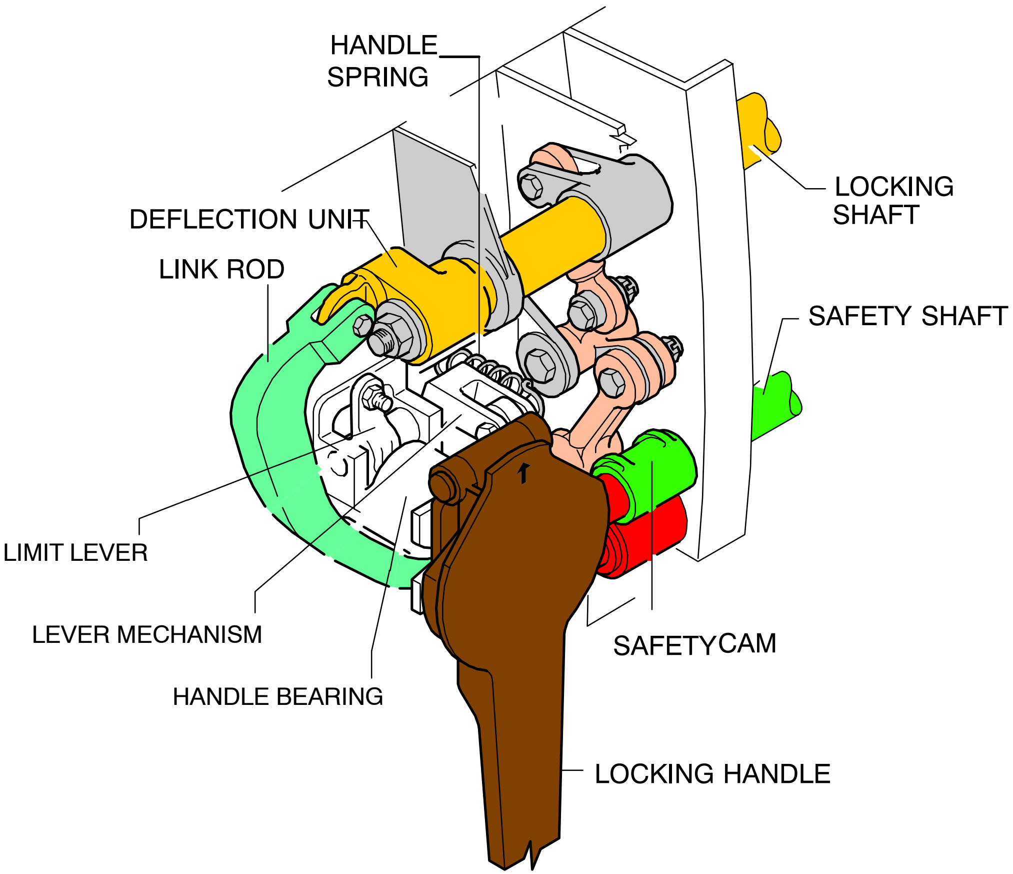
Lining And Insulation (Not Shown)

To protect the cargo door against fire, a door lining is installed on the inner skin with quick-release fasteners and VELCRO tapes. This lining is inthree sections and made of prepreg layers. To protect the cargo door against heat and sound, an insulation mat is attached with VELCRO tapes to each door lining. The mats are made of glass wool and cover material.

Door Seal (Not Shown)

The door seal made of silicone rubber with fabric is a round hose type seal with inflation holes. The door seal is installed in the retainers so that the inflation holes show to the inner side of the cargo compartment. When the cargo door is in the closed position, the door seal comes into contact with the fuselage profile. Due to the higher internal pressure of the cargo compartment during the flight, the door seal is inflated via the inflation holes so that the cargo compartment is sealed air tight.

DOOR LOCKING HANDLE



VENT DOOR MECHANISM

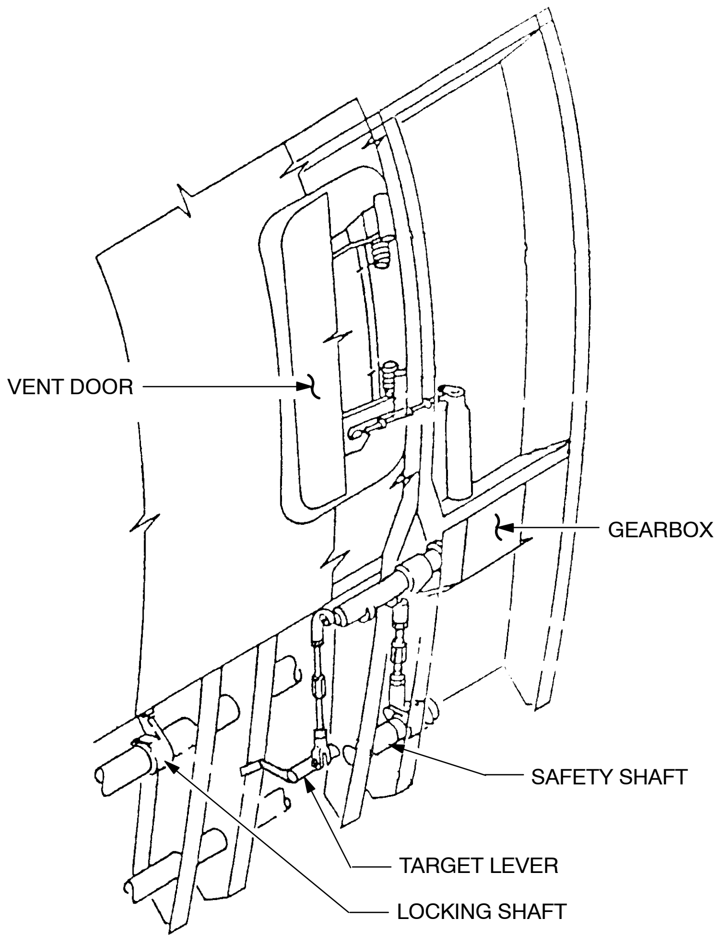


Figure 37 Cargo Door Mechanism

Drift Pin Mechanism

The drift pin mechanism is installed in the middle of the cargo door. It decreases the contour off–set between the fuselage and the door. The drift pin mechanism includes the teleflex controls and the drift pins with the related bellcranks and the connection links.

The teleflex controls transmit the movement of the safety shaft to the bellcranks. They operate the connection links which retract or extent the drift pins. When the cargo door is correctly locked, the extended drift pins engage with the pockets of the fuselage frame.

Locking Mechanism

The locking mechanism which is installed in the lower part of the cargo door includes the subsequent components:

- the locking/latching shaft which has six shaft levers, the control lever, the interlock cam and the deflection unit with the related link rod,
- the six locking units which have a locking hook, a bellcrank, a bellcrank lever and a spring unit.

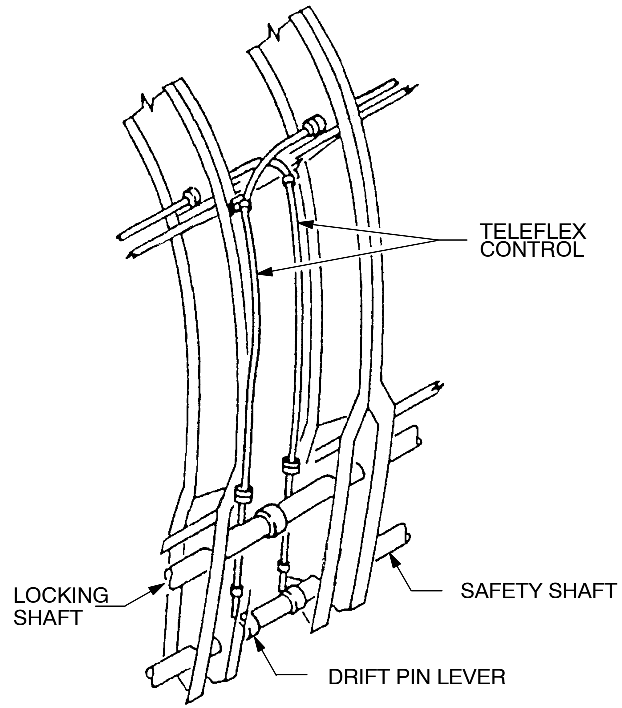
The link rod connects the deflection unit with the handle bearing to transmit the movement of the locking handle to the locking shaft. The shaft levers operate then the locking units which move their locking hooks into the locked or released position. The locked hooks stay in the overcenter position.

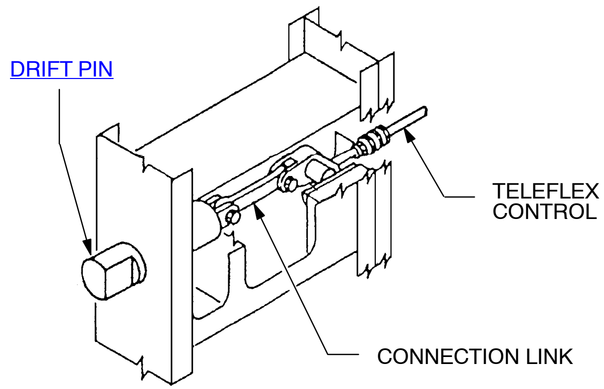
Interlock Mechanism

The interlock mechanism prevents the operation of the locking handle when the cargo door is still opened. The spring unit moves the interlock lever to the blocked position so that its stop bolt touches the interlock cam.

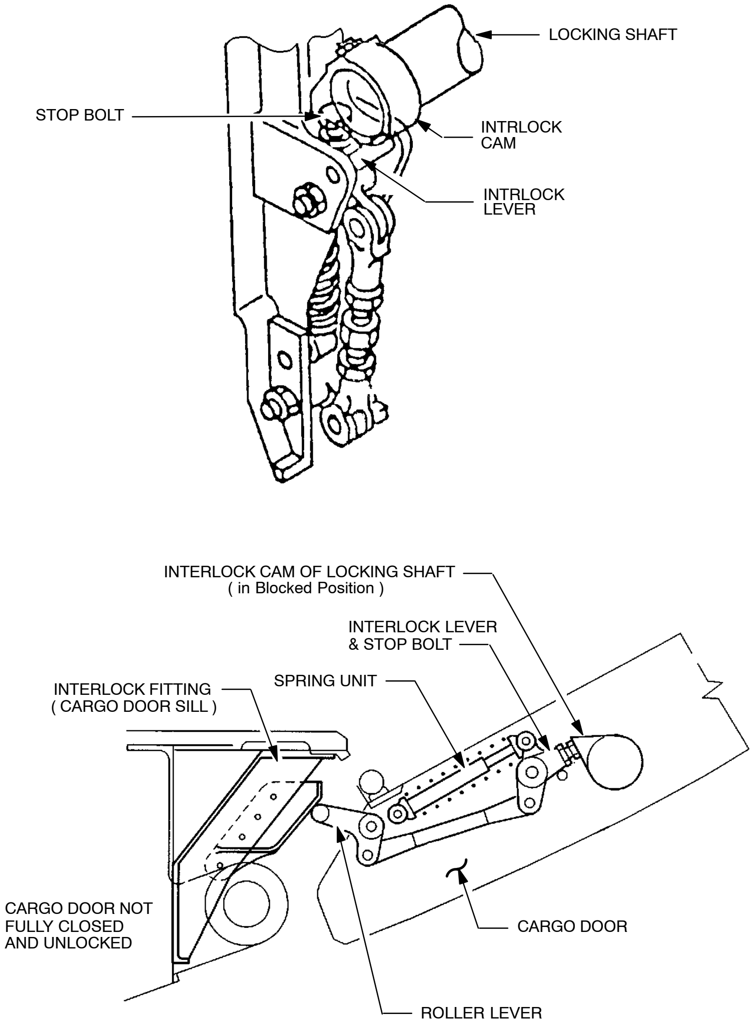
At door-closing the interlock fitting in the door sill area will operate via roller lever and connecting rod the interlock lever with stop bolt. Now the locking/latching shaft is unblocked, the hooks can be closed.

DRIFT PIN MECHANISM





CARGO DOOR INTERLOCK MECHANISM



LOCKING UNIT (6X)

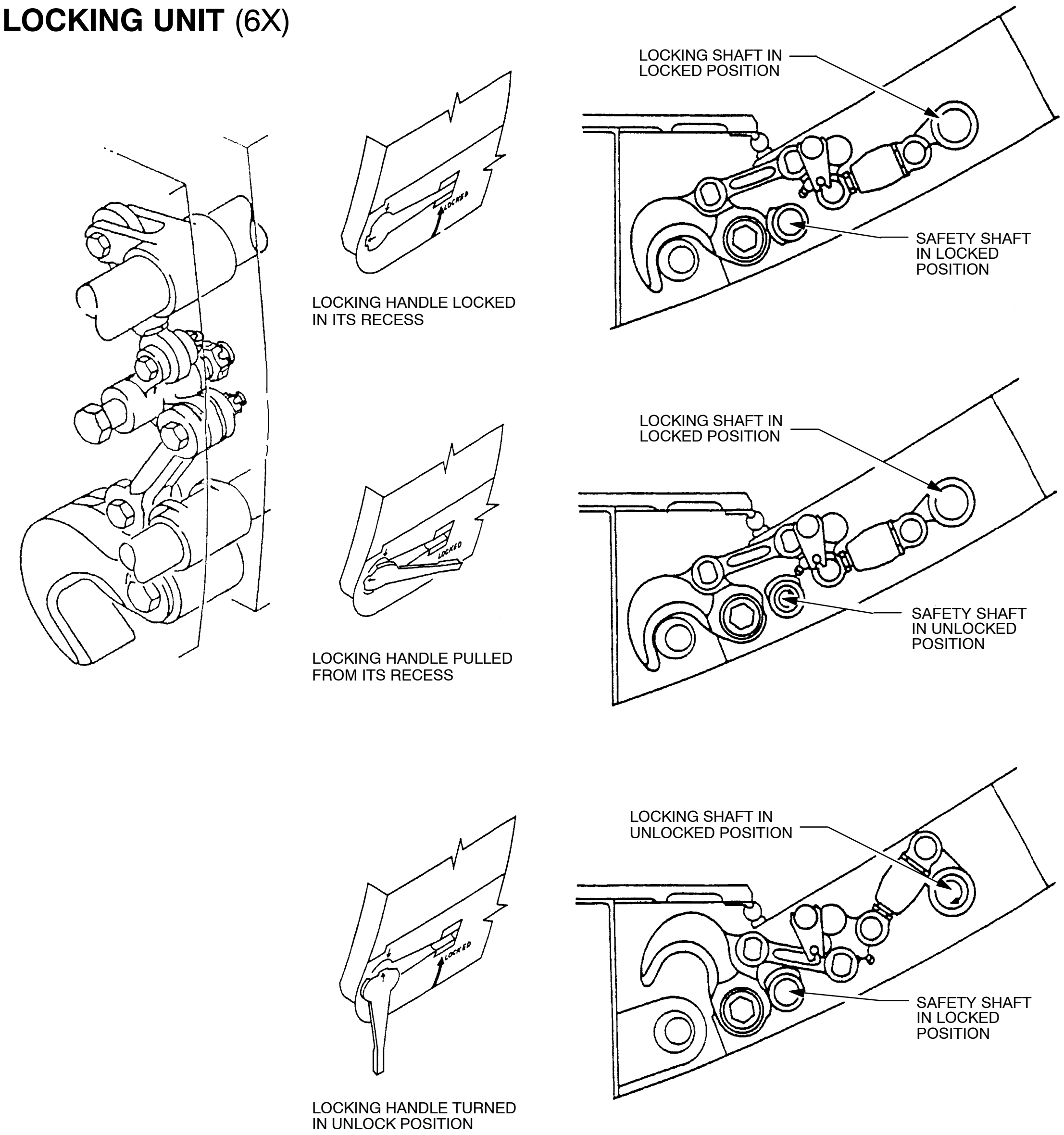


Figure 38 Cargo Door Mechanism

CARGO DOOR PROXIMITY SWITCH DESCRIPTION (CONFIG. 1)

On cargo compartment doors, because of the environmental conditions (pollution, no pressurization), proximity switches with a separate electronic system are used.

Signals from these switches are sent to the LGCIU 1.

The proximity switches with separate electronic system are 32 WV, 34 WV (AFT door), 28 WV and 30 WV (FWD door).

They transmit the indication of the position of the cargo compartment doors.

When the target is near the proximity switch , the phase shift between the supply current and voltage of the proximity switch coil varies , this variation is measured by the LGCIU 1.

The position of the target is sent to the FWCs through the ARINC 429 busbar.

The proximity switch 5MJ (12MJ) with separate electronic system sends a signal to the LGCIU 2 if the cargo door is released (handle in locked position).

This enables the operation of the yellow electric hydraulic pump.

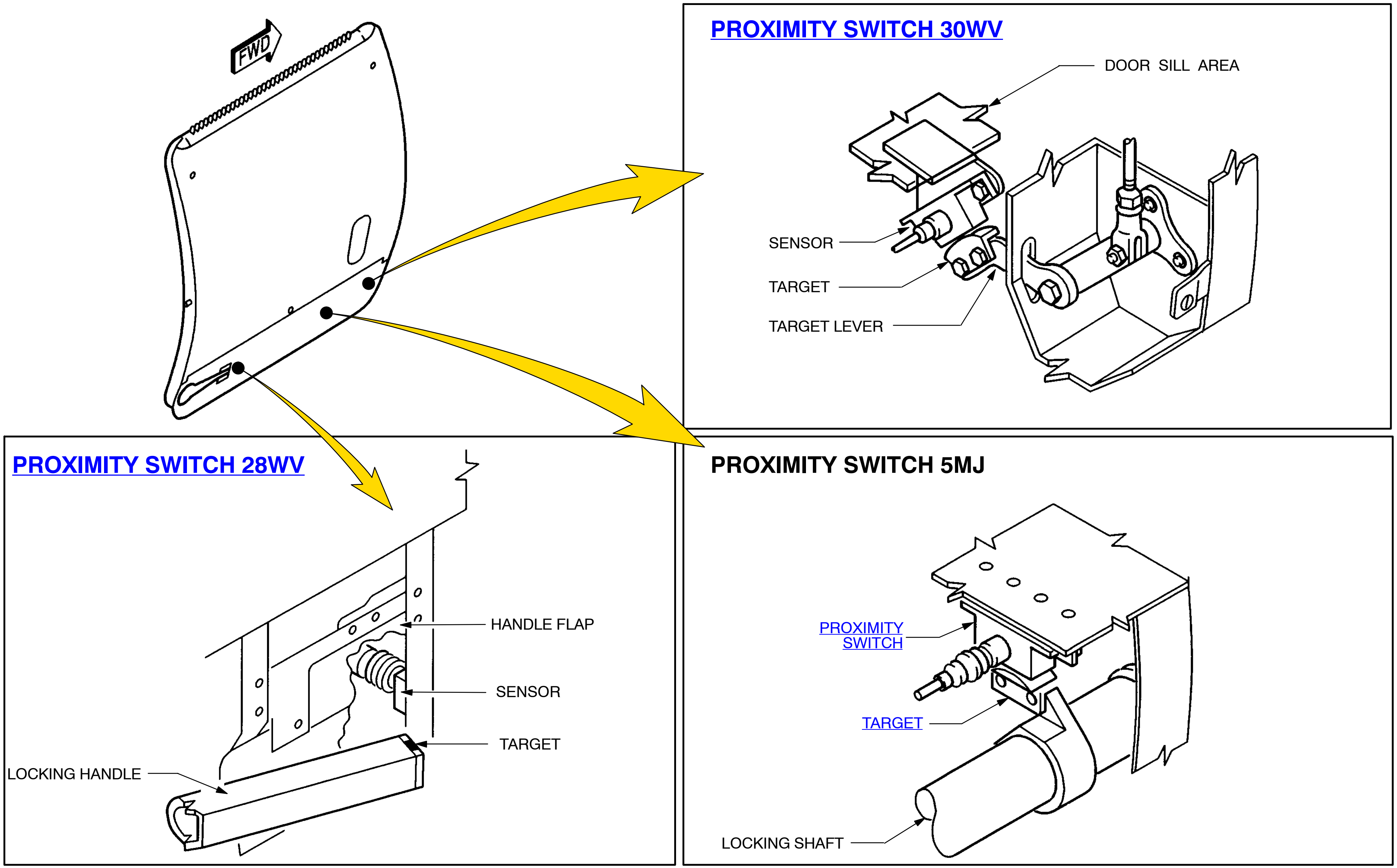


Figure 39 Cargo Door Prox. Switches

CARGO COMPARTMENT DOORS PRESENTATION (CONFIG. 2)

DESCRIPTION AND OPERATION

(FWD door described, AFT door is similar)

The FWD cargo–compartment door (zone 825) opens hydraulically to the outer side and give access to the FWD cargo compartment. It is possible to operate the cargo door at wind speeds up to 60 knots.

The cargo door has a manually operated locking and safety mechanism which keeps it in the closed position and locks it.

The door to fuselage connection is of piano hinges and 6 locking hooks which transmits the load of the cargo door to the fuselage.

The locking hooks of the manually operated locking mechanism keep each cargo door in the closed position. The cams of the safety mechanism engage with the locking hooks when the cargo doors are correctly locked.

When the cargo doors are locked, the door seal makes the related cargo compartment pressure tight. To balance the difference in pressure on the ground and in the cargo compartments, there is a vent door in each cargo door.

This spring loaded vent door opens inboard and remains in this position until the cargo door is correctly locked.

To show this condition there are indication windows in the access panel of each cargo door. The green mark on each safety cam shows that the safety mechanism locking shaft locks each locking unit in its latched position. The red marks show that the locking units are not locked and satisfactory.

The interlock mechanism blocks the locking mechanism latching-shaft in the unlocked position when the cargo door is not closed. Then the locking handle is not movable and the locking hooks stay in the lifted position.

The door actuators use hydraulic pressure from the door hydraulic system to open and close the cargo doors (yellow hydr. system). They have an internal locking mechanism to keep the cargo doors safely in the fully open position.

The proximity switches of the door warning system (circuit WV) monitor the closed and locked condition of the cargo door. They send a signal via the LGCIU 1 to the ECAM (Electronic Centralized Aircraft Monitoring) system when a cargo door is not locked. Then the master caution lights in the cockpit come on and the data is shown on the DOOR page of the ECAM display.

The external indications which show that a cargo door is not correctly locked and latched are:

- the vent door stays in open position,
- the locking handle stays away from the outer contour of the cargo door,
- the red mark of each safety cam is in view through the indication windows.

The AFT cargo door has one fairing more attached to the outer skin.

Door Structure

The primary structure has vertical and horizontal edge members, fairings, longitudinal beams, frames, and an inner and outer skin. These formed and milled components are made from aluminum alloy and riveted together with a sealant compound to make a corrosion resistant cargo door. The sealant compound between the skin and the edge members makes sure that the primary structure is pressure tight.

To prevent corrosion, all components have a surface protection of chromic acid anodizing plus epoxy primer and a polyurethane top coat.

The lower, milled ends of each door frame have provisions for the installation of the locking and safety mechanism. An access panel covers the lower part of the cargo door.

The outer skin has cutouts for the vent door and for the installation of the three hoisting lugs.

The actuator attachment fitting is attached with screws to the inboard side of the frames FR25A and FR26A.

For the attachment of the door seal, the related retainers are riveted at the edge members around the cargo doors.

On the inner skin there are provisions to attach the fire protection lining with quick–release fasteners.

In the corners of the door beams and door frames, there are gaps to drain condensed water. Two drain valves are installed on the lowest beam of the pressure–tight structure and drain this water over board. Some drain holesare added in the critical areas of the internal structure which is painted with a water repellent agent.

CARGO DOOR CONFIG. 2 (TYPICAL)

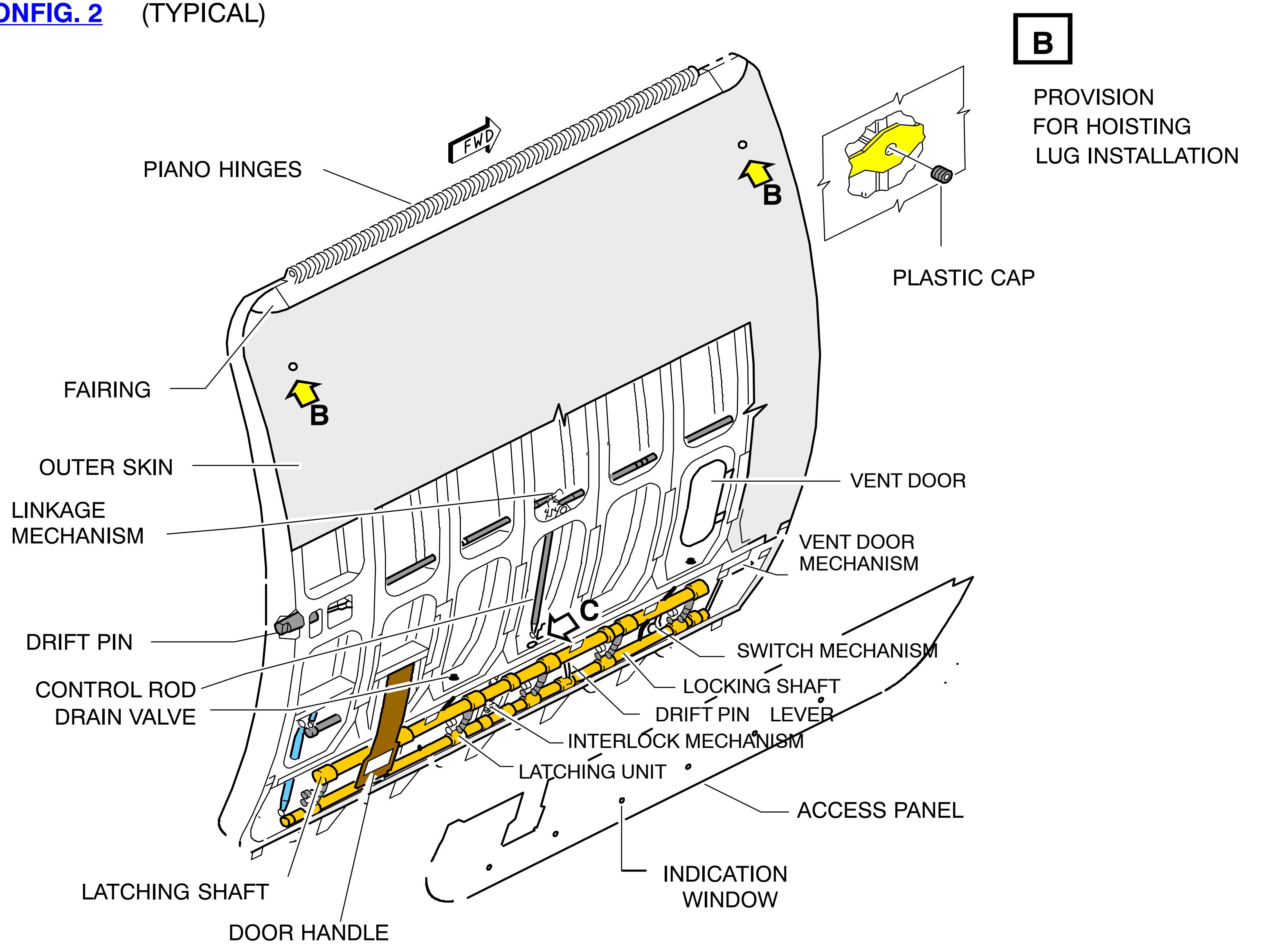


Figure 40 Cargo Compartment Door Config. 2

CARGO DOOR FUNCTIONAL OPERATION (CONFIG. 2)

CARGO DOOR MECHANISM

The cargo door mechanism includes the subsequent components:

- the door handle mechanism with the handle flap,
- the latching mechanism with the interlock mechanism,
- the locking mechanism with the vent door and related mechanism,
- the drift pin mechanism,
- the switch mechanism.

Door Handle Mechanism

The door handle mechanism is installed between FR27 and FR27A to latch/unlatch and lock/unlock the cargo door.

Parts of the door handle mechanism are the door handle, the maltese cross assembly, the linkage mechanism and the handle spring.

The door handle mechanism operates the locking mechanism when the the door handle is pulled up to the 65 degree position. When the door handle is lifted to the 128 degree position, the door handle mechanism operates the latching mechanism.

The Maltese cross assembly transmit the different movement sequence steps of the door handle as follows:

- the Maltese cross lock operates the locking shaft via the linkage mechanism,
- the Maltese cross latch operates the lachting shaft via the connection rod.

The handle spring keeps the door handle in its fully lifted position and vice versa when the door handle is moved into its recess.

Locking Mechanism

The locking mechanism includes the subsequent components:

- the locking shaft which has a link rod, six lock cams with a red and green mark, a drift pin lever and a vent door lever,
- the vent door mechanism which opens and closes the vent door,
- the linkage mechanism which includes the control rod and the gas spring.

The control rod transmits the movemenet of the door handle (from 0 degree to 65 degree) via the Maltese cross lock to the locking shaft. The lock cams then engage with, or disengage from, the recess of the latching hooks.

The engaged lock cams prevent the operation of the latching hooks. Then, the operator can see the **green** mark on each lock cam through the indication windows of the access panel. When the operator can see a **red** mark in the indication windows, then the cam locks are disengaged from the latching hooks.

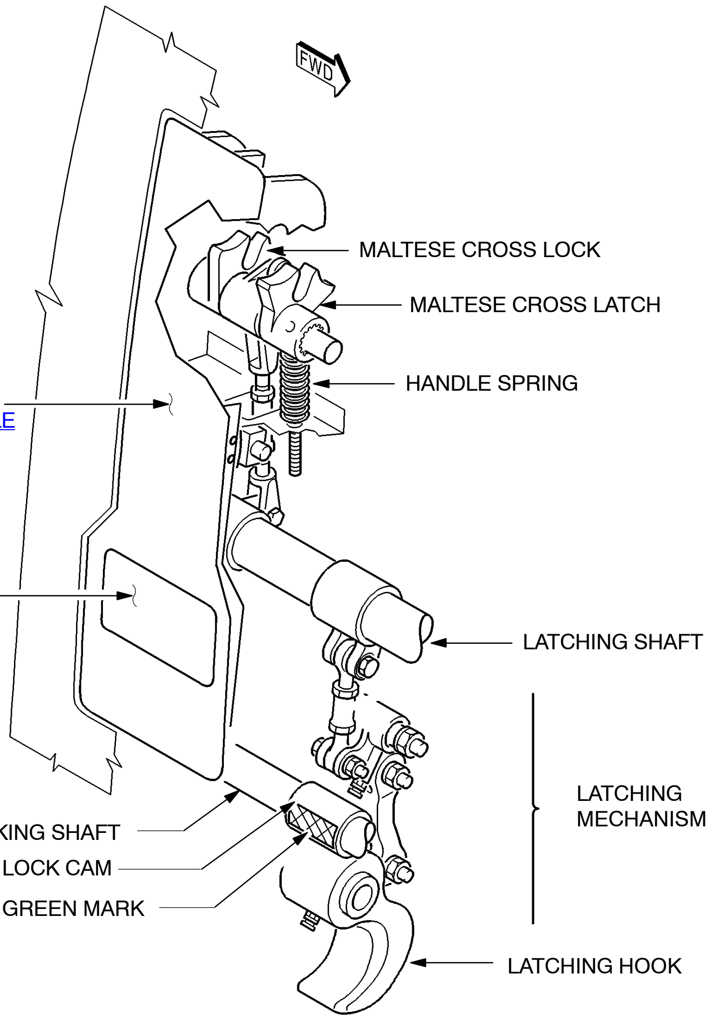
Latching Mechanism

The latching mechanism which is installed in the lower part of the cargo door includes the subsequent components:

- the latching shaft which has six shaft levers, the control lever, the interlock cam and the link lever,
- the six latching units which have a latching hook, a bellcrank, a bellcrank lever and a connection rod,
- the interlock mechanism which includes the interlock lever with the stop bolt, the connection rod and the spring unit.

The Maltese cross latch transmits the movement of the door handle (from 65 degree to 128 degree) via the connection rod to the latching shaft. The shaft levers then operate the latching units which move their latching hooks into the latched or released position.

DOOR HANDLE MECHANISM



DOOR HANDLE MECHANISM OPERATION

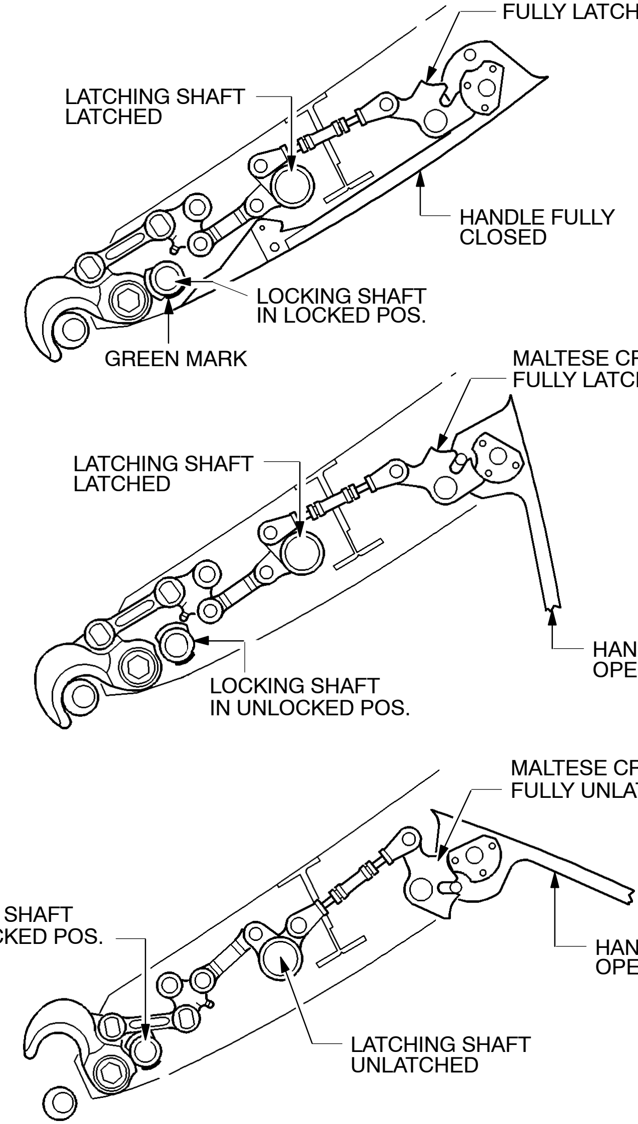


Figure 41 Cargo Door Mechanism

Drift Pin Mechanism

The drift pin mechanism is installed in the middle of the cargo door. It decreases the contour off−set between the fuselage and the door. The drift pin mechanism has a drift pin assy and the linkages mechanism, which includes the connection rods, the control rods, the bearing assy and the housing assy.

The linkage mechanism transmit the movement of the locking shaft to the drift pins which retract or extent then. When the cargo door is correctly locked, the extended drift pins engage with the pockets of the fuselage frame.

Interlock Mechanism

The interlock mechanism prevents the operation of the door handle when the cargo door is still opened. The spring unit moves the interlock lever to the blocked position so that its stop bolt touches the interlock cam.

When the cargo door closes, the roller lever of the interlock mechanism moves against the interlock fitting of the door sill. The roller lever then operates the connection rod which moves the interlock lever against the spring unit. If the cargo door is fully closed, the subsequent occurs:

- the door handle is serviceable to lock the closed cargo door.

Vent Door Mechanism

A connection rod transmits the movement of the locking shaft to the drive shaft of the gear box. The output shaft of the gear box operates the drawbar which opens or closes the vent door.

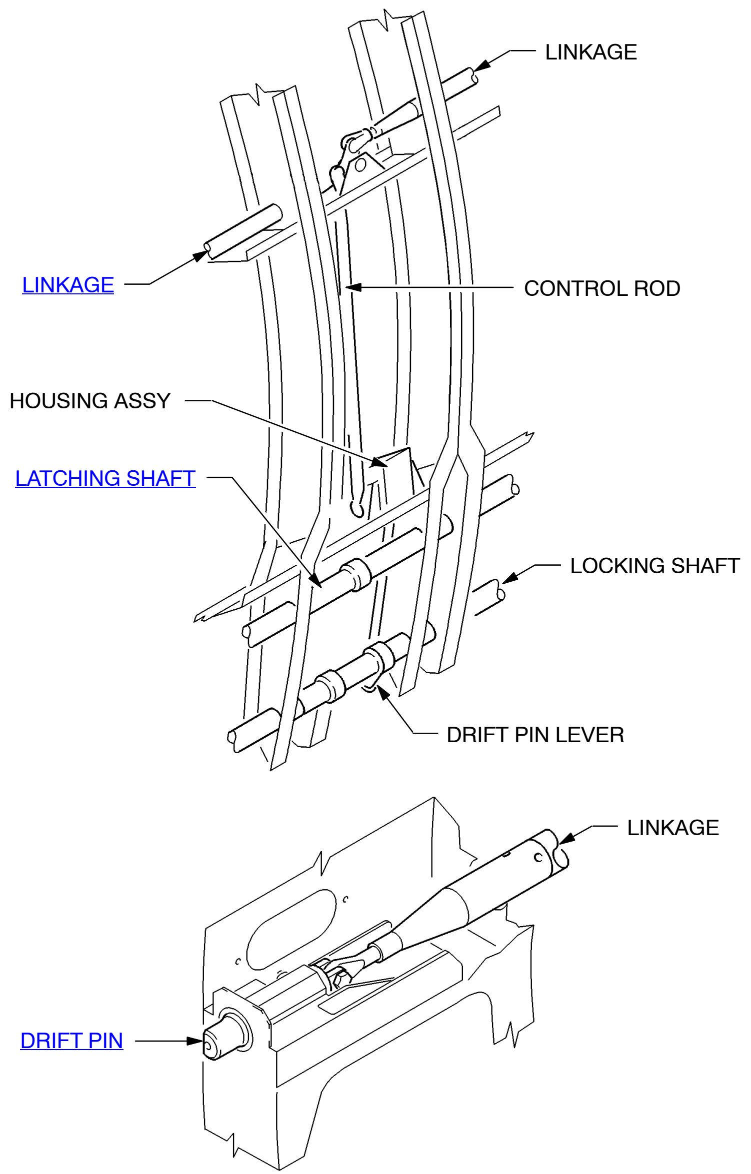
The safety mechanism is installed parallel to and below the locking mechanism in the lower part of the cargo door. The primary task of this mechanism is to tell the operator that the locking mechanism is correctly latched.

Switch Mechanism

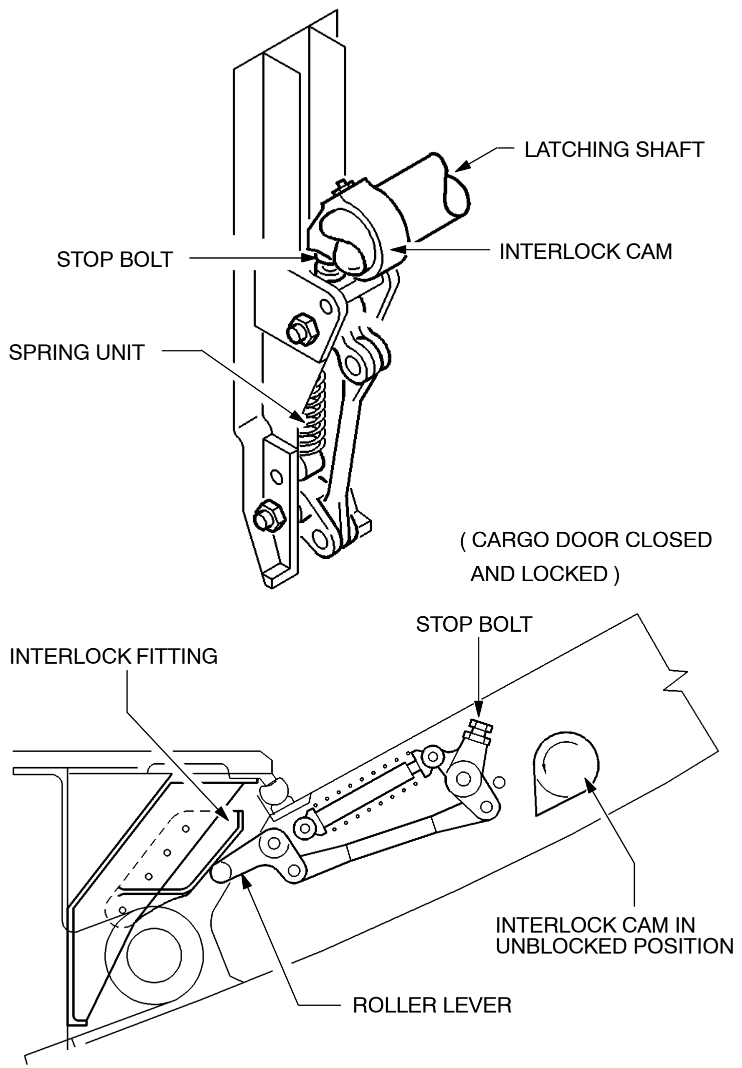
The switch mechanism is installed in the lower part of the cargo doors at FR25. This mechanism includes the target lever with the related target and the link assy.

The target lever is attached on the support fitting which is riveted on the frame structure. The upper fork end of the link assy is installed on the lever of the drive shaft and its lowerrk end on the target lever.

DRIFT PIN MECHANISM



CARGO DOOR INTERLOCK MECHANISM



VENT DOOR MECHANISM

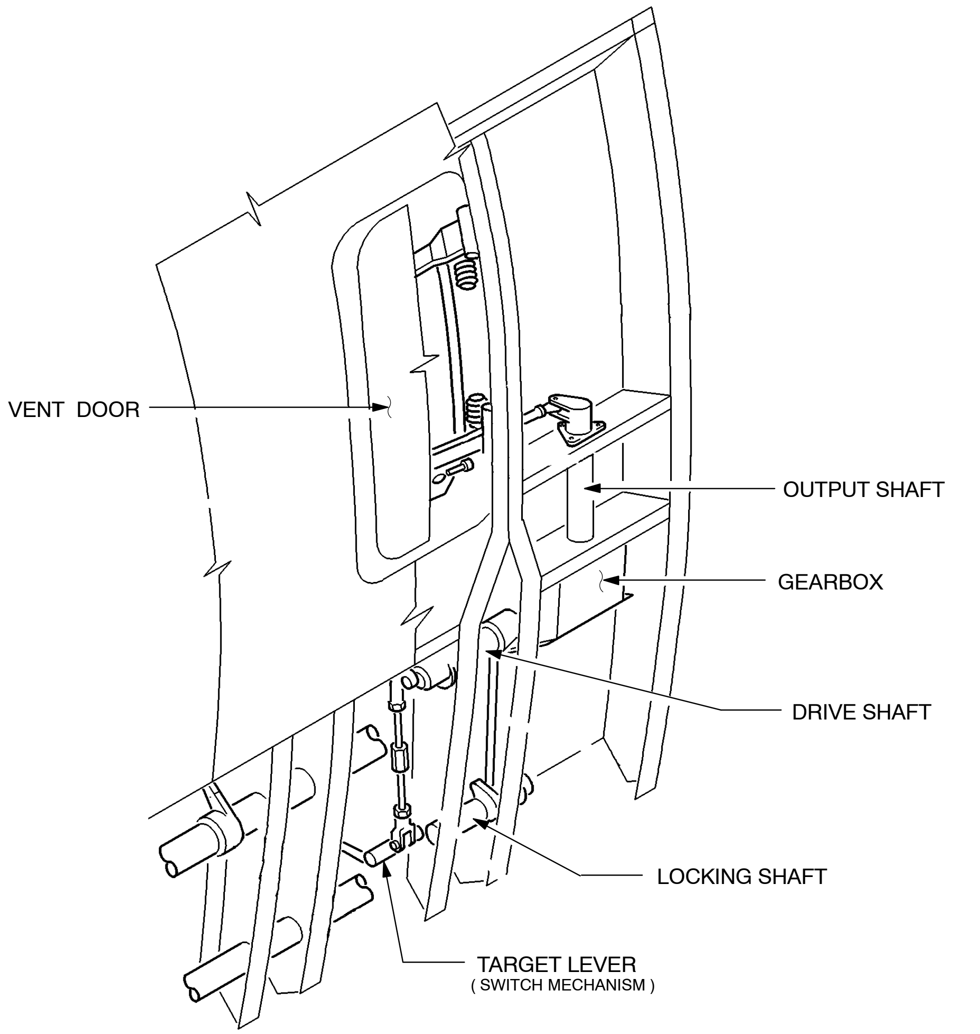


Figure 42 Cargo Door Mechanism

CARGO DOOR PROXIMITY SWITCH DESCRIPTION (CONFIG. 2)

On cargo compartment doors, because of the environmental conditions (pollution, no pressurization), proximity switches with a separate electronic system are used.

Signals from these switches are sent to the LGCIU 1.

The proximity switches with separate electronic system are 32 WV, 34 WV (AFT Door), 28 WV and 30 WV (FWD Door).

They transmit the indication of the position of the cargo compartment doors.

When the target is near the proximity switch , the phase shift between the supply current and voltage of the proximity switch coil varies ; this variation is measured by the LGCIU 1.

The position of the target is sent to the FWCs through the ARINC 429 busbar.

The proximity switch 5MJ (12MJ) with separate electronic system sends a signal to the LGCIU #2 if the cargo door is released (handle in locked position).

This enables the operation of the yellow electric hydraulic pump.

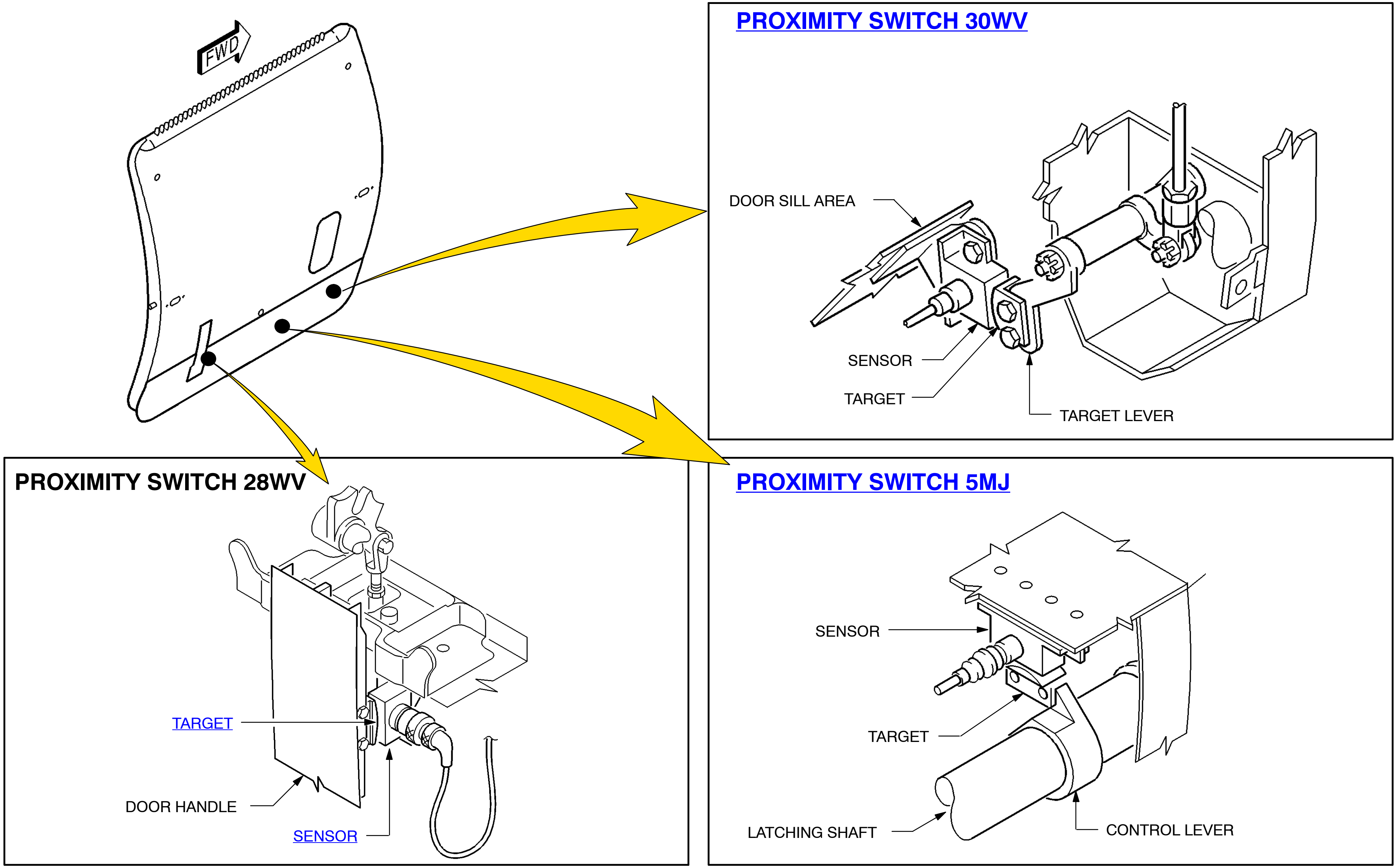


Figure 43 Cargo Door Prox. Switches

CARGO DOOR SYSTEM FUNCTION

Open Mode

When the door locking handle is in the **UNLOCKED** position this operates the proximity switch 5MJ (12MJ) of the locking mechanism. The door control circuit MJ is closed when the selector on the control panel is in the **OPEN** position.

Then:

- the electro (manual) selector valve 2500MJ opens,
- if the manual selector valve 2501MJ (2504MJ) moves in the extension mode, the electric pump 3075GX starts to pressurize the door hydraulic system.

Then, the duplex door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ) extend until the cargo door is fully opened. The green indicator light 9MJ (8MJ) comes on when the door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ are in their locked positions.

Close Mode

When the manual YZ−latches and the overridable Y−latches (part of each door sill latch) are lifted, the limit switches 2507MJ and 2508MJ (2509MJ) are operated. The door control circuit MJ is closed, when the selector on the control panel is in the CLOSED position.

Then:

- the electro − manual selector valve 2500MJ opens,
- if the manual selector valve 2501MJ (2504MJ) moves to the retraction mode,the electric pump 3075GX starts to pressurize the door hydraulic system.

Thus, the green indicator light 9MJ (8MJ) goes off as soon as the duplex door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ) retract. This retraction closes the cargo door.

Manual Opening Procedure

The manual opening procedure of the FWD (AFT) cargo door is an alternative procedure which is used, when :

- there is a failure in the electrical system, or no electrical power is available,
- the electric pump fails.

To release the cargo door, put the door locking handle in the ”unlocked” position. The procedure is the same as for the normal opening procedure.

To operate the door hydraulic system manually, two persons are necessary.

One must turn and hold the selector on the control panel to the ”open” position during the whole procedure. To get access to the control panel, open the access panel 134AR (154AR) beneath the fuselage.

The other operator:

- must open the access panel 198CB in the right, aft belly fairing area,
- must operate the lever (if present) of the electro (manual) selector valve 2500MJ into the “hand−pump” position,
- must operate the hand pump 3009GM on the yellow ground service panel.

The manual opening procedure is complete when:

- the selector on the control panel is released,
- the lever (if present) of the electro (manual) selector valve 2500MJ is in the ”E−pump” position,
- the access panels 134AR (154AR) and 198CB are closed.

Manual Closing Procedure

The manual closing procedure of the cargo door is an alternative procedure which is used, when:

- there is a failure in the electrical system,
- the electric pump fails.

The other operator:

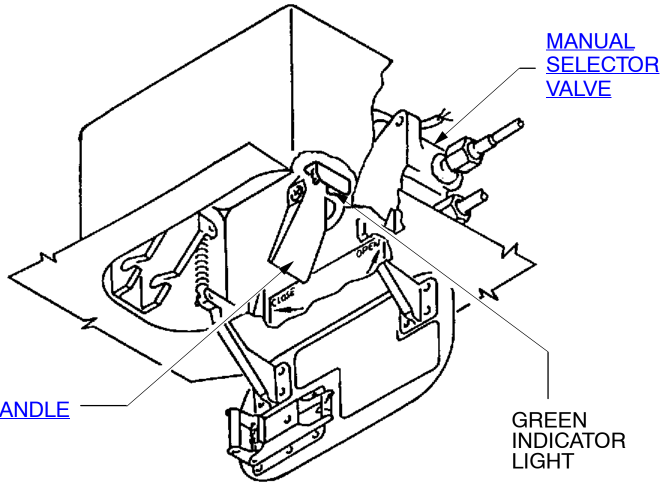
- must open the access panel 198CB in the right, aft belly fairing area.
- must operate the lever (if present) of the electro (manual) selector valve 2500MJ into the ”hand-pump” position,
- must operate the hand pump 3009GM on the yellow ground service panel.

The manual closing procedure is complete when:

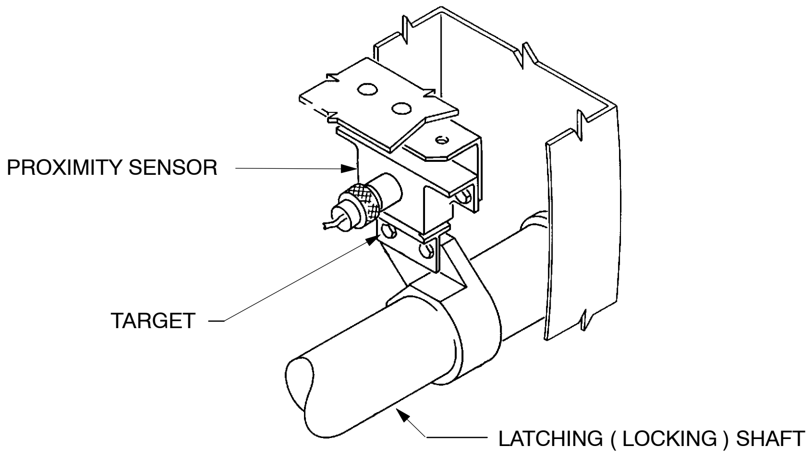
- the selector on the control panel is released,
- the lever (if present) of the electro (manual) selector valve 2500MJ is in the ”E- pump” position,
- the access panels 134AR (154AR) and 198CB are closed.

To latch and lock the cargo door, put the door locking handle in the ”locked” position. The procedure is the same as for the normal opening procedure.

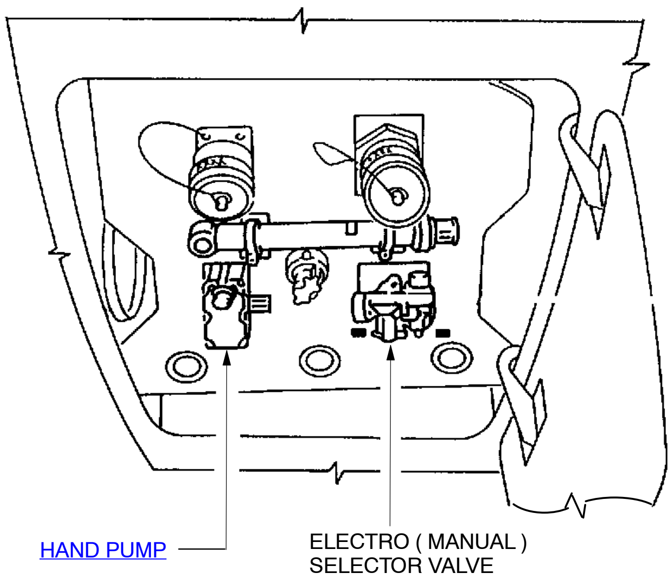
CARGO DOOR CONTROL PANEL



PROX. SW. OF LOCKING MECHANISM (5MJ, 12MJ)



YELLOW GROUND SERVICE PANEL



DOOR SILL LATCHES

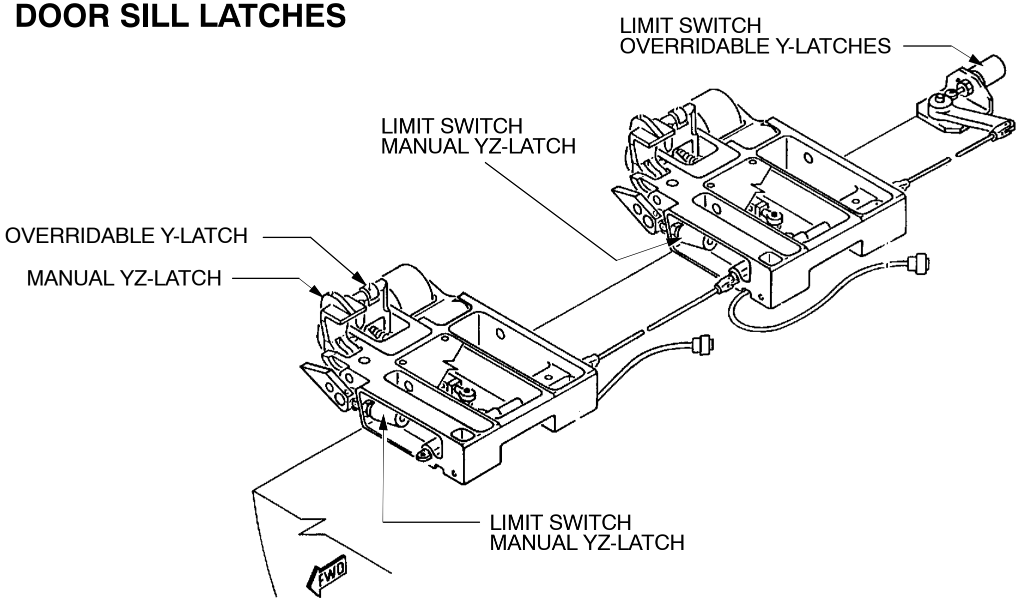


Figure 44 Electro Manual Selector Valve

ELECTRICAL CONTROL SYSTEM DESCRIPTION

GENERAL

The electrical control system of the FWD and AFT cargo compartment doors controls the sequence of the hydraulic operation. It is possible to open or close the FWD and the AFT cargo doors hydraulically at the same time. Each cargo door has a separate circuit.

Electrical Door Control System Schematic And Discription

NOTE: The component identifications in brackets are for the electrical control system components of the aft cargo door.

The cargo door hydraulic system is electrically controlled as follows:

- The in series connected limit switches 2507MJ and 2508MJ (2509MJ) send a signal to the Landing Gear Control and Interface Unit 5GA2 LGCIU 2.
- The proximity switch 5MJ (12MJ) also sends a signal to the LGCIU that the cargo door is released. If the manual selector valve 2501MJ (2504MJ) is operated, its internal proximity switch also sends a signal to the LGCIU. The logic of the LGCIU processes these signals and produces an output signal to operate the L/G position relay 12GB.
- When the aircraft is on the ground, the L/G position relay transmits the LGCIU output signal to 6MJ. The time relay 6MJ then energizes the solenoid of the electro (manual) selector valve 2500MJ. The time relay 6MJ also enegizes the electric pump 3075GX of the yellow hydraulic system which pressurizes the door hydraulic system.
- When this door control circuit is interrupted, the electro (manual) selector valve 2500MJ and the electric pump 3075GX remain energized for 10 sec. more.
- When the door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ) are locked internally, their internal proximity switches send a signal to the green indicator light 9MJ (8MJ) which comes on.

Power Supply

The service busbar 601PP supplies the electrical door control system with 28V DC through the circuit breaker 1MJ. The closed circuit breaker safeties the subsequent components with 5 amperes:

- the indicator lights 9MJ and 8MJ,
- the time relay 6MJ in 103VU,
- the proximity switches of the door actuators 2502MJ, 2503MJ, 2505MJ and 2506MJ,
- the proximity switches of the manual selector valves 2501MJ and 2504MJ.

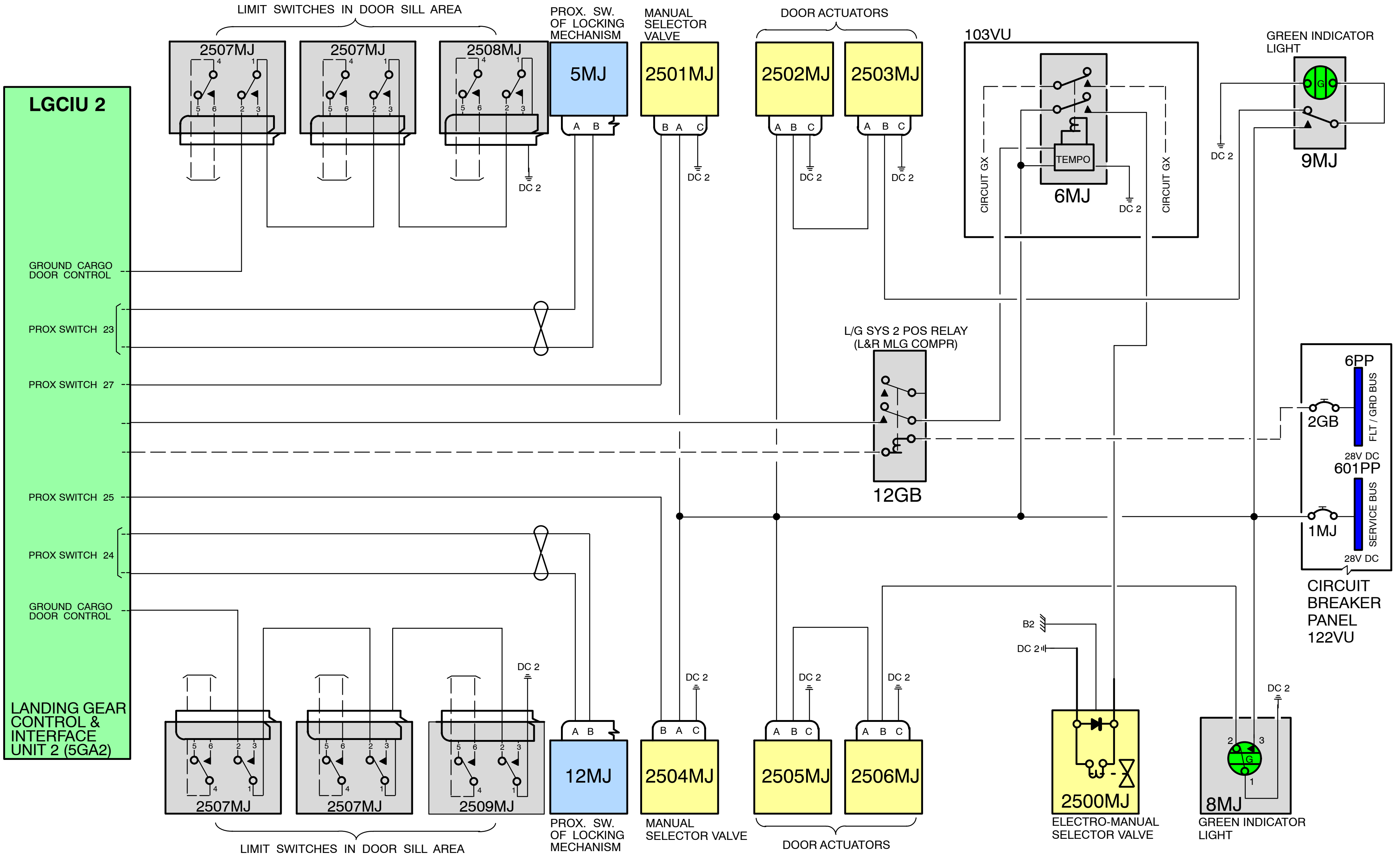


Figure 45 Electrical Schematic

HYDRAULIC SYSTEM DESCRIPTION

SYSTEM DESCRIPTION

The hydraulic system of the cargo compartment doors controls the operation of the FWD and AFT cargo compartment door. The system includes the duplex door actuators (two for each cargo door), two manual selector valves (one for each cargo door) and one electro (manual) selector valve. The system gets its hydraulic supply from the yellow hydraulic system or from a handpump.

The door hydraulic system supplies the duplex door actuators with hydraulic power. The door actuators extend to open the cargo doors to the outer side. It is possible to open the FWD and AFT cargo door at the same time.

The electric pump of the Yellow hydraulic system supplies the door hydraulic system with hydraulic power. If this hydraulic power is not available, it is possible to pressurize the door hydraulic system with the hand pump.

The normal system pressure of the door hydraulic system is 3000 psi (206 bar). The electrical control system of the cargo doors supplies the hydraulic components with electrical power. It prevents the operation of the door hydraulic system when the cargo doors are locked.

The restrictors of the door actuators and the manual selector valves control the speed of the cargo doors.

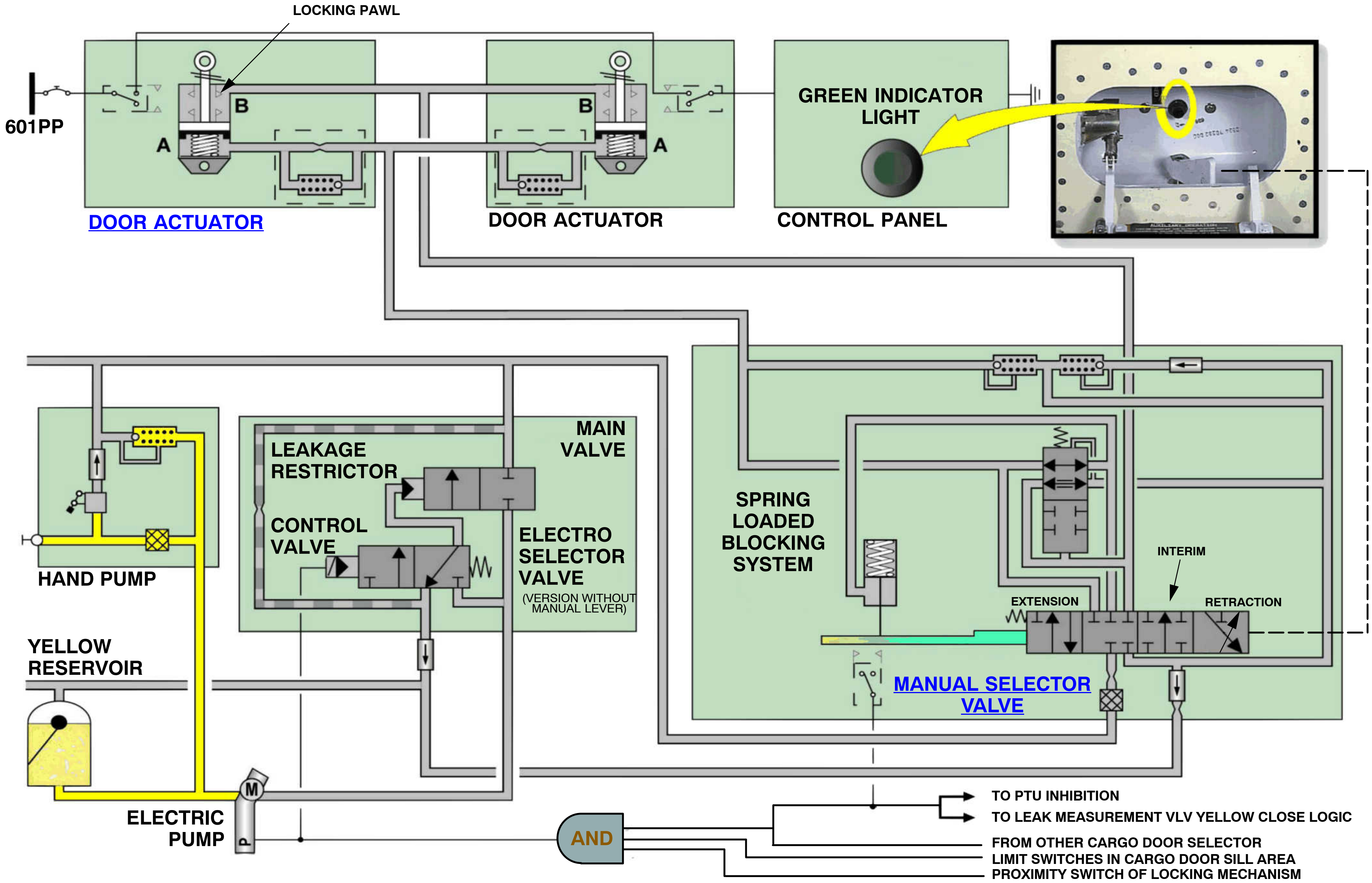


Figure 46 Cargo Door Hydraulic Schematic

CARGO DOOR COMPONENT PRESENTATION

Cargo Door Control Panel

To operate the FWD (AFT) cargo door, a control panel is installed on the fuselage. To get access to the control panel, open the access panel 134AR (154AR). On the control panel there is a selector to operate the manual selector valve 2501MJ (2504MJ) and a green indicator light 9MJ (8MJ).

The indicator light comes on when the door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ) are in their extended, locked positions. The selector is spring−loaded to the neutral position. When you release it in the ”Open” or ”Closed” position, it moves back to the neutral position.

Manual Selector Valve

The manual selector valve 2501MJ (2504MJ) is installed behind the control panel and controls the operation of the cargo door. This valve has an extension mode, a neutral mode, an interim mode and a retraction mode. The extension mode makes sure that the HP (high pressure) fluid can flow through the valve to extend the door actuators. In the neutral mode, the HP fluid can not flow through the valve. For safety reasons, the interim mode pressurizes first the extension sides of the door actuators. This prevents a sudden movement of the cargo door to a lower position when it starts to close. When the pressure is sufficient, the valve can move in the retraction mode. The HP fluid can then flow through the valve to pressurize the door actuators on the retraction sides.

Electrical Selector Valve (Not Shown)

The electrical selector valve 2500MJ is installed on the yellow ground service panel of the aft, right belly fairing.

The valve housing includes:

- a solenoid−operated control valve,
- a hydraulically operated main valve,
- a leakage restrictor.

Electro Manual Selector Valve

The electrical selector valve 2500MJ controls the normal and the manual mode of the door hydraulic system. When the solenoid is energized, it moves the control valve in position which lets the HP fluid operate the main valve.

The pressure puts the main valve in position and the HP fluid can flow to pressurize the door hydraulic system (normal and/or manual mode).The leakage restrictor allows residual system pressure to drain into the return line.

The electro/manual selector valve 2500MJ is installed on the Yellow ground service panel of the aft, right belly fairing. The valve housing includes:

- a solenoid operated control valve,
- a hydraulically operated main valve,
- a manual operated shut−off valve with a control lever.

The electro−manual selector valve 2500MJ controls the normal and the manual mode of the door hydraulic system.

When the solenoid is energized, it moves the control valve in position which lets the HP fluid operate the main valve. The pressure puts the main valve in position and the HP fluid can flow to pressurize the door hydraulic system (normal mode). In this mode, the control lever stays in the ”E−Pump” position.

The control lever must stay in the ”Hand Pump” position to pressurize the door hydraulic system with the hand pump 3009GM (manual mode). In this position, the shut−off valve prevents the hydraulic fluid flow through the electro manual selector valve 2500MJ directly in the return line.

Door Actuators

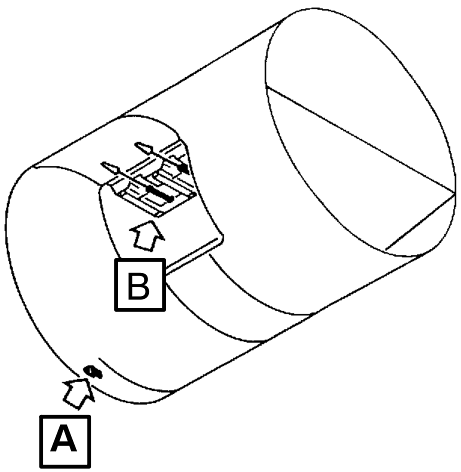
The door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ) are installed at FR26A (FR54A) and FR25A (FR53A). They are attached between the actuator attachment fitting on the door structure and the actuator beam of the fuselage structure.

Usually, the door actuators 2502MJ and 2503MJ (2505MJ and 2506MJ) extend in parallel and divide the total load of the cargo door. If one door actuator fails, the other is sufficient to operate the cargo door with the same performance.

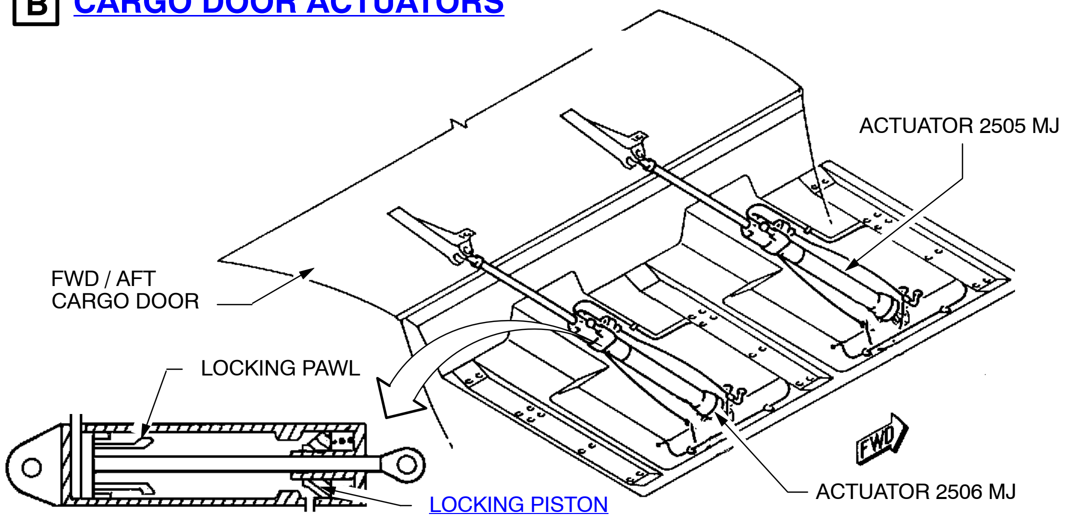
The internal proximity switches of the door actuators are connected in series. They give a signal to show the operator that the door actuators are fully extended and locked internally.

Indicator Light 9MJ (8MJ)

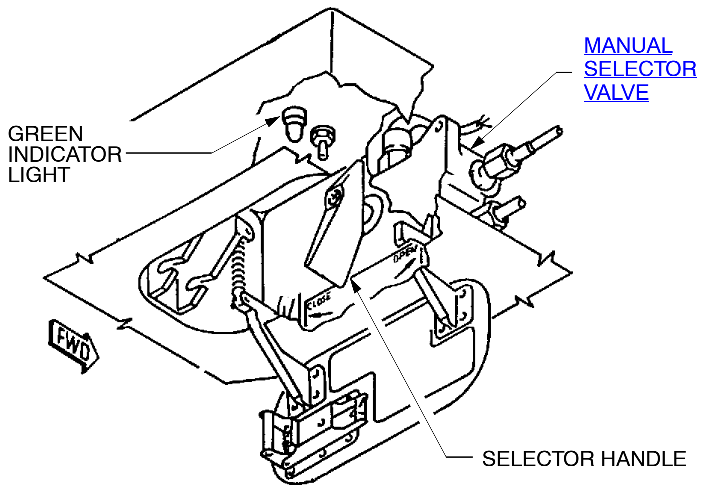
The green indicator light gets a signal from the internal proximity switches of the door actuators. It comes on when the door actuators are fully extended and locked internally. The light goes off as soon as the internal locking mechanism of the door actuator is released.



B CARGO DOOR ACTUATORS



A CARGO DOOR CONTROL PANEL



YELLOW GROUND SERVICE PANEL

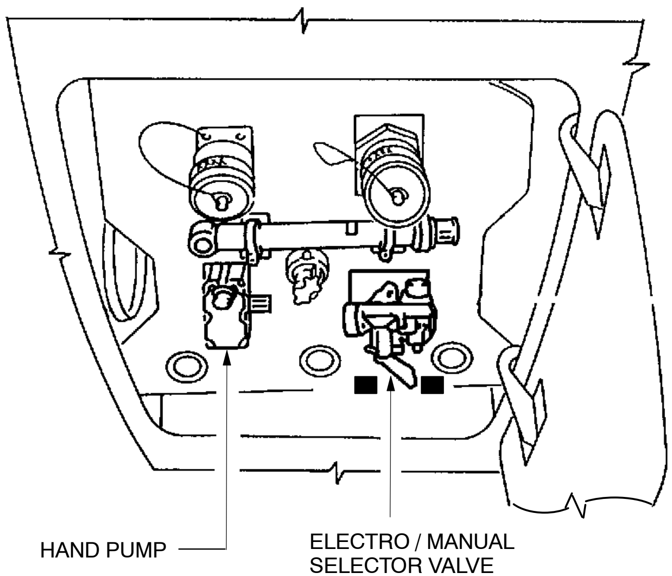


Figure 47 Electro Manual Selector Valve

52 – 33 BULK CARGO COMPARTMENT DOOR

BULK CARGO DOOR DESCRIPTION

GENERAL

The bulk cargo compartment door (optional) is installed on the lower right side of the fuselage between FR60 and FR62. The bulk door is a manually operated door and gives access to the bulk cargo compartment. It opens to the inner side and a hook arrester safeties it in the fully open position.

Its weight is 32.2 kg (71 lbs).The bulk cargo door is of plug type design.

The bulk door is attached with two hinge arms on the related hinge fittings to the fuselage.

It has a balance mechanism to decrease the force necessary to open the bulk door to the inner side. This mechanism keeps the bulk door open so that it can not fall down when it is not fully opened. The door handle mechanism operates the locking shaft which locks or releases the bulk door. The locking shaft also operates the latch assy which safeties the bulk door in its fully open position.

A proximity switch of the door warning system monitors the locked condition of the bulk door. This switch sends signal to the Electronic Centralized Aircraft Monitoring system (ECAM) which gives a warning in the cockpit.

DOOR STRUCTURE

A liquid drain device is installed in the lower beam between the seal and outer skin. On ground, the drain opens to let the liquid out. During flight, the drain device closes because of differential pressure.

DOOR SUSPENSION

The suspension of the Bulk door includes two hinge fittings and two hinge arms with their dampers. The hinge arms are attached to the hinge fittings and connected to the fuselage door frame. Dampers decrease the shockloads of the hinge fittings which can occur during the pressurization of the fuselage.

DOOR SEAL

The door seal, made of special rubber hose, is installed in the retainers, riveted on the door structure. When the Bulk door is closed, the door seal is pressed on a bulb section of the fuselage door frame. The cabin pressure inflates the door seal to make a pressure tight interface.

LOCKING MECHANISM

The locking mechanism is installed in the lower section of the bulk door. Its primary components are the door handle mechanism, the locking shaft and the latch assy.

The door handle mechanism has the lever assy, which is installed in the housing. The external door handle contains a lock mechanism which keeps the handle in the recess of its housing. The external door handle can operate the locking shaft only when it is out of the recess.

A spring unit is installed between the lever assy and the door structure. It makes sure that the lever assy is always in the overcenter position. The locking shaft includes the torque tubes, the shaft lever, the main lever and the barrel locks. The two barrel locks engage with the latch spigots to lock the bulk door in the closed position. The latch spigots are on the door frame of the fuselage. The push–rod connects the lever assy with the main lever to transmit the movement of the door handle to the locking shaft.

To safety the bulk door in the open position, the hook of the latch assy engages with the hook arrester. The spring unit connects the hook with the shaft lever so that the movement of the locking shaft operates the hook. The two barrel locks engage with the latch spigots and hold the bulk door in the closed position. The latch spigots are attached to the door frame of the fuselage.

BALANCE MECHANISM

The balance mechanism includes the torsion bar, the pre load unit and the connection rod. All components are installed in the upper section of the bulk door.

The connection rod is attached between the forward lever of the torsion bar and the fuselage structure. The connection rod causes a tension of the torsion bar during the movement of the bulk door in the open position. The preload unit includes the flange bearing assy, the clamping sleeve and the clamping screw. A pivot pin connects the rear lever of the torsion bar with the clamping sleeve. The clamping screw sets the torsion bar in the preload condition.

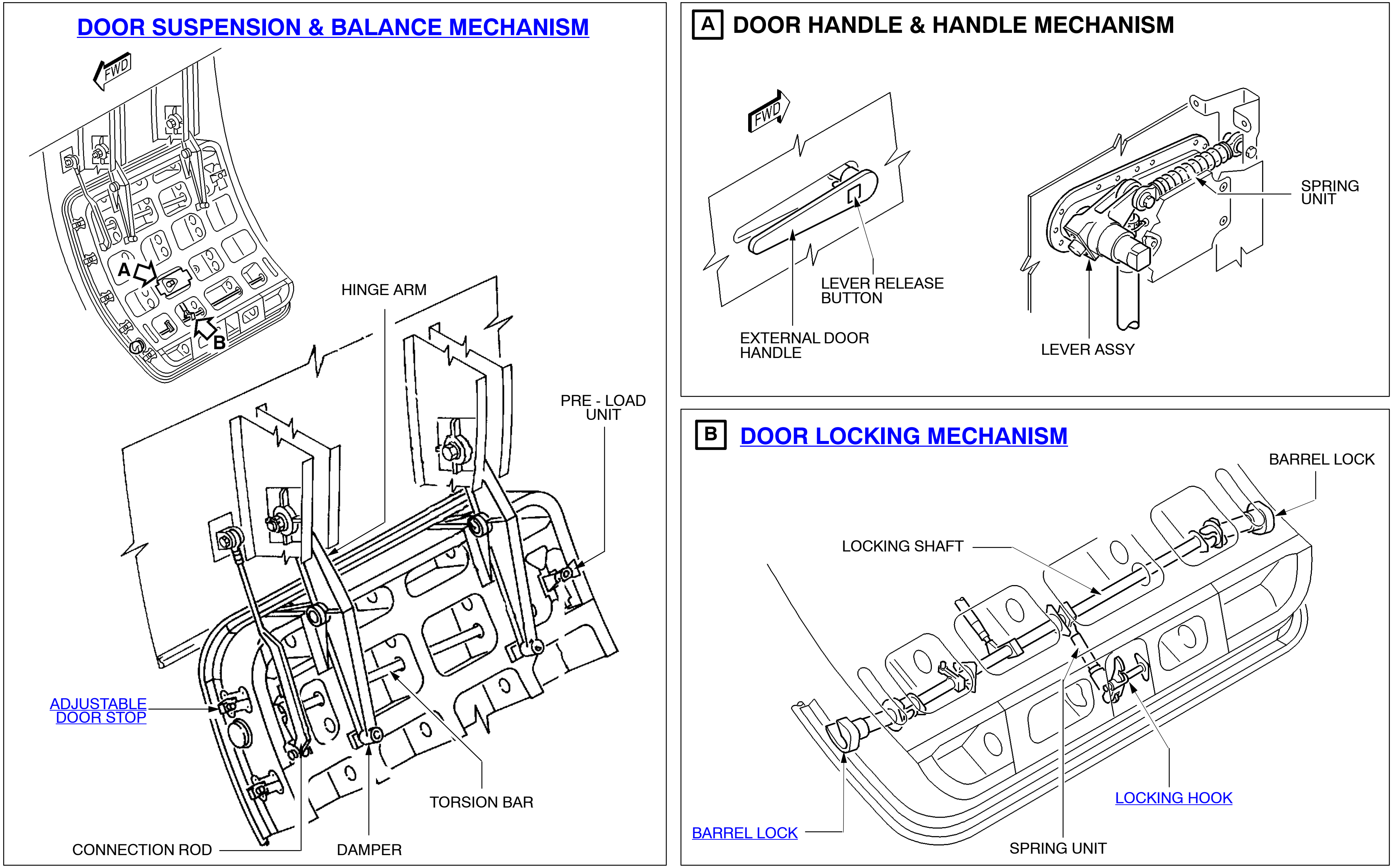


Figure 48 Bulk Cargo Door Mechanism

52–70 DOOR WARNING

DOOR INDICATION

GENERAL

Description

For indication and warnings, all door open/closed and locked positions concerning passenger/crew doors, emergency exit hatches, cargo doors, avionic compartment doors are detected by proximity sensors.

Escape slides armed/disarmed positions are sensed by proximity switches. The signals are sent to the ECAM system, for indication and warnings.

The door warning system informs the crew, that:

- doors are open or closed and locked
- a person is trying to open a door or emergency exit when the emergency escape slide is armed,
- overpressure may exist in the cabin, with the engines shut down and the emergency escape slide disarmed, when a person tries to open a door.

ECAM DOOR PAGE

Description

Passenger/crew doors appearing closed on ECAM (symbol coloured green) when the locking hook is in locked position and locking shaft stayes in the overcentered position.

Cargo compartment doors appearing closed on ECAM when the locking hooks and the operating handles are in closed and locked position.

Avionic compartment doors appearing closed on ECAM depending only of there locking hook position.

Escape slides conditions (ARMED/DISARMED) of passenger/crew doors and Emergency exits are indicated by a white title “SLIDE“ (armed).

Emergency exit hatches appearing closed on ECAM when the cover flap is installed.

INDICATION AND OPERATION

Description

Door symbol indication displayed on the lower ECAM display unit.

Indications Without warnings:

Automatically during flight phase 1 and 10 the “DOOR“ page appears.

Closed doors (locked) are displayed in green.

When a door is open (not locked) the symbol and the door name appears in amber.

If the escape slide is in ”ARMED” position a white “SLIDE“ sign will be shown.

There is no information on the upper ECAM display unit (Engine and Warning Display).

During all other flight phases the DOOR page can be requested by pressing the “DOOR“ push button on the ECAM control panel.

Indication With warnings:

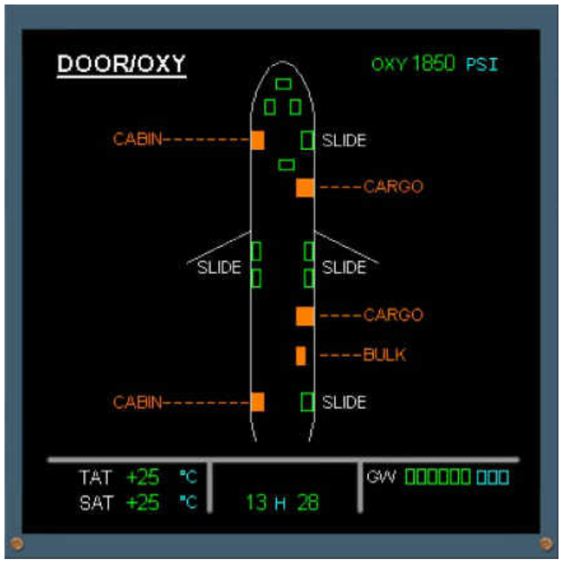
In case of a door/slide fault during flight phase 2, 3, 6 and 9 automatically the DOOR page comes into view, the door symbol and door/slide name shown in amber.

On the upper ECAM display unit (E/WD) a warning message appears in amber and a single chime aural signal sounds and the MASTER CAUTION lights comes on.

During flight phases 4, 5, 7 and 8, warnings will be suppressed and activated when the aircraft passes into a flight phase where warnings permitted, see above.

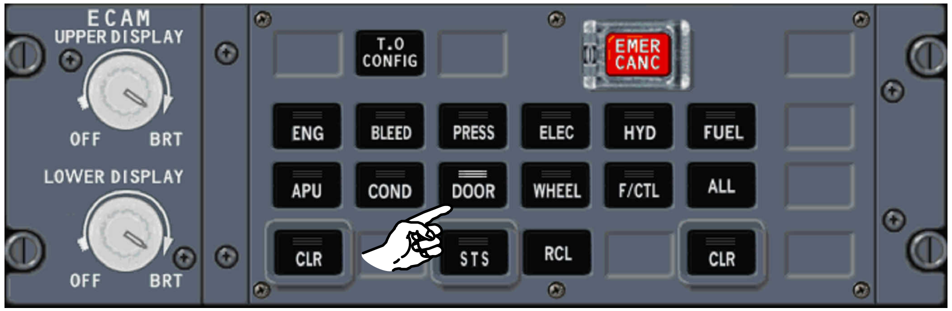
A318/A319

A321



A320

ECAM CONTROL PANEL (ECP)



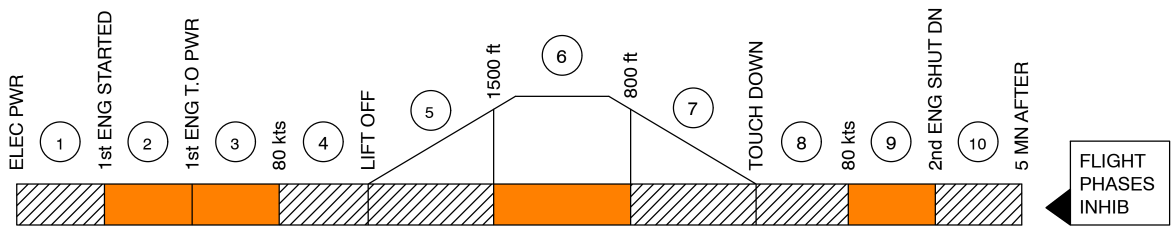


Figure 49 ECAM System Display Door Page

CONTROL & INDICATING

PASSENGER DOORS

Two different indicating systems are installed on the door:

- a mechanical indicating system,
- an electrical indicating system.

The mechanical indicating are:

- a visual indicator on the top of the door shows if the door is LOCKED or UNLOCKED,
- a visual indicator on the slide arming lever shows if the slide is ARMED or DISARMED.

The electrical indicating are:

- two warning lights installed below the door window,
- they are visible from the inside and the outside.

When a person tries to open the door the white SLIDE ARMED light indicates that the escape slide is in the ARMED mode.
The red CABIN PRESSURE light flashes when there is a residual pressure in the cabin with the slide disarmed.

WARNING: DO NOT OPEN A DOOR WHEN THE AIRCRAFT IS PRESSURIZED.

THIS WILL CAUSE EXPLOSIVE DECOMPRESSION, AND KILL OR CAUSE INJURY TO PERSONS AND MATERIAL.

NOTE: Note: The A321 emergency exit doors have the same control indicating as the passenger doors.

EMERGENCY EXITS

Accidental opening of the cover flap for access to the inner control handle will automatically activate the white indication light beside the exit.

The ARMED/DISARMED condition of the exit is indicated on the ECAM DOOR/OXY Page (DISARMED position only for maintenance work).

CARGO DOORS

Two different indicating systems are installed on the cargo door:

- a mechanical indicating system,
- an electrical indicating system.

In the access panel at the bottom of the door, there are indication windows to check if the door is correctly locked.

- red marks: door not correctly locked,
- green marks: door correctly locked.

When the door is fully open and locked, a green indicator light comes on, on the cargo door control panel. The cargo door control panel is installed on the centre line of the aircraft near each door.

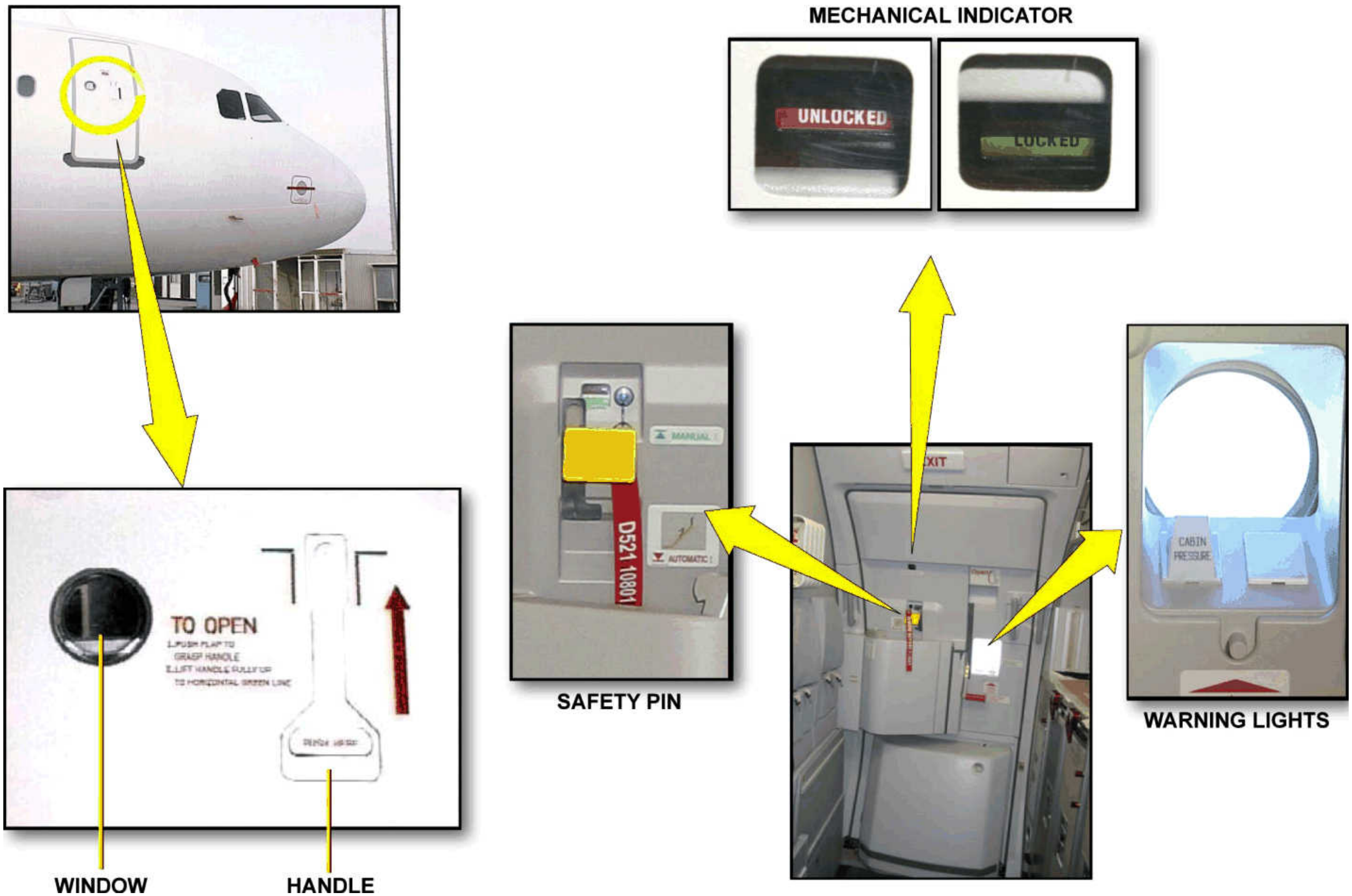


Figure 50 Control & Indicating - Passenger/Crew Doors

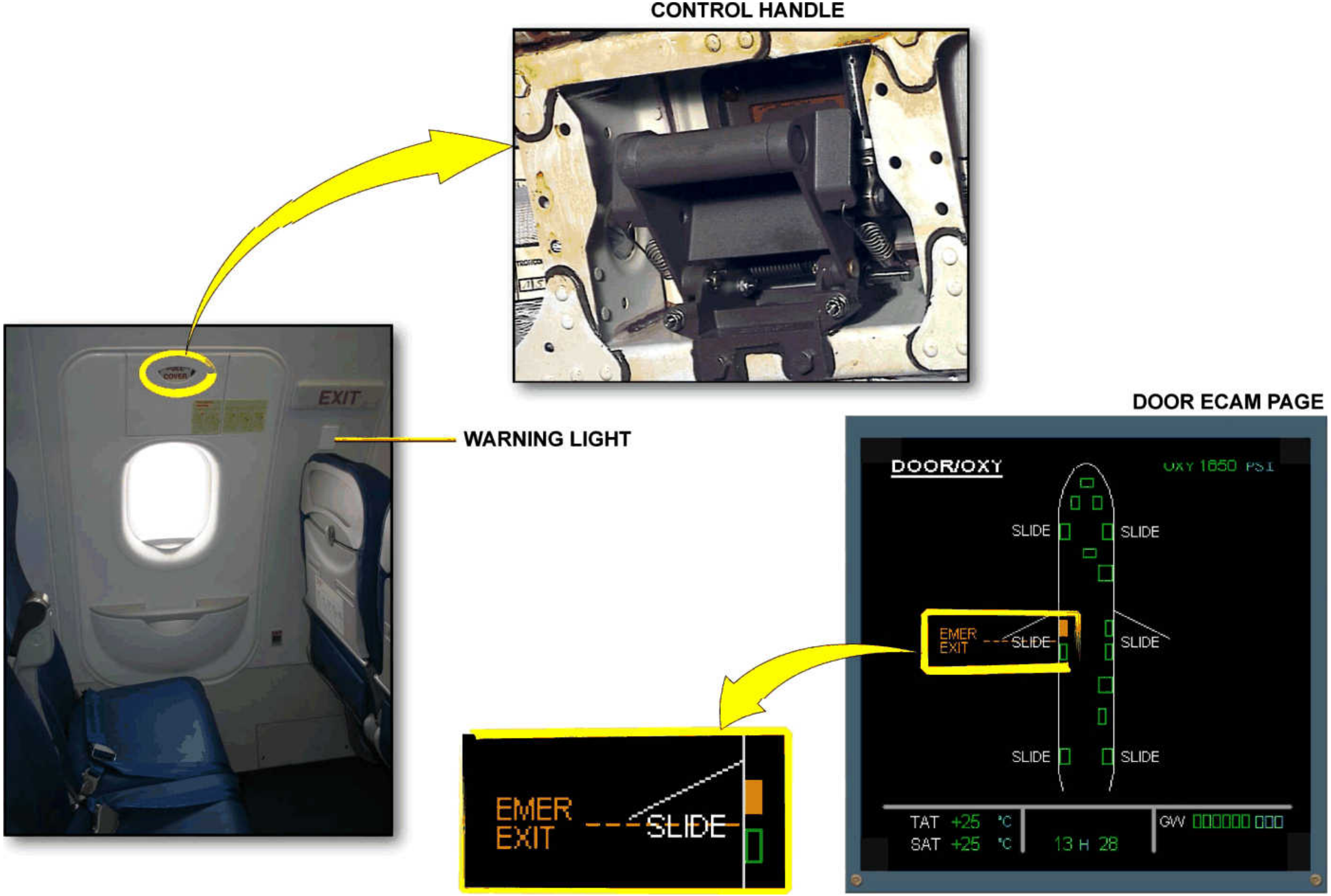
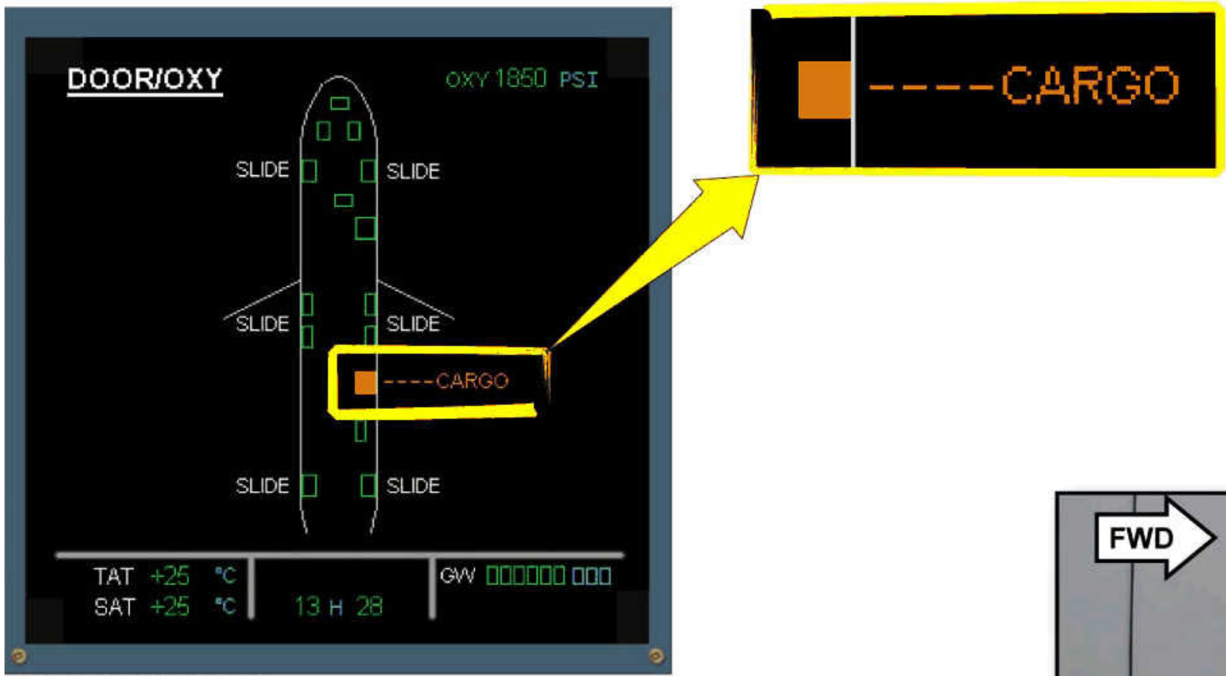
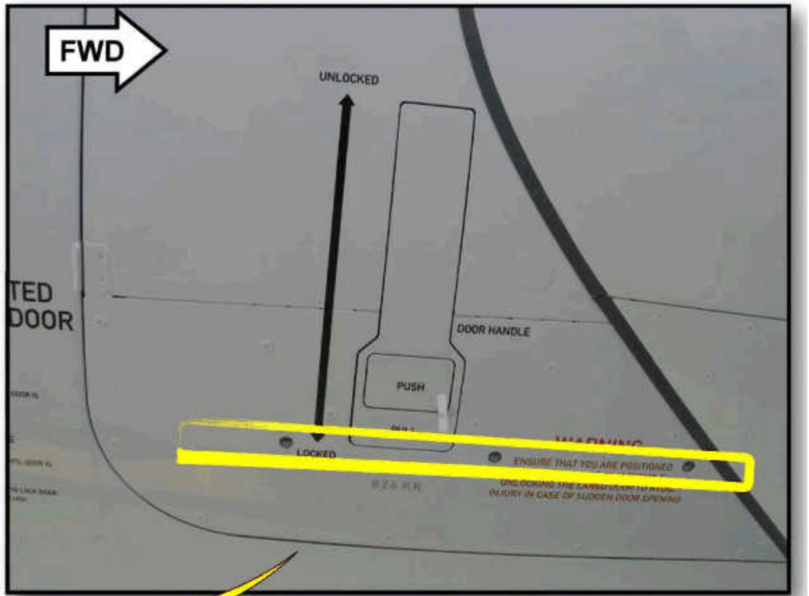


Figure 51 Control & Indicating - Emergency Exits (A320)

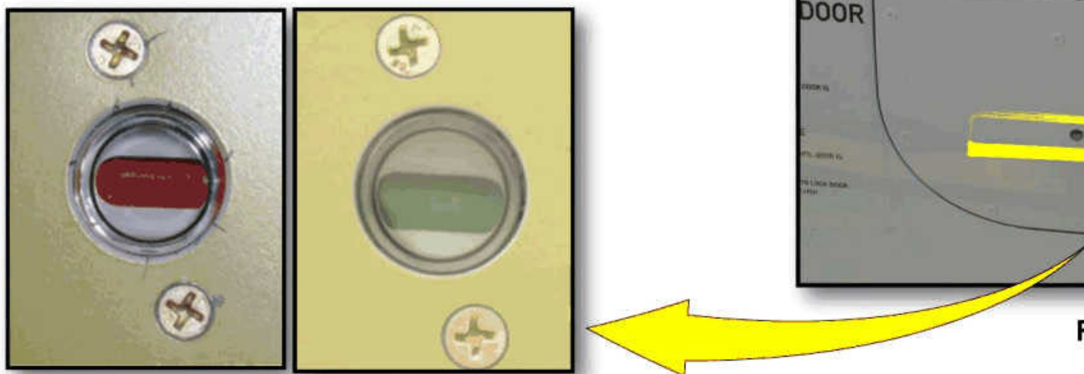


DOOR ECAM PAGE

CONTROL PANEL



FWD CARGO DOOR



MECHANICAL INDICATOR

Figure 52 Control & Indicating - Cargo Doors

DOOR WARNING SYSTEM DESCRIPTION

Description

For indication and warnings, all door open/closed and locked positions concerning passenger/crew doors, emergency exit hatches, avionic compartment doors are detected by proximity sensors. The signals are sent to the SDACs and FWCs to the ECAM system directly. Cargo door position signals are sent to the LGCIU 1 by proximity sensors and been transfered from the LGCIU 1 to the FWCs and SDACs using ARINC 429 busses.

Escape slides armed/disarmed positions are sensed by proximity sensors. The signals are sent to the ECAM system, for indication and warnings.
The door warning system informs the crew that:

- doors are open or closed and locked,
- a person is trying to open a door or emergency exit when the emergency escape slide is armed,
- overpressure may exist in the cabin, with the engines shut down and the emergency escape slide disarmed.

PROXIMITY SENSORS (TYPICAL)

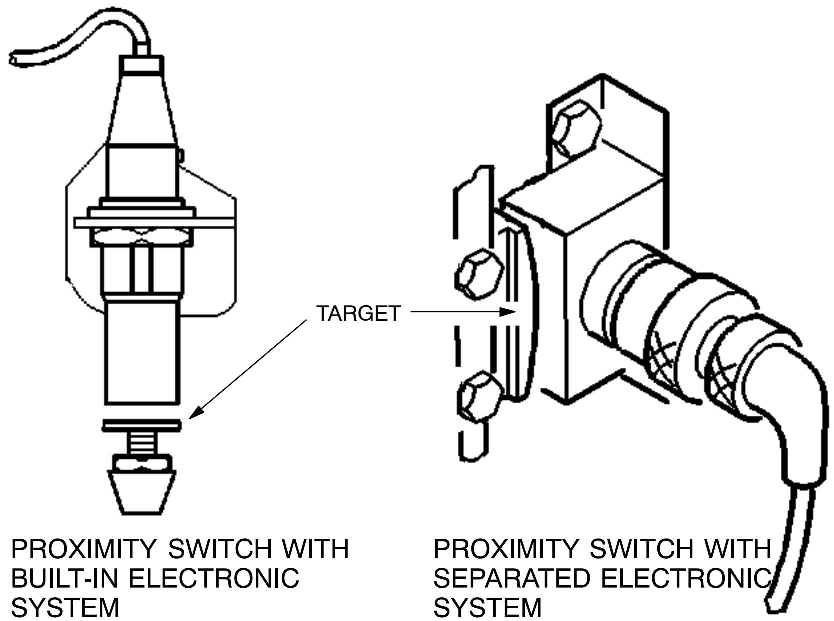


Figure 53 Proximity Sensors

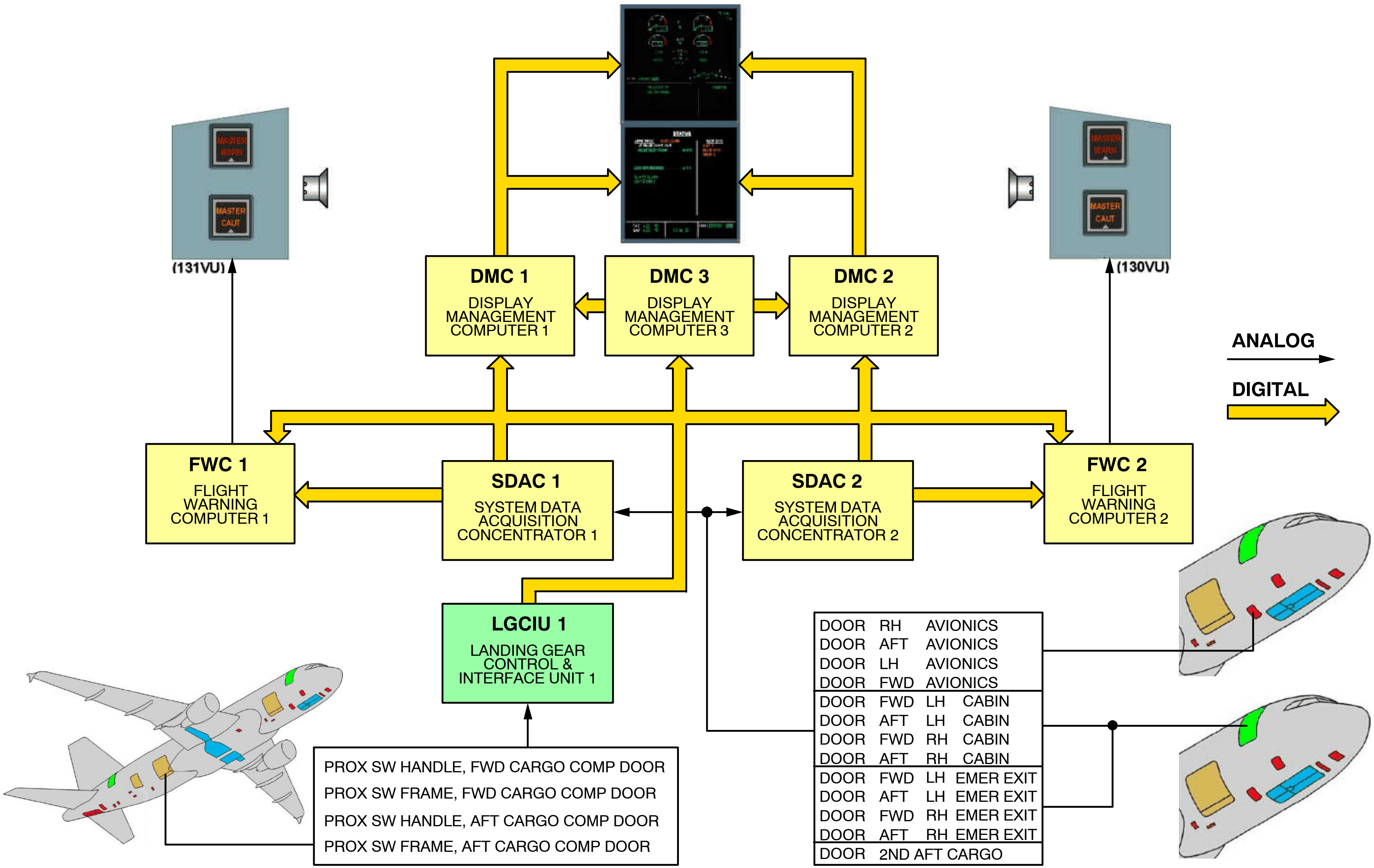


Figure 54 Door Warning System

PAX/CREW, EMERGENCY & AVIONIC DOOR DESCRIPTION

PROXIMITY SWITCHES ON PAX/CREW DOORS, EMERGENCY DOORS (A321) AND AVIONIC DOORS

General

Discret signals from passenger/crew doors, emergency exits, avionic compartment doors and bulk cargo compartment doors are sent to the ECAM system.

Proximity switches with integrated electrocnic are installed on following doors:

- Passenger/crew doors,
- Emergency exits,
- Avionic compartment doors,
- Bulk cargo compartment door,
- Optional: The door of the entrance stair.

This door signals are going directly to the SDACs.

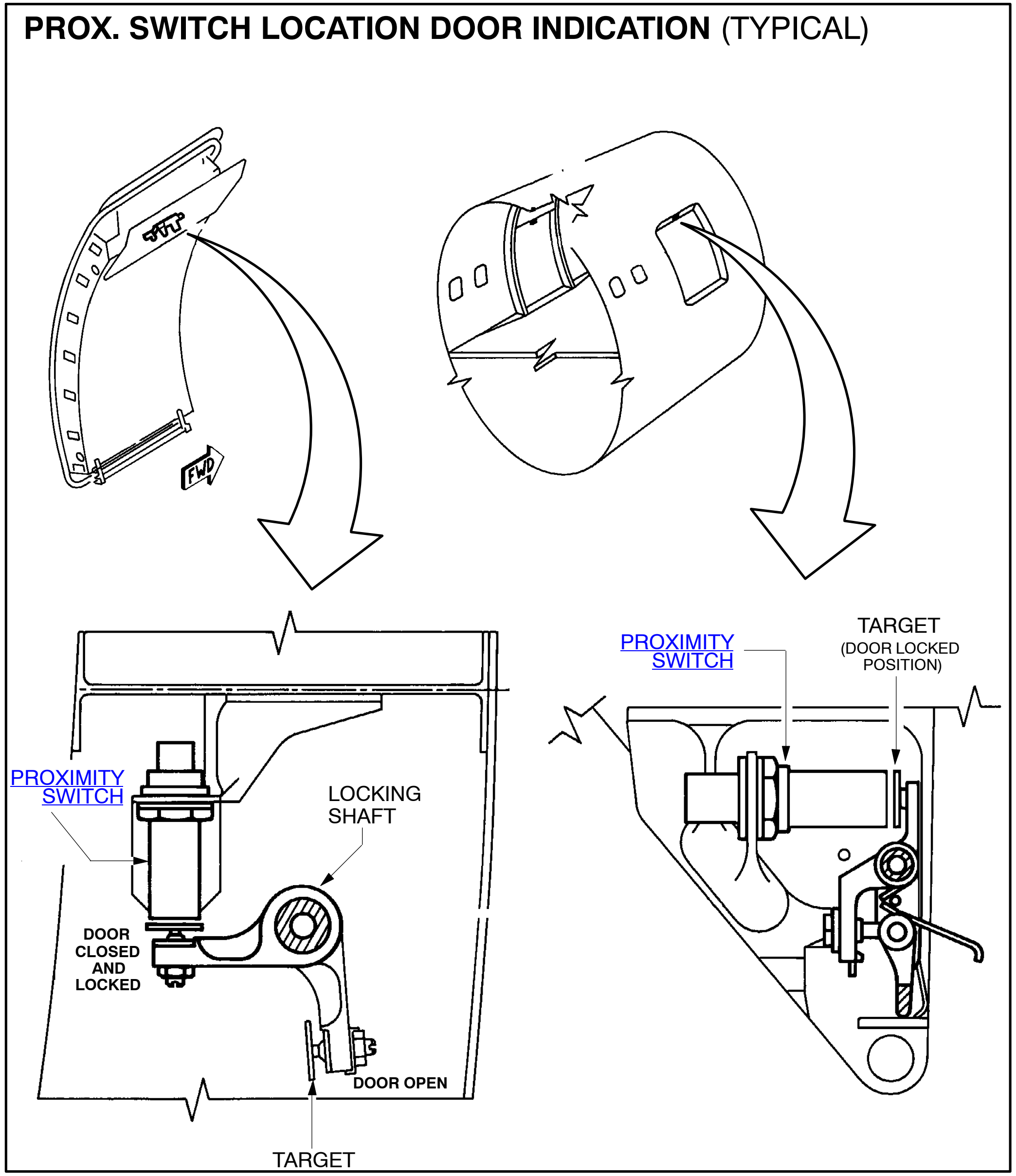
For this doors the door open warning is generated by the FWC, which receive the door status from the SDACs.

Proximity switches without integrated electronics, because of the environmental conditions (pollution, no pressurization), are installed on:

- FWD cargo compartment door and
- AFT cargo compartment door.

These door signals are transfered via LGCIU 1 to the DMCs.

For this doors the door open warning is generated by the FWC, which receive the door status from the LGCIU 1.



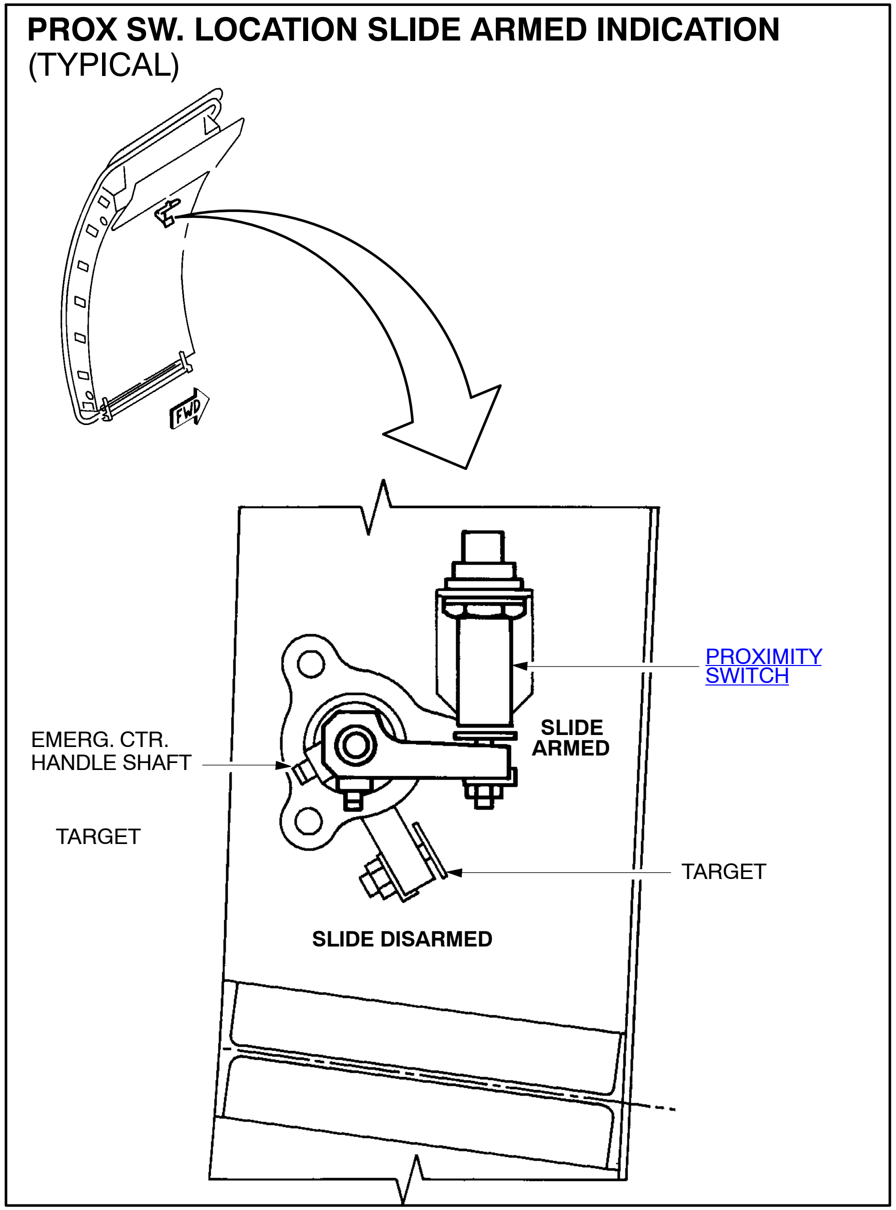
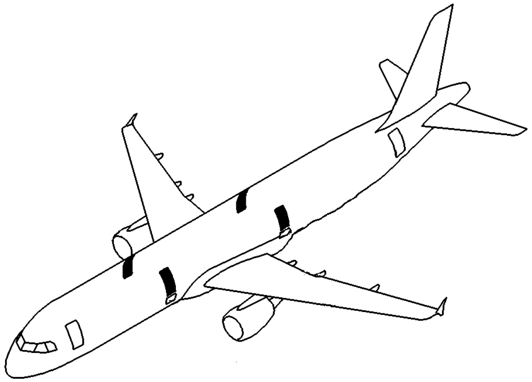
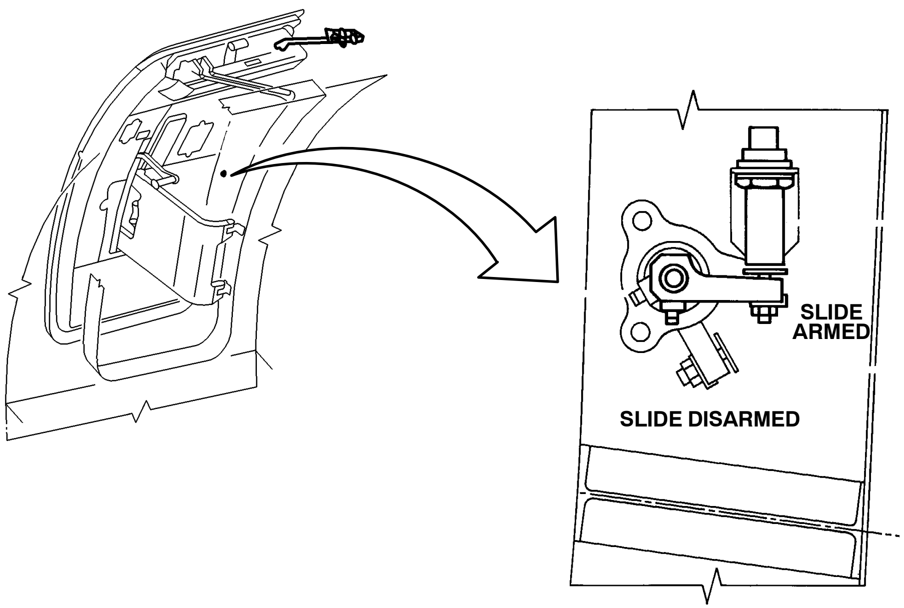


Figure 55 Passenger/Crew Door Switches



PROX SW. LOCATION SLIDE ARMED INDICATION (TYPICAL)



PROX. SWITCH LOCATION DOOR INDICATION
(TYPICAL)

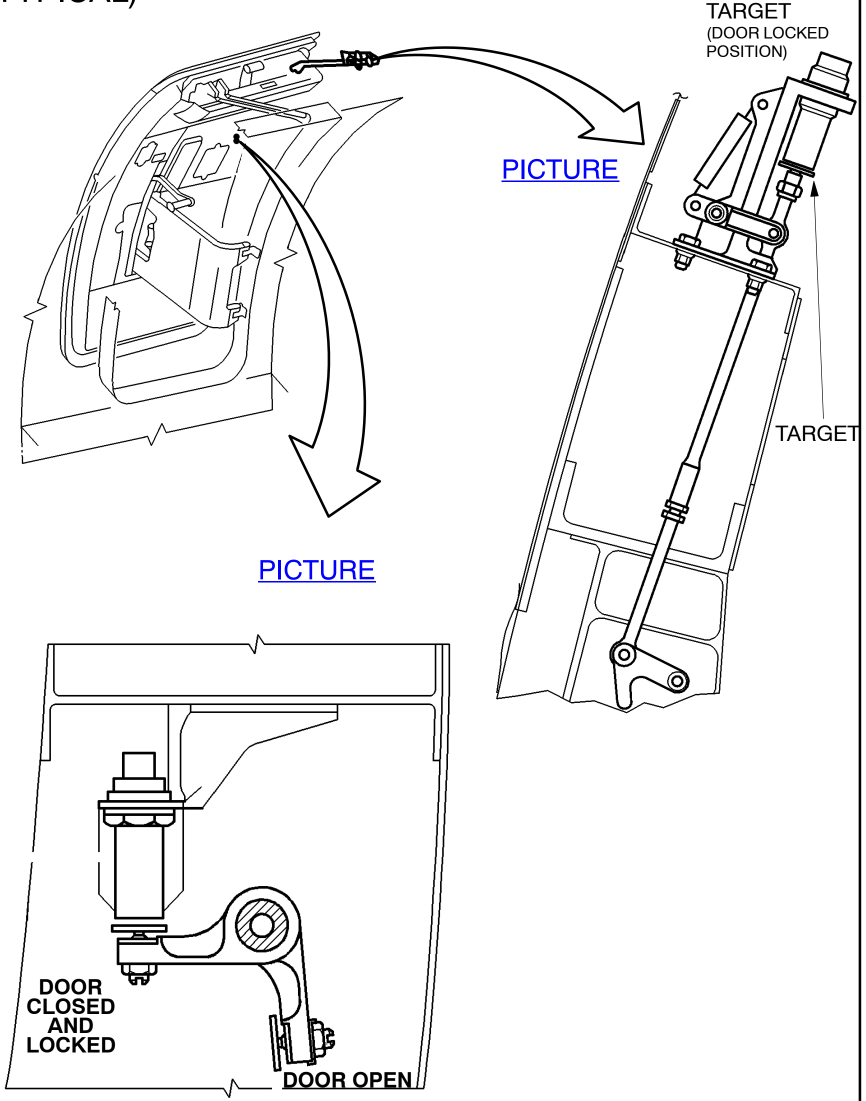
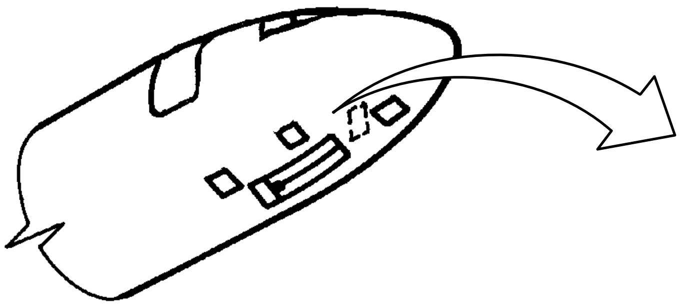
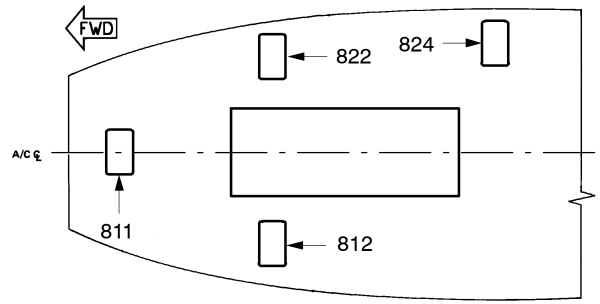


Figure 56 A321 Emergency Exit Doors

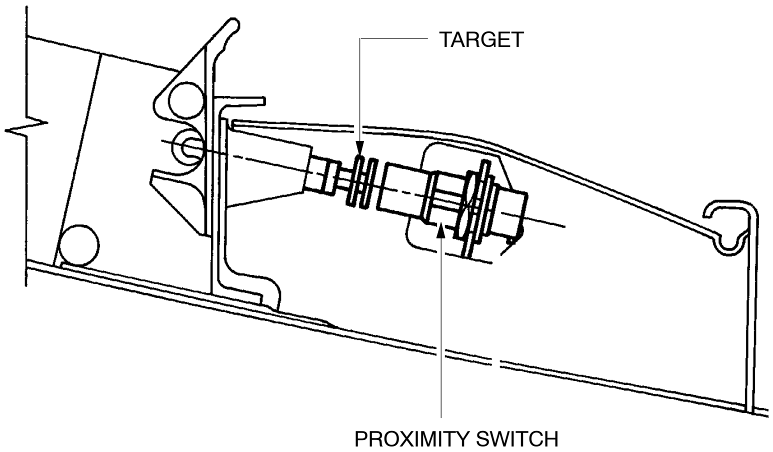


AVIONIC COMPARTMENT DOORS LOCATIONS



AVIONIC COMPARTMENT DOOR SW. MECHANISM (TYPICAL)

(TARGET SHOWN IN DOOR CLOSED POSITION)



AVIONIC COMPARTMENT DOOR SW. MECHANISM (TYPICAL)

(TARGET SHOWN IN DOOR OPEN POSITION)

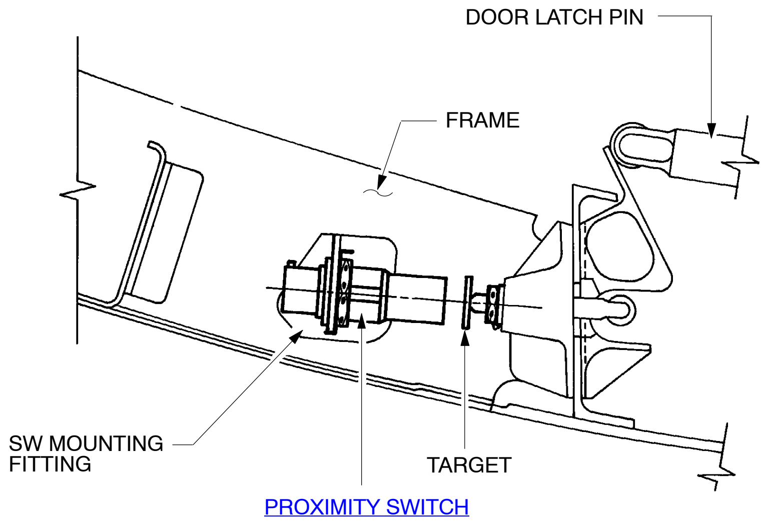


Figure 57 Avionic Compartment Doors Switches

DOOR WARNING LIGHTS DESCRIPTION

CABIN OVERPRESSURE WARNING LIGHT

Description

A red cabin overpressure warning light at the passenger/crew doors indicates (flashing) a residual cabin pressure. All passenger/crew doors and the emergency doors on A321 aircraft are equiped with this light.

Depending on aircraft MSN and Service Bulletin status:

Config. 1(Pre SB 52–1091):

The CABIN PRESSURE warning light flashes when:

- The oil pressure of the two engines decreases.
- The escape slide is in disarmed position.
- The passenger cabin pressure is higher than 2.5 mbar (0.04 psi) for more than 5 seconds.

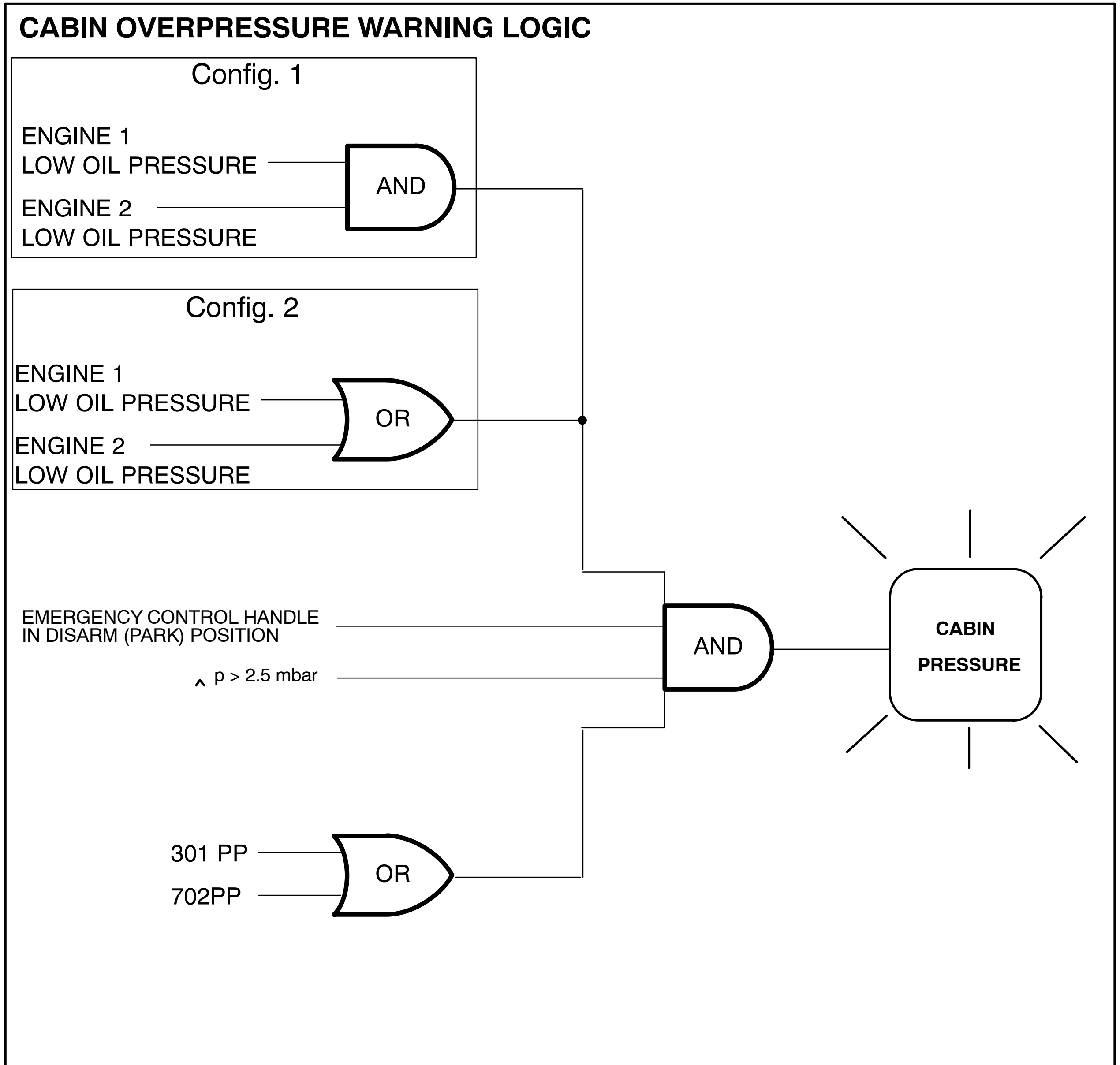
When these 3 conditions are present simultaneously, the CABIN PRESSURE warning light flashes.

Config. 2 (Post SB 52–1091):

The CABIN PRESSURE warning light flashes when:

- The oil pressure of one of the two engines, or the two engines, decreases.
- The escape slide is in disarmed position.
- The passenger cabin pressure is higher than 2.5 mbar (0.04 psi) for more than 5 seconds.

When these 3 conditions are present simultaneously, the CABIN PRESSURE warning light flashes.



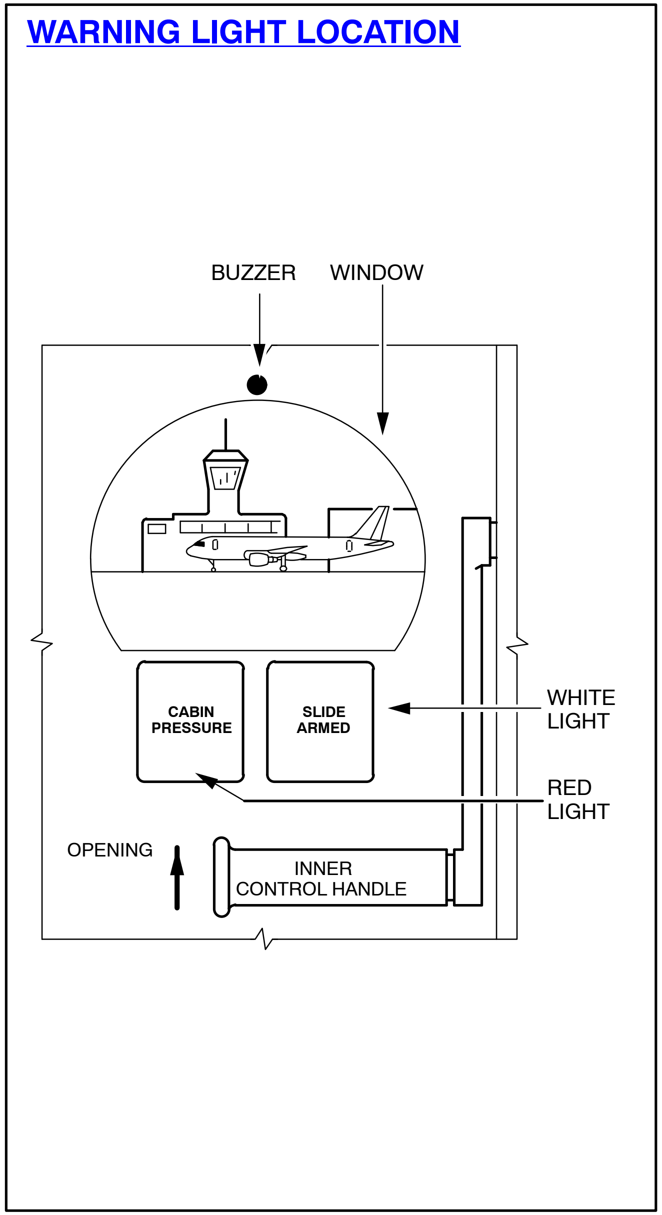


Figure 58 Cabin Overpressure Warning Light Logic

SLIDE ARMED LIGHT

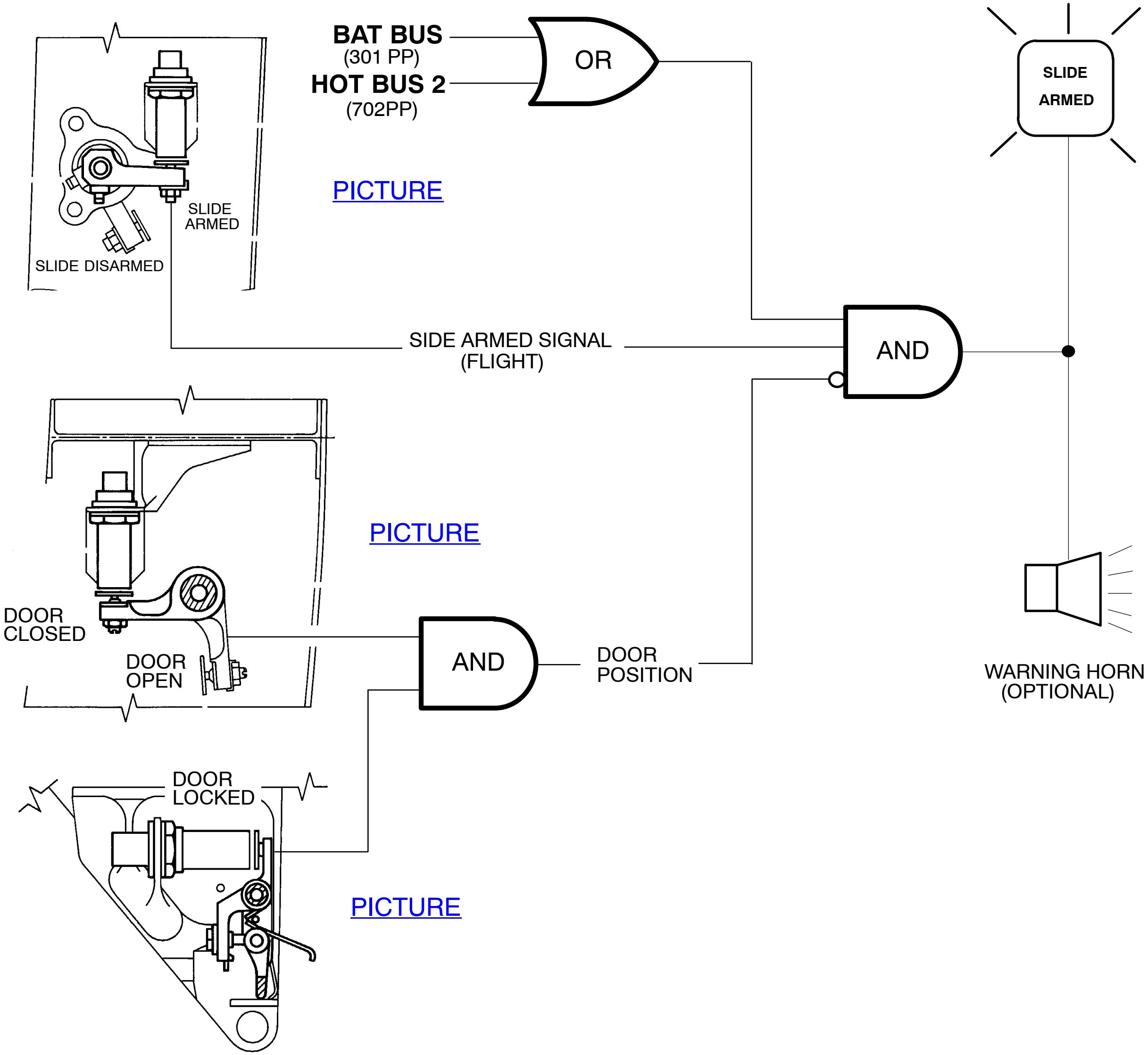
Description

A white Slide Armed Light in the windows of the passenger/crew doors indicates the emergency control handle stays in ARMED position and the door control handle is not closed anymore. All passenger/crew doors and emergency doors on A321 aircrafts are equiped with this light. Two conditions must be fullfilled to warn the door operator for activating the slide by a white light on:

- Escape slide in ARMED position.
- Door control handle not closed.

In case of emergency (escape slide in armed) and the door will be opened, this light will be ignored.

SLIDE ARMED WARNING LIGHT LOGIC



WARNING LIGHT LOCATION

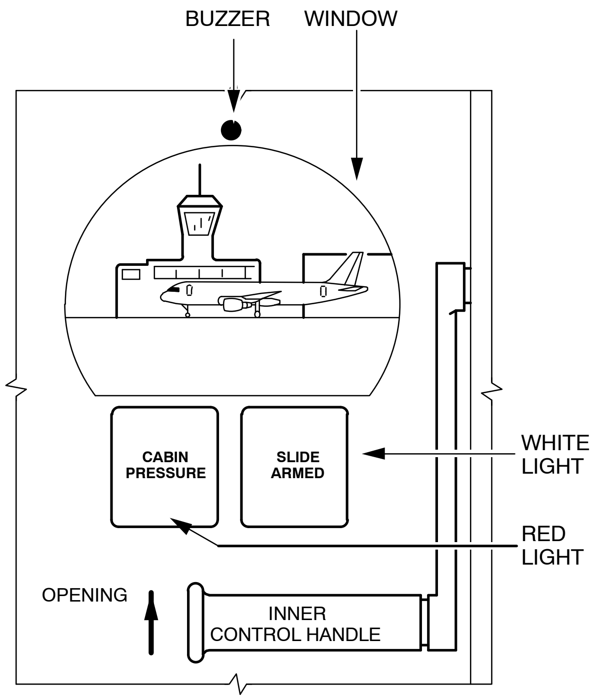


Figure 59 Slide ARMED Warning Light Logic

EMERGENCY EXIT WARNING LIGHT

EMERGENCY EXIT HATCHES INDICATION LOGIC (A320 SHOWN)

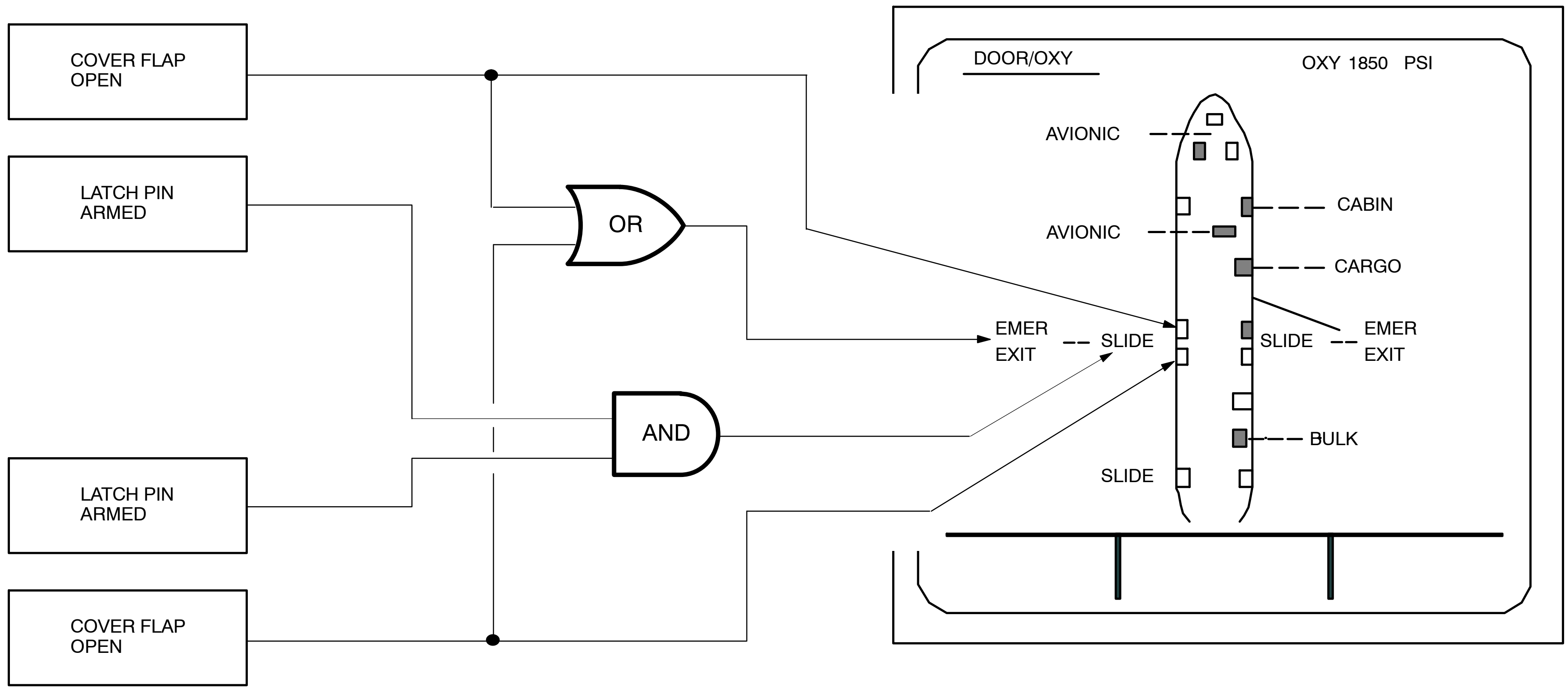
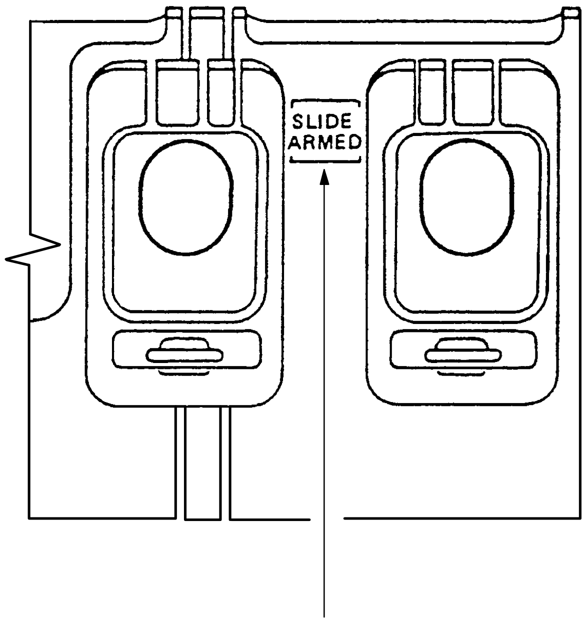


Figure 60 Emergency Exit Hatches Indictaion Logic



WHITE " SLIDE ARMED "
INDICATOR LIGHT

SLIDE ARMED INDICATOR LIGHT LOGIC (A320 SHOWN)

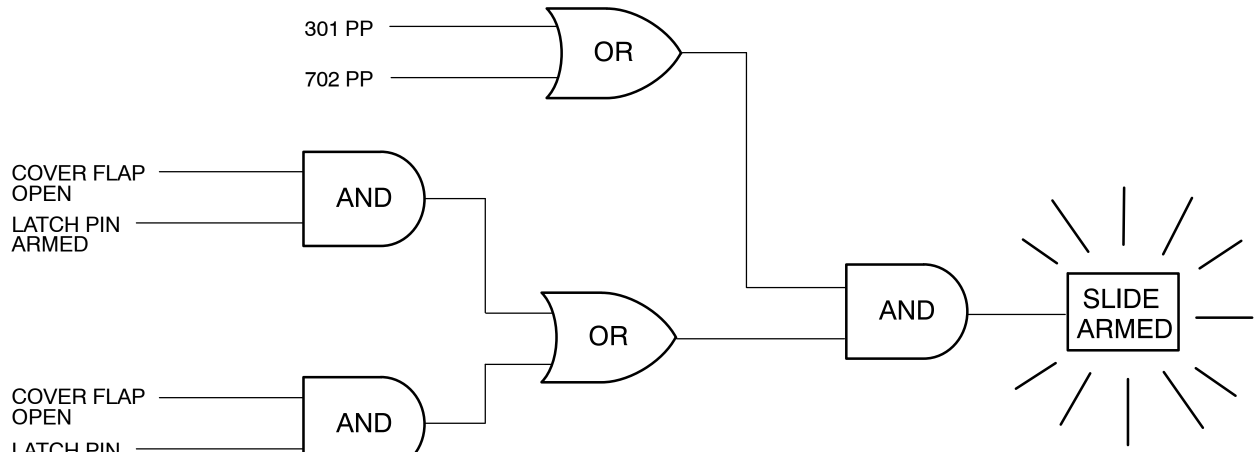


Figure 61 SLIDE ARMED Indicator Light

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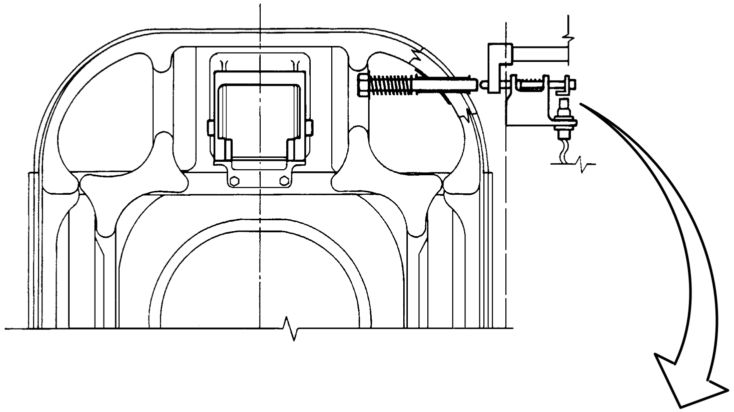
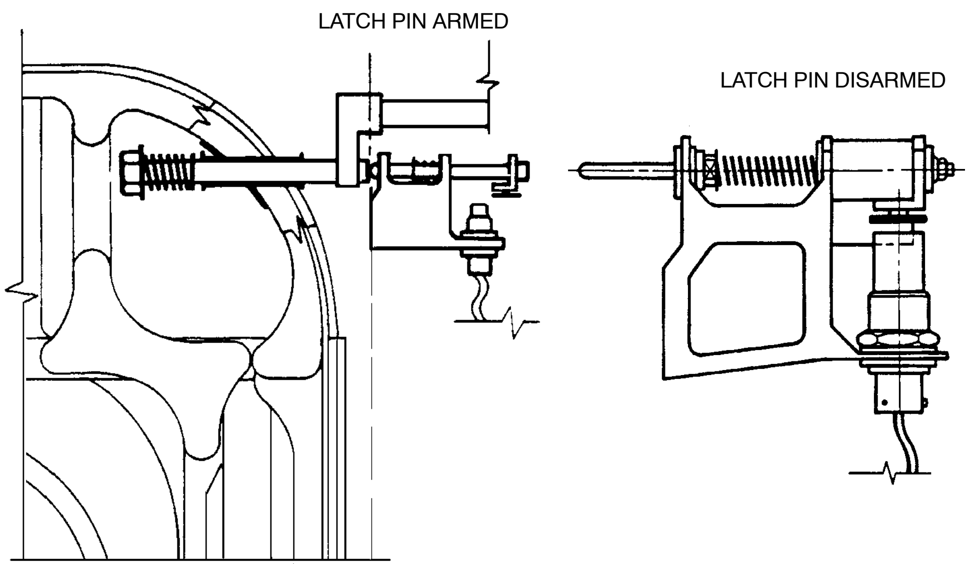


LATCH PIN SENSOR



COVER FLAP SENSOR

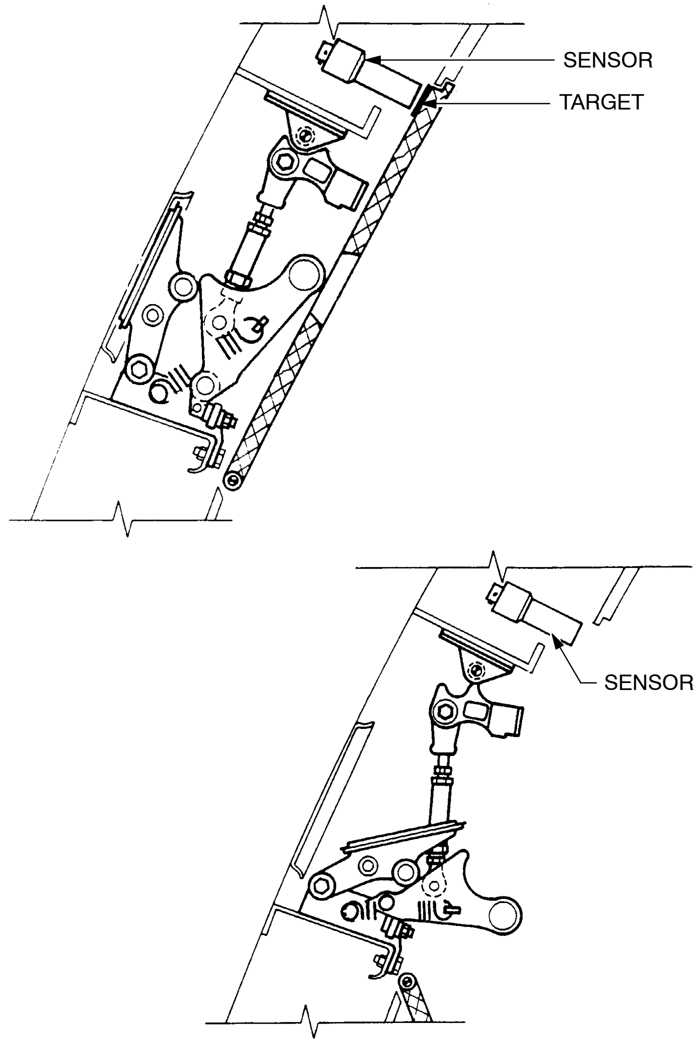


Figure 62 Emergency Exit Hatch Switches

CARGO & BULK CARGO DOOR INDICATION DESCRITPION

FWD & AFT CARGO DOORS

The FWD and aft cargo doors have three similar proximity switches:

- the handle proximity switch,
- the frame proximity switch,
- the latching shaft proximity switch.

DOOR INDICATING AND WARNING PRINCIPLE

The locking handle and the frame proximity switches give the door indication on the ECAM via the Landing Gear Control and Interface Unit (LGCIU).

Cargo Door Locked

When the door is latched and locked, the handle and frame proximity switch targets are NEAR. The door symbol is green on the ECAM DOOR page. The latching shaft proximity switch target is FAR.

Cargo Door Not Locked And Not Fully Open

As soon as the frame or the door handle proximity sensor detects target FAR the door is indicated as unlocked and the symbol is amber on the ECAM DOOR page. The latching shaft proximity switch target is FAR.

Electrical Control System - Enable Logic

The electro selector valve is supplied when:

- the latching shaft proximity switch target is near, (this target near position is only available when the locking handle is in the fully open position),
- the manual selector valve is operated.

Electrical Control System - Control

When the manual selector valve is operated, the integrated proximity sensor sends a signal to the LGCIU to open the electric selector valve and to start the electric pump of the yellow hydraulic system.

Cargo Door Fully Open

When the cargo door actuators are in the fully open and locked position, their internal proximity switches control illumination of the green indicator light fitted in the manual selector recess.

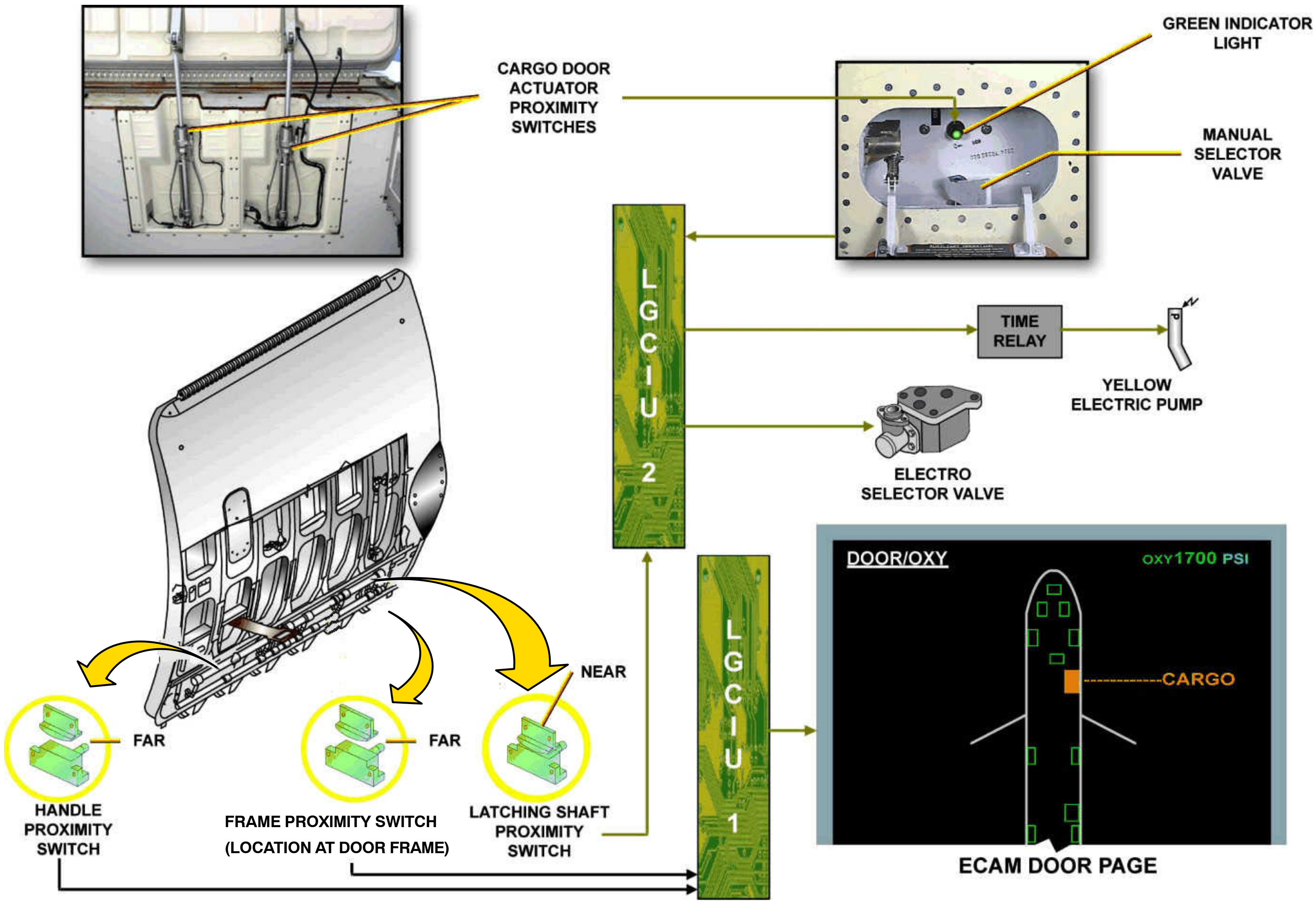


Figure 63 Cargo Door System

AVIONICS, BULK CARGO & AIRSTAIRS DOORS

Bulk cargo and Airstairs doors are optional. The avionics, bulk cargo and airstairs doors use a single proximity switch for the door warning function.

It is installed in the door frame on the fuselage.

Principle

The proximity switch gives door indications on the ECAM DOOR page via the SDAC, except for the airstairs door indications, which are not displayed when the door is closed and locked.

When the door is locked, the proximity switch target is near and the door symbol is green on the ECAM DOOR page.

Figure 64 Entrance Stairs (Optional)

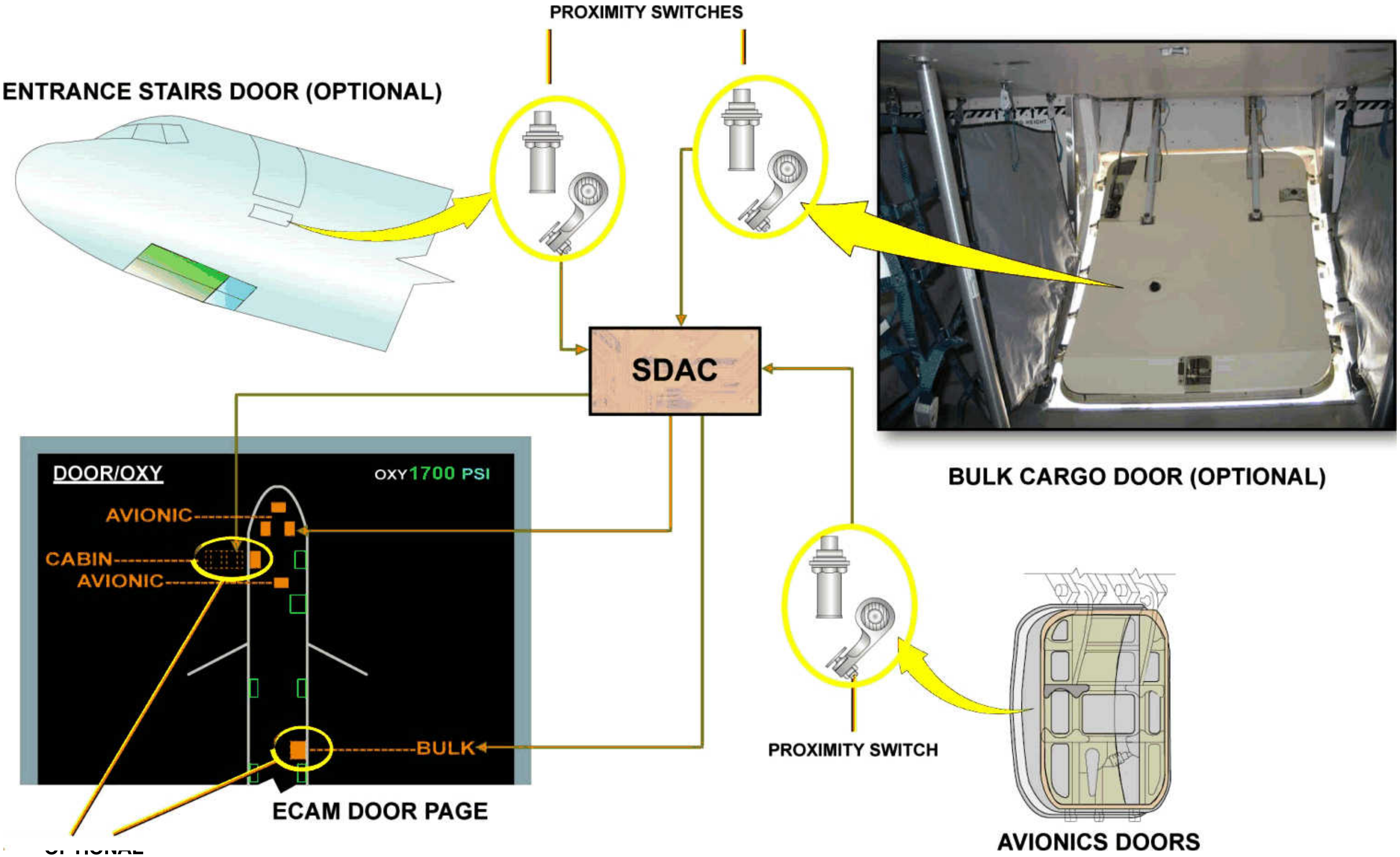


Figure 65 Bulk Cargo & Avionic Door System

ATA 53 FUSELAGE

53-00 FUSELAGE - GENERAL

INTRODUCTION

GENERAL

The fuselage is a semi-monocoque structure. Light alloy circular frames and longitudinal stringers support and strengthen the main fuselage skin. There are no longitudinal stringers in the nose assembly.

The fuselage is made of separate assemblies which are put together to make the complete fuselage shell. The assemblies are as follows:

- nose forward fuselage,
- forward fuselage,
- center fuselage,
- rear fuselage,
- cone/rear fuselage.

Frames 24, 35, 47 and 70 make the joints for the assemblies.

Pressure bulkheads are installed at FR1 and FR70. The pressure bulkheads and the fuselage skin make the basic pressurized zone. The cockpit, cabin, avionics compartment and the FWD and AFT cargo compartments are included in the pressurized zone.

The structure is made of frames, stringers and skin panels. They are riveted together to make the fuselage shell. Crossbeams make the shell stronger in the forward and aft fuselage. Support struts are attached to each end of the crossbeams.

Longerons and seat tracks that are attached to the crossbeams make the cabin floor structure. The belly fairing primary structure is installed on the exterior of the lower fuselage between FR31/35 and FR48/FR53. It is an extension to the lower fuselage and contains the air-conditioning and hydraulic services equipment.

The cabin floor structure divides the fuselage into two areas, the upper fuselage and the lower fuselage. The upper fuselage includes the cockpit and the cabin. The lower fuselage includes the avionics compartments, nose and main gear bays and the FWD and AFT cargo compartments. Crossbeams and support struts support the cabin floor structure at STGR23.

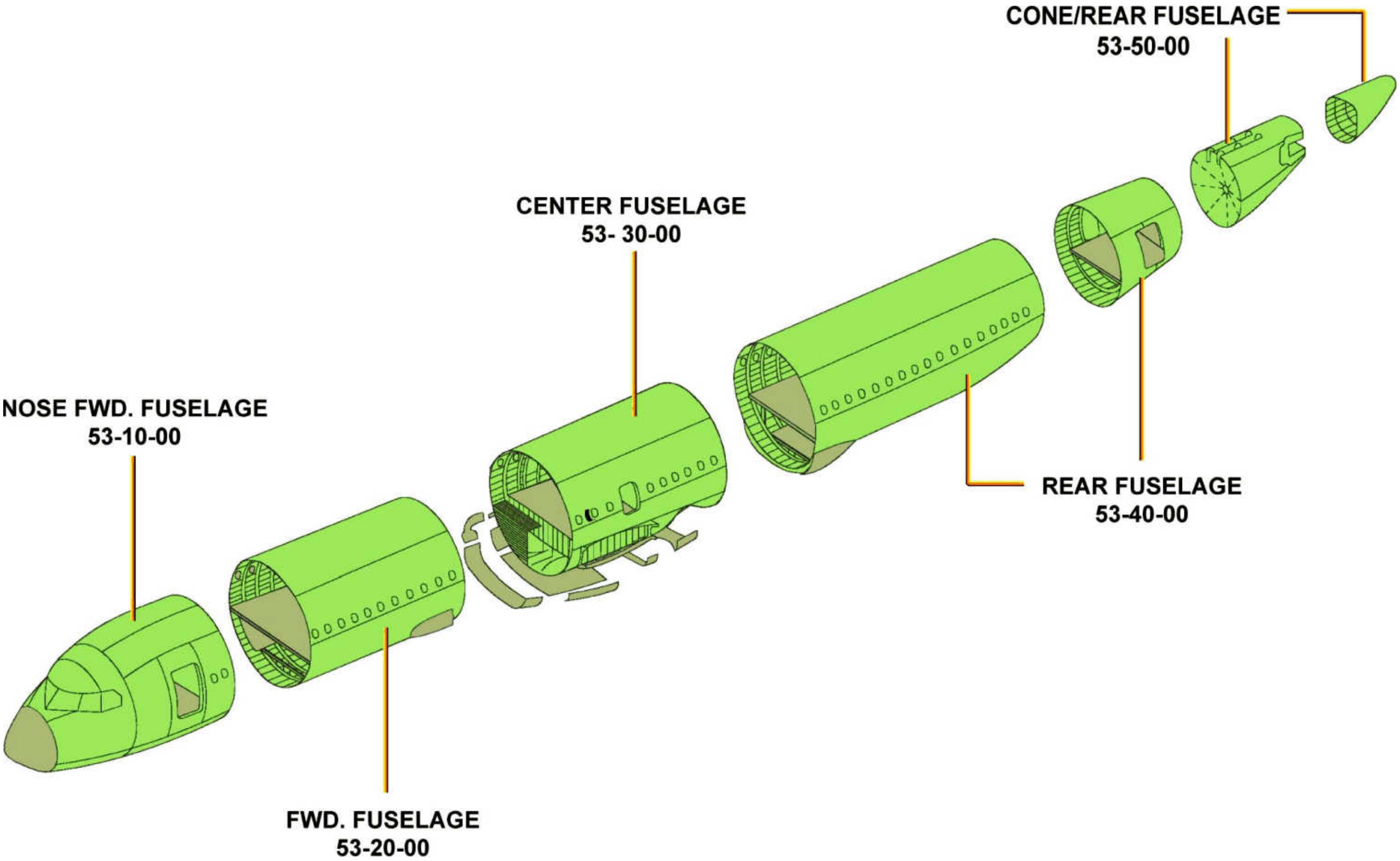


Figure 66 Fuselage ATA Breakdown

FUSELAGE BREAKDOWN

Compared with the A320, the A321 forward fuselage is eight frame bays longer (additional section 14A, extending between frames (Fr) 35 and 35.8).

The A321 rear fuselage is five frame bays longer (additional section 16A, extending between Fr 47 and Fr 47.5.

Compared with the A320, the A319 forward fuselage (section 13/14) and the rear fuselage (section 16/17) are respectively three frame bays and four frame bays shorter.

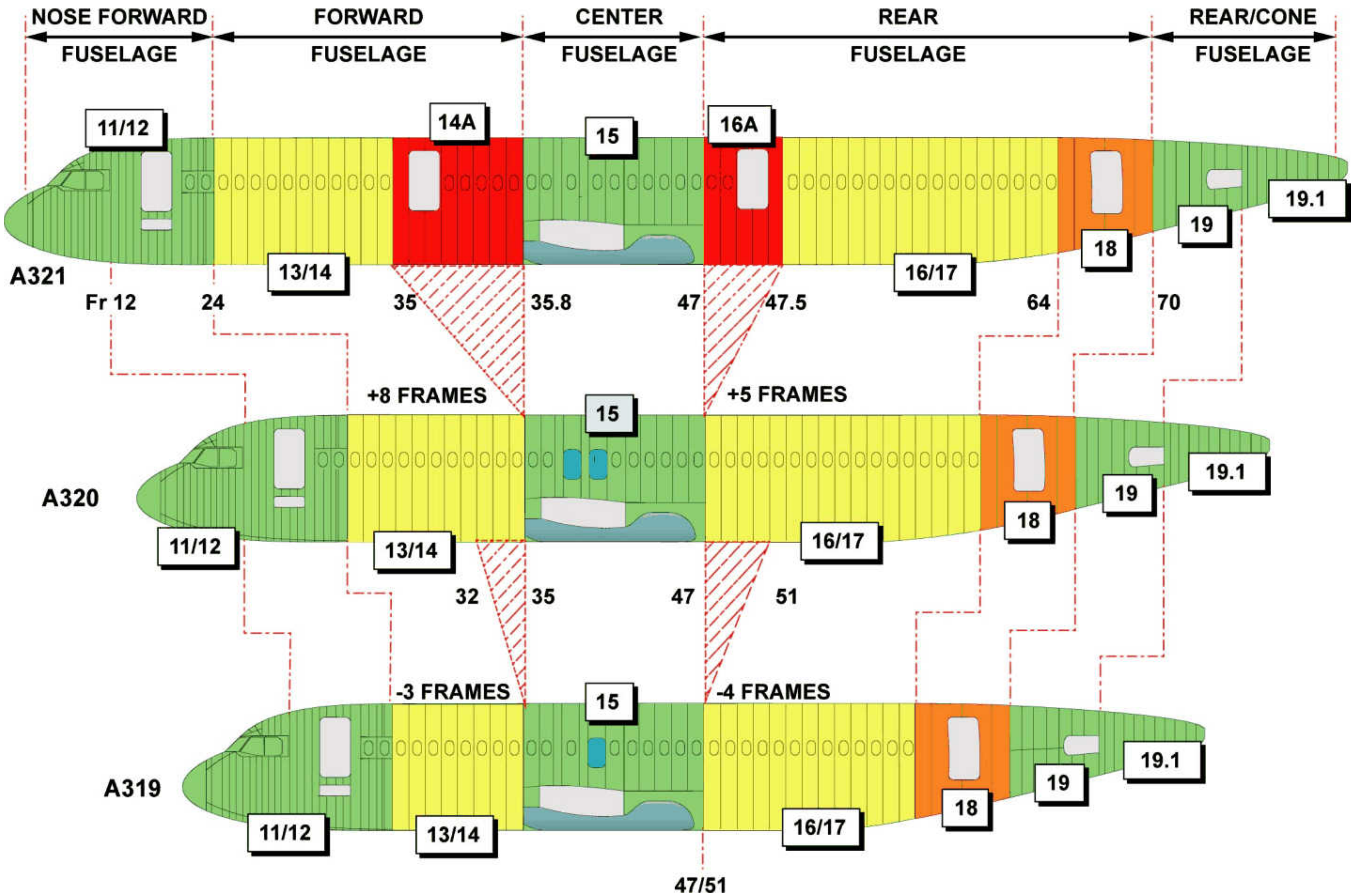


Figure 67 A319-A321 Fuselage Breakdown

53–10 NOSE FORWARD FUSELAGE

NOSE FORWARD FUSELAGE PRESENTATION (SECTION 11/12)

DESCRIPTION

This section of the fuselage (frame 1 to 24) contains in its upper forward region the flight deck and aft of that the entrance area of the forward passenger and service door.

The lower region contains the nose landing gear bay, the electrics and avionics bay.

There are no stringers in this section but the frames are pitched at about half that of the typical pitch in the main fuselage. The aluminium alloy skin panels are chemically milled.

The skin panels below and above the center windshield are made of titanium to provide a good protection against bird impact.

Frames of this section are formed of sheet metal except in the lower region where the frames are machined from plate. The nose landing gear bay box is located between frames 9 and 20, it consists of integrally machined panels.

A jacking point is provided at the aircraft centre line between frames 8 and 9.

Frame 1 provides attachment for the machined flat front pressure bulkhead and a mounting for the radome.

Between frames 16 and 20, below the floor structure, space and structural provisions are made for installation of the optional airstairs.

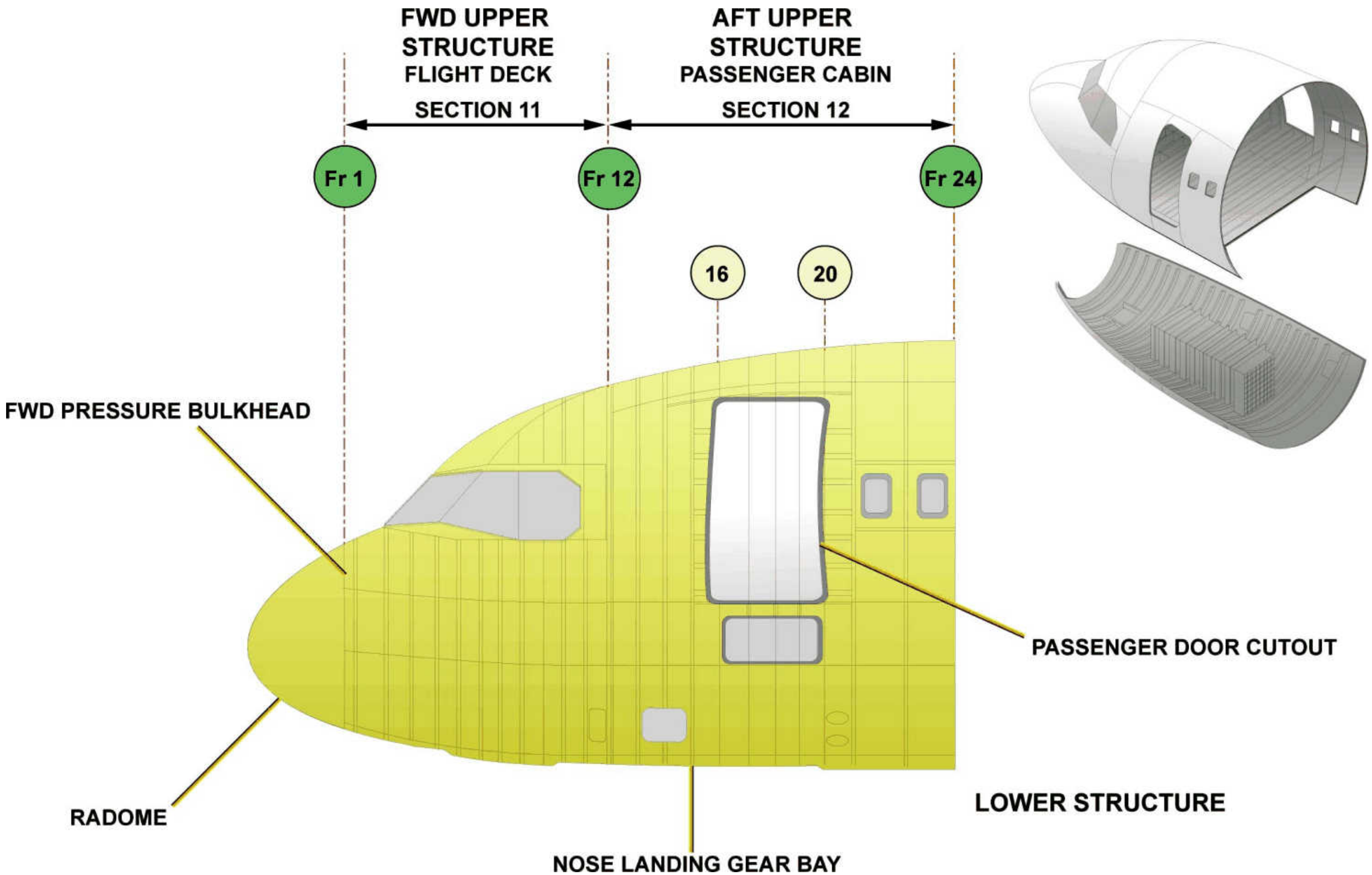


Figure 68 Nose Forward Fuselage

NOSE FORWARD FUSELAGE STRUCTURE DESCRIPTION

FORWARD & AFT UPPER STRUCTURES

The forward upper structure between Fr 1 and Fr 12 includes:

- closed frames,
- opened frames at level of openings for windshield and side windows,
- the forward pressure bulkhead,
- the flight deck floor support structure including two lateral boxes,
- the skin panels and the windshield frames,

The skin panels just above and below the windshield are made of titanium alloy for bird impact requirements.

The aft upper structure, between Fr 12 and Fr 24, is the forward passenger compartment and contains:

- the forward passenger/crew door between Fr 16 and 20,
- conventional assembly of skin, stringers and frames,
- the floor support structure.

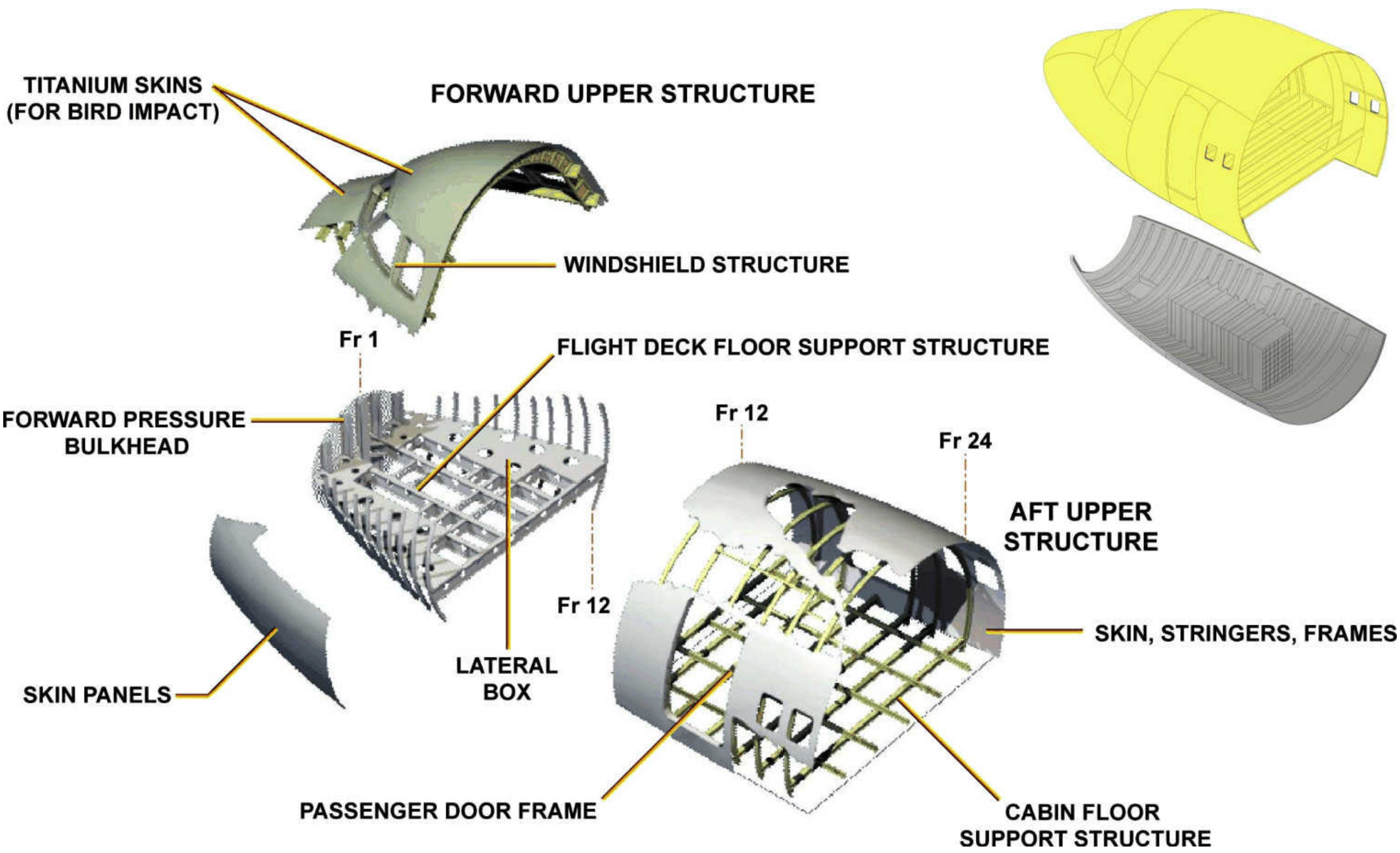


Figure 69 Forward & Aft Upper Structure

LOWER STRUCTURE

This part of section 11/12 contains the nose landing gear bay, access and service door cutouts.

The nose landing gear bay is shaped by three machined panels reinforced by horizontal and vertical extruded sections attached to the corresponding frames.

The lower parts of Fr 9 and Fr 20 are the forward and rear limits of the gear bay.

The lower fuselage comprises three skin panels. The central panel has an opening for access between Fr 3 and 5 and the opening for the nose landing gear bay between Fr 9 and 20.

The right hand side panel has two openings for access, between Fr 12 and 14 and Fr 21 and 23.

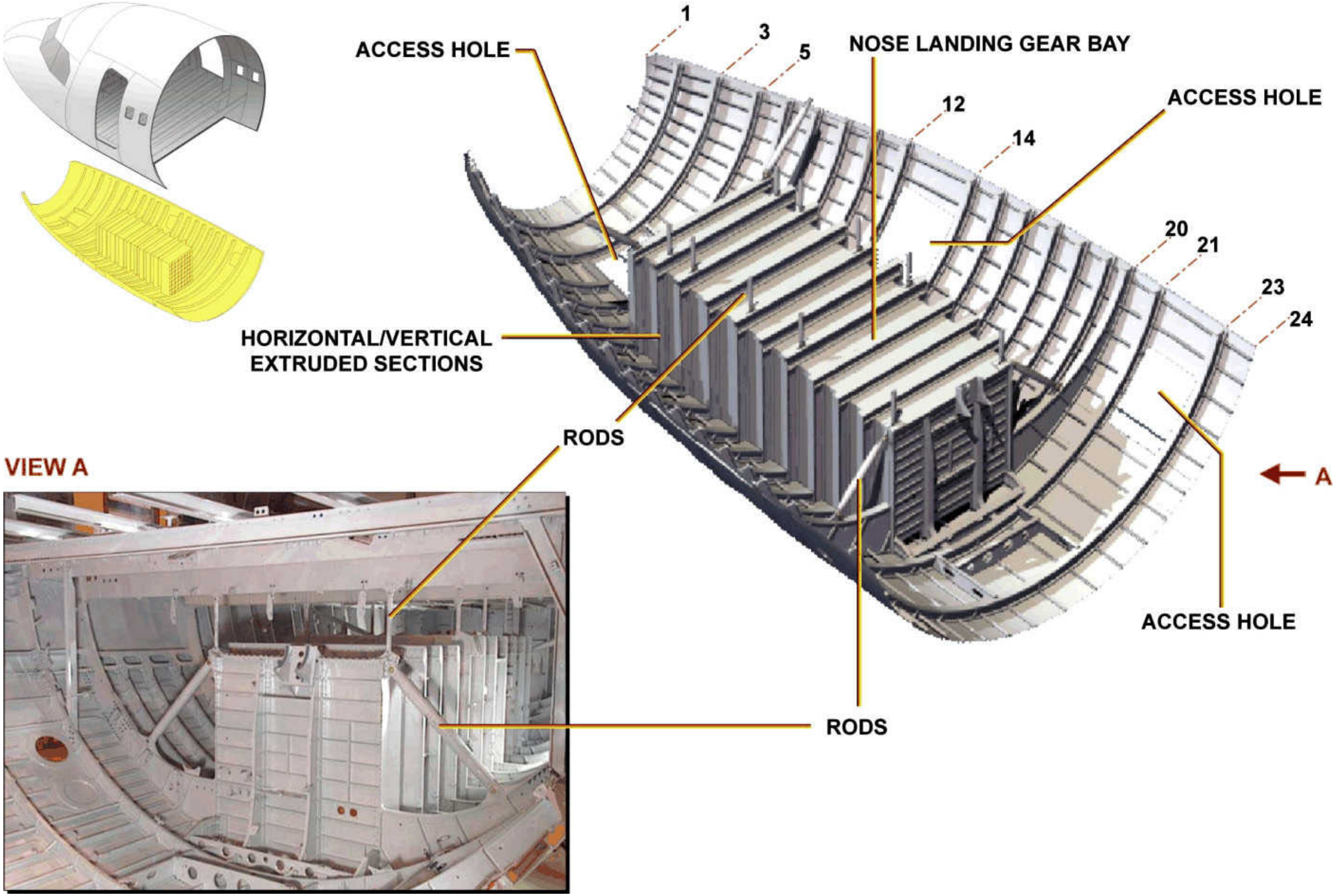


Figure 70 Forward Lower Structure

53–20 FORWARD FUSELAGE

FORWARD FUSELAGE PRESENTATION

FORWARD FUSELAGE (SECTION 13/14)

Description

This section of the fuselage lies between frames 24 and 35. It contains the front part of the passenger cabin and beneath the cabin floot, the forward cargo compartment. It has, on the starboard side, the forward cargo door.

This section is of conventional construction consisting primarily of chemical milled skin panels, frames and stringers formed from sheet metal. The ends of the cabin floor cross beams are attached to the frames, supported on each side of the freight compartment by extruded aluminium alloy struts. In the lower region of each frame an aluminium alloy structure is installed to support the cargo floor. The fuselage frames are arranged at regular intervals of 533,3 mm (21 inch). The standard frames have a common Z–shaped section made from formed sheet which provides a continuous structural member attached to the skin and stringers by sheet metal cleats.

FORWARD FUSELAGE (SECTION 14A ON A321)

Description

This region of the fuselage lies between frames 35.1 and 35.8. It contains also the front part of the passenger cabin and beneath the cabin floot the forward freight compartment. It has, on both sides emergency exits and containers to carry the slide rafts for this exits. Construction like section 13/14.

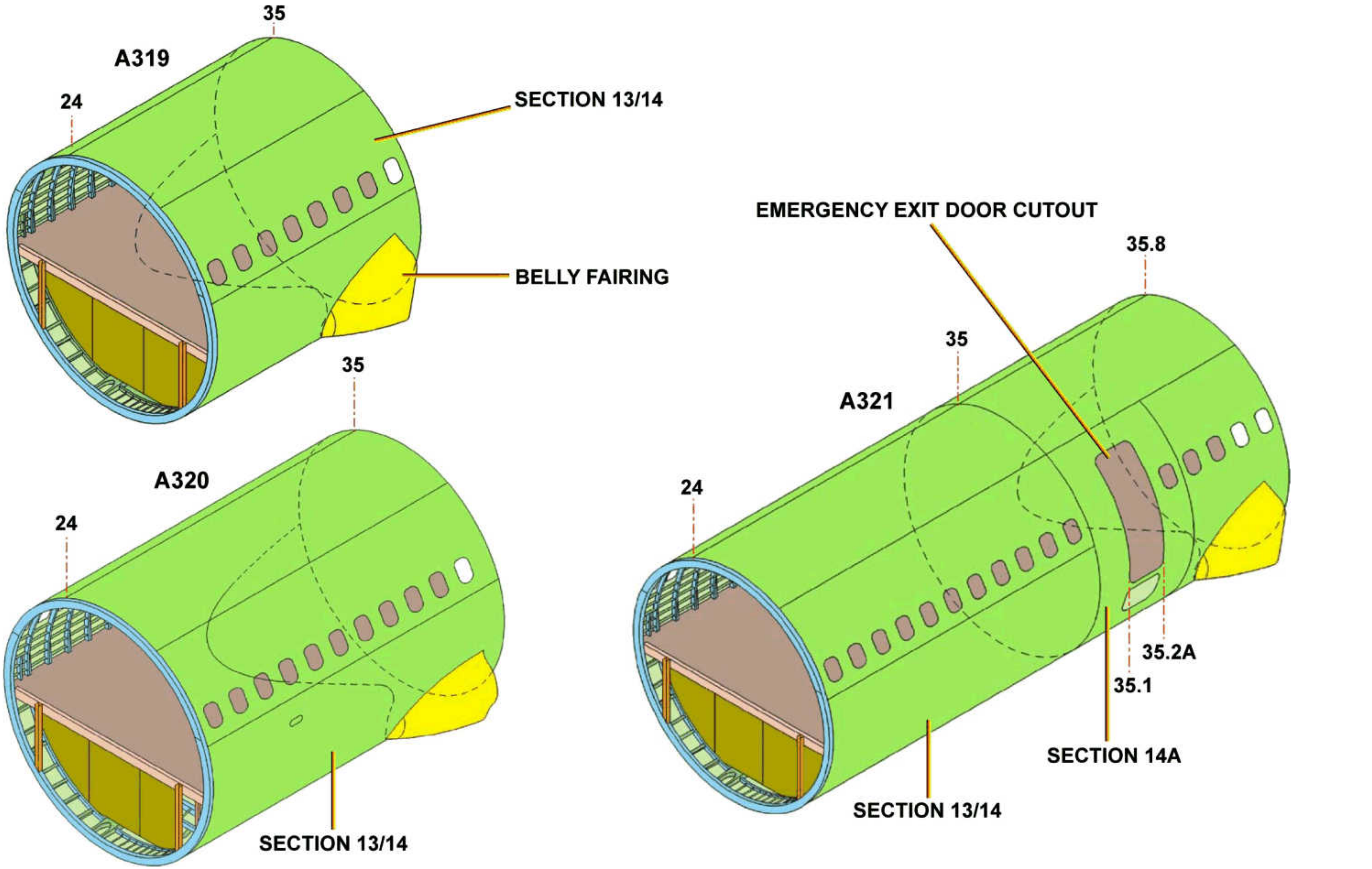


Figure 71 Forward Fuselage

FORWARD FUSELAGE STRUCTURE DESCRIPTION

FORWARD FUSELAGE STRUCTURES

Typical Structure

This section is of conventional construction mainly composed of chemically milled skin panels, frames made from sheet metal and extruded stringer profiles.

The standard frames have a common Z–shaped section made from formed sheet, which provides a continuous structural member attached to the skin and stringers by means of sheet metal cleats.

The structure of the cabin floor has:

- cross beams,
- seat tracks,
- floor support struts,
- floor panels.

Longitudinal Skin Joints

The longitudinal joints are generally longitudinal lap joints with three rivet – row joints.

As the skin is, in most areas, 1.6 thick, it is reinforced by bonded doubler straps of at least 0.6 mm to allow countersunk riveting. For chemical milled skins the maximum thickness is at least 2.2 mm in the joint areas.

In addition, at each intersection of frames and lap joints, a 1 mm titanium alloy strap has been added to provide good damage tolerance capabilities.

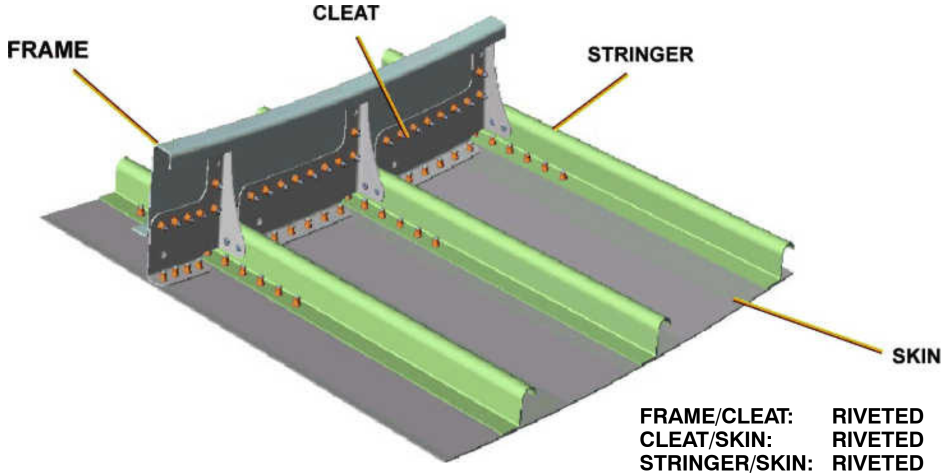


Figure 72 Typical Structure

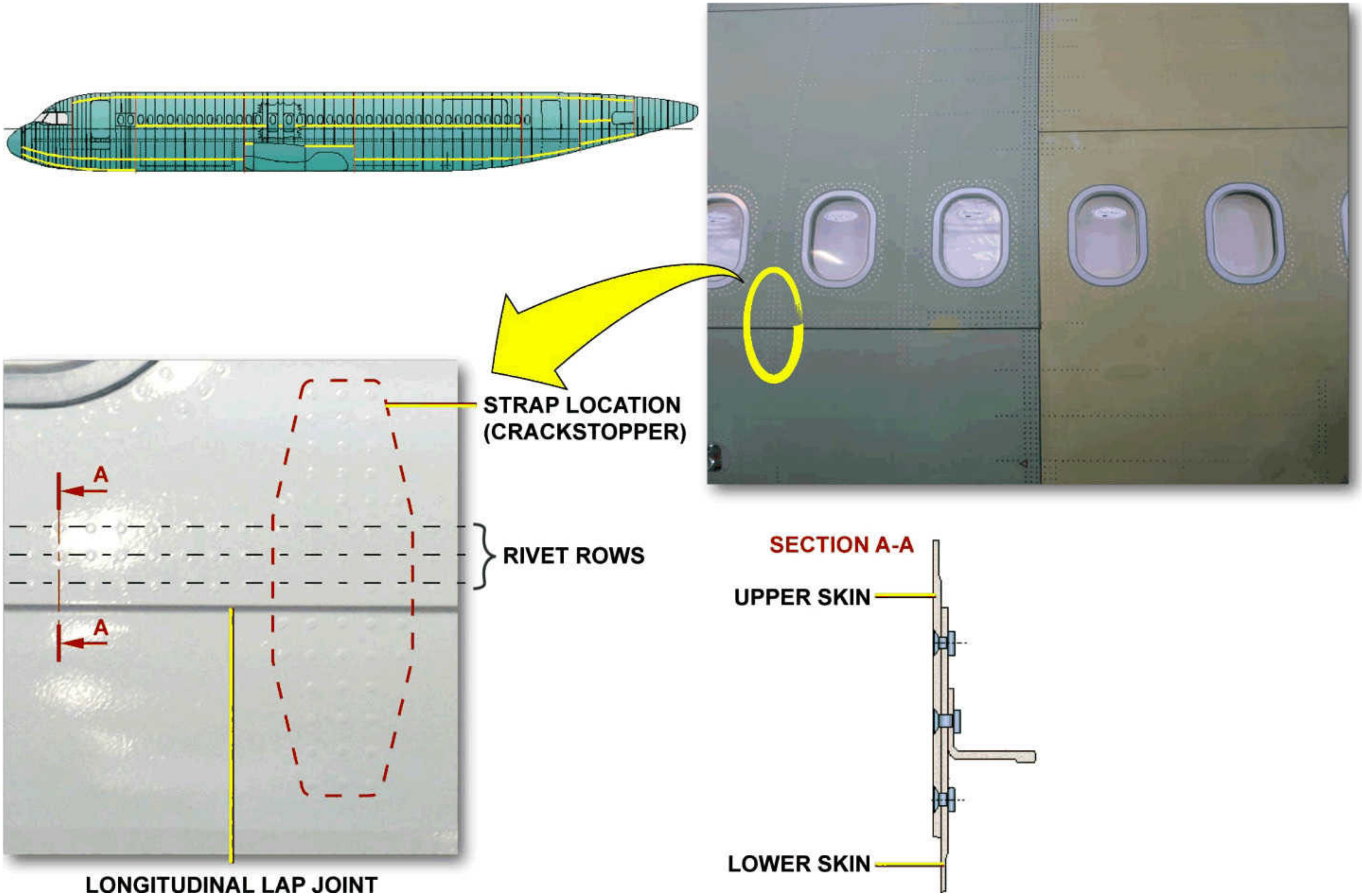


Figure 73 Longitudinal Skin Joints

Circumferential Skin Joints

At the typical joints the skin panels are connected by a circumferential strap and three rivet rows. The stringers are coupled by joint pieces.

In the region of the circumferential joints all stringers are riveted to the skin.

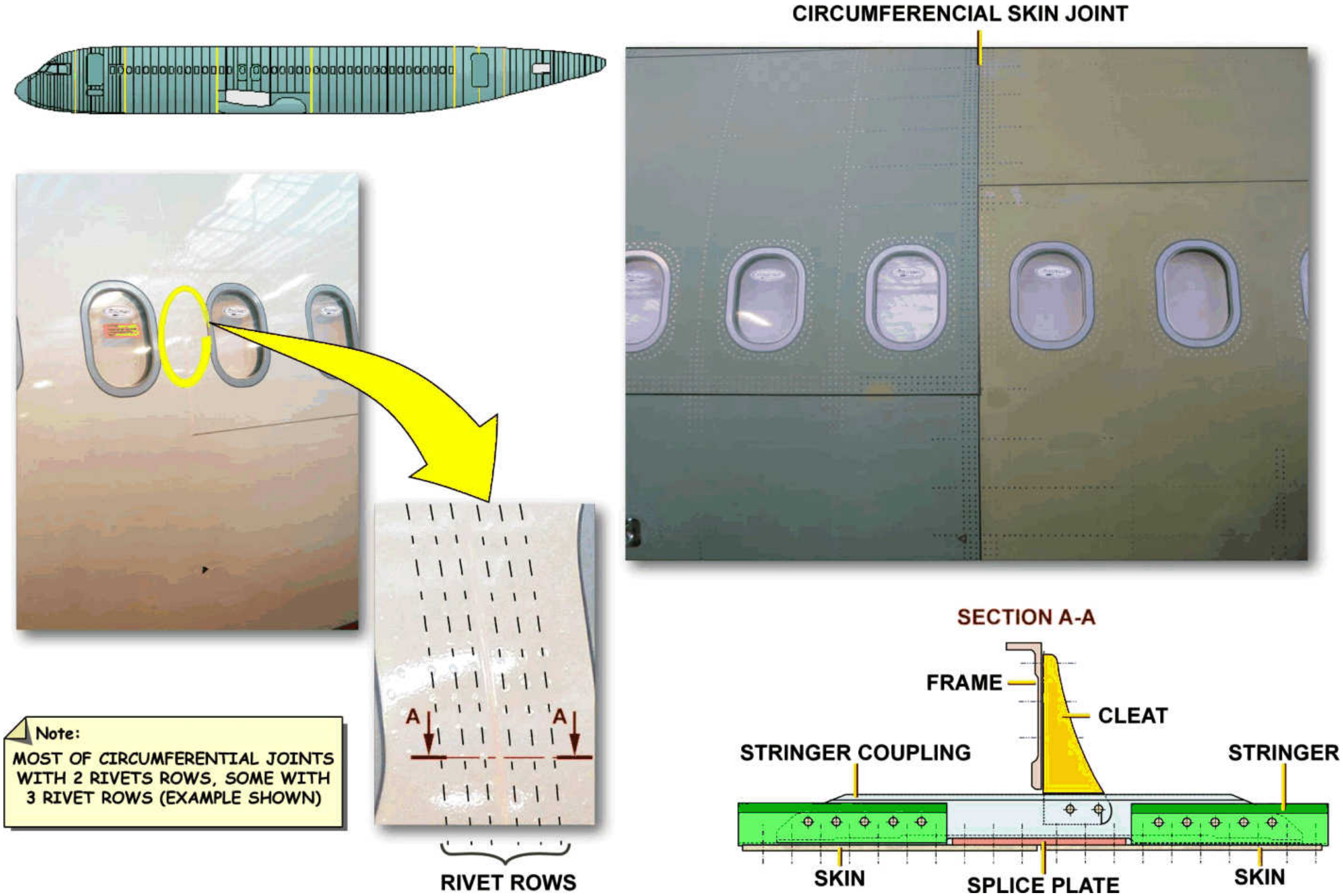


Figure 74 Circumferential Skin Joints

53–30 CENTER FUSELAGE

CENTER FUSELAGE PRESENTATION

GENERAL

This region of the fuselage is located between frames 35 and 47. It provides part of the cabin together with the integration structure for the wing centre box. Beneath the cabin floot; it comprises the air conditioning, hydraulic and main landing gear bay in conjunction with a belly fairing. The zone beneath the cabin floor is unpressurized the actual pressure boundary being formed by the upper skin panels of the centre wing box and a pressure diaphragm extending from the wing box to frame 46 above the main landing gear bay. The forward pressure boundary is formed by the lower region of frame 35, and the aft boundary is formed by an inclined pressure bulkhead installation as lower part of frame 46.

Frames

The frames are arranged at regular intervals of 533 mm (21 inch) except in the emergency exits area. Typical frames between 35 and 47 are machined except in their upper region where they are formed from sheet metal.

Frames 36 and 42 belong to the centre wing box section 21 (see description in chapter 57, paragraph 2). This frames transmitt forces between wing center box and the fuselage.

The main landing gear bay panels are chemically milled, with externally riveted stringers.

Longitudinal structural continuity of the lower fuselage is maintained by a keel beam which transmits the overall fuselage bending loads. This beam is a box stiffened by internal ribs, which also provides attachment points for the landing gear bay doors and door actuators. The beam is attached to frames 35 and 46/47 and to the lower part of the centre wing box.

Skins and Stringers

The upper shell skin panels to the level of the window frames and the lower side skin shells are chemically milled, with riveted stringers.

The emergency exit panels are chemically milled, with riveted stringers. A320 aircrafts have 4, A319s have 2, and A321s have no emergency exits in this section.

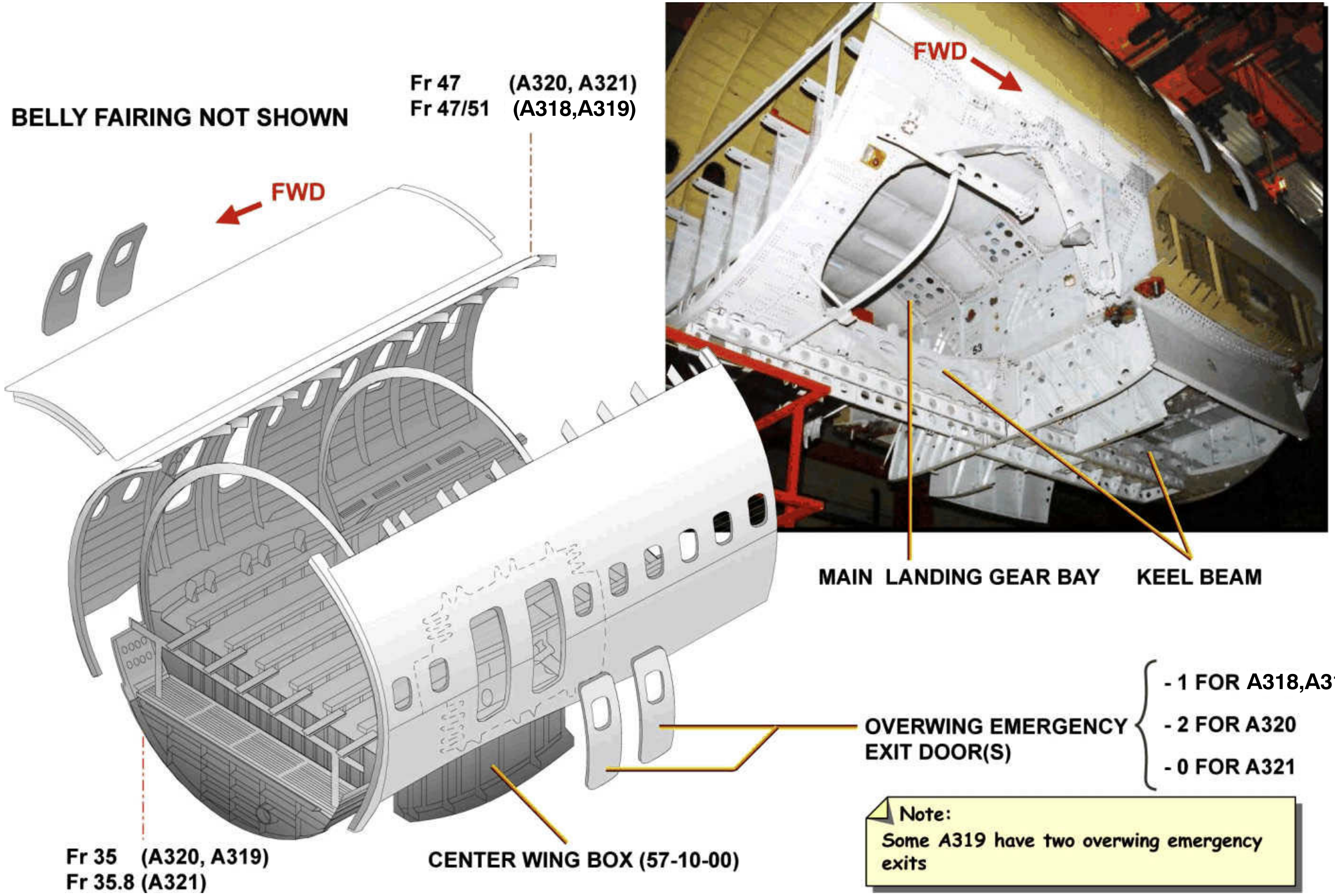


Figure 75 Center Fuselage

CENTER FUSELAGE STRUCTURE DESCRIPTION

CENTER FUSELAGE STRUCTURES

Keal Beam

The longitudinal structural continuity of the lower fuselage in this area is maintained by the keel beam.

This beam is an aluminum alloy box structure, including skins, stringers and ribs, and provides attachments for the main landing gear doors and door actuators.

In its center area, the keel beam side walls are connected to the wing-box aft lower panel.

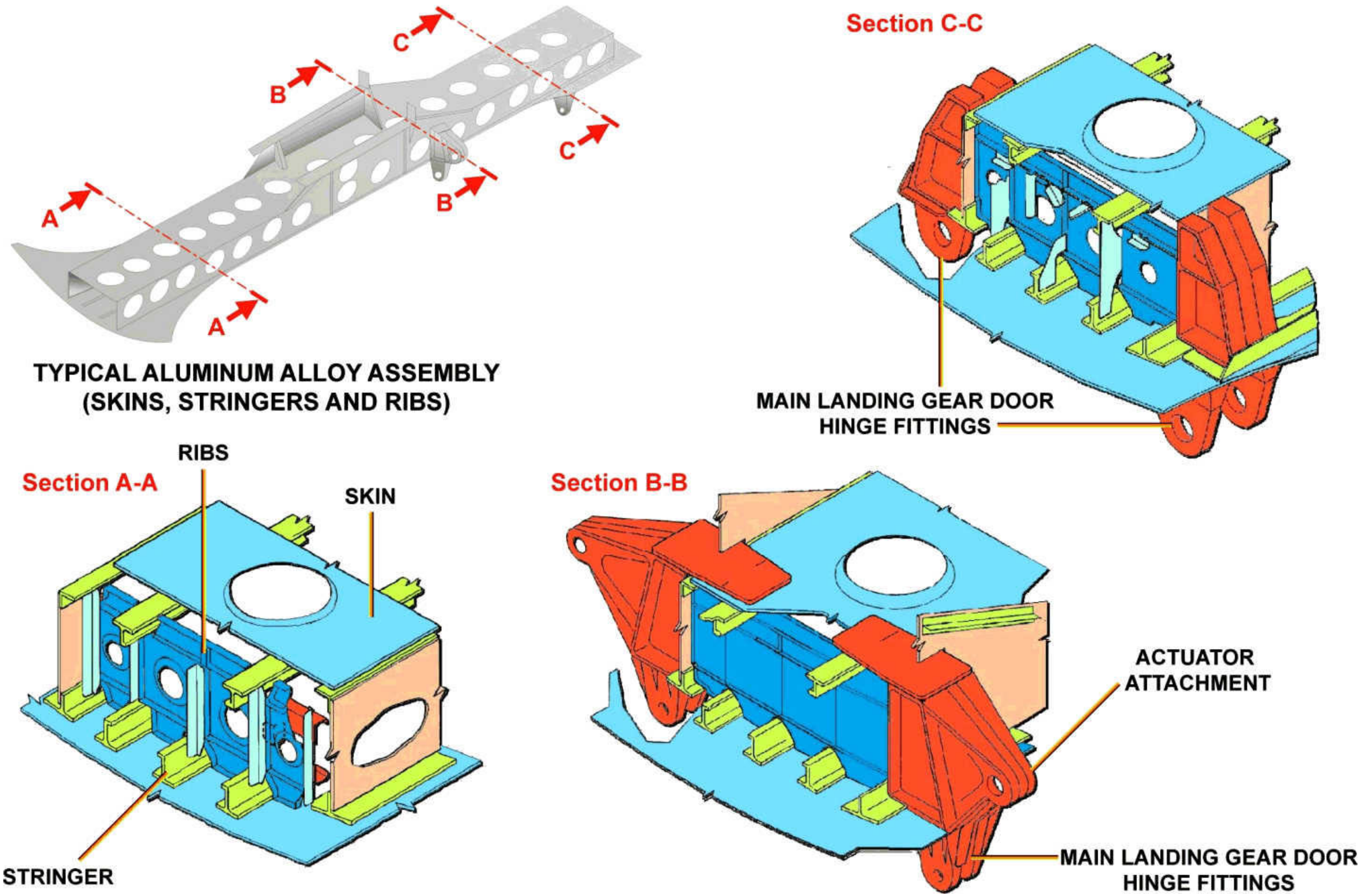


Figure 76 Center Fuselage - Keal Beam

Belly Fairing

The belly fairing includes a substructure made of aluminum alloy frames and webs which are attached to the fuselage via fittings and rods.

This substructure supports the panels made of composite materials.

The belly fairing also includes the landing gear doors, external access panels and access doors for maintenance.

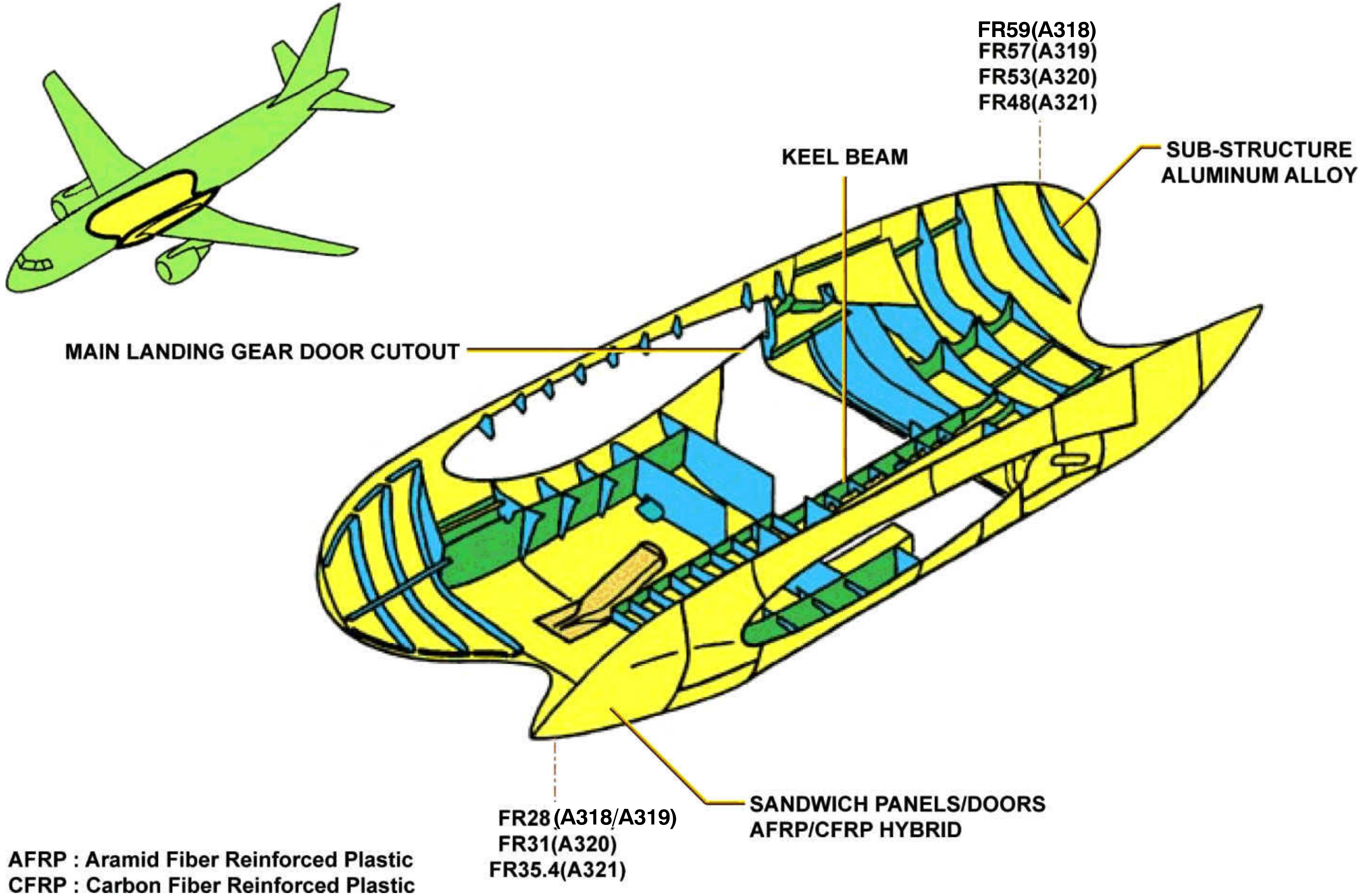


Figure 77 Center Fuselage - Belly Fairing

53–40 REAR FUSELAGE

REAR FUSELAGE PRESENTATION

REAR FUSELAGE (SECTION 16/17 AND 18)

A319/A320 General Arrangement

The rear fuselage assembly is a pressurized area, which extends from Fr 47 to Fr 70.

The A319 and A320 rear fuselage is divided into two sections (the A321 has an additional section 16A):

section 16/17 between Fr 47 and Fr 64,

section 18 between Fr 64 and Fr 70.

Section 16/17 is shorter by four frames than on the A320.

The upper part of the fuselage contains the aft section of the passenger cabin and the aft passenger/crew doors located between Fr 66 and Fr 68.

The lower part contains the aft cargo compartment. The aft cargo compartment door is installed between Fr 52A and Fr 56 (RH side); the bulk cargo compartment door is installed between Fr 60 and Fr 62 (RH side).

The design of section 16/17 is similar to that of forward fuselage sections (typical skin, stringer and frame arrangement).

Skin panels of the lower area have support attachment structures for the belly fairing rear part.

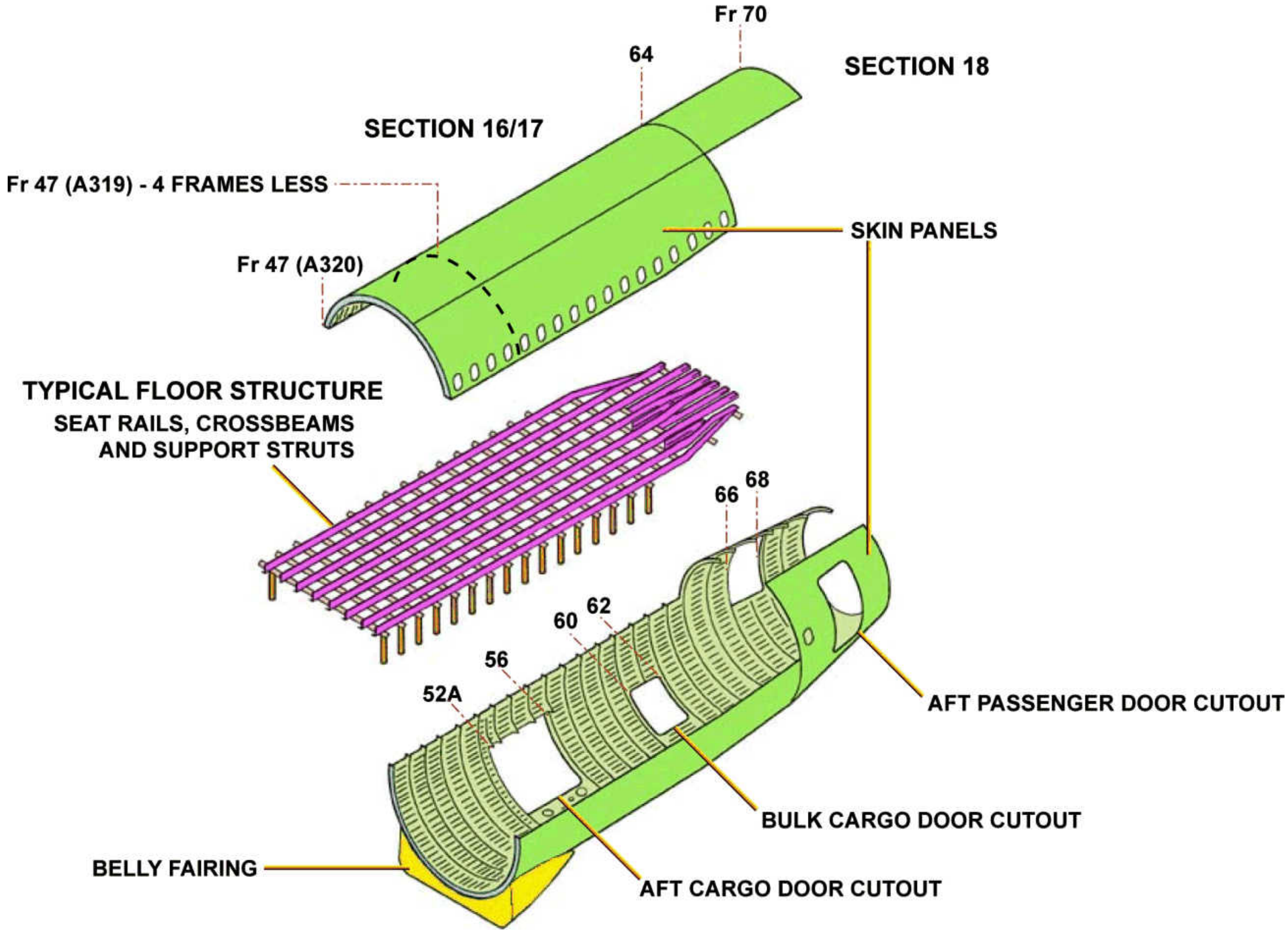


Figure 78 Rear Fuselage (A319/A320)

A321 General Arrangement

The A321 rear fuselage assembly is a pressurized area, which extends from Fr 47 to Fr 70.

The A321 rear fuselage is divided into three sections:

- section 16/17 and 18 which are similar to the A320,
- section 16A.

The section 16A includes the passenger cabin part in the upper section, and beneath the cabin floor, the forward part of the rear cargo compartment.

The section 16A is of similar construction to section 16/17 but includes the emergency exit cut−outs (one on each side of the fuselage) between Fr 47.2A and Fr 47.4.The slide is installed in a separate compartment below each door.

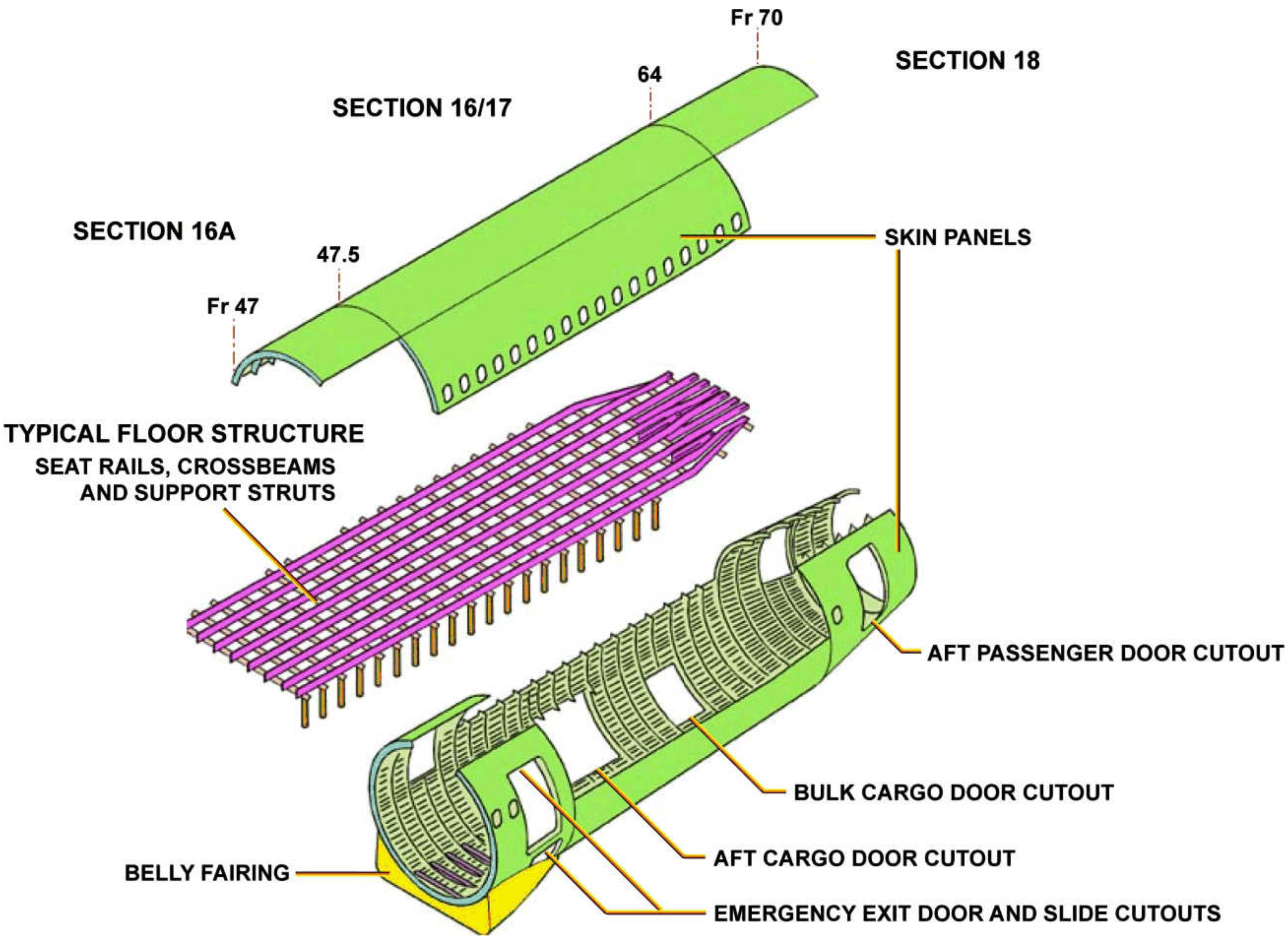


Figure 79 Rear Fuselage (A321)

53–50 CONE/REAR FUSELAGE

CONE/REAR FUSELAGE PRESENTATION

TAIL CONE (SECTION 19/19.1)

General Arrangement

This section comprises the un–pressurized part of the rear fuselage extending from Fr 70 to Fr 87.

It includes:

the mounting structures for the vertical and horizontal stabilizers,

the rear pressure bulkhead,

a support pad used during jacking operations,

attachment structure for the tail cone, which houses the Auxiliary Power Unit (APU).

It is divided into two main sections:

section 19 between Fr 70 and Fr 77,

section 19.1(tail cone) aft of Fr 77.

Section 19 is composed of chemically milled skins, riveted stringers and frames.

The side skin panels include the horizontal stabilizer cut–out. The lower panel has an access door for this section where a maintenance floor is installed.

Rear Pressure Bulkhead

The rear pressure bulkhead installed at Fr 70, divides the pressurized rear fuselage from the cone/rear fuselage, which is not pressurized.

It is made of a spherical membrane, and four aluminum alloy sheet segments joined together on the inner surface by means of four ”I” profile sections. Four additional ”I” profile radial stiffeners are also installed.

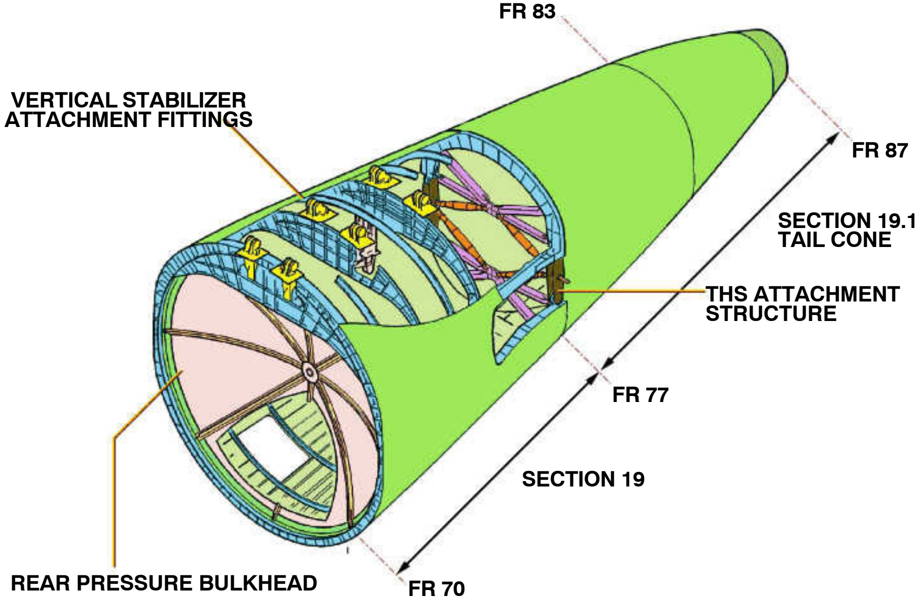


Figure 80 Cone/Rear Fuselage

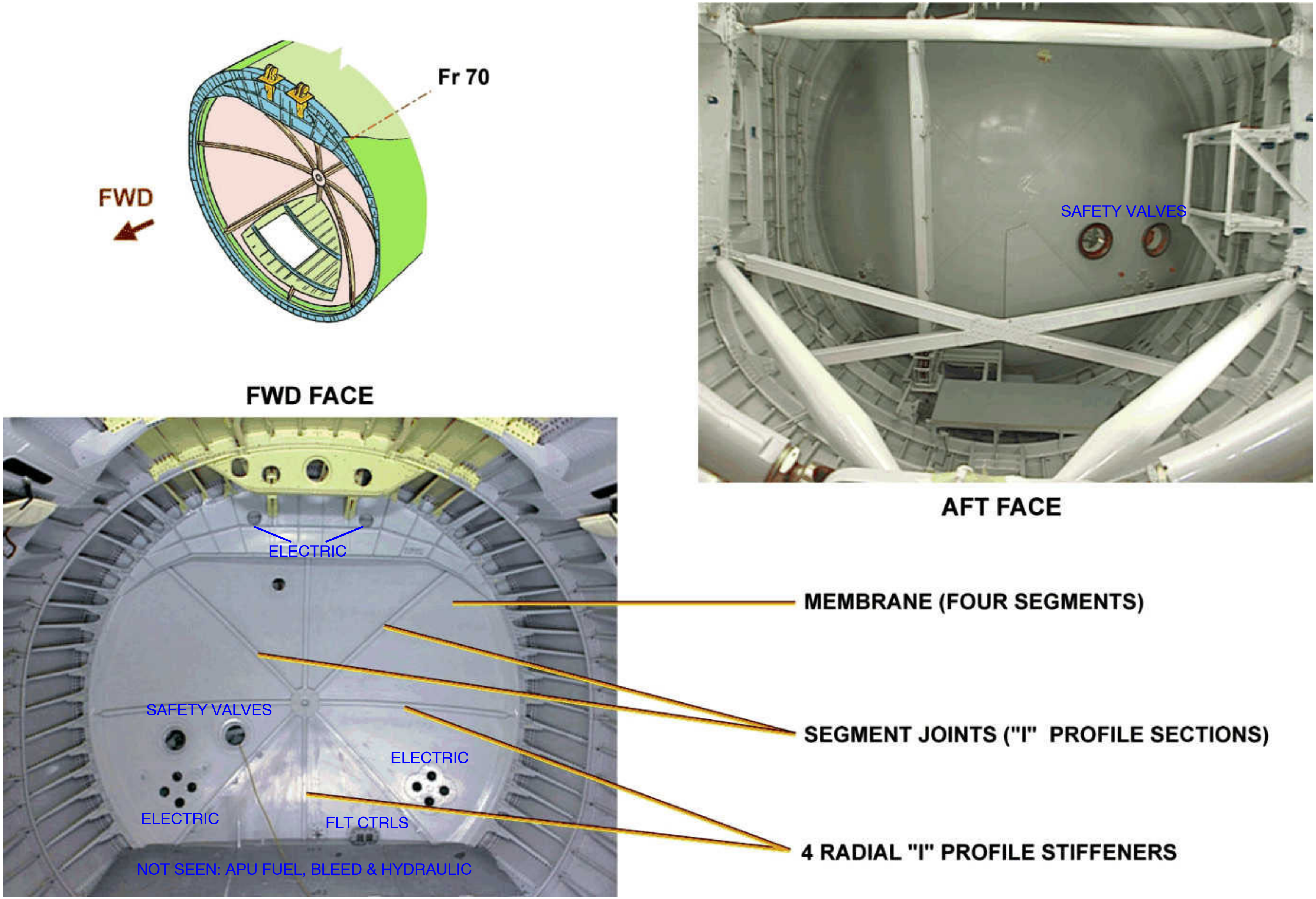


Figure 81 Cone/Rear Fuselage - Rear Pressure Bulkhead

CONE/REAR FUSELAGE STRUCTURE DESCRIPTION

CONE REAR FUSELAGE STRUCTURES

Vertical Stabilizer Attatchment Fittings

The vertical stabilizer spar box attachment fittings are located at Fr 70, Fr 72 and Fr 74.

They have six fail safe yokes, which transmit the vertical and longitudinal stabilizer loads into the fuselage frames via shear bolts.

Transversal loads are transmitted via rods between stabilizer and attachment fittings.

The frame 70 is fully machined, the upper segments of frames 72 and 74 are machined from plates while the lower segments are made from sheet metal.

THS Attatchment Fittings

The fuselage area between Fr 73 and Fr 77 houses the horizontal stabilizer.

There is a large cut-out between Fr 73 and Fr 77, which is surrounded by machined beams. A system of diagonal struts is installed on the horizontal and vertical plane in the upper and lower areas of the cutout to increase the rigidity of this open section.

The machined frame 77 supports the tailplane hinge bearings and the lateral load fittings. They introduce horizontal stabilizer loads into the fuselage structure, via the central bracing structure and the upper and lower bracing structures.

Frame 77 also includes four lugs for the attachment of the tail cone unit.

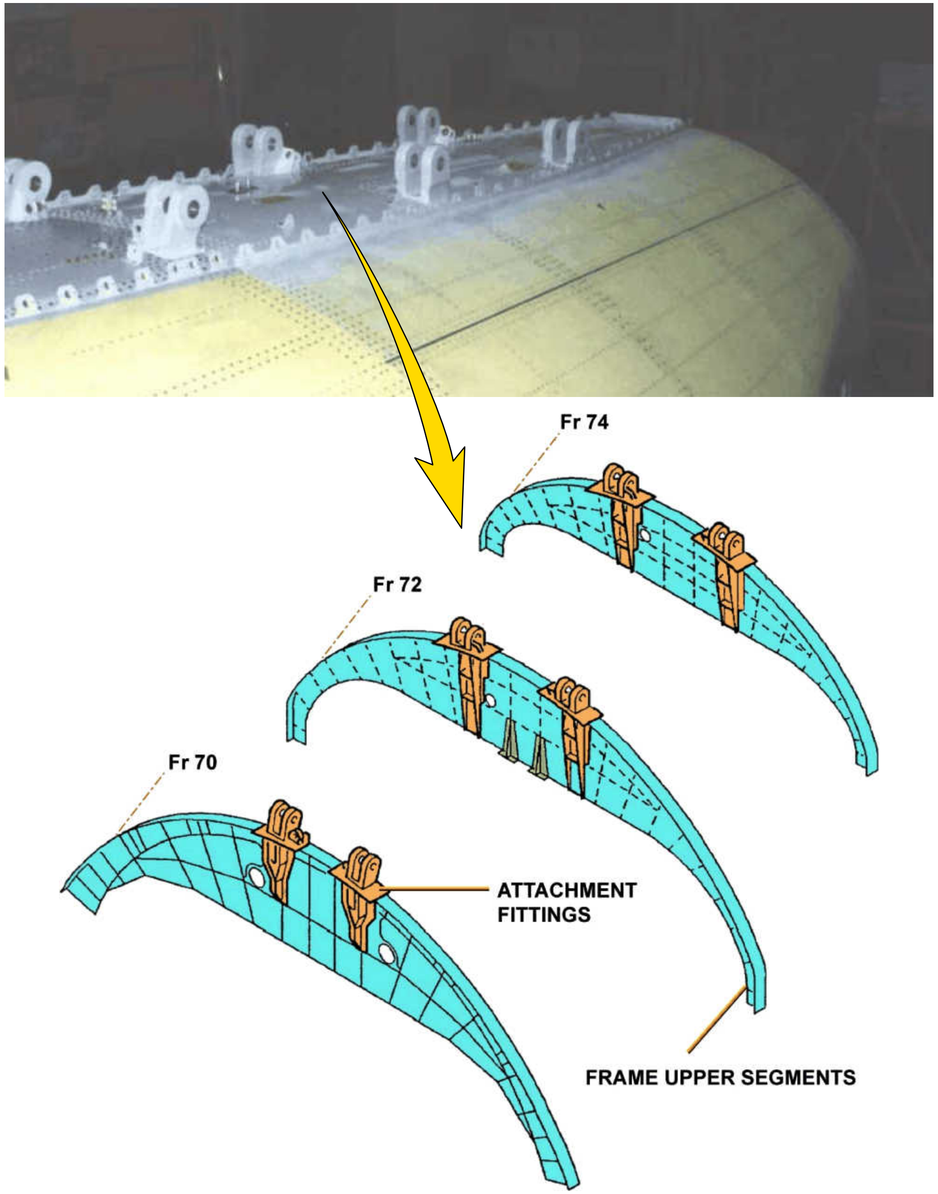


Figure 82 Vertical Stabilizer Attachment Fittings

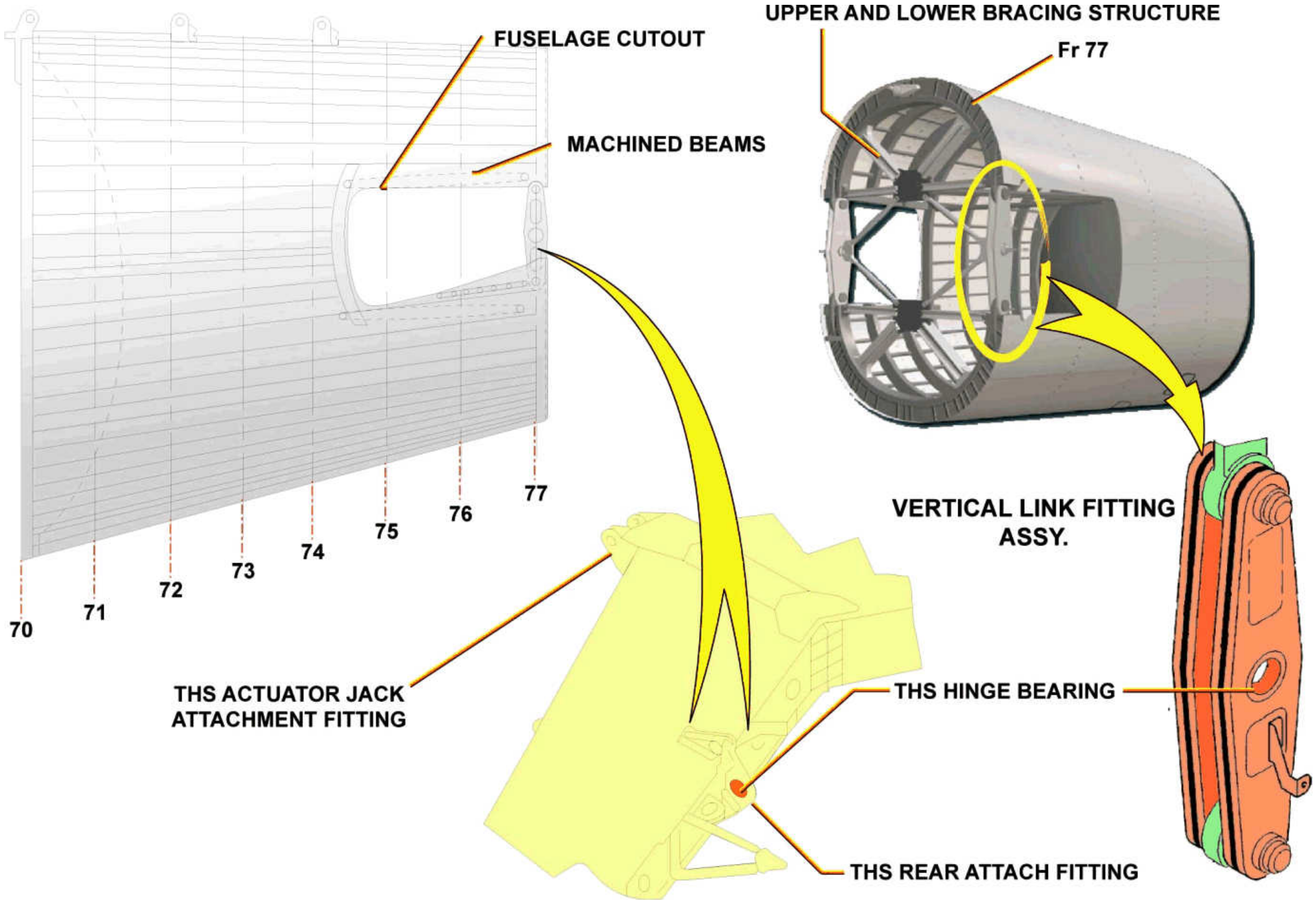


Figure 83 THS Attatchment Fittings

Tail Cone

The tail cone unit is located aft of Fr 77 and houses the APU. This section is connected to section 19 by means of four lugs and one spigot.

The inner skins and forward wall of the APU compartment are made from titanium alloy to create a fire containment compartment.

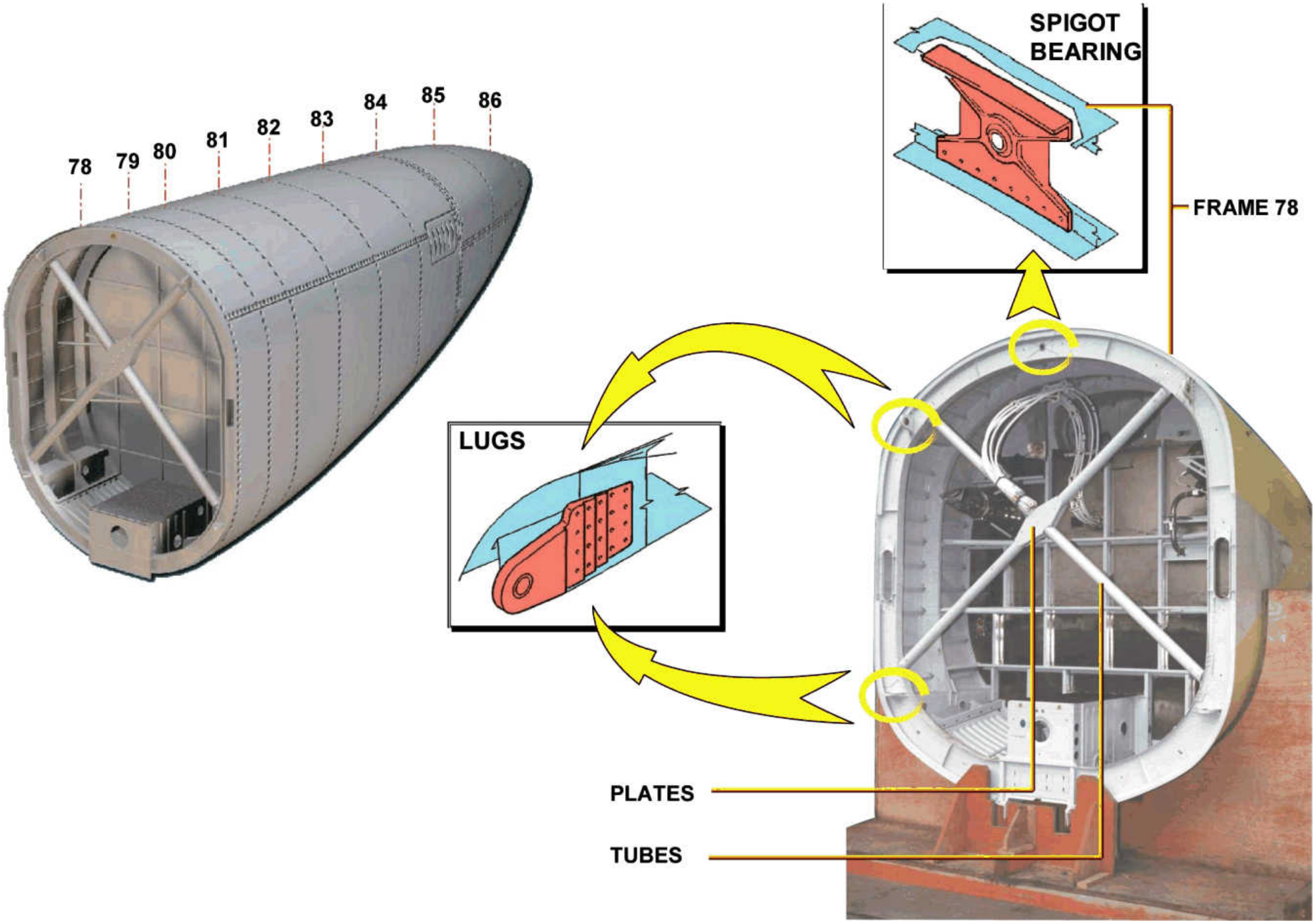


Figure 84 Tail Cone

ATA 54 NACELLES/PYLONS

54–00 NACELLES PYLONS GENERAL

INTRODUCTION

GENERAL

The function of the engine pylons installed under each wing is:

to support the engine,

to transmit the engine thrust to the aircraft,

to enable the routing and attachment of all the systems connected with the engine (electrical wiring, hydraulic, bleed air and fuel lines).

The nacelle gives the engine an aerodynamic shape and supports the thrust reverser system.

Information concerning structure of the nacelle can be found within the nacelle manufacturer documentation.

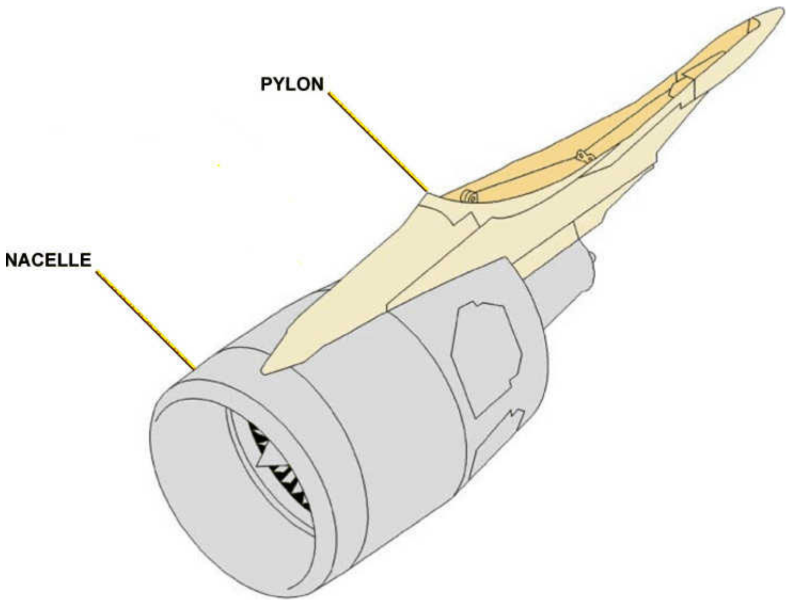


Figure 85 Nacelles/Pylons General

54–10 NACELLE SECTION

GENERAL

The nacelle section consists of:

- ATA 71–10–00 Cowling,
- ATA 78–30–00 Thrust Reverser.

Cowling General Description

The cowls enclose the periphery of the engine so as to form the engine nacelle.

The nacelle provides:

- protection for the engine and the accessories,
- airflow around the engine during its operation,
- lightning protection,
- HIRF (**H**igh **I**ntensity **R**adiated **F**ield) and EMI (**E**lectro**m**agnetic **I**nterference) attenuation,

This section is a description of the following cowls:

- air intake cowl
- fan cowl

the thrust reversers and the primary exhaust (Ref. 78–00–00).

NOTE: Fan cowls and thrust reversers are not removed for an engine change.

Thrust Reverser General Description

The fan thrust reverser is located immediatly downstream of the fan frame.

An adaptor ring attached to the rear engine fan frame interfaces between the engine and the reverser itself.

In direct thrust configuration, the cowling masks the blocker doors, thus providing fan flow ducting with minimized thrust loss.

In reverse thrust configuration, the blocker doors are deployed in order to obstruct the fan duct ; the fan flow is rejected laterally through the reverser with a forward velocity component which provides the reverse thrust.

The reverse mode is controlled and indicated in the cockpit (Ref. 78–31–00).

The reverse mode is hydraulically actuated after cockpit command.

The reverse thrust mode is only operative on ground

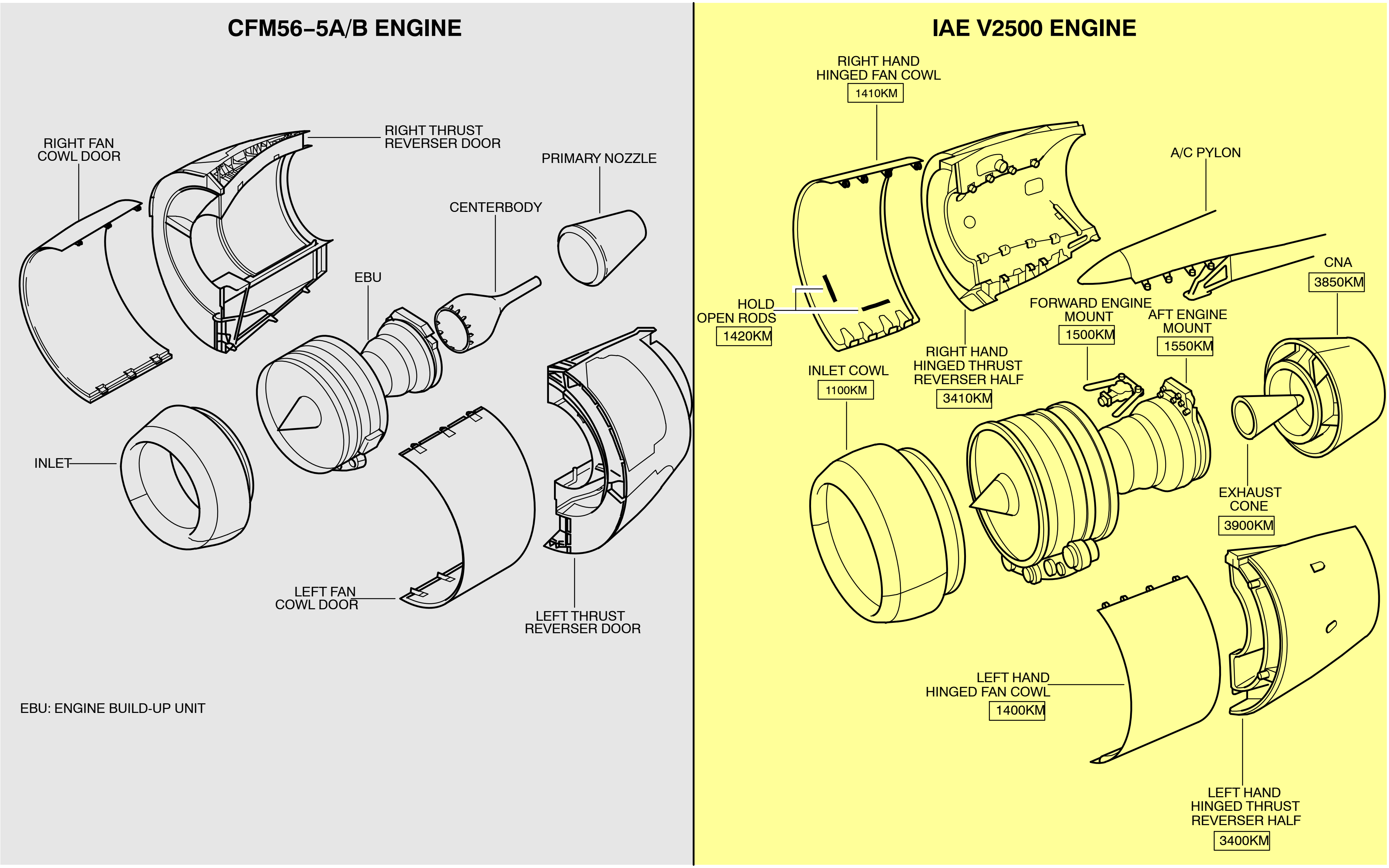


Figure 86 Engine Nacelles

54–50 PYLONS

PYLONS GENERAL DESCRIPTION

The purpose of the engine pylon mounted underneath each wing is:

- to support the engine,
- to transmit the engine thrust to the aircraft,
- to route and support all the systems related to the engine (electrical wiring, hydraulic and fuel lines up to the engine and all return lines).

PYLON STRUCTURE

Pylon box

The pylon box is the primary structure which supports the engine at two points and is attached at two points to the half wing.

Forward fairing

The forward fairing is the fixed secondary structure.

Pylon–to–wing center fillets

The pylon–to–wing center fillets consist of access panels providing the junction between the wing lower surface and the pylon box.

Aft fairing

The aft fairing is a removable secondary structure composed of two parts:

- a main fairing situated at the rear of the pylon box
- a movable fairing underneath the flap.

Lower fairing

The lower fairing is a removable secondary structure situated between the pylon box and the engine nozzle.

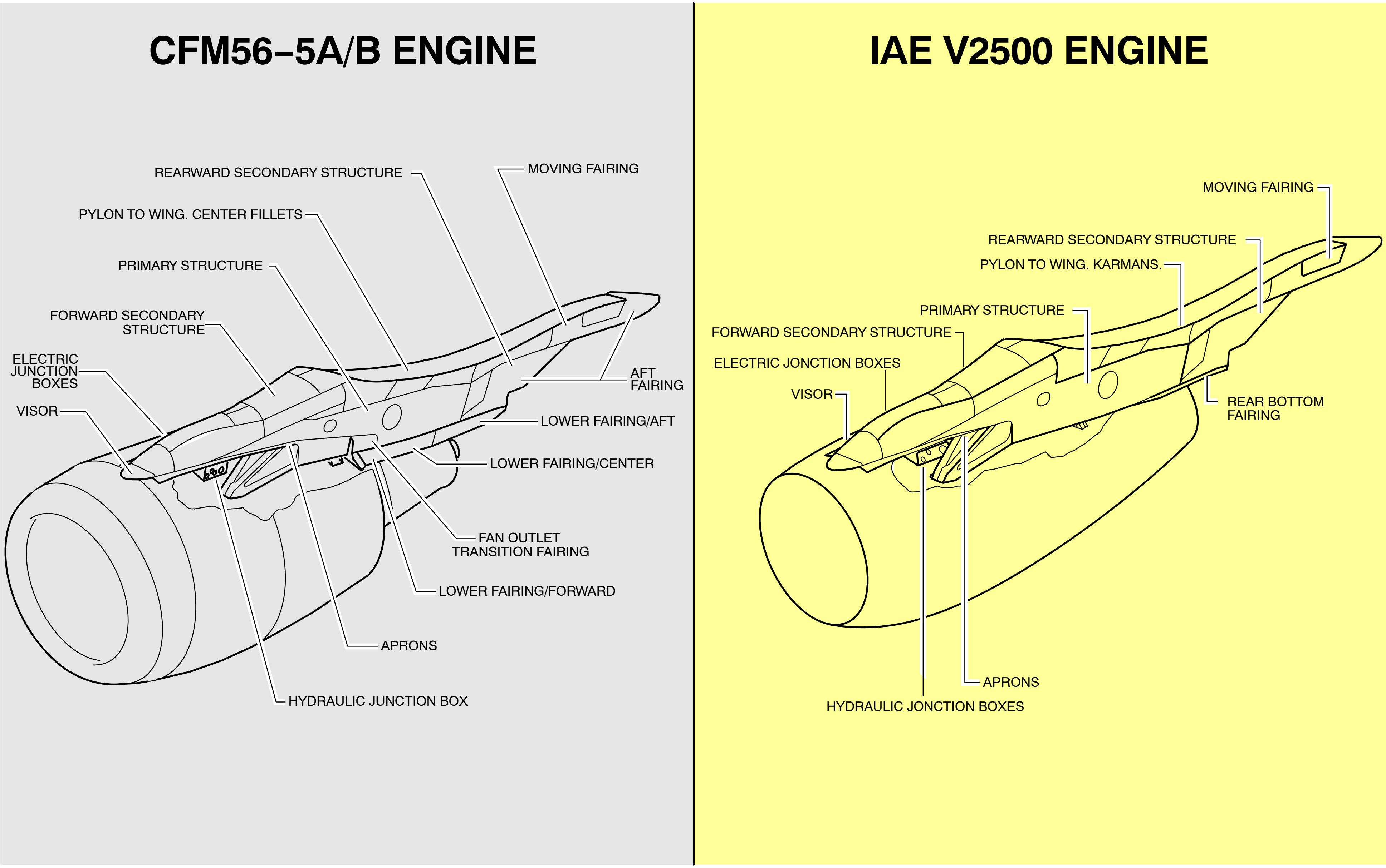


Figure 87 Pylons

PYLONS STRCUTURE

The pylon box is the primary structure of the pylon. The secondary structure comprises the forward, the lower and the aft fairings and the pylon to wing center fillets.

The pylon box is an assembly of titanium alloy and steel parts which includes spars, ribs, side panels, engine attachment, pylon to wing attachment fittings.

Compartment

For safety purposes the engine pylon is divided into 7 compartments, each houses a particular type of equipment.

DESIGNATION	SYSTEMS
Forward Fairing	Flammable Fluids (Fuel, Haydraulics), Bleed Air (High & Low Temperatures), Electrics
Pylon Box	Hydraulics Without Couplings, Extinguishers
Rearward Secondary Structure	Hydraulics, Limited Electrics.
Lower Fairing	None
Pylon to Wing Center Fillets	Fuel (No Couplings), Electrics, Bleed Air (Low Temperature)

Each compartment is separately ventilated, separately drained overboard. The air of each zone is renewed.

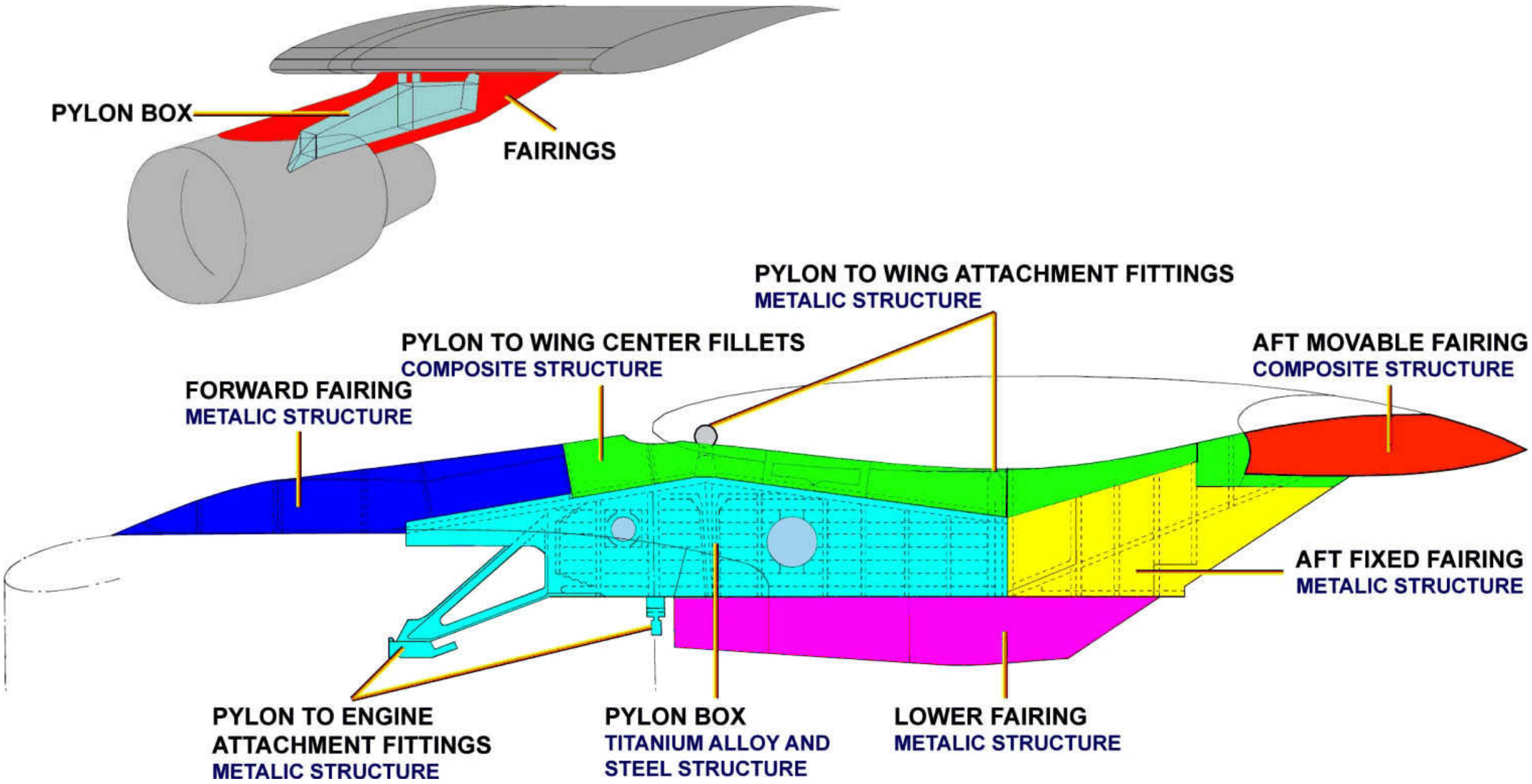


Figure 88 Pylons Structure

PYLONS PRIMARY STRUCTURE PRESENTATION

GENERAL ARRANGEMENT

The pylon box is the primary structure. It supports the engine by two points and is attached to the wing at three points.

Pylon To WIng Attachment

The forward pylon to wing attach fitting has a double lugged fork attachments connected to the wing fitting by means of four shackles.

This fitting located at Rib 4 is made of titanium alloy and carries vertical loads.

The aft pylon to wing attach fitting has a single fail safe lug connected to the wing fitting by means of two shackles. This fitting located at Rib 10 is made of titanium alloy and carries vertical and side loads.

Immediately behind the forward attach fitting a spherical bearing transmits the thrust to a spigot bolted to the bottom wing skin panel.

Pylon To Engine Attachment

At The forward engine to pylon attach fitting there is a pyramid attached to the rib and made of steel alloy.

This fitting transmits the engine thrust, side loads and vertical loads.

At The aft engine to pylon attach fitting there is an engine mount located at Rib 3 for CFM 56-5 engine configuration or at Rib 4 for IAE V2500 engine configuration. This fitting reacts to vertical loads, side loads and roll movement.

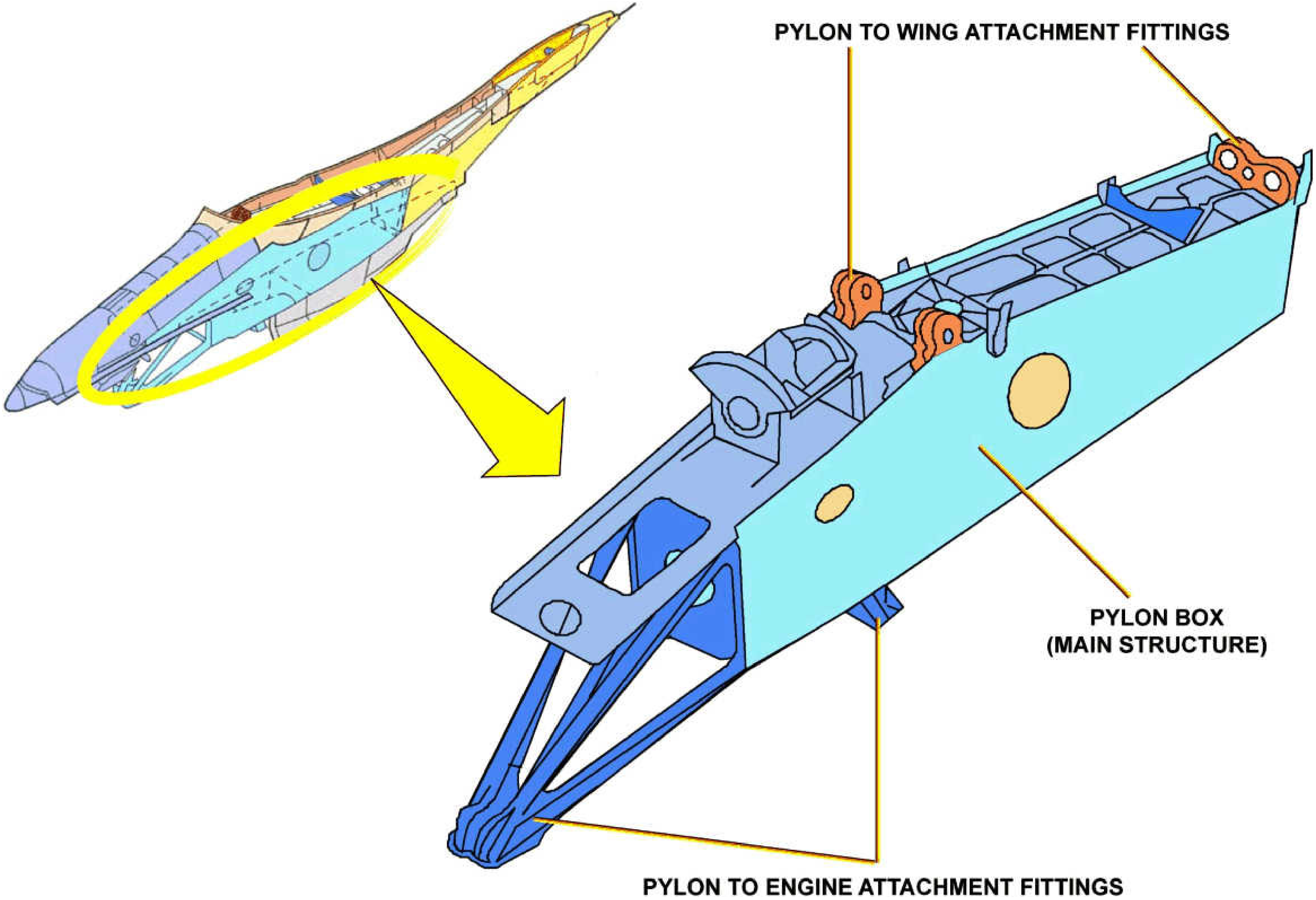


Figure 89 Pylons General Arrangement

PYLONS SMAIN ASSEMBLY COMPONENT DESCRIPTION

MAIN ASSEMBLY

The pylon box is composed of ribs, two upper spars and one lower spar, and panels mainly made from steel and titanium alloys.

Description

The pylon box is damage tolerant and comprises:

- 1 lower spar made of corrosion resistant steel,
- 1 forward upper spar made of special carbon steel,
- 1 rearward upper spar made of special carbon steel,
- 10 ribs, 4 of which introduce loads.

At pylon−to−engine attach fittings : RIB1 is made of corrosion resistant steel and RIB3 is made of titanium.

At pylon−to−wing attach fittings : RIBs 4 to 10 made of titanium RIBs 2, 5, 6, 7, 8, 9, are made of titanium.

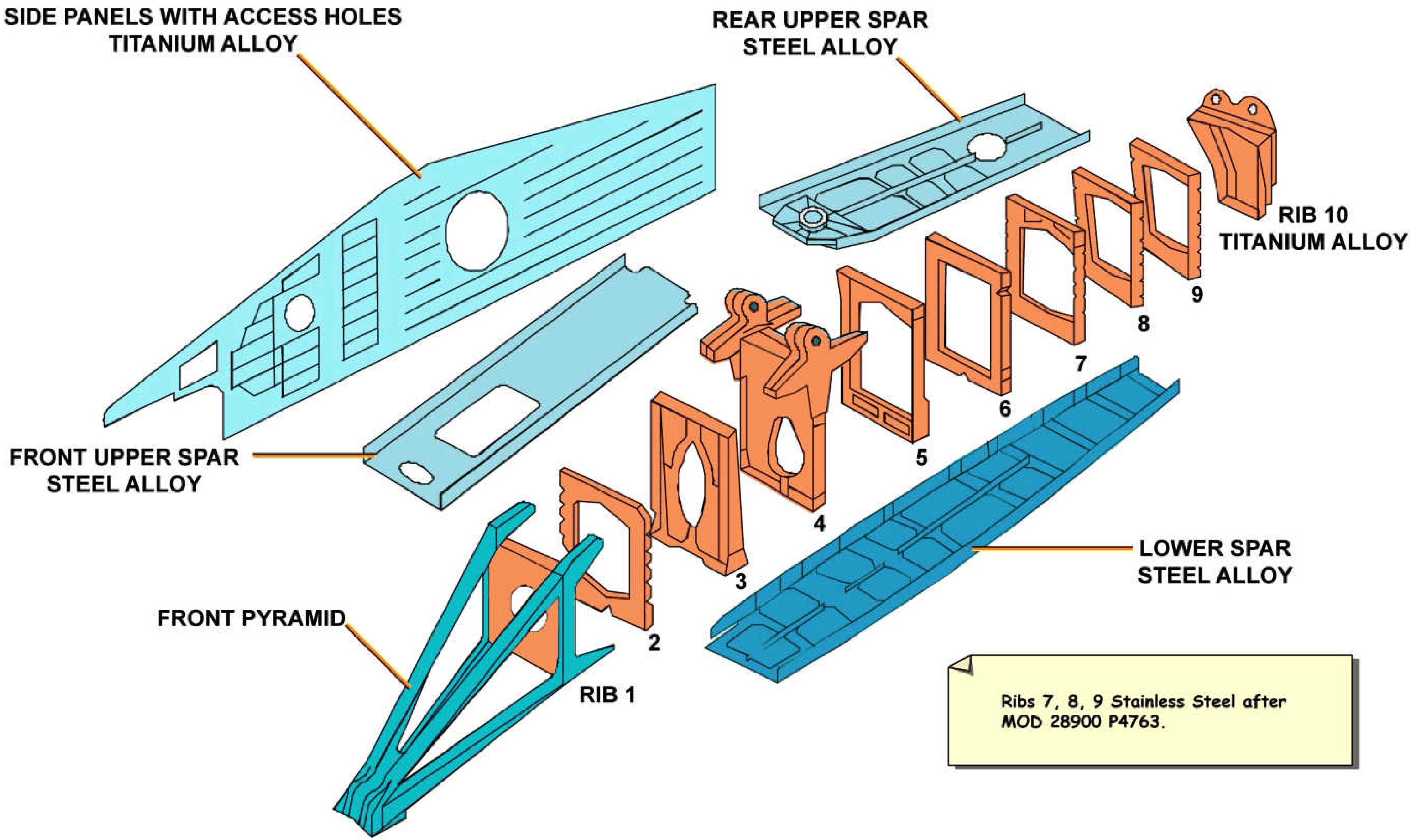


Figure 90 Pylons Main Assembly

PYLONS SECONDARY STRUCTURE DESCRIPTION

GENERAL ARRANGEMENT

The secondary structure is composed of:

- the forward fairing,
- the pylon to wing center fillets,
- the aft fairing,
- the lower fairing.

The forward fairing can be divided into two sections; the cantilever structure between Rib 01 and Rib 05, and the structure between Rib 05 and Rib 9.

The cantilever structure has an aerodynamic contour between the engine nose cowl and the pylon box structure. It routes all systems and the bleed air from the engine to the fuselage.

The structure between Rib 05 and Rib 9 has an aerodynamic contour between the cantilever structure and the wing leading edge, and enables the routing of various system lines and electrical wiring.

It includes in particular two pressure relief doors (made from titanium), which are designed to open in case of hot bleed air duct bursting.

The structure is mainly made of stainless steel alloy. The pylon to wing center fillets give an aerodynamic contour between the pylon box and the wing bottom skin panel.

The pylon-to-wing center fillets are made of aluminum alloy ribs. These ribs support the panels made of Carbon Fiber Reinforced Plastic (CFRP) and Aramid Fiber Reinforced Plastic (AFRP) sandwich construction.

The aft fairing is a removable secondary structure composed of two parts:

- a fixed fairing installed at the rear of the pylon box,
- a movable fairing underneath the flap.

The fixed fairing is attached by two points to the pylon box at Rib 10 and by one point to the wing box at the false rear spar.

The fixed fairing is an assembling of ribs and skin panels made of aluminum alloy, and includes a lower aft fairing made in inconel.

The movable fairing is hinged at Rib 14 and linked to the flap by a rod attached to the fairing by a serrated plate system.

The internal structure of the movable fairing is mainly made of aluminum alloy. The side panels are made from AFRP sandwich construction and the tail cone is made from AFRP or CFRP monolithicconstruction.

A fairing installed under the pylon box (lower fairing) makes sure that there is a continuity of the aerodynamic profile between the pylon box and the engine nozzle.

Its function is:

- to supply thermal protection to the pylon from the engine exhaust gases,
- to smooth out protrusions with minimal aerodynamic drag changes.

The lower fairing structure is mainly made of aluminum alloy, stainless steel and inconel alloys.

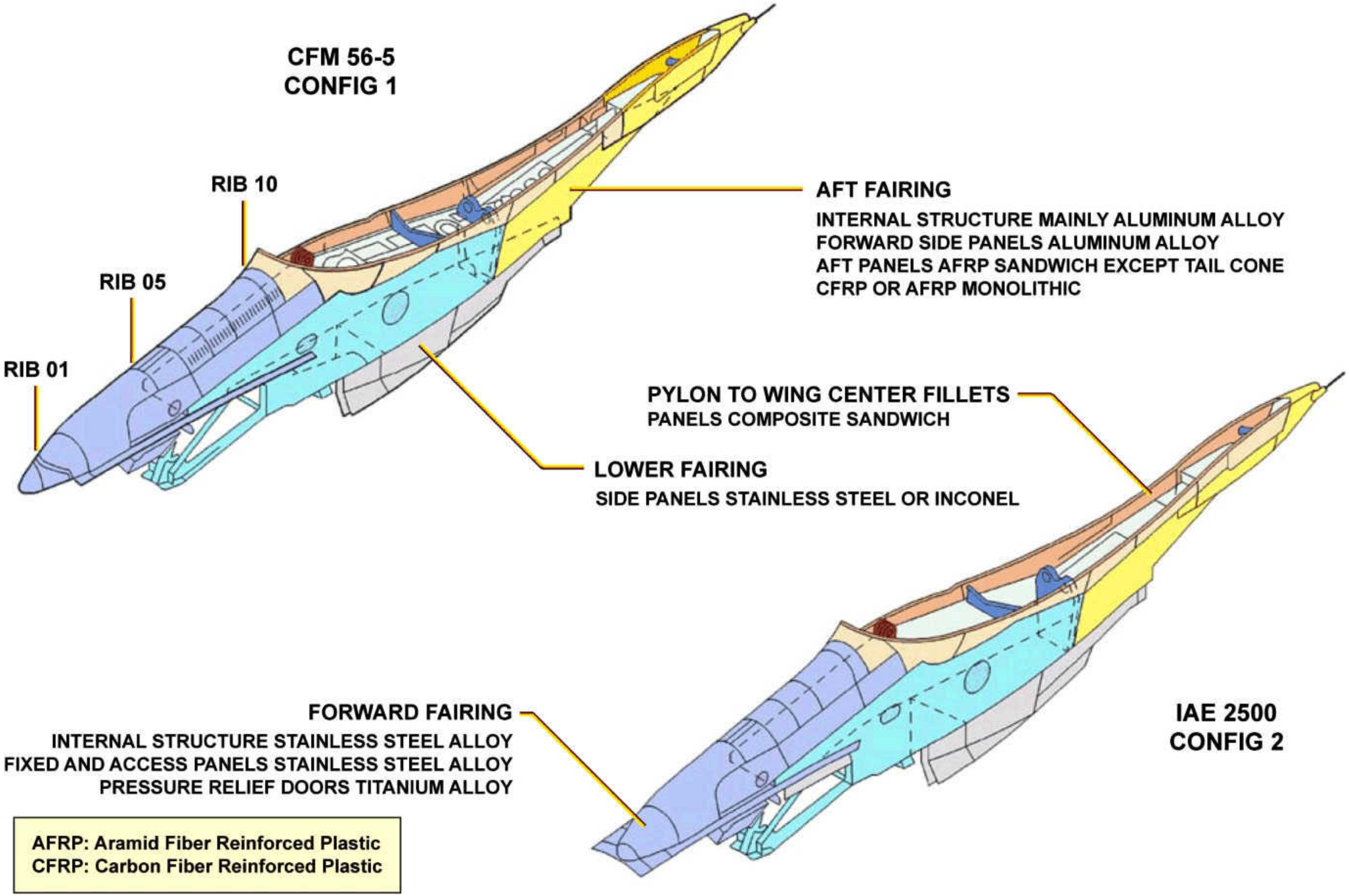


Figure 91 Pylons Secondary Structure

ATA 55 STABILIZERS

55–00 STABILIZERS - GENERAL

INTRODUCTION

STABILIZERS – HORIZONTAL STABILIZER & ELEVATORS

The horizontal stabilizer main structure includes center joint and two outer spar boxes.

On each side, the horizontal stabilizer also includes a leading edge, a trailing edge structure, both being mainly made from Carbon Fiber Reinforced Plastic (CFRP) and a tip which is made of aluminum alloy.

The elevators are basically CFRP structure including top and bottom skin panels, ribs and front spar. The hinge and actuator fittings and the trailing edge profile are from aluminum alloy.

The vertical stabilizer structure has:

- the main spar box,
- the leading edge,
- the tip,
- and the trailing edge.

The main box is an assembly of CFRP ribs, spars and side panels.

The vertical stabilizer structure has also:

- a leading edge made of Glass Fiber Reinforced Plastic (GFRP),
- a tip made from aluminum alloy,
- a trailing edge structure made of aluminum alloy,
- and trailing edge panels made of CFRP.

The rudder structure has:

- two side panels made of CFRP,
- a front spar made of CFRP,
- leading edge panels made of CFRP,
- hinge and actuator fittings made of aluminum alloy,
- and the trailing edge profile made of aluminum alloy.

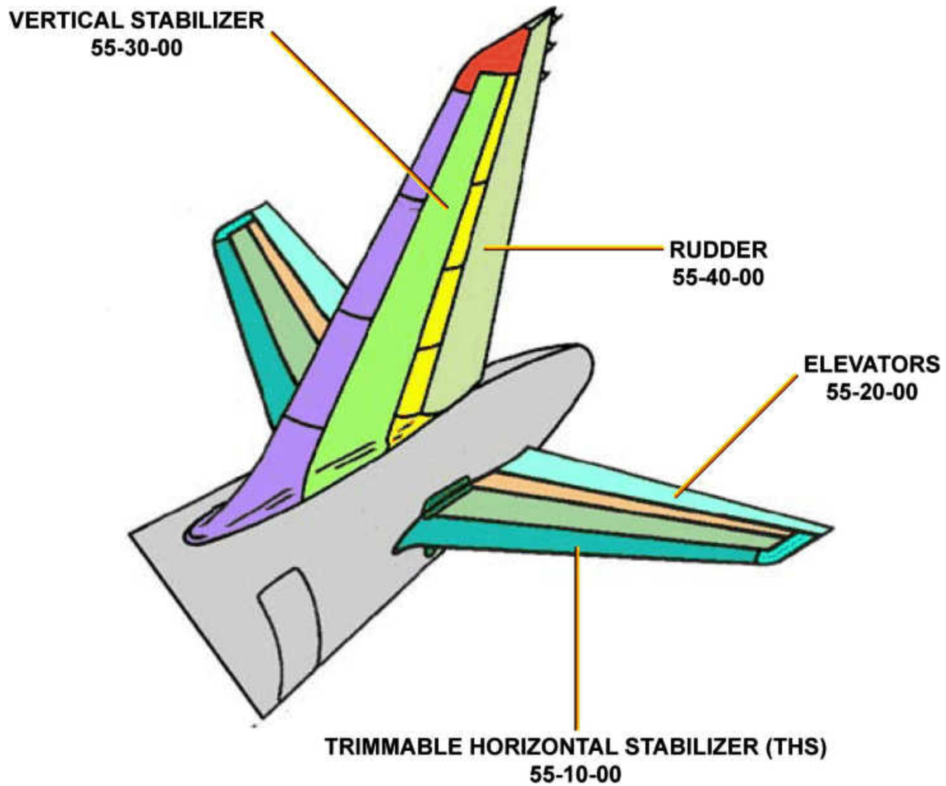


Figure 92 Stabilizers ATA Breakdown

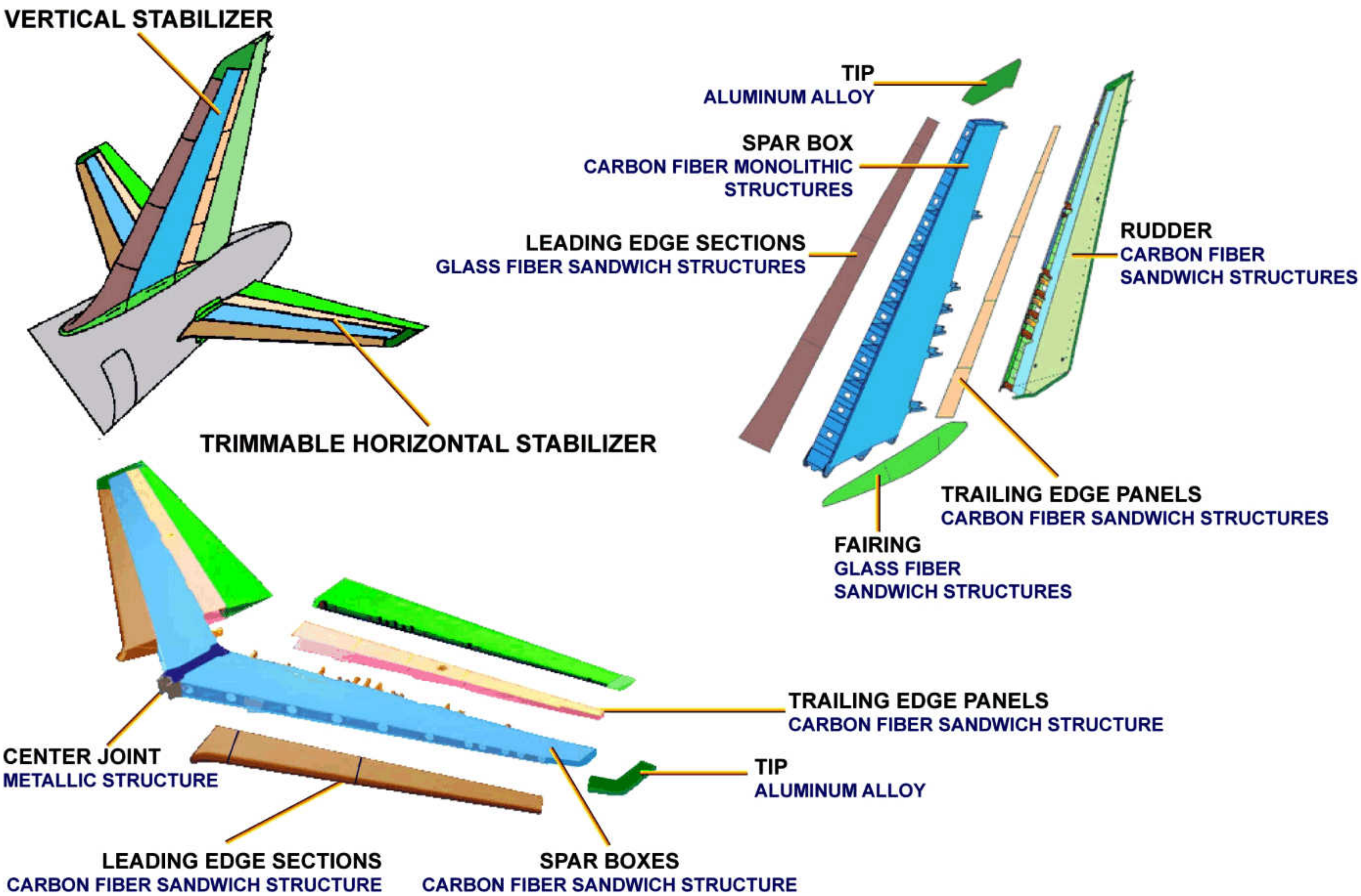


Figure 93 Stabilizers General

55-10 HORIZONTAL STABILIZER

TRIMMABLE HORIZONTAL STABILIZER (THS) PRESENTATION

GENERAL ARRANGEMENT

The THS main structure has:

- the spar boxes (Center, Left Hand (LH) and Right Hand (RH) sides),
- the leading edge,
- the trailing edge,
- the attachment fittings.

The spar boxes are the primary structure of the horizontal stabilizer and support all the other components.

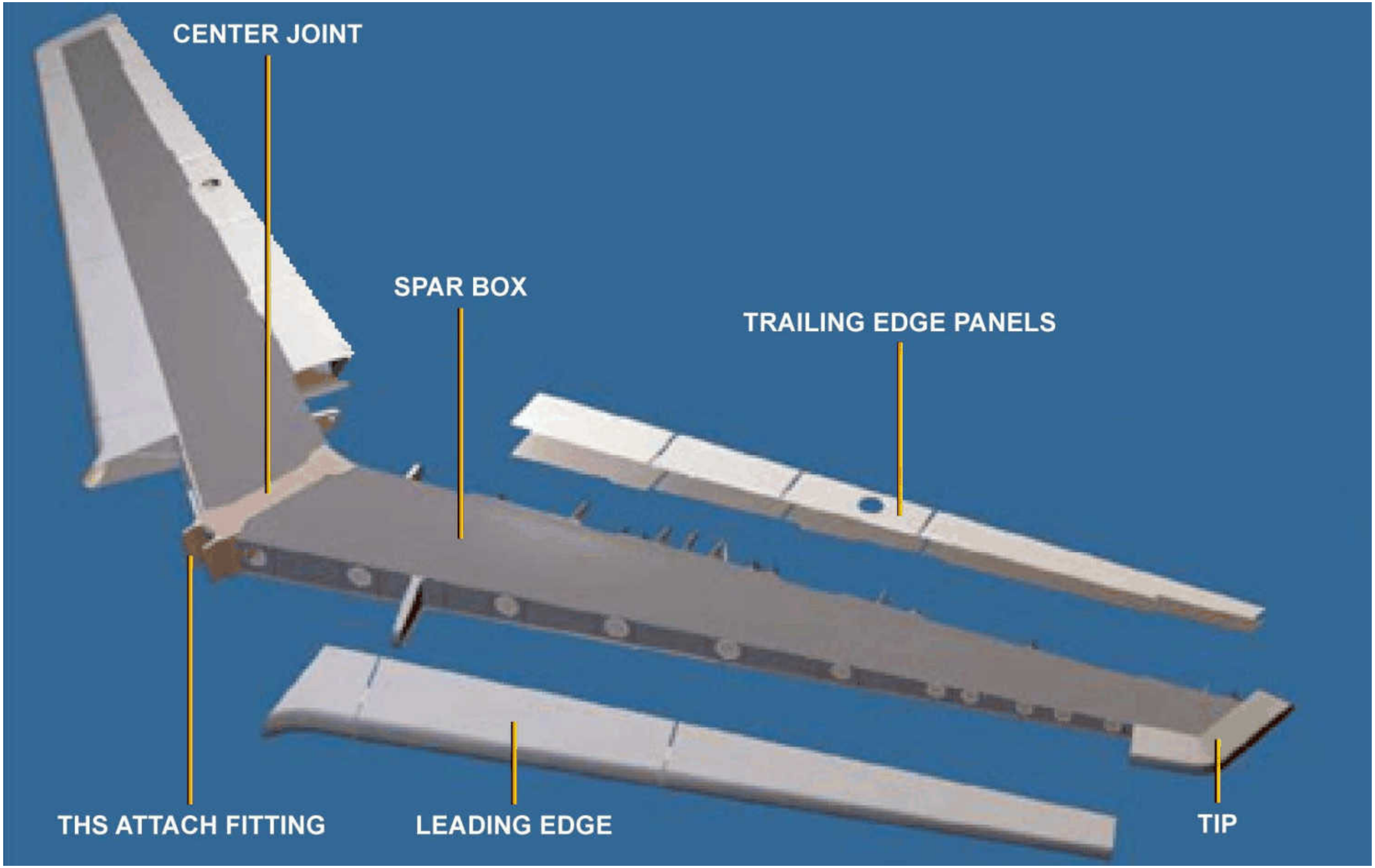


Figure 94 THS General

55-11 THS SPAR BOX

COMPONENT DESCRIPTION

SPAR BOXES

The complete spar box assembly has the LH and RH boxes and the center joint.

Each spar box includes top and bottom skin panels, a front spar, a rear spar and thirteen ribs (from Rib 2 thru Rib 14).

The LH and RH spar boxes are laminated in Carbon Fiber Reinforced Plastic (CFRP).

The center joint is made from titanium and connects the LH and RH spar boxes to make one single unit.

CFRP: CARBIN REINFORCED PLASTIC

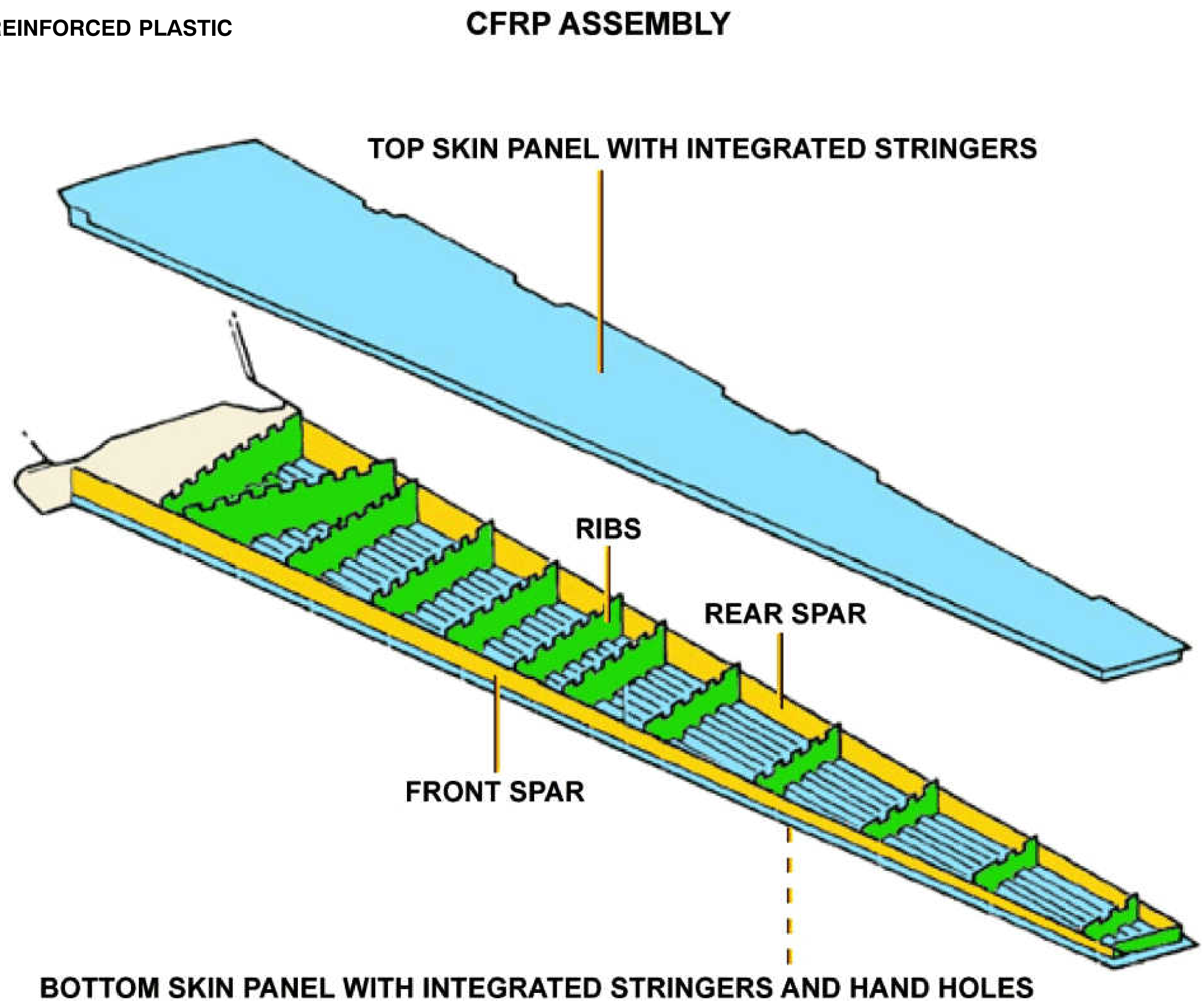


Figure 95 THS Spar Boxes

55–12 THS LEADING EDGE

COMPONENT DESCRIPTION

LEADING EDGE

The leading edge has an aerodynamic shape at the front of the THS.

On each side of the THS centerline, the THS leading edge includes:

- three leading edge primary ribs,
- one inboard leading edge section,
- one outboard leading edge section and,
- one leading edge intersection.

All components are laminated in CFRP.

The front part of the inboard and outboard leading edges stretch from Rib 1 to Rib 25 of the leading edge structure. Each section has a stainless steel protection, bonded to the leading edge.

The leading edge intersection is attached to Rib 1 of the leading edge substructure and to the spar box. A rubber strip is attached to the intersection. It seals the gap between the fuselage skin and the leading edge intersection.

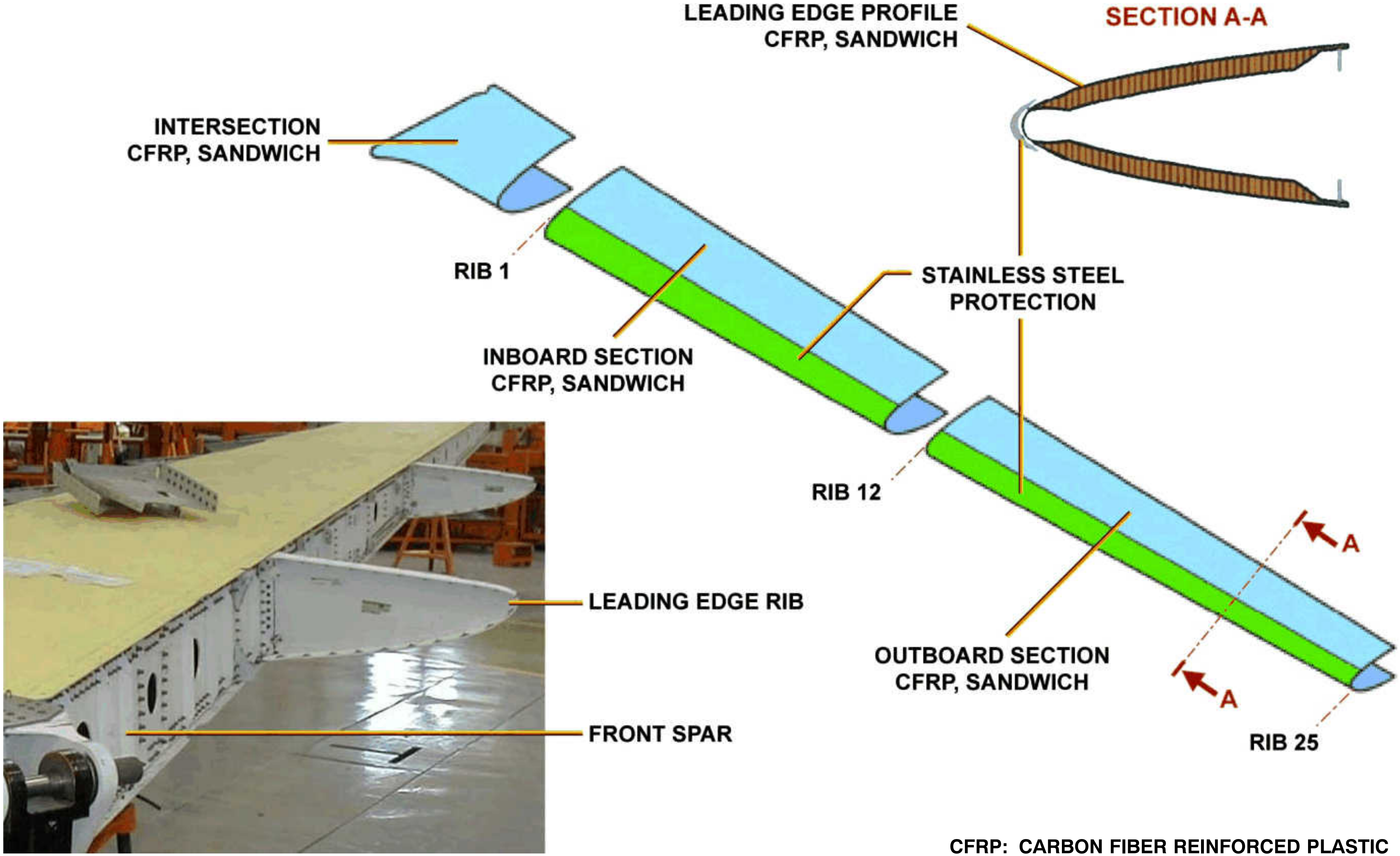


Figure 96 THS Leading Edge

55-13 TRIMMABLE HORIZONTAL STABILIZER TRAILING EDGE

COMPONENT DESCRIPTION

TRAILING EDGE

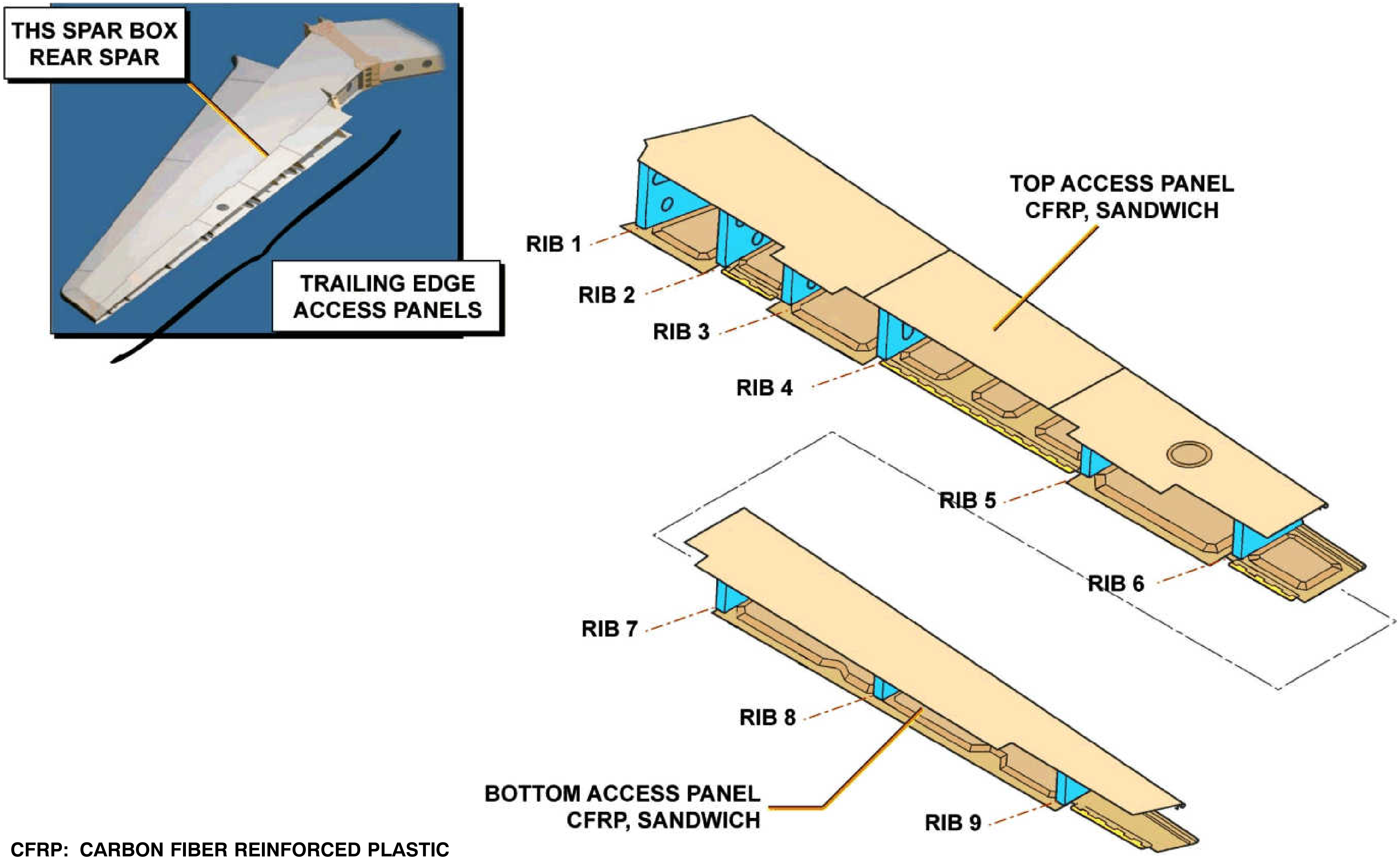
The trailing edge shapes an aerodynamic surface between the THS spar box and the elevator.

On each side of the THS centerline, the trailing edge panels are supported by nine intermediate ribs, and by six hinge elevator arm supports.

The access panels are laminated in CFRP bonded to a honeycomb core.

On each side there are four panel assemblies on the top surface and four access panels on the bottom surface.

A rubber seal is installed between the panel assemblies and the access panels along the trailing edges to prevent dirtiness.



CFRP: CARBON FIBER REINFORCED PLASTIC

Figure 97 THS Trailing Edge

55−14 THS TIPS

COMPONENT DESCRIPTION

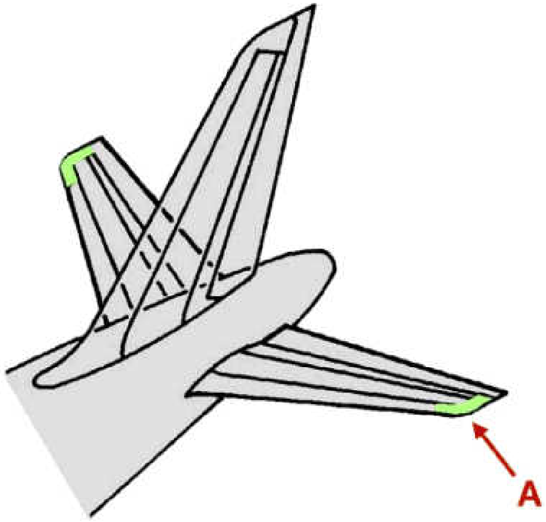
THS TIP

The tips of the THS are the LH and RH outer fairings.

The tips are made of aluminum alloy and include rib and skin panels.

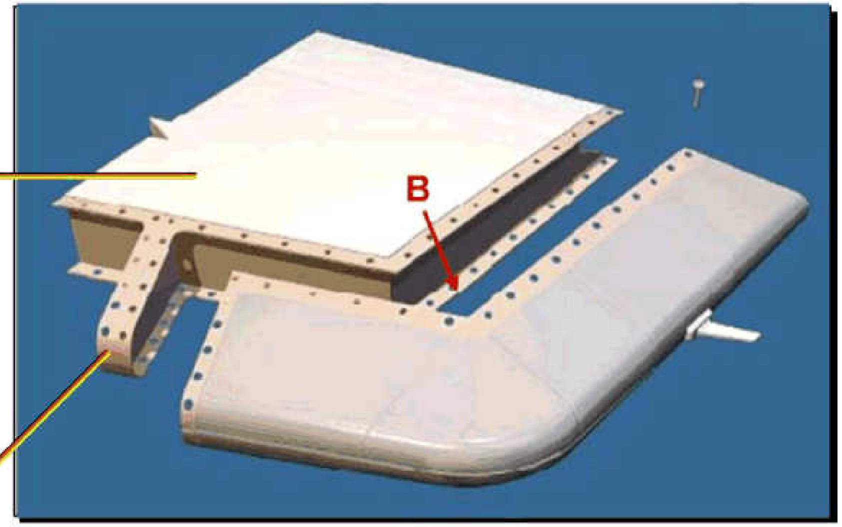
The tips are attached to the leading edge rib 25 and to the upper and lower shells of the spar box.

For electrical bonding there are bonding plates of light alloy along the mating surfaces of the tips. Each tip has a static discharger.



ALUMINUM ALLOY STRUCTURE

VIEW A



VIEW B

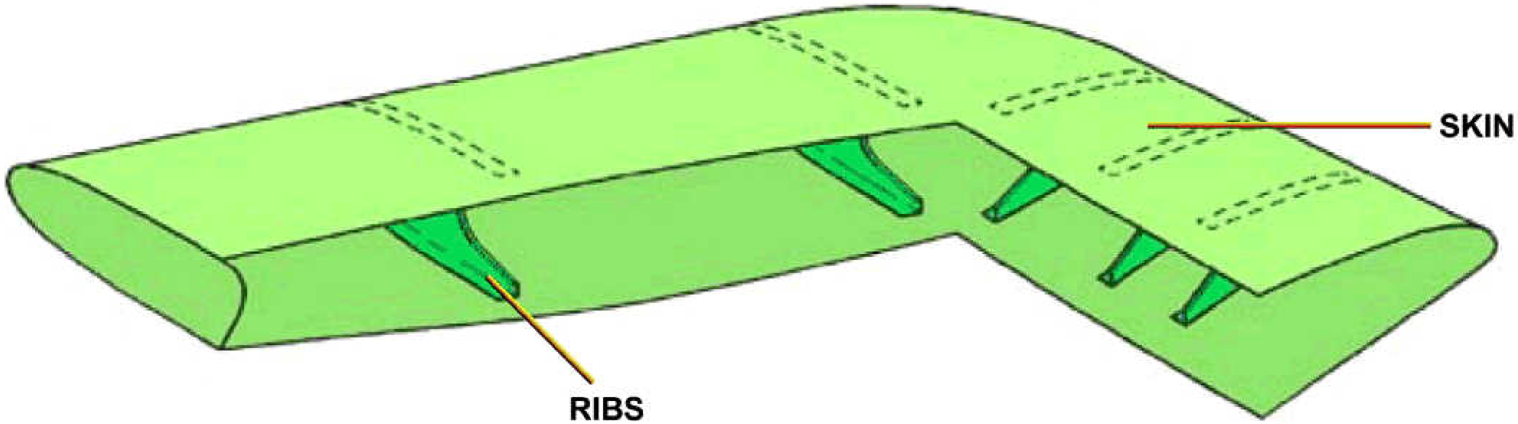


Figure 98 THS Tip

55–16 THS ATTACH FITTINGS

COMPONENT DESCRIPTION

MAIN SUPPORT FITTINGS

A hydromechanical actuator enables the adjustment of the angle of incidence of the THS. The actuator is connected to a dual fitting (front spar fitting) at the forward end of Rib 1, by means of ball nut and a jack crew.

The THS is attached to the cone rear fuselage structure at two pivot points (rear support fittings). They are installed on each side of the THS at Rib 3. All fittings are made of CFRP.

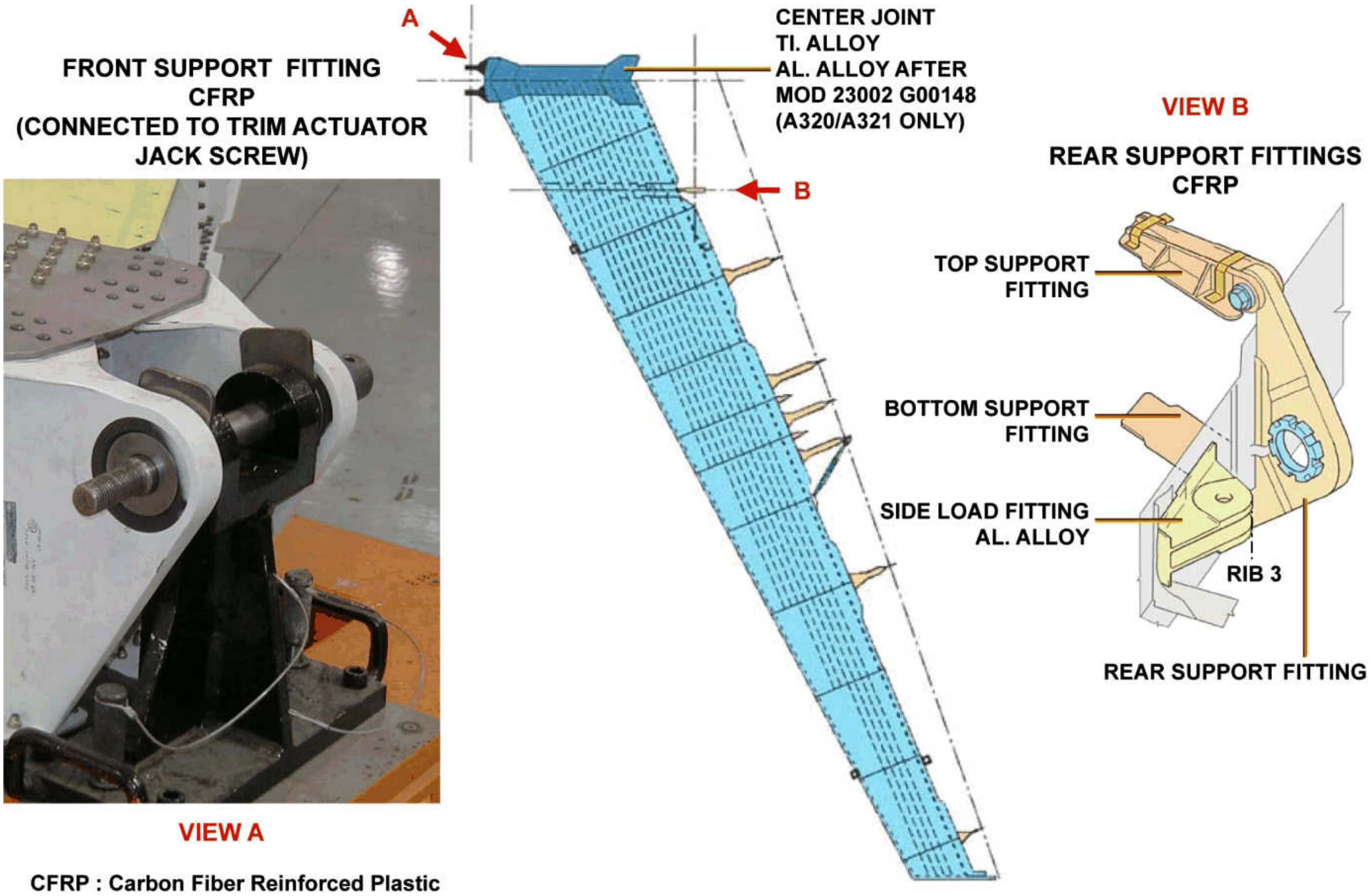


Figure 99 THS Main Support Fittings

55-20 ELEVATORS

ELEVATORS PRESENTATION

ELEVATORS - STRUCTURE LAYOUT

The structure of each elevator includes:

- a front spar,
- top and bottom skin panels,
- four ribs.

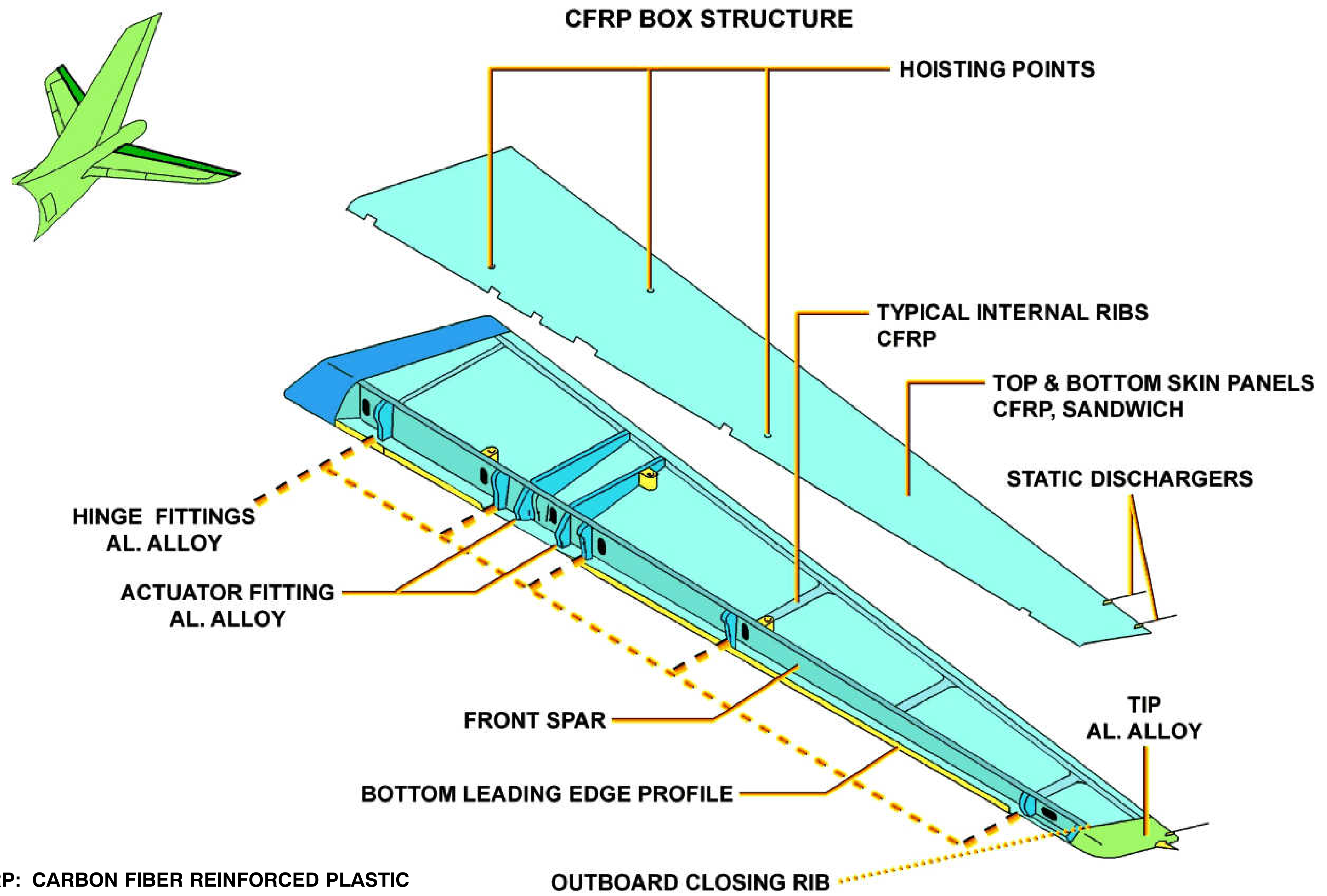
All components are laminated in CFRP; the top and bottom panels are made in sandwich construction.

The outboard closing rib and the tip are made from aluminum alloy, like the actuator and hinge attachment fittings.

Rivets attach an aluminum profile to the trailing edge to act as lightning strike protection.

Six hinge fittings attach each elevator to the spar box of the THS. Two fittings attach the servo control units. You can remove the tips and the inboard end caps.

Each elevator has three hoisting points and four static dischargers.



CFRP: CARBON FIBER REINFORCED PLASTIC

Figure 100 Elevators Structure

55−26 ELEVATOR ATTACH FITTINGS

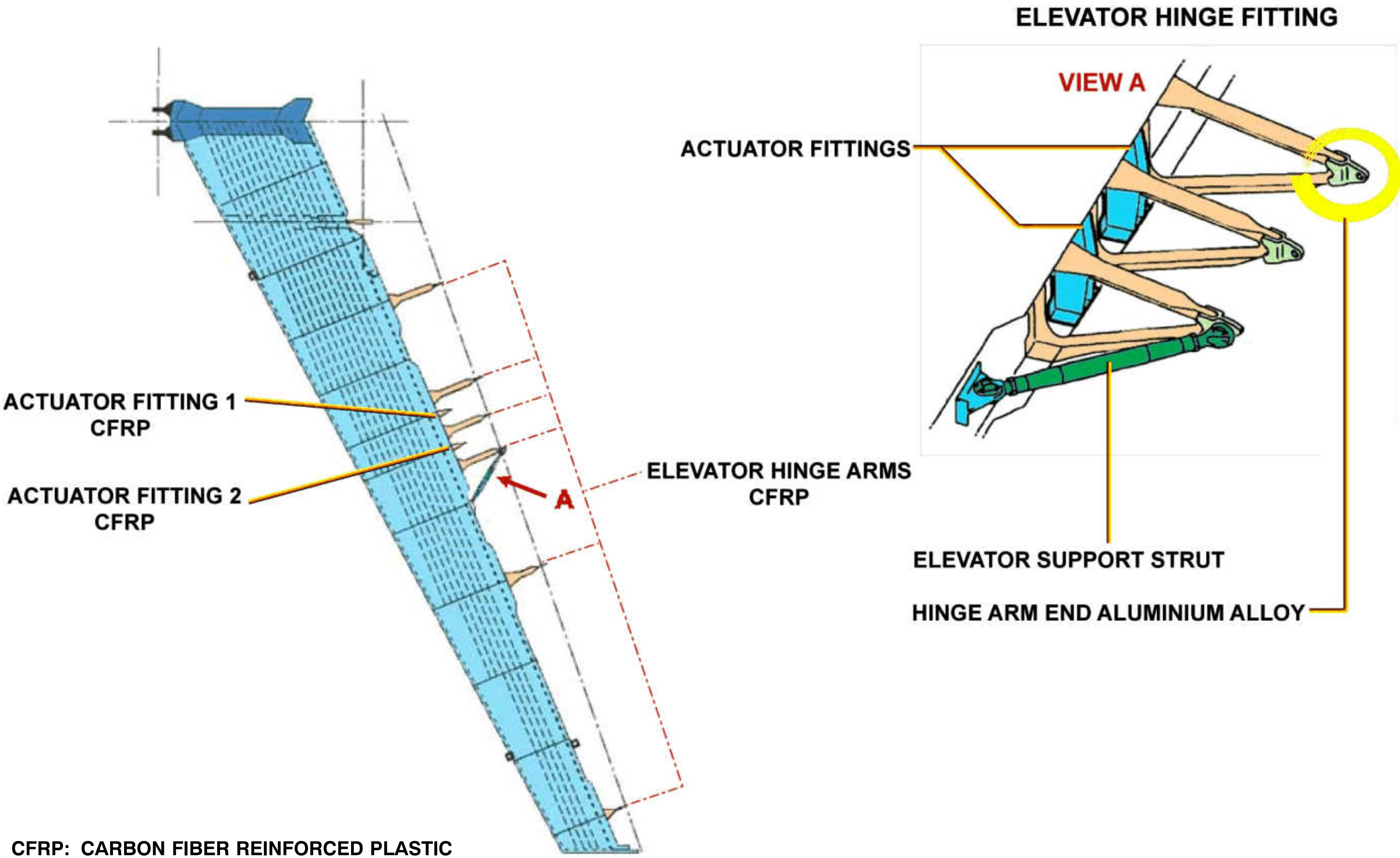
COMPONENT DESCRIPTION

ELEVATOR ATTACHMENT FITTINGS

Each rear spar bears six elevator hinge arms and two fittings for the attachment of the elevator servocontrol actuators.

The elevator attach fittings attach the elevator through hinge bolts to the hinge arms of the horizontal stabilizer. The actuator attach fittings attach the elevator to the elevator servo controls.

All the fittings are made of light alloy. Hi−Lok fasteners attach them to the spar.



CFRP: CARBON FIBER REINFORCED PLASTIC

Figure 101 Elevator Attachment Fittings

55–30 VERTICAL STABILIZER

VERTICAL STABILIZER PRESENTATION

GENERAL ARRANGEMENT

The vertical stabilizer is attached to the top of the rear fuselage. It supports the rudder, which is operated by three servo control units.

The High Frequency (HF) antenna and the Very high frequency Omnibearing Range (VOR) antenna are also attached to it.

The main components of the vertical stabilizer are:

- the spar box,
- the leading edge,
- the trailing edge,
- the tip,
- the attach fittings.

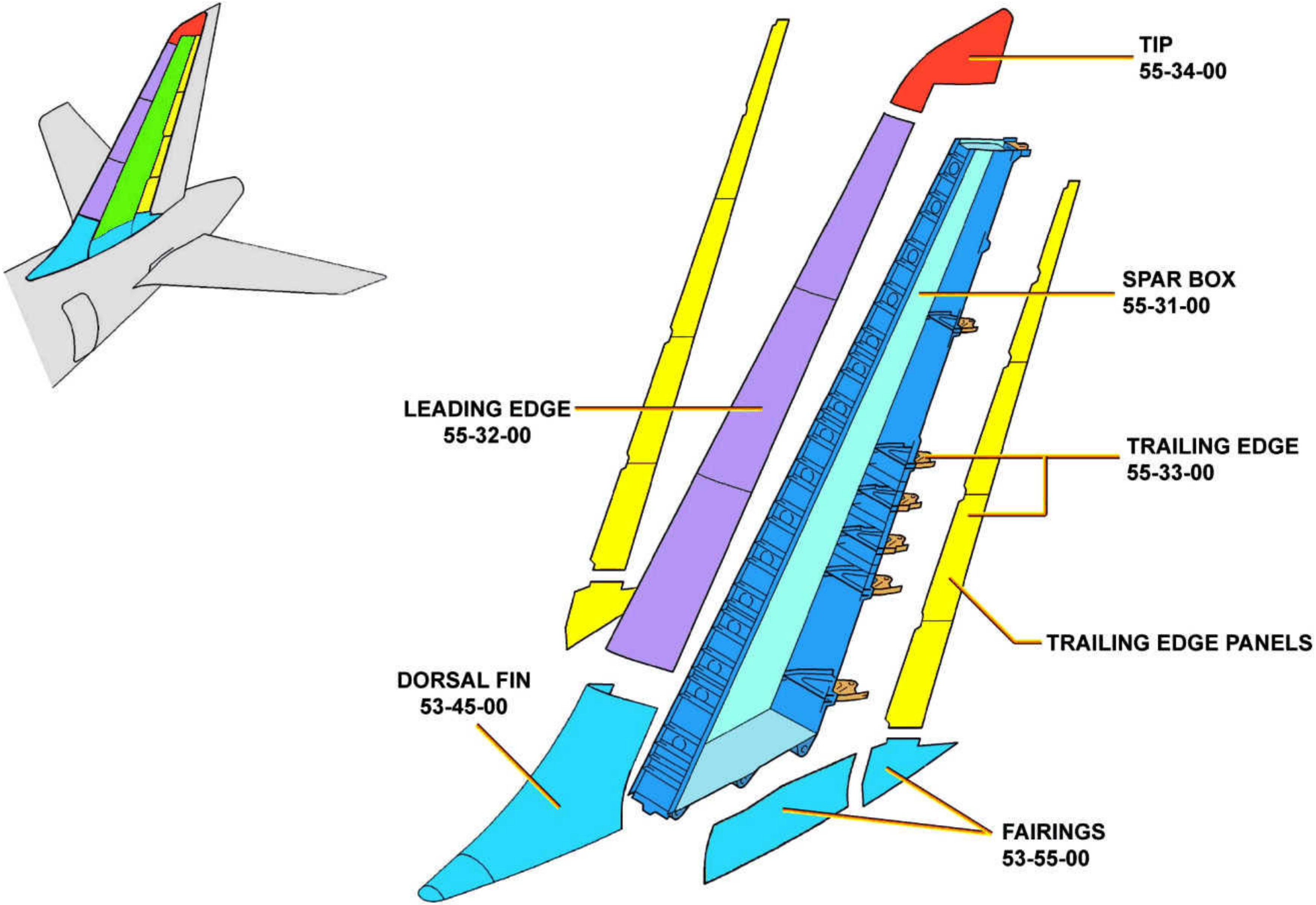


Figure 102 Vertival Stabilizer

55−31 VERTICAL STABILIZER SPAR BOX

COMPONENT DESCRIPTION

SPAR BOX − STRUCTURE LAYOUT

The spar box is the primary structural component of the vertical stabilizer.

All the other components of the vertical stabilizer are attached to it.

The spar box has a front, a center and a rear spar, ribs and two side panels with co−bonded stringers, all laminated in CFRP.

Three pairs of main attach fittings made of CFRP attach the spar box to the fuselage.

Spar Box Structure

The vertical stabilizer spar box has a front, center and rear spar, ribs and side shells. All components are made of laminations of the Carbon Fiber Reinforced Plastic (CFRP).

Seven ruddre hinge arms, the hinge arm fittings and three actuator fittings are made of aluminum alloy. They are attached to the rear spar and the side shells. Hi−Lok fasteners are used to attach them.

The left−hand and right−hand side shells are made by a one−shot−bonding technique. The skin, stringers, webs and three fuselage attachment fittings are one unit.

The front spar and the rear spar are riveted between the two side shells. Hi−Lok rivets are used for the installation. The spars have a number of holes to give access to the inside of the spar box. An intermediate spar is riveted between rib 1 and rib 2. Each spar has a transverse−load fitting at its lower end.

The spar box has eleven ribs. Except for rib 1 and rib 2, they are at right angles to the rear spar. The center spar divides rib 1 into two. All ribs are riveted to the side shells, webs and through angles to the spars. Hi−Lok fasteners are used to attach them.

Two hoisting points are installed on each side of the spar box. Each hoisting point has a threaded sleeve which is bonded into the side shell. There is a plastic plug in each hoisting point, that must be removed before the hoist fitting is installed. When the hoisting points are not in use they are covered with self adhesive disks.

Each side shell has four levelling points.

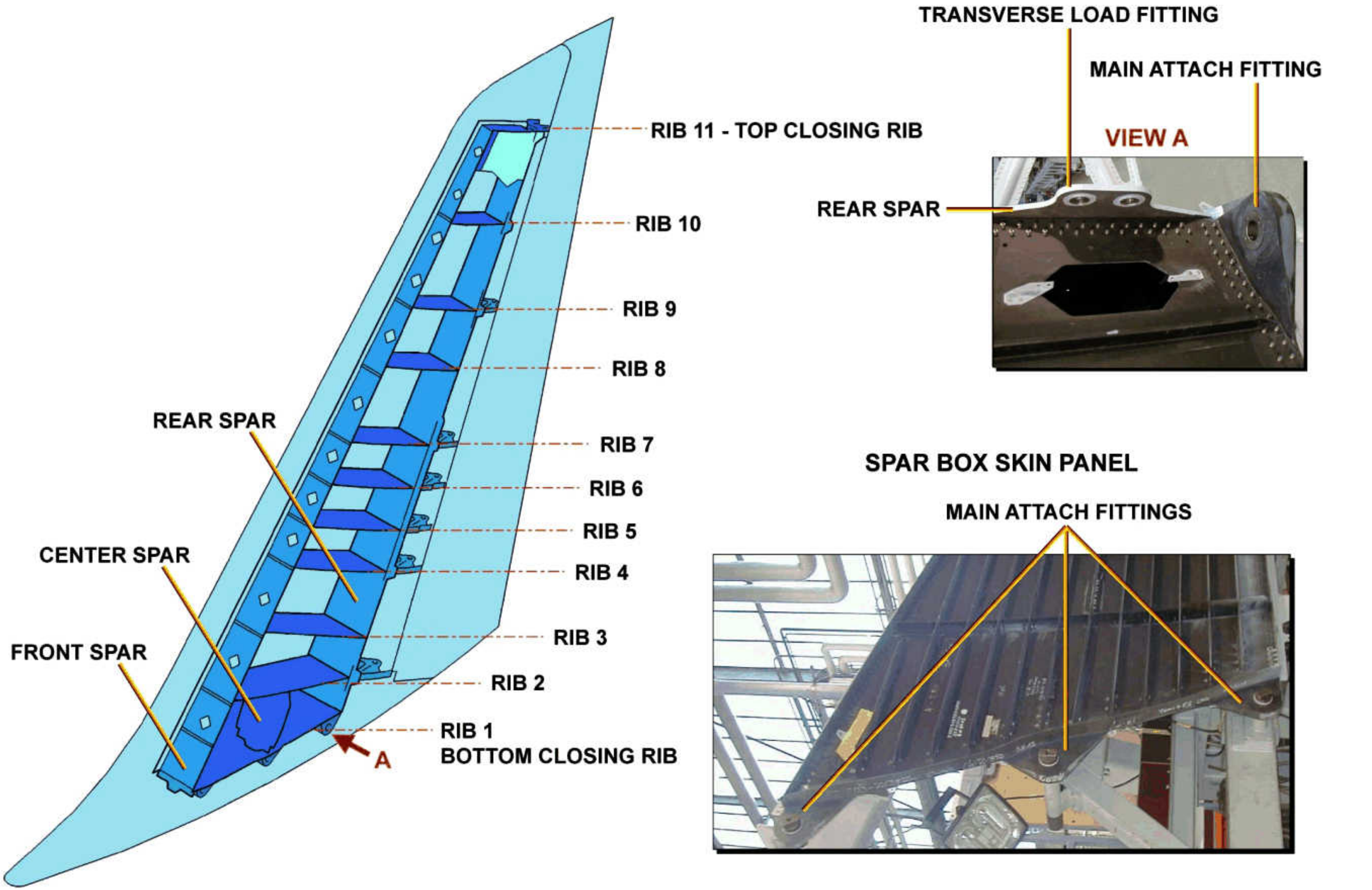


Figure 103 Vertica Stabilizer Spar Box

55−32 VERTICAL STABILIZER LEADING EDGE

COMPONENT DESCRIPTION

LEADING EDGE

The vertical stabilizer leading edge has three removable sections.

They are attached to the forward edge of the spar box side panels and to the leading edge ribs. The lower section gives access to the HF antenna (see ATA 53 fuselage description for the lower section).

The three sections give an aerodynamic shape to the front of the vertical stabilizer.

The three sections are laminated in Glass Fiber Reinforced Plastic (GFRP) bonded to a honeycomb core. A stainless steel cover can be bonded to the most forward part of the leading edge to prevent erosion damage.

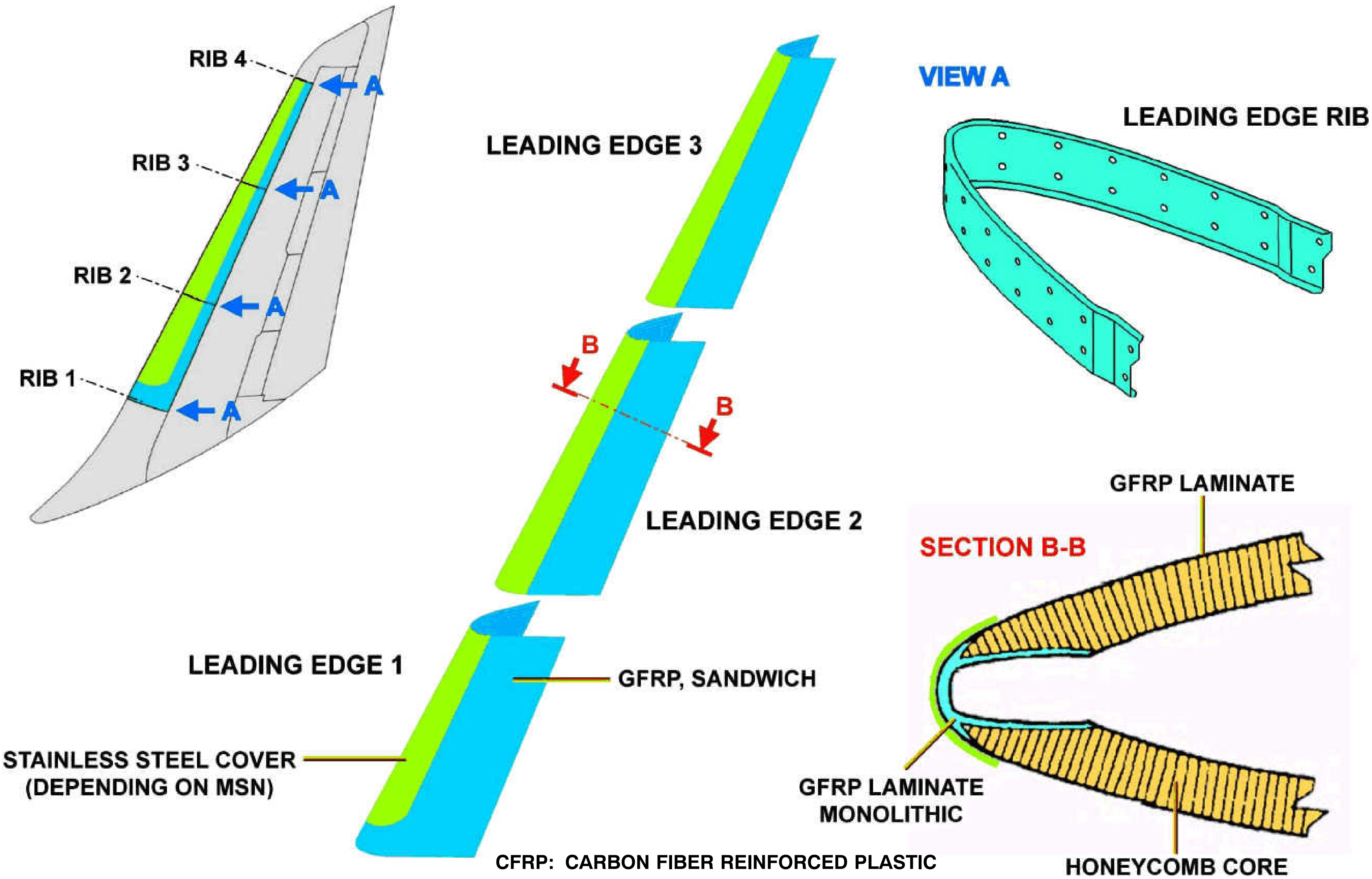


Figure 104 Vertical Stabilizer Leading Edge

55–33 VERTICAL STABILIZER TRAILING EDGE

COMPONENT DESCRIPTION

TRAILING EDGE

The trailing edge components are attached to the rear spar of the vertical stabilizer.

The supporting structure is made from aluminium alloy fittings, hinge arms and four access panels on each side. The panels give access to the rudder servo control actuators and the hinge arms.

The panels are laminated in CFRP and GFRP bonded to a honeycomb core.

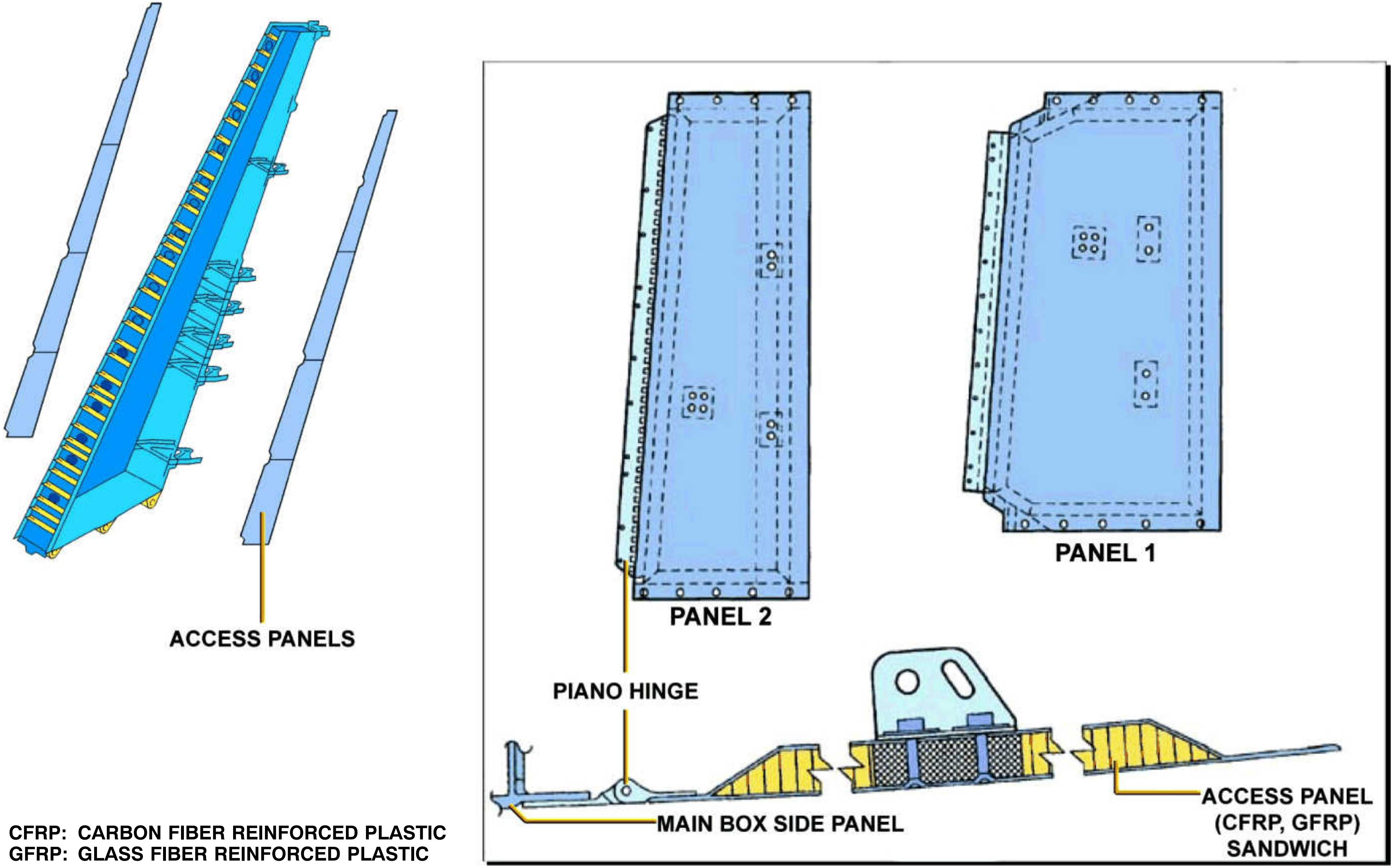


Figure 105 Vertical Stabilizer Trailing Edge

55−34 VERTICAL STABILIZER TIP

COMPONENT DESCRIPTION

TIP − STRUCTURE LAYOUT

The vertical stabilizer tip is laminated in GFRP bonded to a honeycomb core. It is attached to the leading edge end rib and the stabilizer spar box.

An aluminum lightning strike protection strap is bonded along the top of the tip.

Description

The vertical stabilizer tip is made of laminations of Glass Fiber Reinforced Plastic (GFRP) on a honeycomb core. It is attached to the leading−edge end−rib and the stabilizer spar box. Countersunk screws are used to attach it.

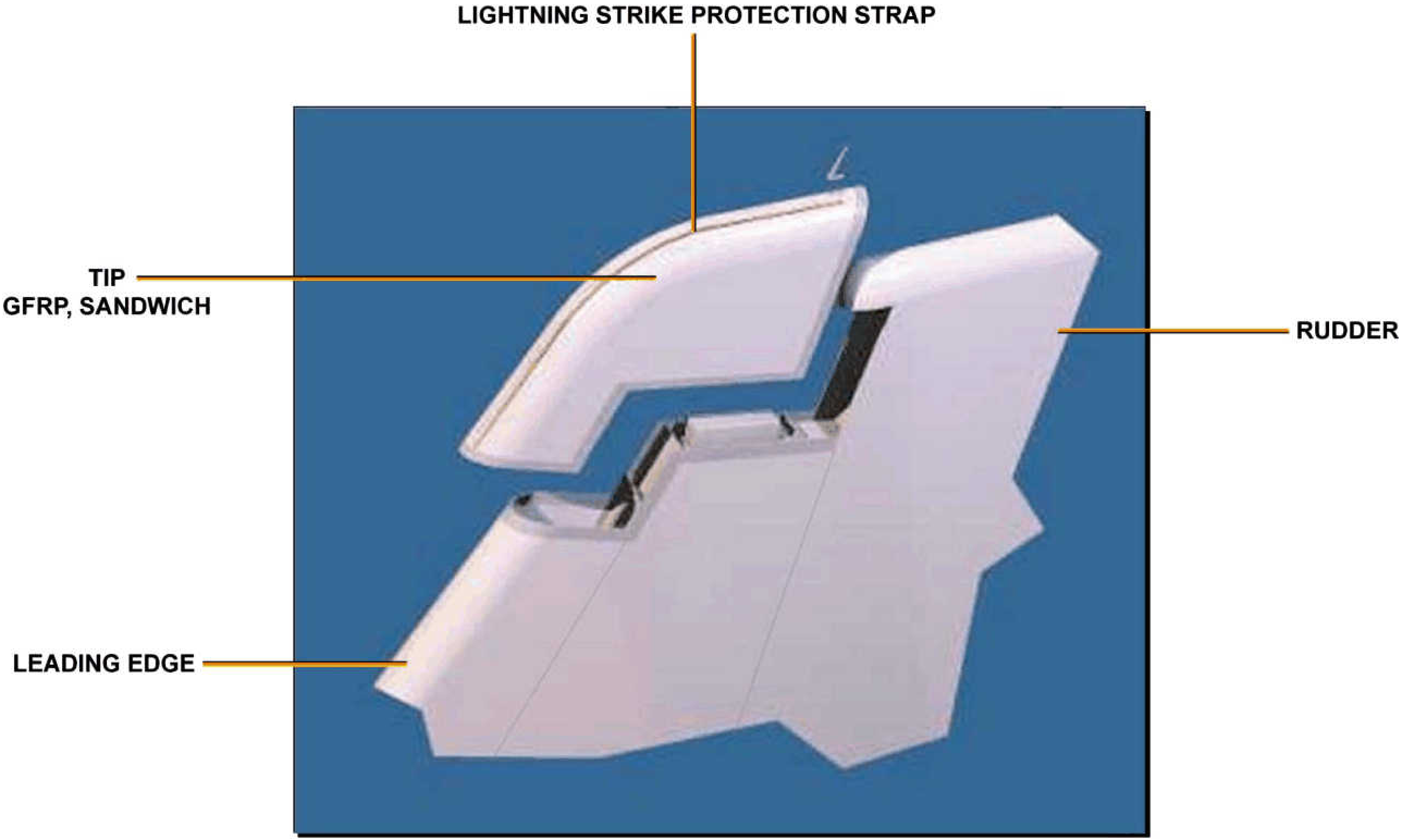
A light−alloy lightning conductor is bonded along the top of the tip. Two lightning conductors are laminated to the left−hand and right−hand outer surface. A fourth lightning conductor is laminated to the inner surface of the tip. A static discharger is attached to the lightning conductor on the top of the tip.

Hosting Points Version 1

The vertical stabilizer tip has two hoisting points. The hoisting points have threaded sleeves which are bonded into the tip and hoist fittings. When they are not in use the hoisting points make a smooth surface with the tips contour. When you use the hoisting points you must remove the hoist fittings and install them in the opposite position. Then the eye ends come out of the tips contour.

Hosting Points Version 2

The vertical stabilizer tip has a hoisting point. The hoisting point has a threaded sleeve which is bonded into the tip. When hoisting point is not in use, a plastic insert is fitted in the threaded sleeve. The hoisting point is covered with a self adhesive disc which makes a smooth surface with the contour of the tip.



GFRP: GLASS FIBER REINFORCED PLASTIC

Figure 106 Vertical Stabilizer Tip

55–40 RUDDER

RUDDER PRESENTATION

GENERAL ARRANGEMENT

The rudder is one of the primary flight controls of the aircraft.

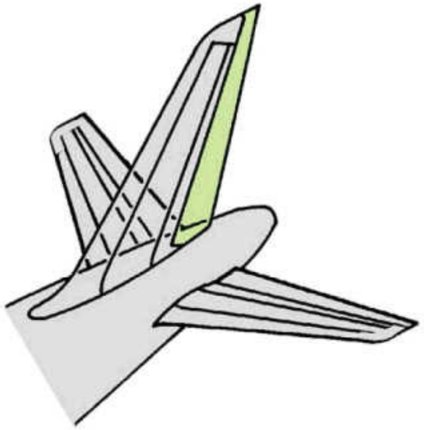
The components of the rudder are:

- the main structure,
- the leading edge,
- the tip,
- the hinge and actuator fittings.

The rudder is made as one unit. It is attached to hinge arms on the trailing edge of the vertical stabilizer. The rudder hinge line lies on the 70 % line of the vertical stabilizer and rudder assembly.

You can deflect the rudder up to 30 degrees either side of neutral. Three servo control units control the deflection of the rudder.

The rudder main structure is made of laminations of Carbon Fiber Reinforced Plastic (CFRP).



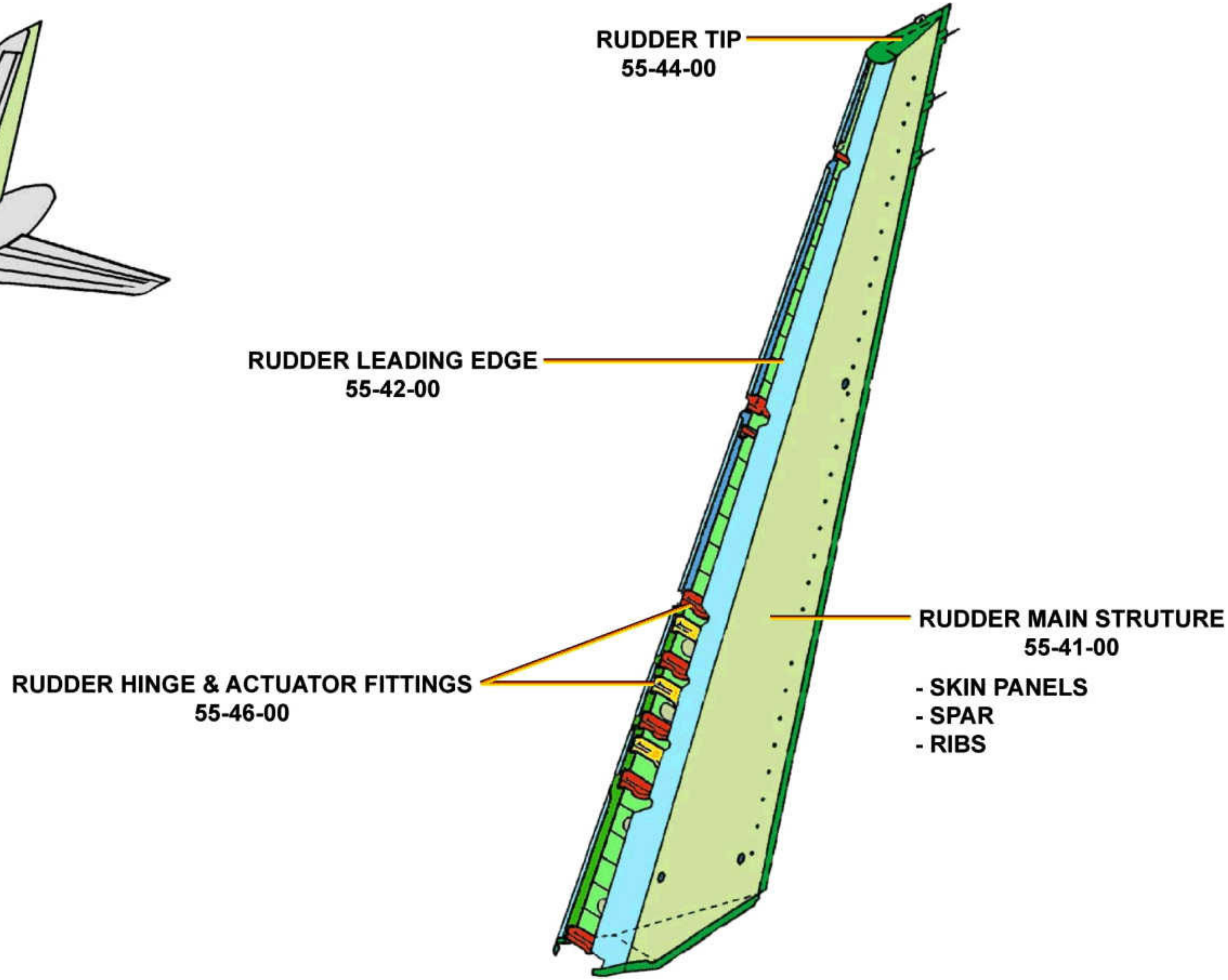


Figure 107 Rudder

55−41 RUDDER MAIN STRUCTURE

COMPONENT DESCRIPTION

STRUCTURE LAYOUT

The rudder main structure is the primary structural component of the rudder.

It is an assembly of two CFRP sandwich panels, CFRP laminates front spar, top and bottom closing ribs.

An access panel, installed on the left hand side shell, gives access to the No. 7 rudder hinge fittings. At the other locations, cutouts in the side shells give access to the adjacent hinge fittings.

Three actuators and seven rudder hinge fittings are attached to the forward face of the rudder main structure, and rivets attach them to the spar and to the skin panels.

NOTE: The bearings can be replaced without removing the rudder.

Description (Version 1)

All components of the rudder main structure are made of laminations of Carbon Fiber Reinforced Plastic (CFRP). Hi−Lok fasteners connect them, but not the trailing edge. The side shells are installed to the front spar. In the area of the rudder attach fittings the side shells have cut−outs for clearance. Two rows of fasteners connect the side shells at the trailing edge. The inner row has threaded inserts and countersunk screws, the outer row has shear head rivets. Three hoisting points are bonded into each side shell.

Description (Version 2)

All components of the rudder main structure are made of laminations of Carbon Fiber Reinforced Plastic (CFRP). Hi−Lok fasteners connect them, but not the trailing edge. The side shells are installed to the front spar. An access panel, installed in the left side shell, gives access to the No. 7 rudder attach fittings. The access panel is attached with countersunk screws. At the other locations, cutouts in the side shells give access to the adjacent attach fittings. Two rows of fasteners connect the side shells at the trailing edge. The inner row has threaded inserts and countersunk screws, the outer row has shear head rivets. Three hoisting points are bonded into each side shell.

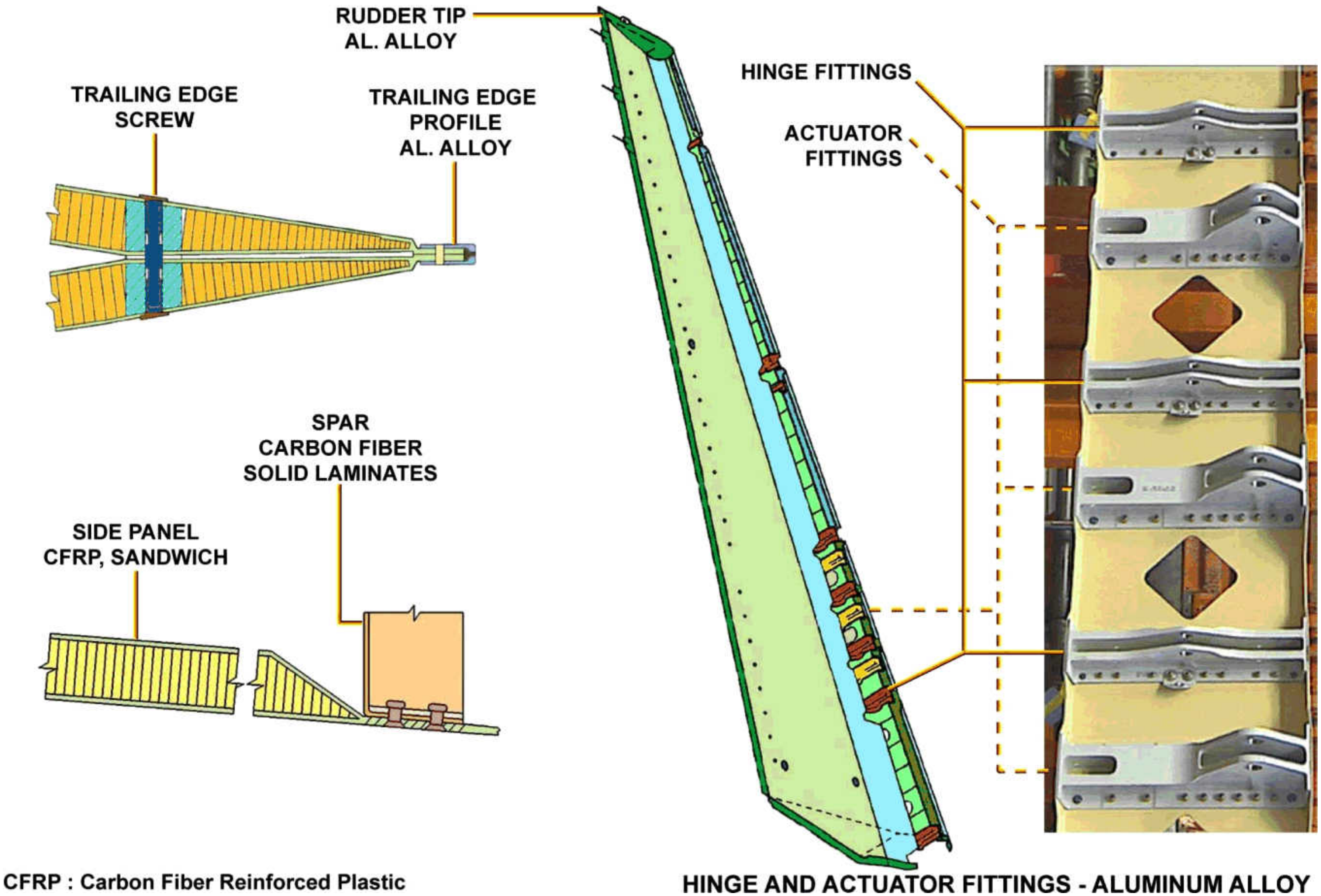


Figure 108 Rudder Main Structure

ATA 56 WINDOWS

56–00 WINDOWS - GENERAL

INTRODUCTION

WINDOWS

The ATA 56 chapter describes the cockpit, cabin and door windows.

Windows are installed in the aircraft cockpit and the cabin.

The different types and locations of the windows are:

- the cockpit windows (windshield, fixed and sliding side),
- the cabin windows,
- the cabin dummy windows,
- the passenger/crew door windows.

The cockpit windows include the windshield, the sliding windows and the side fixed windows.

The cabin windows include an inner and an outer pane installed in a seal. This assembly is installed in the window frame from inside the fuselage and held in position by a retainer ring.

The door windows are of the same design principle as for the cabin windows.

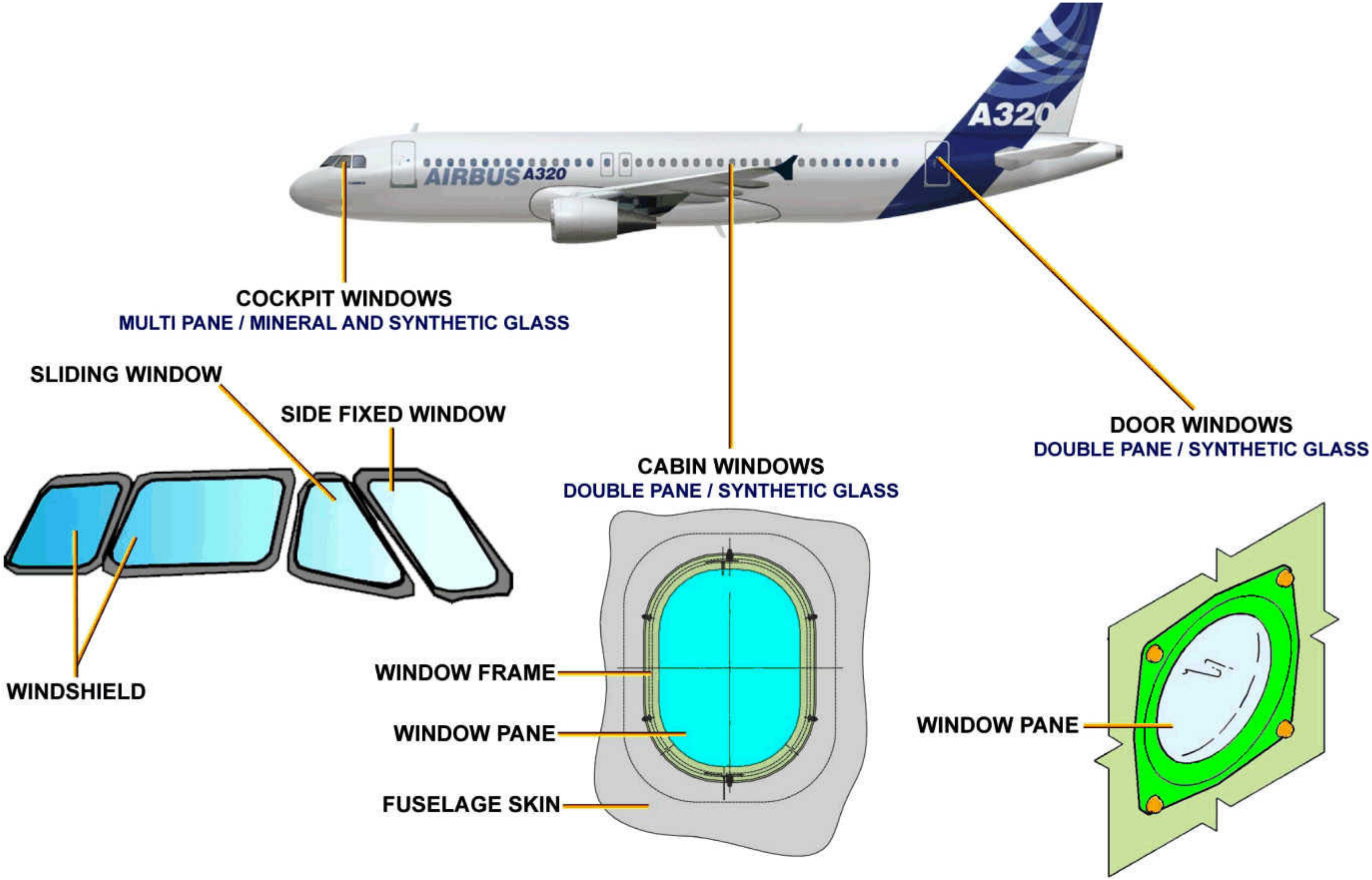


Figure 109 Windows General

56-10 COCKPIT

COCKPIT WINDOWS PRESENTATION

GENERAL

There are two types of windows:

- the fixed windows,
- the sliding windows.

There are four fixed windows installed in the cockpit:

- two windshields,
- two fixed side windows.

The left and right windows are symmetrical.

These windows are mounted in a frame and can be removed and installed from the exterior.

The sliding windows are installed as follows:

- on a mobile frame with a mechanism controlled from the cockpit.

Flight Deck Windshields

The flight deck windschield arrangement is designet to ensure maximum visibility with a minimum glazed aerea, protection by heating against bird impact and adequat ice, rain and mist protection.

The cockpit window frame assemblies are riveted to the fuselage. The windshields and fixed side windows are installed directly into the frame structure. Installation is made from the external area of the cockpit.

Each windshield assembly is made of three laminations of toughened glass.

The laminates are mounted in directly moulded seals which are clamped within the windshield frames.

The fixed side window assemblies are made of two stretched acrylic laminates. Each assembly is set in a moulded silicon-rubber seal.

The windshields and fixed side windows are chemically strengthened and are resistant to hail and bird-strike damage. Electrical heating elements give clear vision in all conditions.

Sliding Windows

The sliding side-windows are attached to support tracks before they are installed in the frame structure. Installation of the sliding side-window assembly is made in the cockpit.

The sliding side-window assemblies are made of two stretched acrylic laminates. Each assembly is set in a moulded silicon-rubber seal.

The windows are chemically strengthened and are resistant to hail and bird-strike damage. Electrical heating elements give clear vision in all conditions.

The sliding side windows have a mechanism to open, close and to lock them. The crew can use them as emergency exits.

Fixed Windows

There are four fixed windows installed in the cockpit:

- two windshields,
- two fixed side windows between FR8 and FR11.

The left and right windows are symmetrical.

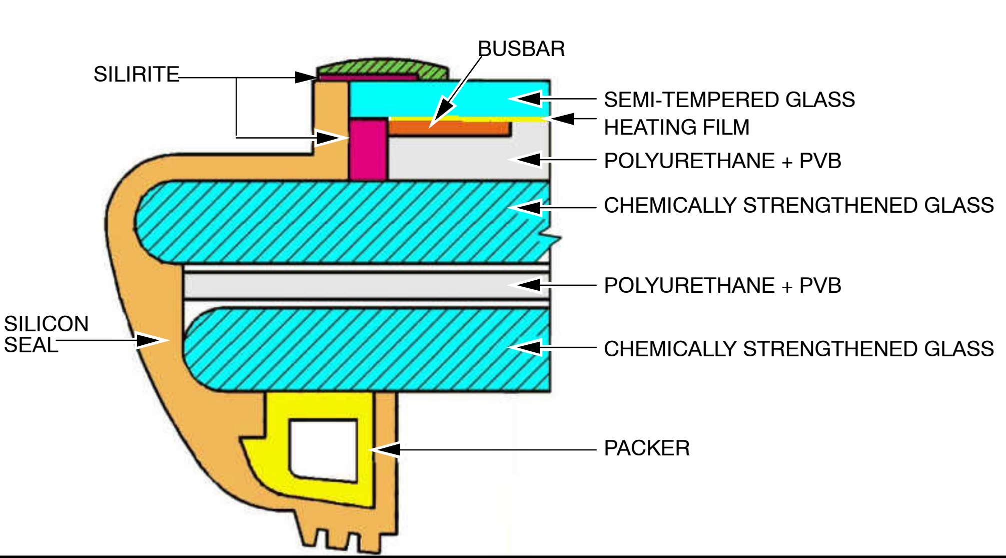
The windows are mounted in a frame which enables them to be removed and installed externally.

All windows are interchangeable.

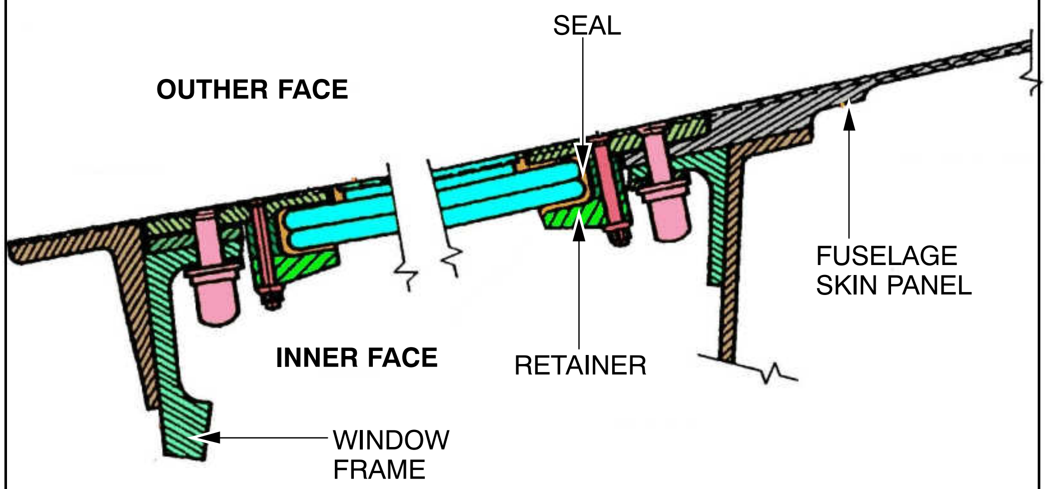
The fixed side windows consist of several layers of different materials. The fixed side windows are fitted with an integral anti-icing and defogging system.

Acrylic windows (GKN (formerly LUCAS/ACT) supplier) and glass windows (PPG and SGS (formerly SPS) suppliers) windows are mounted on a removable frame enabling the window to be bolted on to the window frame on the aircraft. This assembly is sealed with sealing compound.

WINDSHIELD



FIXED WINDOW



SLIDING WINDOW

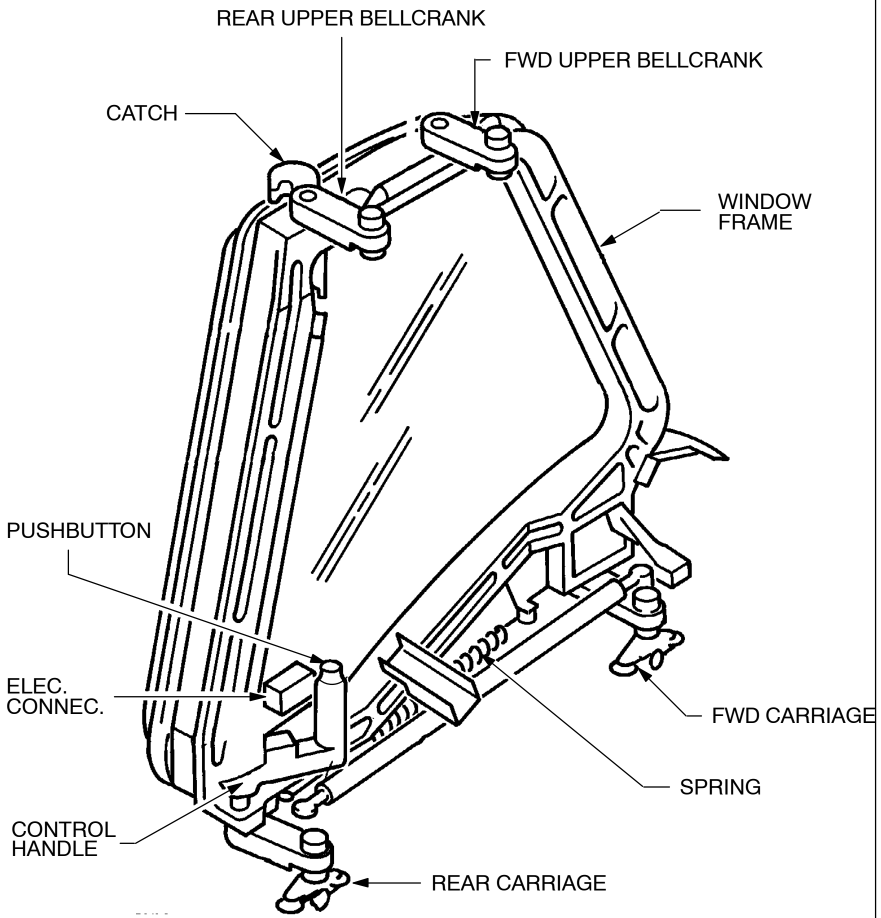


Figure 110 Cockpit Windows

56–20 CABIN

CABIN WINDOWS PRESENTATION

GENERAL

The cabin windows are 230 mm (9.1 in.) wide and 330 mm (13 inch) high, and are fitted between the frames at intervals of 533.4mm (21 inch). The layout provides excellent visibility for the passengers in all seating arrangements. Each window is made with two panes.

Each of the two panes can carry the full differential cabin pressure (fail safe). The panes are made of stretched acrylic. Their thickness are 9.5 mm for the outer and 4 mm for the inner pane.

These panes are mounted in an injection moulded seal and fitted into the frames by one easily removable retaining ring and six nuts.

Near the bottom of the inner pane, at the center, there is a small vent hole to equalise the pressure between the panes in normal operating conditions. However, in the event of a failure of the outer pane, the inner pane is capable of carrying the full differential pressure.

Window Frames

The main window frame is made from a drop-forging which has a T-shaped cross section. To avoid fatigue problems, the window frame is designed on the basis of following criteria:

The inner flange of the forging accommodating the panes is free from holes since it is necessary to keep this flange free from stress raiser to ensure a good fatigue life.

The outer flange is riveted to the structure and has a varying cross section which gives a good load diffusion characteristic.

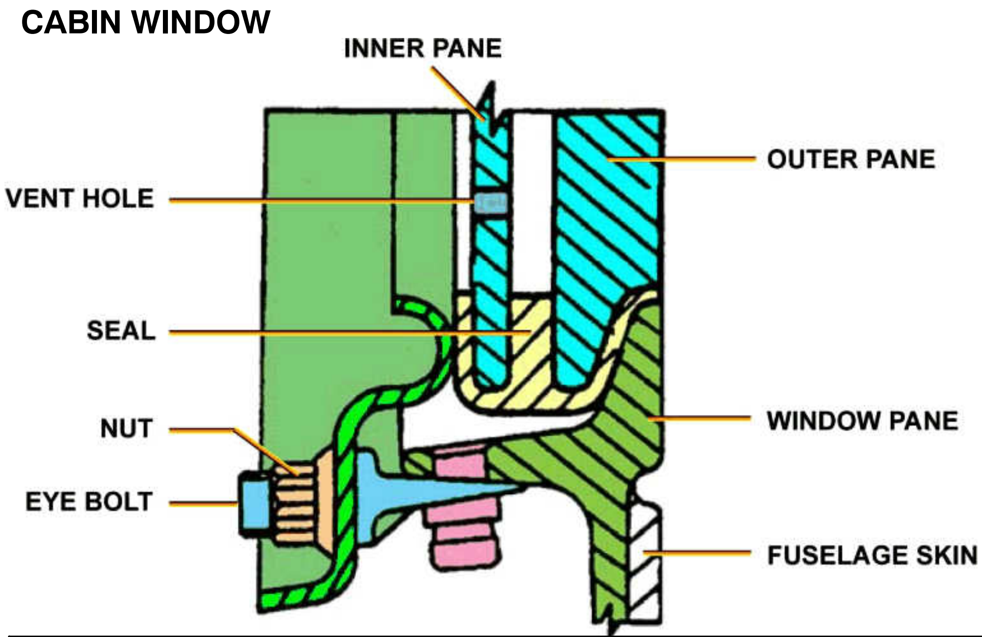
The third flange is a stiffener and carries the fixation elements.

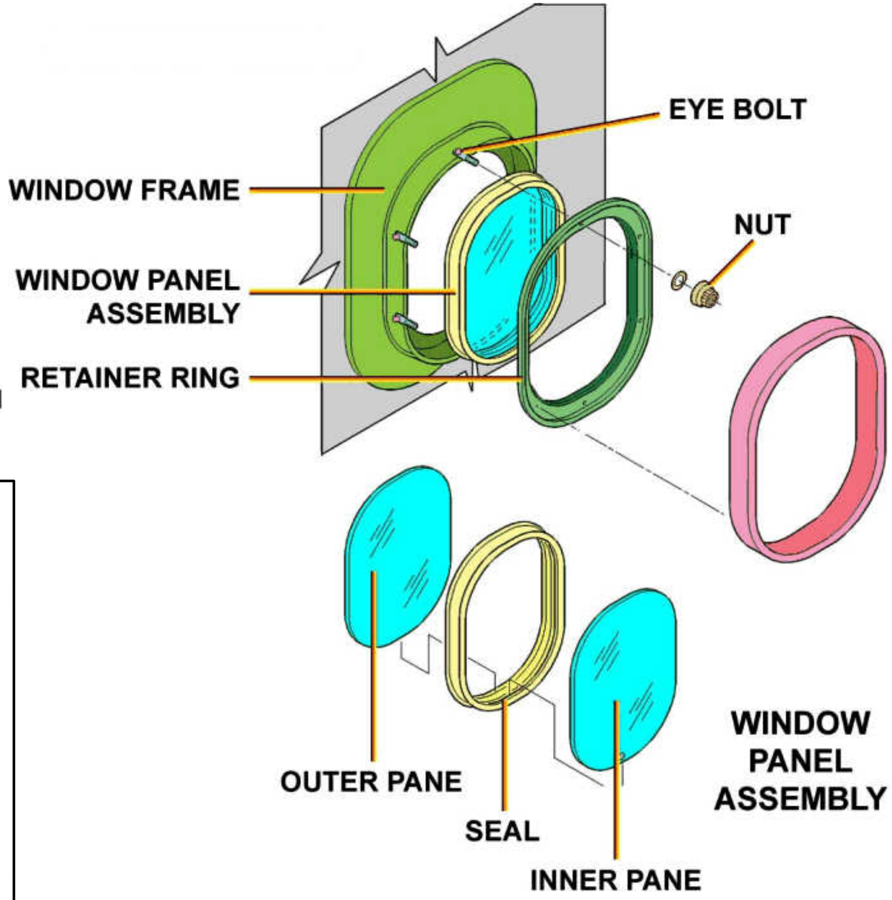
Dummy Windows

The cabin dummy windows are installed in locations where a cabin window is blocked with cabin equipment and furnishings, e.g. toilets, galleys, etc.

The dummy window is made up of light alloy plate, spacers and a seal.

The dummy window is attached to the window frame with a retainer, eyebolts and nuts.





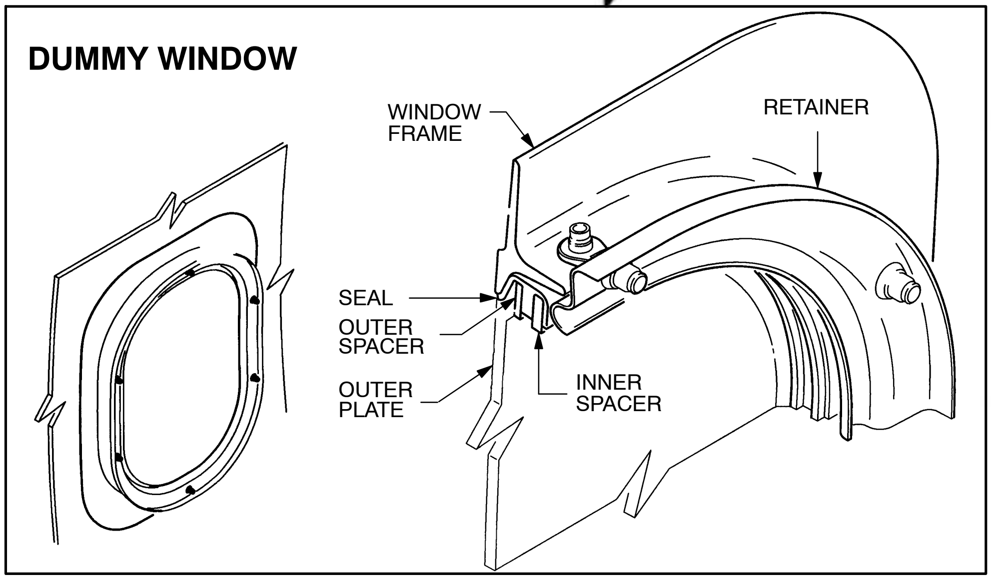


Figure 111 Cabin & Dummy Windows

56–30 DOOR

PASSENGER/CREW DOOR WINDOWS PRESENTATION

GENERAL

The passenger/crew doors and emergency exit doors have a circular window. They are used for inspection and observation in order to check from outside if the cabin is pressurized or to verify from inside if the outside is clear for door opening/slide deployment.

The windows have a seal, inner and outer panes made of stretched acrylic, held in position by a retainer ring. A vent hole in the inner pane allows to pressurize only the outer pane in normal operation.

The inner pain is able to maintain the cabin pressure in case of outer pane failure.

The components of the window are interchangeable.

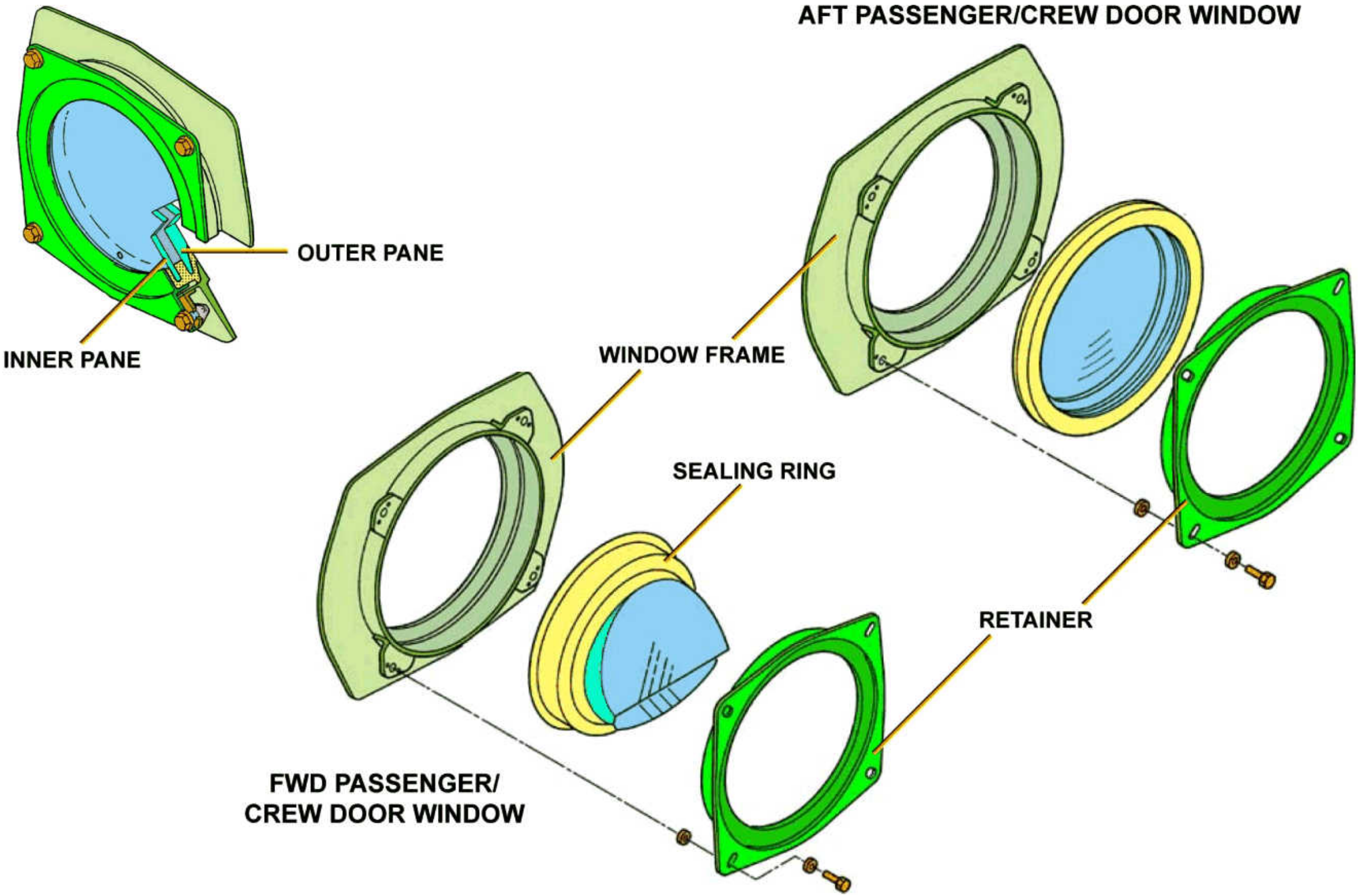


Figure 112 Passenger/Crew Door Windows

ATA 57 WINGS

57–00 WINGS - GENERAL

INTRODUCTION

WINGS FIXED PARTITION

The wings consist in a center wing box which is installed in the center fuselage section and which provides the cantilever attachment of the outer wings. The center wing box is an assembly of aluminum alloy parts, located between frames 36 and 42.

Each outer wing has a main box (outer wing box), which is the main load carrying structure. The main box supports a fixed leading edge structure, a fixed trailing edge structure and a wing tip.

The fixed leading edge structure has leading edge ribs, attached to the main box front spar, and which support the ”D–nose” structure.

The fixed trailing edge structure includes hinge fittings and actuator fittings for the movable surfaces, and intermediate ribs. The access panels are made of CFRP.

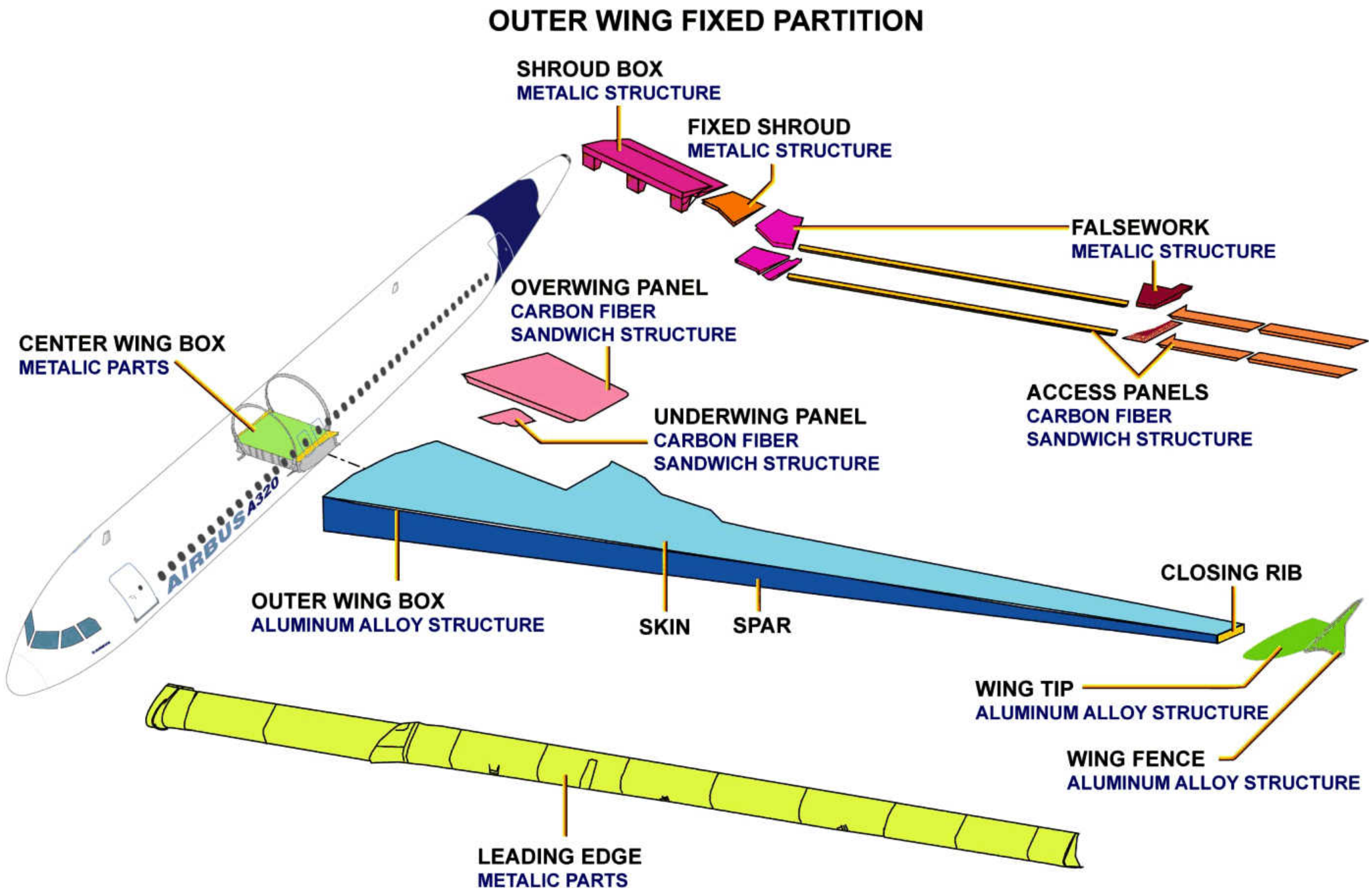


Figure 113 Wings Fixed Partition

WINGS MOVABLE SURFACE

Each outer wing is fitted with:

- five slats made of aluminum alloy,
- an inboard flap and an outboard flap with a CFRP structure and a sandwich aluminum trailing edge structure,
- five CFRP spoilers,
- and one aileron, mainly made from CFRP.

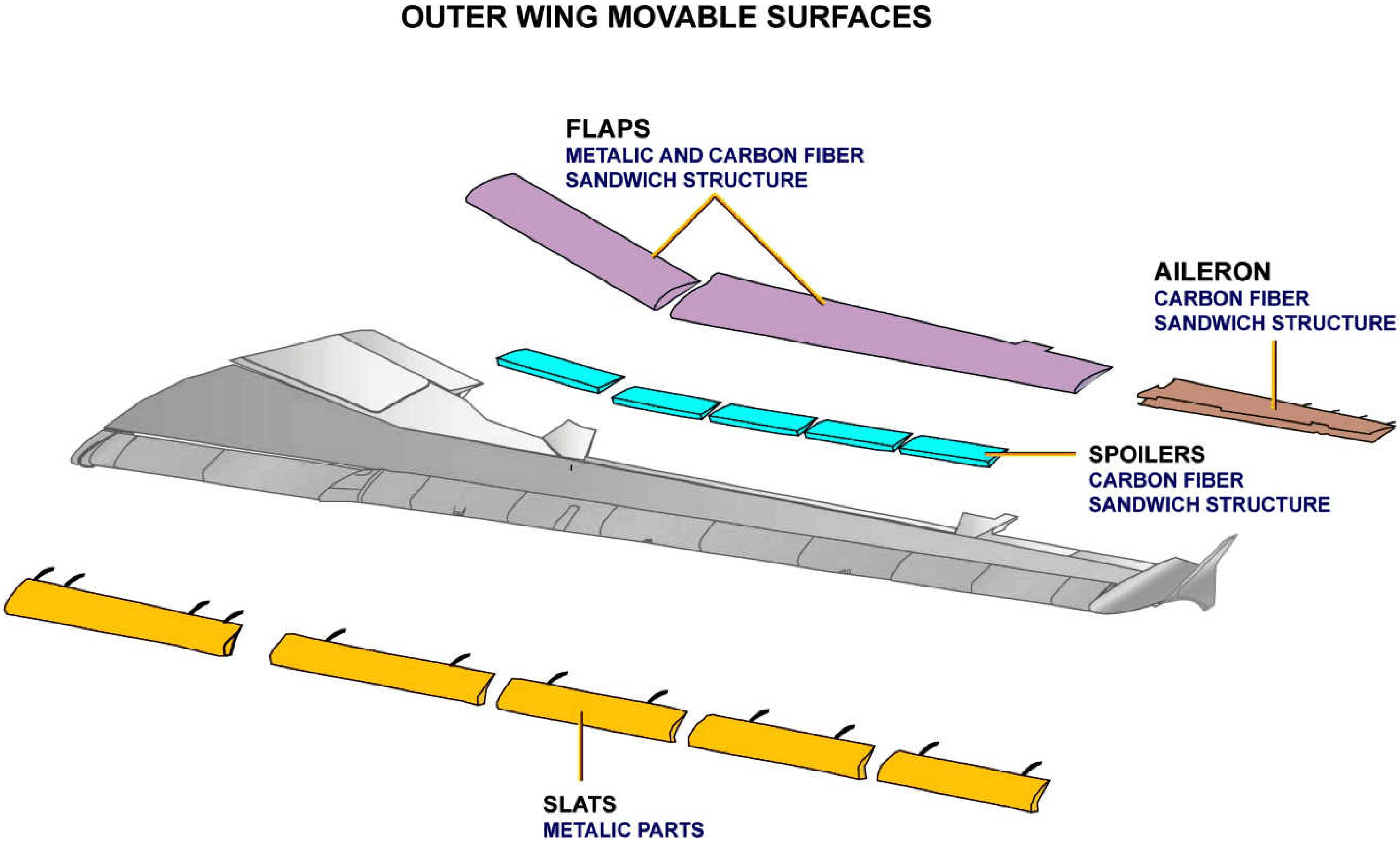


Figure 114 Wings Movable Surface

WINGS DESCRIPTION

DESCRIPTION

The aircraft wing is a continuous structure which goes through the fuselage between frames 36 and 42. It is made in three parts:

- the center wing box (zone 140),
- the left outer wing (zone 140),
- the right outer wing (zone 600).

The center wing box is part of the fuselage and gives attachment points for the cantilevered outer wings. Each outer wing has a wing box, leading edges and trailing edges and a wing tip. The leading edge has attachments for the slats and the trailing edge has attachments for the main landing gear, aileron, flaps and spoilers.

A wingtip fence is installed on the wingtip.

Components

The main Component of the wing are:

- the center wing (ATA 57–10),
- the outer wing (ATA 57–20),
- the wing box (ATA 57–21),
- the wing tip (ATA 57–30),
- the leading edge and leading edge devices (ATA 57–40),
- the trailing edge and trailing edge devices (ATA 57–50),
- the aileron (ATA 57–60),
- the spoilers (ATA 57–70).

Center Wing Box

The center section of the wing extends from L/H RIB 1 to R/H RIB 1 across the width of the fuselage between frame 36 and 42 and forms an integral fuel tank.

Center wing box includes:

- the front and rear spar at (frames 36 and 42),
- the upper and lower skin panels,
- the two main frames (frames 36 and 42),
- a set of 38 integral alluminium alloy rods,
- the left RIB 1 and right RIB 1.

The center wing has attachement for the left and right outer wings at the left RIB 1 and right RIB . The center wing box has an integral fuel tank. Access to this fuel tank is through the 2 access doors in the frame 42.

Wing Box

The main structure of each outer wing is the wing box which tapers from the wing root to the wing tip. Its front and rear spars extend from RIB 1 to RIB 27. The rear spar is made in three parts and has joints at RIB 6 and RIB 22. The wing box has 27 ribs. The ribs are continuous between the front and the rear spars. The top surface of the wing box has two skin panels, and the bottom surface has three panels. Each of the wing panels extends forward of the front spar and aft of the rear spar.

The leading and the trailing edge structures attach to these projections and to the front and rear spars. Stringers give strength to the top and the bottom skin panels.

The wing box makes an integral fuel tank and a vent surge tank. 21 access panels in the lower skin give access to the fuel tank and the vent surge tank.

The wing box also has attachments for:

- the leading edge and the leading edge devices,
- the wing tip and the wingtip fence,
- the trailing edge and the trailing edge devices,
- the engine mounting pylons,
- the main landing gear.

Outer Wing

Each outer wing includes:

the wing box,

the wing tip,

the leading edge and the leading edge devices,

the trailing edge and the trailing edge devices.

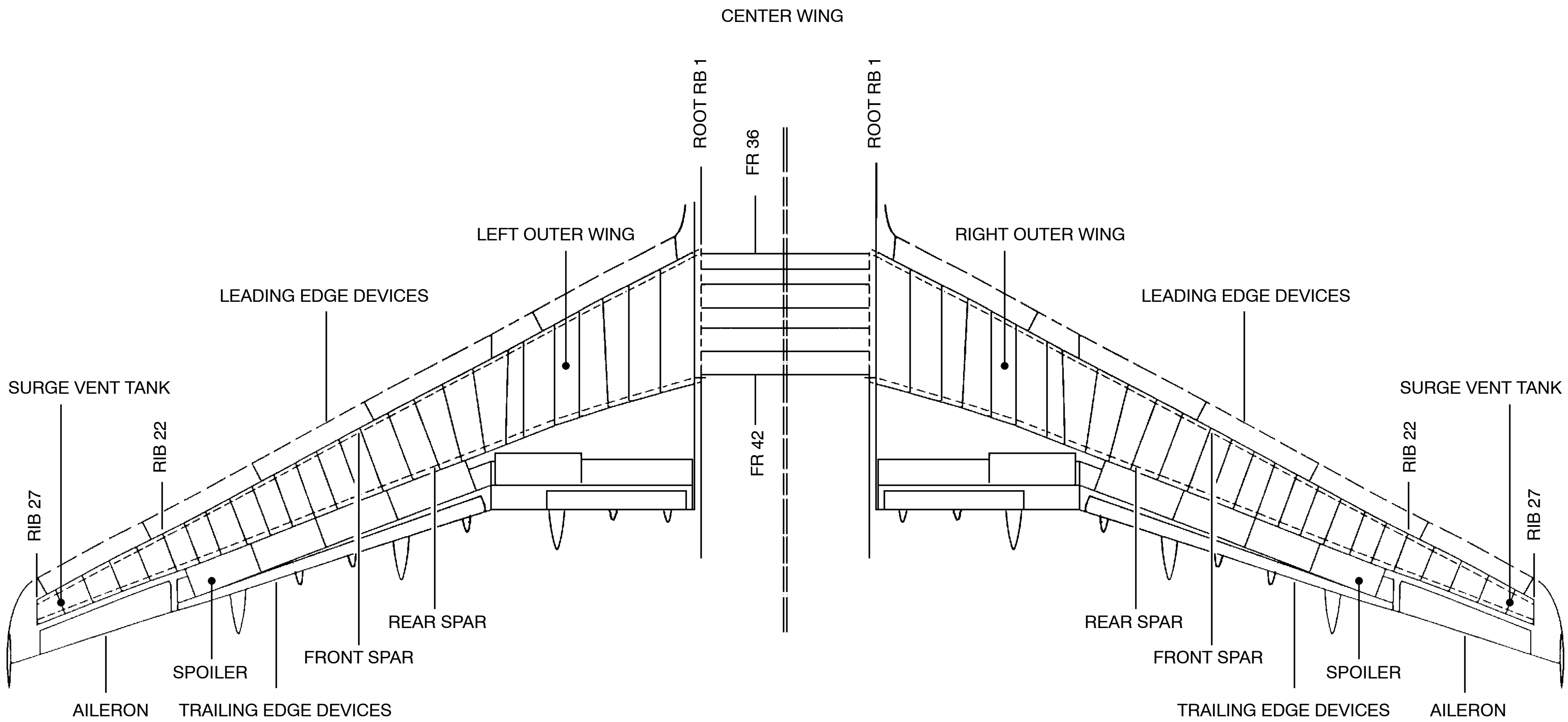


Figure 115 Wings

WING COMPONENTS

Wing Tip

The wing tip is installed at Rib 27. The wing tip fence attaches to the outboard end of the wing tip.

Leading Edge and Leading Edge Devices

The leading edge assembly is forward of the front−spar of the wing−box.

It includes the inboard and the outboard leading−edge assemblies and the top and the bottom panels. The inboard and outboard leading−edge assemblies have their D−noses and panels installed on ribs which attach to the frontspar.

The hold−down devices and the rotary actuators (for slat 1 tracks 2 and 3) are on other ribs. The leading edge devices are the five slats.

Leading Edge Slats

The leading edge slats are installed on the wing as follows:

- Slat 1 is between RIB 2 and RIB 7,
- Slat 2 is between RIB 8 and RIB 12,
- Slat 3 is between RIB 12 and RIB 17,
- Slat 4 is between RIB 17 and RIB 22,
- Slat 5 is between RIB 22 and RIB 27.

Trailing Edge and Trailing Edge Devices

The trailing edge structure is aft of the rear spar of the wing box and includes the inner, mid and outer rear−spar trailing−edges.

The inner rear−spar trailing−edge includes:

- the shroud box,
- the overwing panel,
- the fixed shroud,
- the underwing panel.

The mid and outer rear−spar trailing−edges include:

- the hinge ribs,
- the intermediate ribs,
- the actuating−cylinder brackets,
- the top and bottom panels,
- the trailing−edge support structures.

The trailing edge devices are:

- the two trailing edge flaps,
- the aileron,
- the five spoilers.

Trailing Edge Flaps

The inboard and the outboard flaps are installed on the trailing edge of the wing. The inboard flap is between RIB 1 and RIB 9 and the outboard flap is between RIB 9 and RIB 22.

On A321 the trailing edge flaps are equiped with tabs.

Aileron

The aileron is installed on the trailing edge of the wing, between RIB 22 and RIB 27.

Spoilers

There are five spoilers installed on the upper surface of each wing, forward of the trailing edge flaps. Spoiler 1 is installed between RIB 5 and RIB 9. Spoilers 2 thru 5 are installed between RIB 10 and RIB 22.

Materials

The outer−wing main−box structure and the slats are made of high−grade aluminium alloys.

The ailerons, flaps, spoilers and fairings are made of CFRP (**C**arbon **F**iber **R**einforced **P**lastic).

Titanium alloys and steel alloys are used where necessary.

Protective Treatment

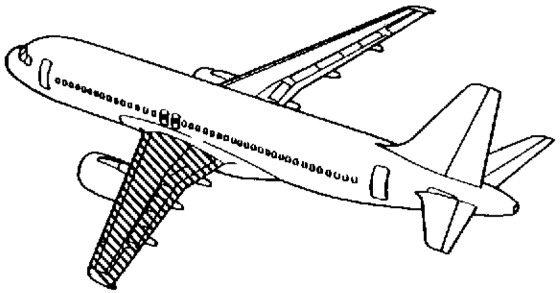
This is given in Protective Treatment (Ref. 51−21−00).

Paint Coatings

This is given in Paint Coatings (Ref. 51−23−11).

Outer Wing Tank Sealing

The fuel tanks are sealed, while the outer wing is being assembled.



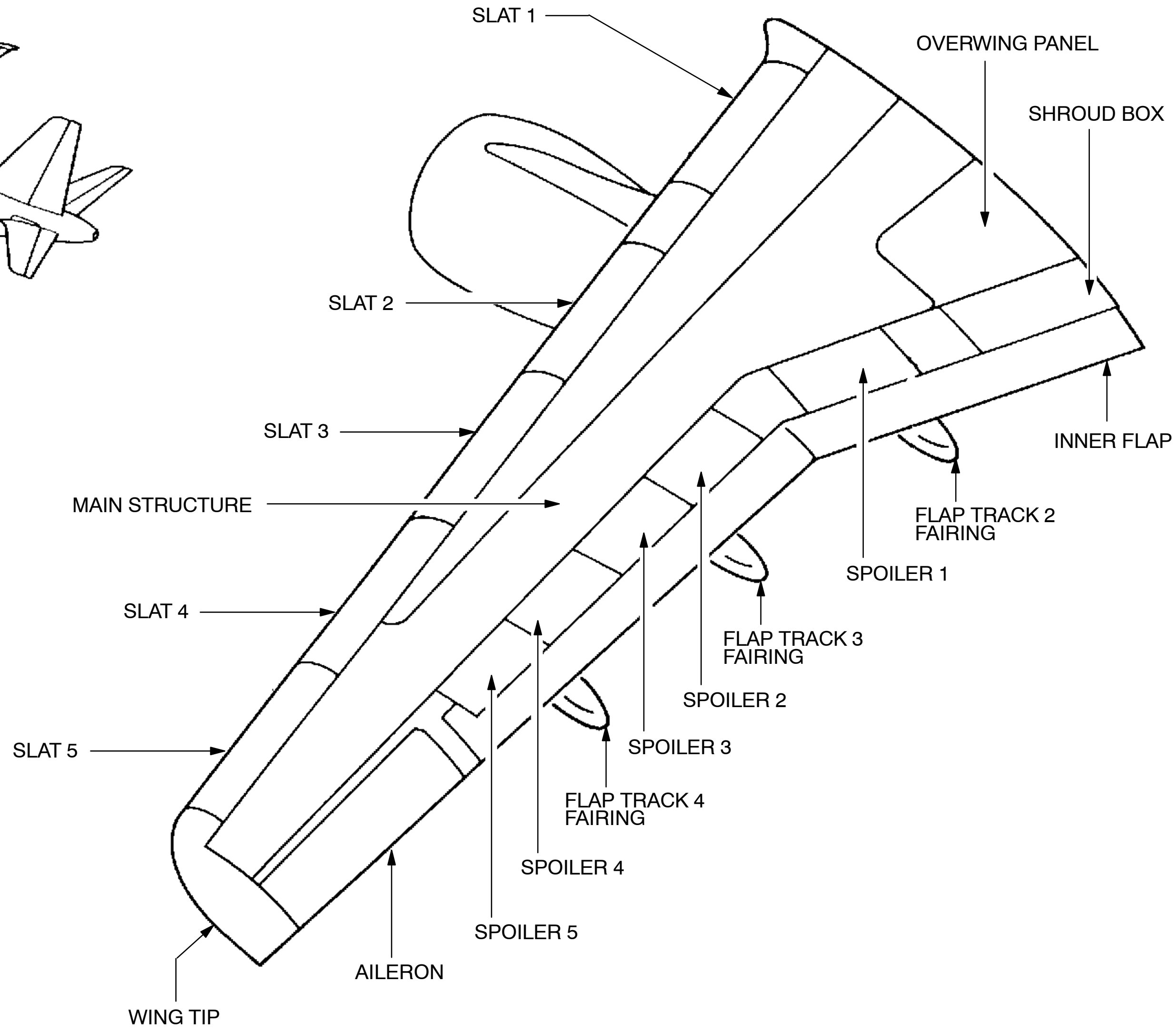


Figure 116 Wing Components

57–10 CENTER WING

CENTER WING PRESENTATION

PRINCIPLE

The aircraft wing is in the continuity of the structure going through the fuselage which is divided into three parts:

- the center wing box,
- the left outer wing and,
- the right outer wing.

Center Wing Box General

The center wing box (section 21) is installed in the fuselage between the frames FR36 and FR42.

It provides the cantilever attachment for the wings, distributes their load in the fuselage and can form an optional integral fuel tank.

The wings of the aircraft are attached to the box by the left and right RIB1.

Access for maintenance to the center wing box is through one or two triangular openings in the rear spar secured to frame FR42.

The lower skin panel of the center wing box is fitted out to house the fuel tank pumps.

The center wing box structure has:

- two forward and rear spars,
- two frames FR36 and FR42,
- an upper skin panel,
- a lower skin panel,
- six rod assemblies (4 x 6 & 2 x 7),
- two ribs RIB1 left and right,
- ten frame support assemblies (left and right).

The junction between the center wing box and the outer wings is done at the left hand and right hand sides rib 1.

The access for maintenance to the center wing box is done through two triangular openings in the rear spar.

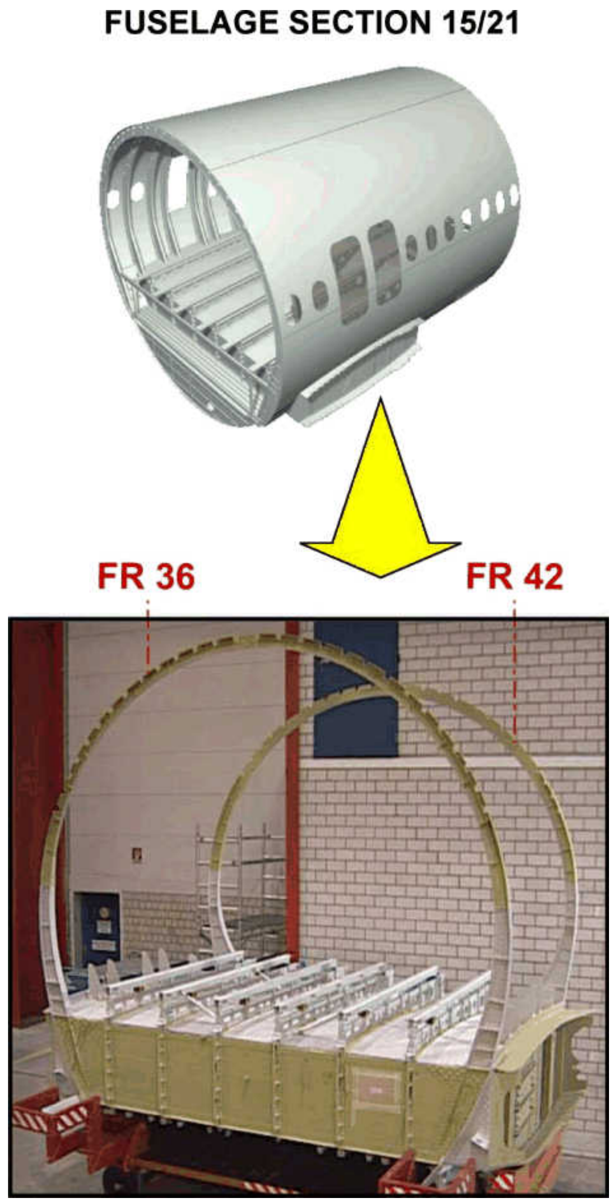


Figure 117 Center Wing Box Location

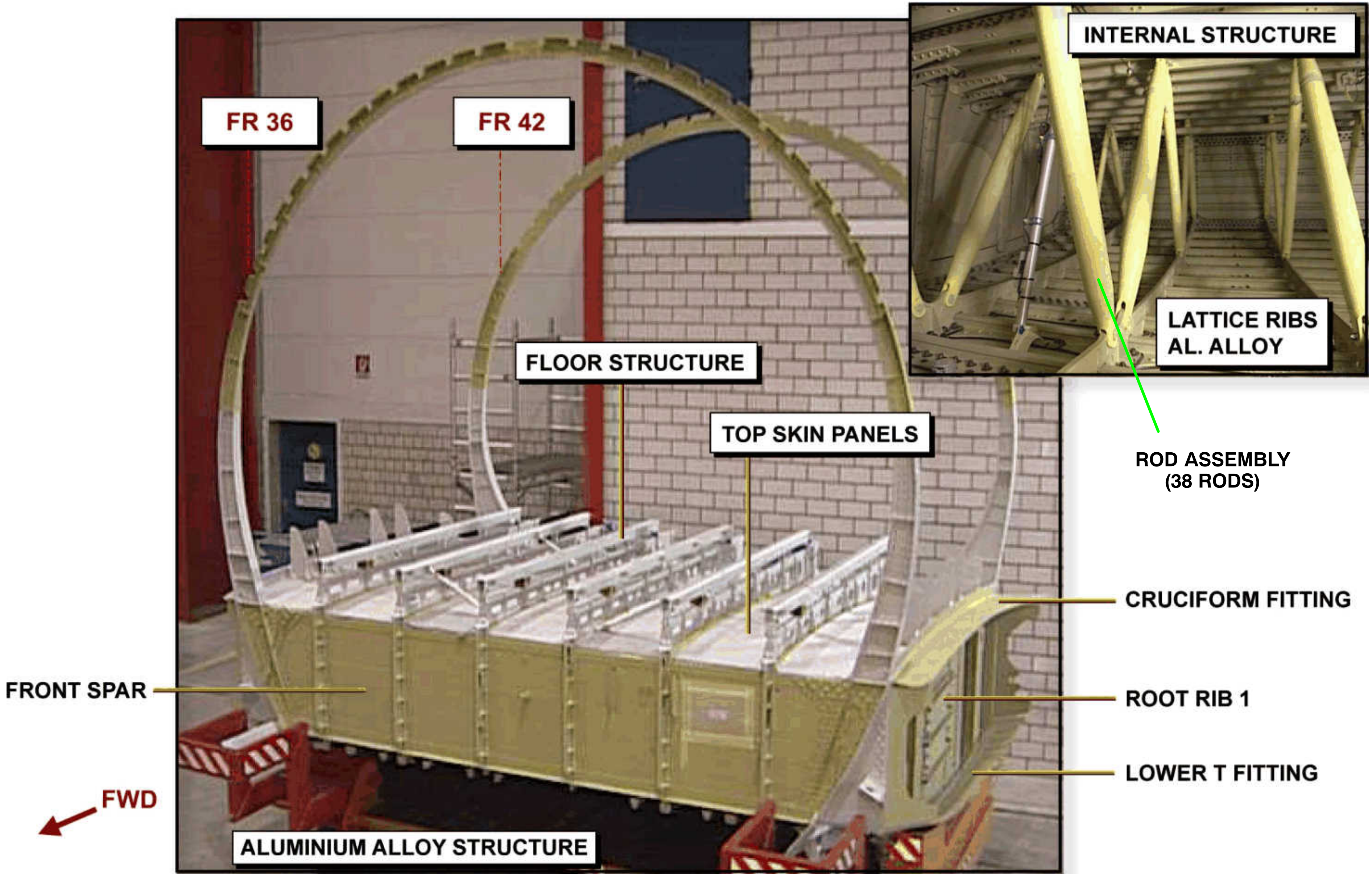


Figure 118 Center Wing Box

CENTER WING COMPONENT DESCRIPTION

WING ROOT JOINT

General

An upper cruciform fitting and a lower triform fitting ensure the junction between the center wing box and the outer wing box.

The upper cruciform fitting makes the junction between the center wing box top skin panels, the outer wing box top skin panels, fuselage and Rib 1.

The lower triform fitting and a safety butt–strap fitting make the junction between the center wing box bottom skin panels, the outer wing box bottom skin panels and Rib 1.

Description

The wing box of the outer wing is attached to the wing box of the center wing at RIB1. Top and bottom fittings of aluminum alloy connect the spar webs of the center wing to those of the outer wing. A cruciform member is used to keep the continuity of the top skin across the joint. Bolts attach the top skin panels of the center wing and the outer wing to the cruciform member.

Crown fittings made of aluminum alloy keep the continuity of the top skin stringers across the joint. The crown fittings are attached to the outboard vertical face of the cruciform member (RIB1). Bolts attach the stringers to the crown fittings.

The continuity of the bottom skin across the joint is kept through a triform member. There is a strap machined from aluminum alloy across the joint. Interference bolts attach the strap and the bottom skin panels to the triform member. The bottom skin stringers are not continuous across the joint. End loads are absorbed by the stringer–to–skin joint.

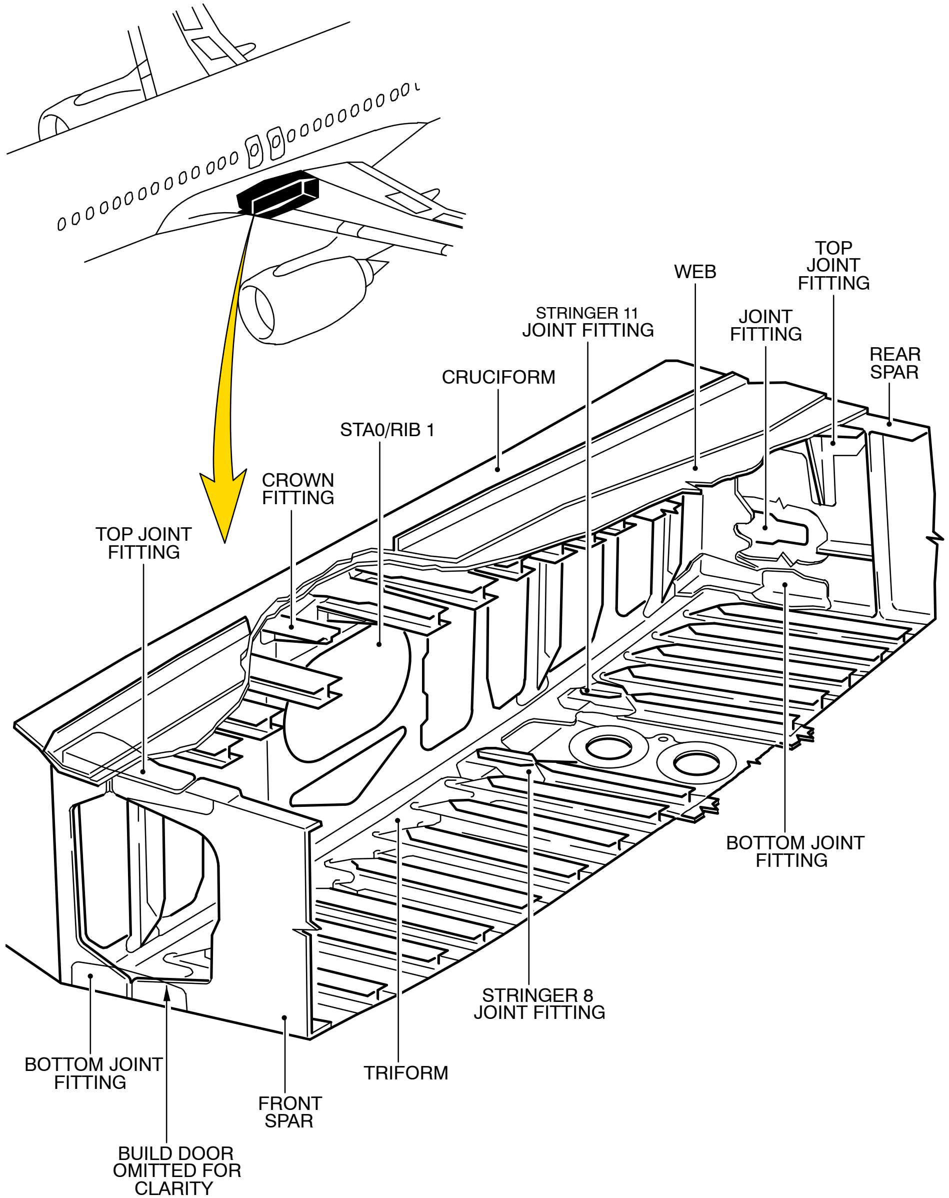
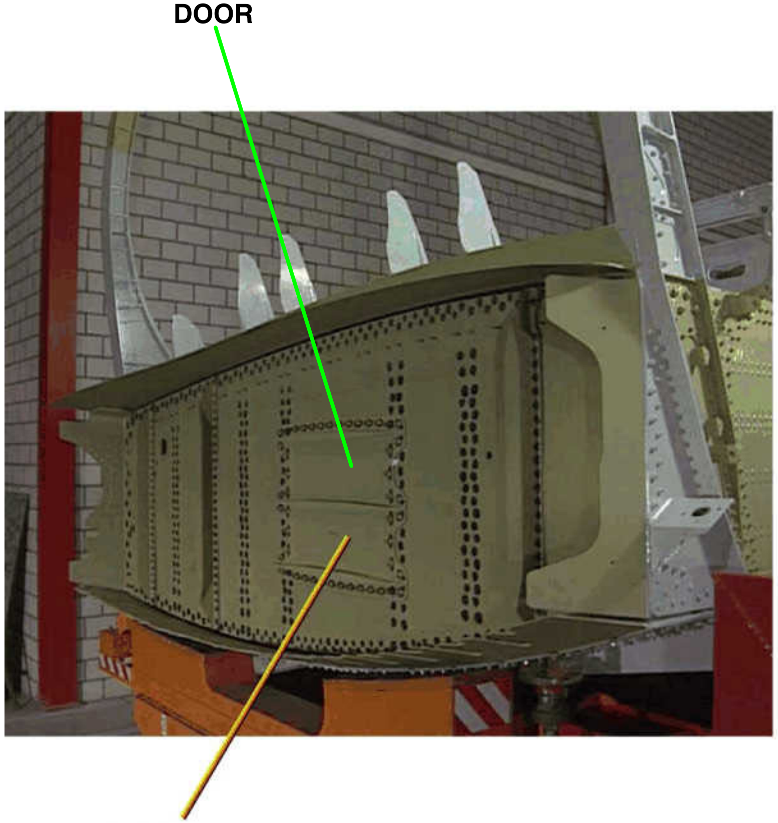


Figure 119 Wing Root Detailed Schematic



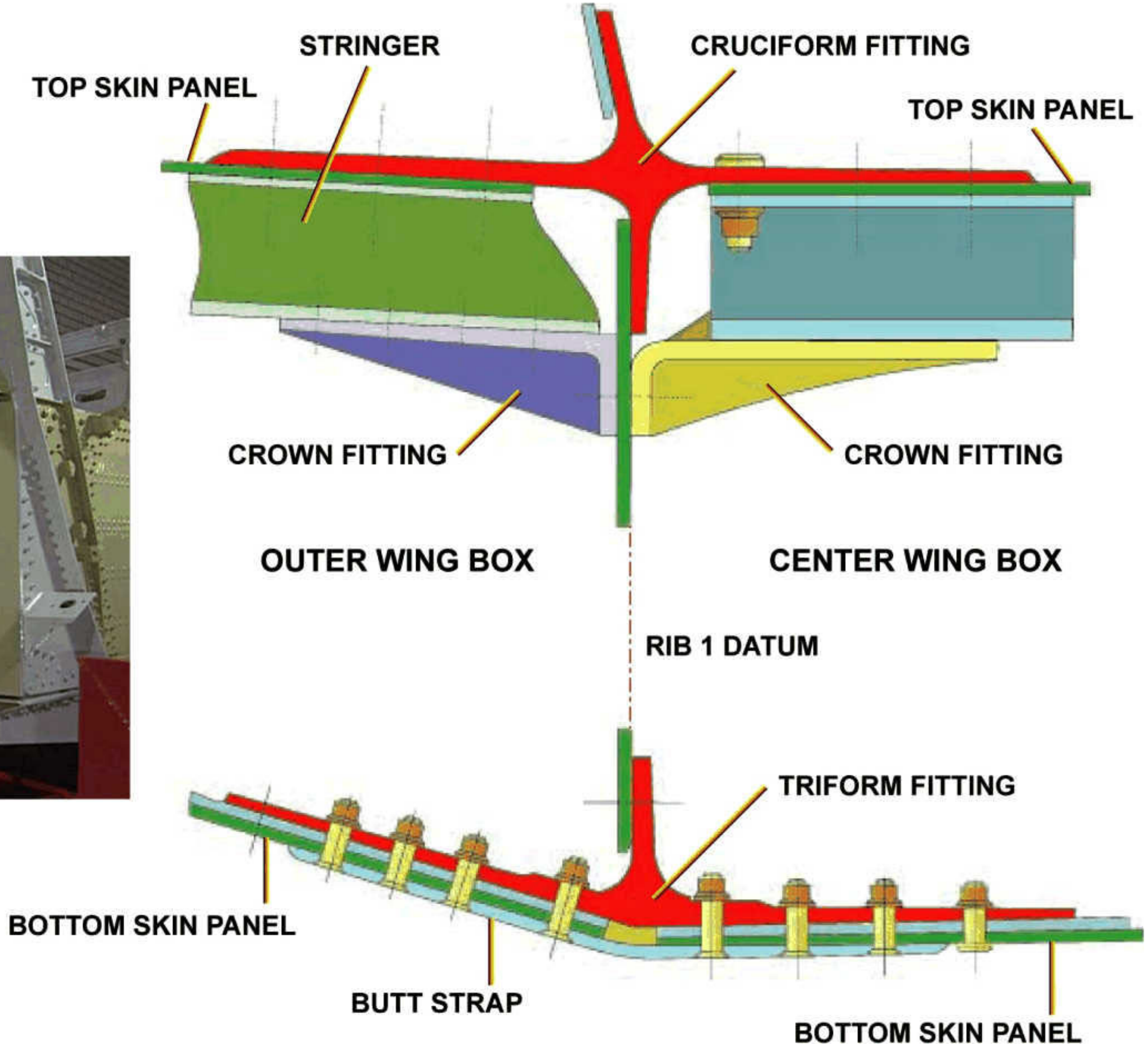


Figure 120 Center Wing Box Root Joint

57–20 OUTER WING

OUTER WING PRESENTATION

OUTER WING GENERAL ARRANGEMENT

Each outer wing has:

- a main structure (outer wing box),
- a wing tip,
- a leading edge and leading edge devices,
- a trailing edge and trailing edge devices.

The trailing edge control surfaces are:

- the inboard flap,
- the outboard flap,
- the two ailerons,
- the six spoilers.

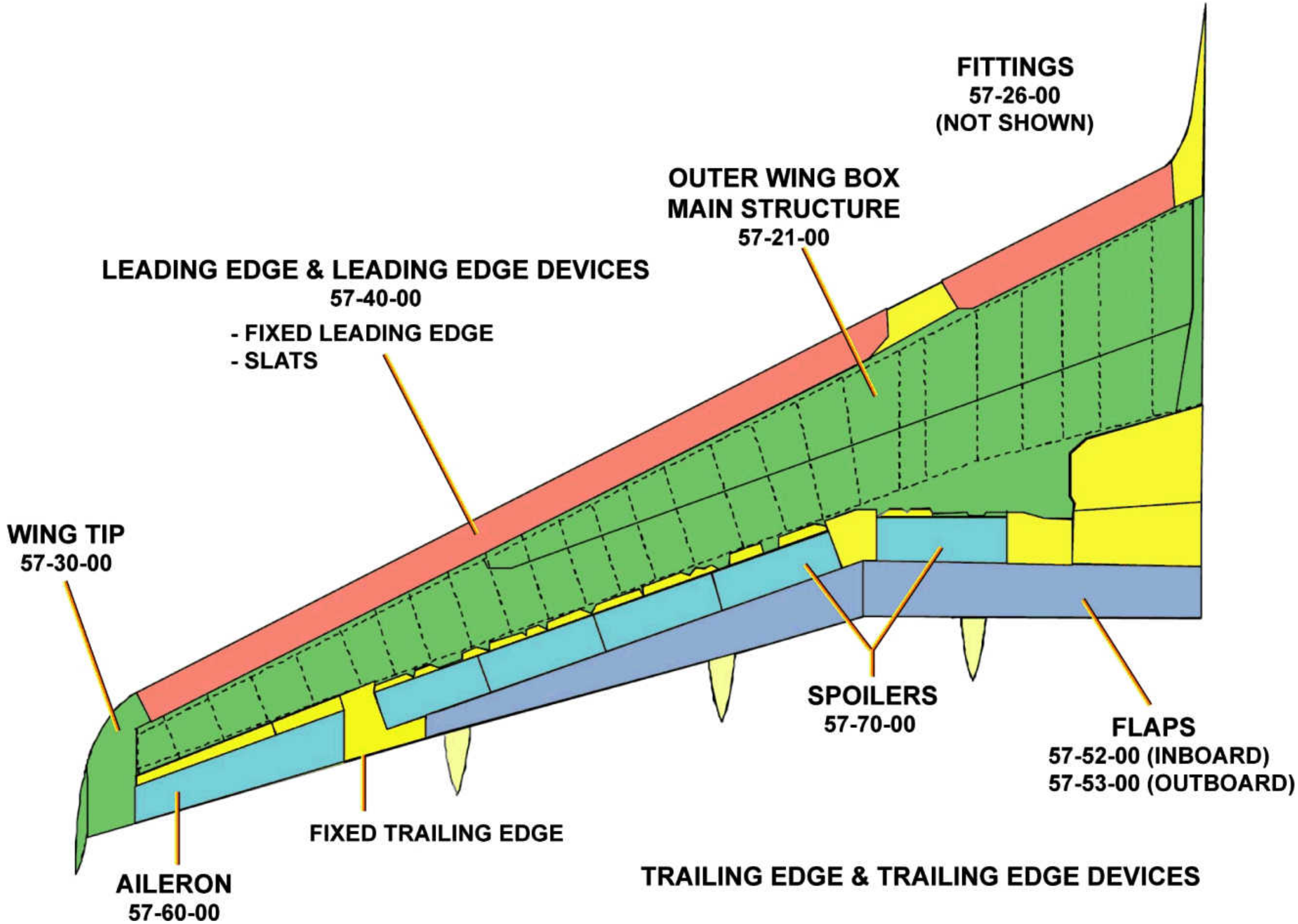


Figure 121 Outer Wing General

DESCRIPTION

The main structure of the outer wing is the wing box, which tapers from wing root (RIB 1) to wing tip (RIB 27). It also makes the integral fuel tank and the vent surge tank. Access into the wing box is through the access panels in the bottom skin.

Component Location

The wing box is made of:

- the wing spars (front and rear),
- the ribs,
- the top and bottom skin−panels,
- the top and bottom stringers,
- the wing−root joint.

Attached to the wing box are:

- the fixed partitions (slat cans) (ATA 57−24),
- the attachment fittings (ATA 57−26),
- the access panels (ATA 57−27),
- the jacking point, the drip fence and on A321 the air dam (Ref. 57−29).

Wing Box

The wing box makes the integral fuel tank and the vent surge tank. Sealed inter spar ribs separate these tanks. The primary sealing of the tanks is made through the mechanical attachment of the structure. Interfay sealants are used at the tank edges.

Each outer wing fuel tank also has a closed area, made between RIB 1 and RIB 2, which is a collector cell for the main fuel pumps.

On each wing there are two dry bays, which are inboard of the engine, immediately behind the front spar. The larger of the bays is between ribs RIB 5 and RIB 6. A short rib, RIB 6B, makes the outboard end of the smaller bay.

Sealing blocks and seals prevent fuel leakage into the dry bays between the stringers and the top and bottom skin panels.

Two holes in the front spar give access into the dry bays. They are closed with closing plates.

Ribs

There are 27 ribs, machined from aluminum alloy, installed in the wingbox of each outer wing. Each rib is continuous between the front and rear spars.

The center−wing to outer−wing joint is made at STA 0/RIB 1, which closes the center wing box. RIB 22 and RIB 27 make the other lateral boundaries of the fuel and vent tanks. Between RIB 1 and RIB 2 the fuel collector tank is built.

Rib 2 has two hinged access doors, which are kept closed with springs (access to collector tank). On the **A318/A319/A320 only** the RIB 15 splits the fuel tank into inner and outer cell.

Spars

The rear spar is made from three parts. These are the inner, the middle and the outer sections. Joint plates connect these sections together to make a continuous structure. The joints are made at RIB 6 and RIB 22. The rear spar is machined to include:

- a horizontal stiffener (crack retarder),
- vertical web stiffeners,
- reinforced holes for the components of the fuel system,
- a reinforced jacking point at RIB 9.
- The front spar is made as a single piece, to include:
- a horizontal stiffener (crack retarder),
- vertical web stiffeners,
- a reinforced hole at each slat track position,
- reinforced holes for the components of the fuel system,
- an opening for the build door between STA0/RIB 1 and STA 700/RIB 2, for theinstallation of the outer wing to the center box.

Top/Bottom Skin Panels

The top and the bottom surfaces of the wing box are made of skin panels machined from aluminum alloy.

There are two panels on the top skin and three panels on the bottom skin.

To increase their strength, the panels have stringers machined from aluminum alloy extrusions. Joint straps, made of aluminum alloy, connect the panels. Interference bolts attach the panelsto the ribs and the spars.

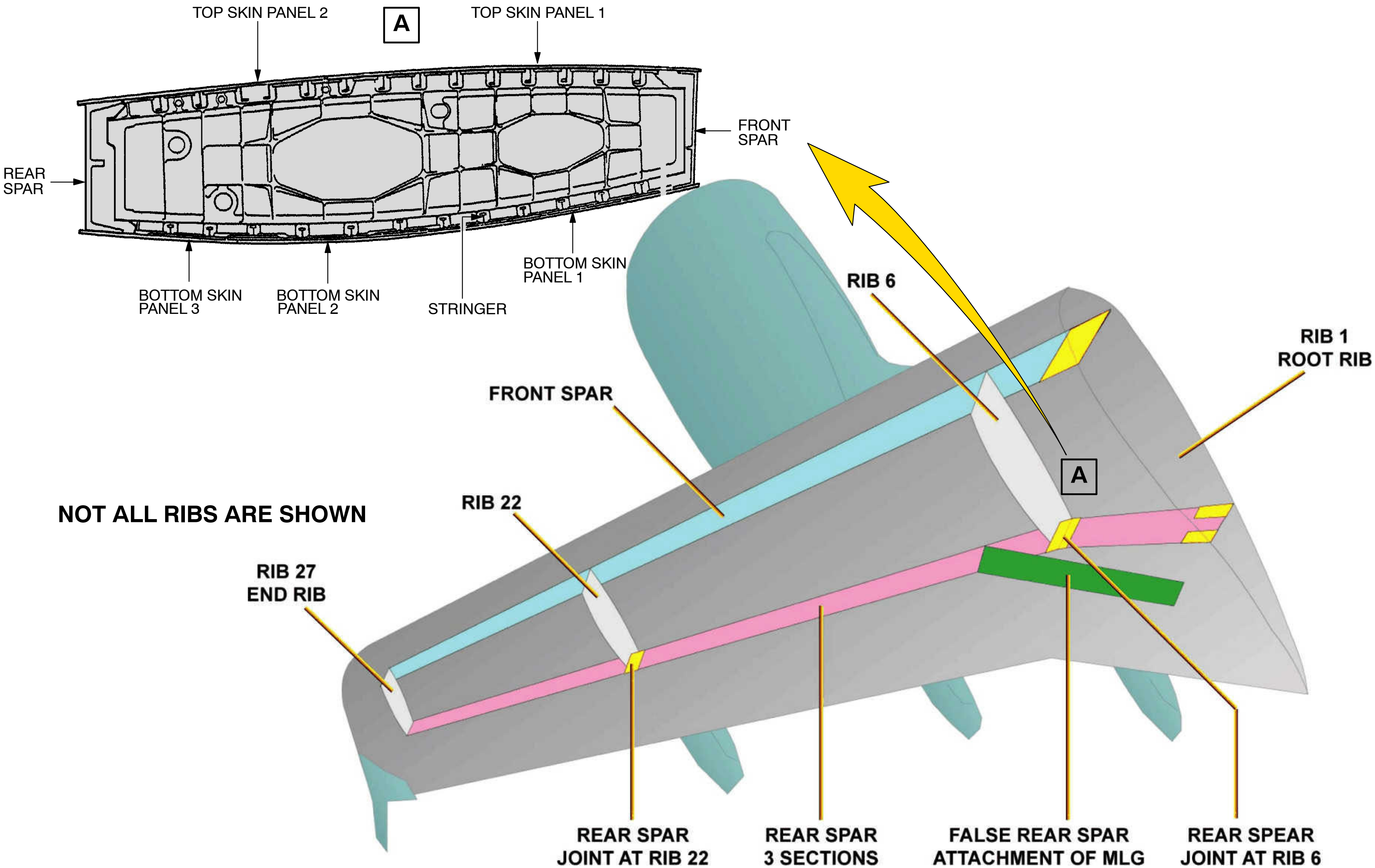


Figure 122 Outer Wing Box

57–21 MAIN STRUCTURE

OUTER WING BOX COMPONENTS DESCRIPTION

SKIN PANELS

General

The top and the bottom surfaces of the outer wing box are made of skin panels machined from aluminum alloy.

There are two top skin panels and three bottom skin panels. To increase their strength, the panels have stringers machined from aluminum alloy extrusions. Joint straps, made of aluminum alloy, connect the panels. Interference bolts attach the panels to the ribs and the spars.

The top and the bottom skin panels continue a short distance forward of the front spar. The leading edge structure attaches to these projections.

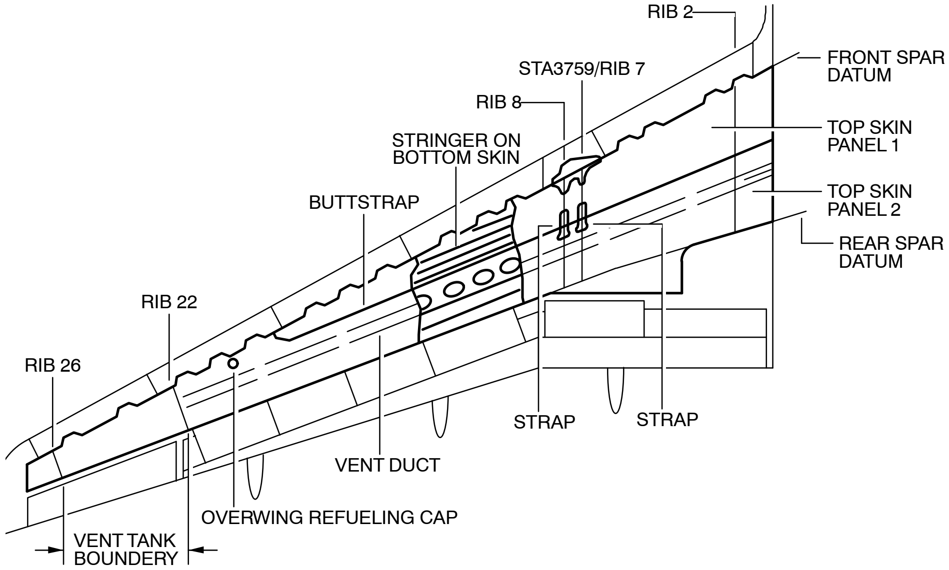
Outboard of the MLG support rib, the skin panels continue a short distance aft of the rear spar. The trailing edge structure and the trailing edge devices attach to these projections.

There are 21 access panels, in the bottom skin panels, which give access into the wing box. The bottom skin panels are reinforced in the area around the holes for the fuel pumps (ATA 28–21).

There is one opening in the top skin between RIB22 and RIB23, for the overwing refuel adaptor.

Reinforcing plates are attached to the outer face of the bottom skin panels, and to the inner face of the top skin panels to add strength at the pylon attachments.

A reinforcing plate, machined from aluminum alloy, is attached to the outer surface of the wing–box bottom skin. This adds strength to the skin panels at the MLG attachments.



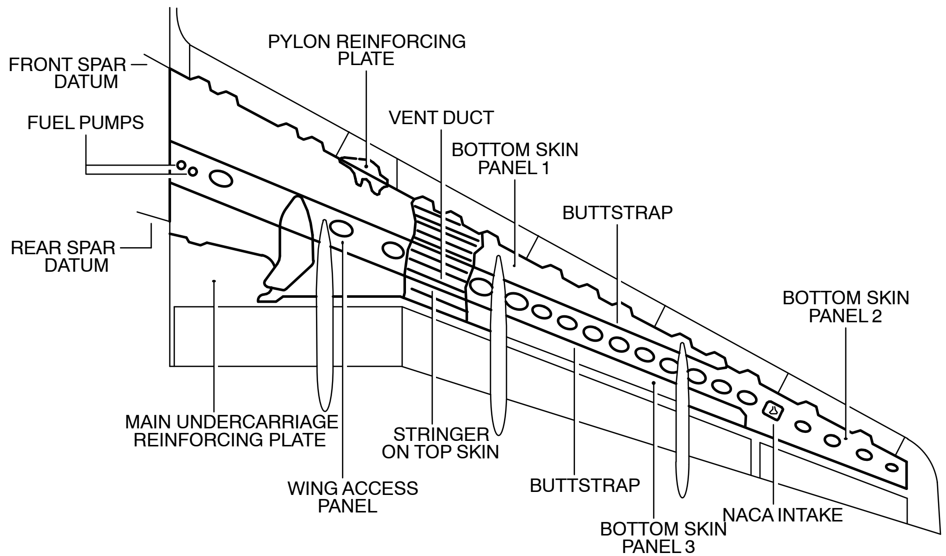
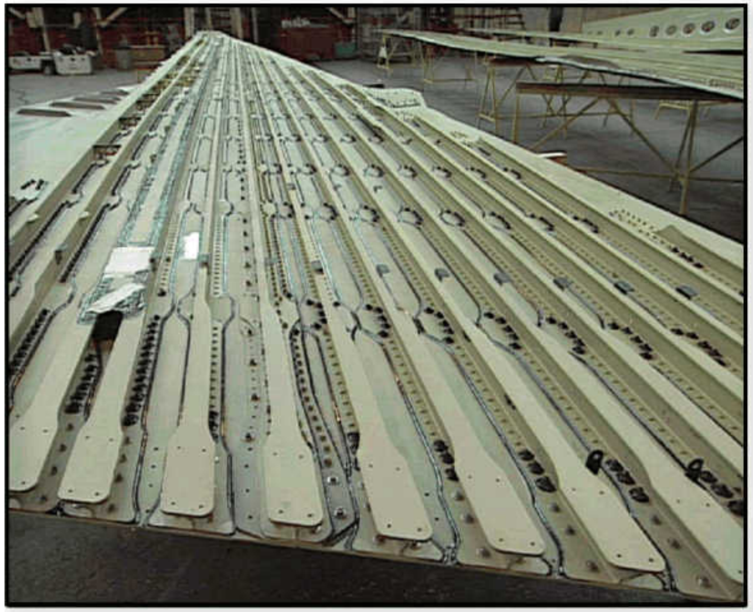


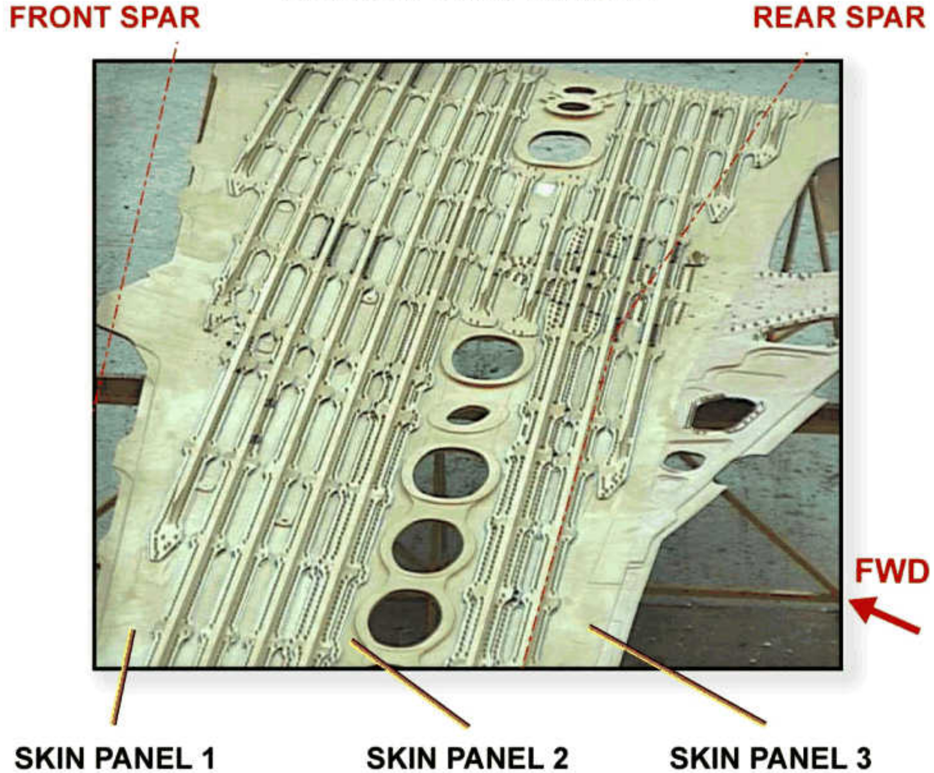
Figure 123 Skin Panel Detailed Schematic

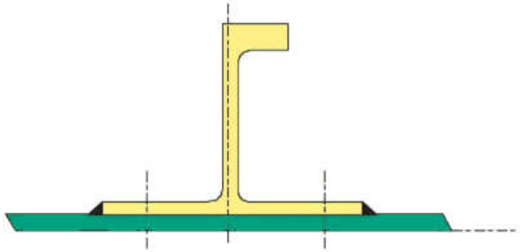
ALUMINIUM ALLOY SKIN PANELS

TOP SKIN PANELS

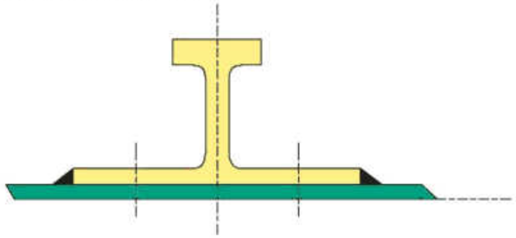


BOTTOM SKIN PANELS





TYPICAL STRINGER SHAPE



TYPICAL STRINGER SHAPE

Figure 124 Outer Wing Box Skin Panels

RIBS, SPARS AND DRY BAYS

Ribs

There are 27 ribs, machined in aluminum alloy, installed in the outer wing box of each outer wing. Each rib is continuous between the front and rear spars. The junction between the center wing box and the outer wing joint is at Rib 1. Rib 1 is the boundary of the lateral section of the center wing box. Ribs 22 and 27 make the other lateral boundaries of the fuel and vent tanks.

At RIB2 thru RIB9, and at RIB12 and RIB19, the ribs have double flanges for attachment of skin panels. The remainder have single flanges.

Cleats attach the top stringers to the ribs. Ribs 12 and 19 are reinforced to provide attachment points for the forward flap−track−beam attachment. The holes in the ribs, for access and fuel pipes, are reinforced.

Rib 2 has two hinged access doors (Ref. 57−27−00), which are kept closed with springs. Access for build is provided in RIB5 and the hole is closed with a load−carrying door.

Spars

The wing spars are machined in aluminum alloy. They give strength to the wing box and they extend from Rib 1 to Rib 27.

The front spar is made as a single piece, to include:

- a horizontal stiffener (crack retarder),
- vertical web stiffeners,
- a reinforced hole at each slat track position,
- reinforced holes for the components of the fuel system (ATA 28−00),
- an opening for the build door between STA0/RIB1 and STA700/RIB2, for the installation of the outer wing to the centre box.

The rear spar is made from three parts. These are the inner, the middle and the outer sections. Joint plates connect these sections together to make a continuous structure. The joints are made at RIB6 and RIB22.

The rear spar is machined to include:

- horizontal stiffener (crack retarder),
- vertical web stiffeners,
- reinforced holes for the components of the fuel system (ATA 28−00),
- a reinforced jacking point at RIB9.

Dry Bays

On each wing there is a dry bay which is inboard of the engine, and immediately behind the front spar. Machined aluminum alloy posts, located against the ribs, are the vertical attachments for the closing panel. There is a top plate land, attached to a stringer from the fuel tank area, and a sealing angle on the bottom. Brackets reinforce both areas. Sealing blocks and seals prevent leaks between the stringers and the top and bottom skin panels. The closing panels are made of carbon fiber with a honeycomb core and are attached with nuts and bolts to give easy access. Access is also available through the front spar.

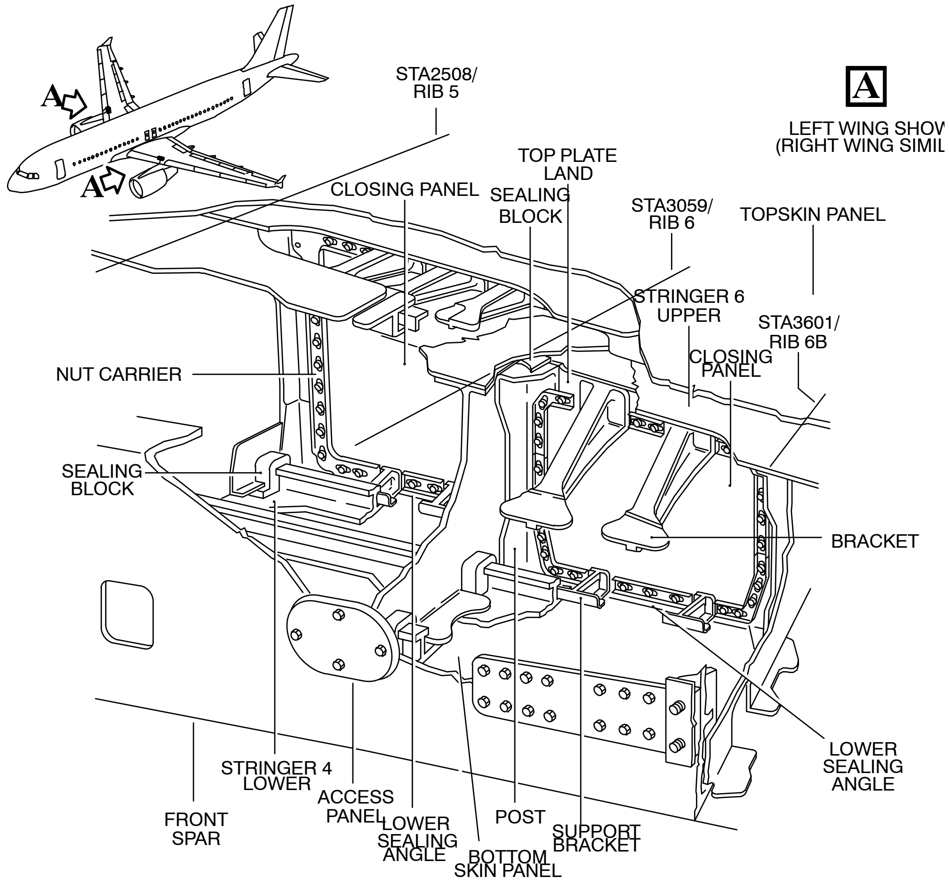


Figure 125 Typical Dry Bay

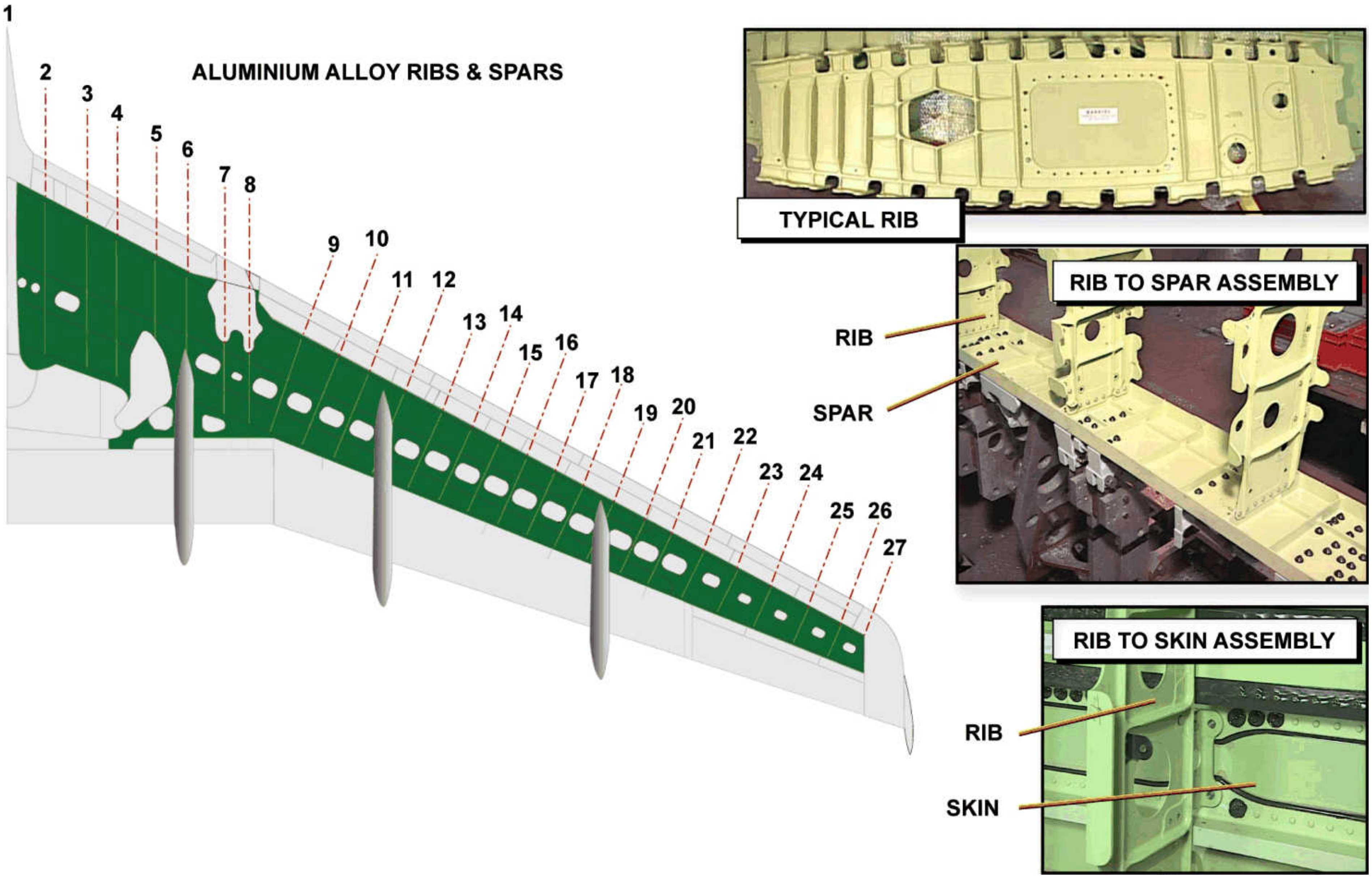


Figure 126 Outer Wing Box Ribs & Spars

ACCESS HOLES/COVERS

Access holes in the outer wing are closed by:

- access panels,
- door panels,
- cover plates

There are twenty–one access covers installed in the bottom skin panels of the outer wing box. All panels close the openings that give access to the outer wing box.

There are:

- seven non load–carrying access panels between Rib 1 and Rib 13, clamped on the wing skin,
- fourteen load–carrying access panels between Rib 14 and Rib 27, bolted through the skin panel.

These acces panels are of ten types. Type 23R, 24, 25, 25A, 27, 27A, 28, 29, 29A and 30.

Location	Panel Type	Material	Remarks
Rib 2–13	23R, 24	Titanium alloy (super plastic formed)	N/A
Rib 13–22	25, 25A, 27, 27A	Aluminum alloy	25A has an Over–Pressure Protector (ATA 28–12). 27 has a Manual Magne-ticndicator (ATA 28–43).
Rib 22–27	28, 29, 29A, 30	Aluminum alloy	28 has a NACA vent intake (ATA 28–12). 29A has an Over–Pressure Protector (ATA 28–12).

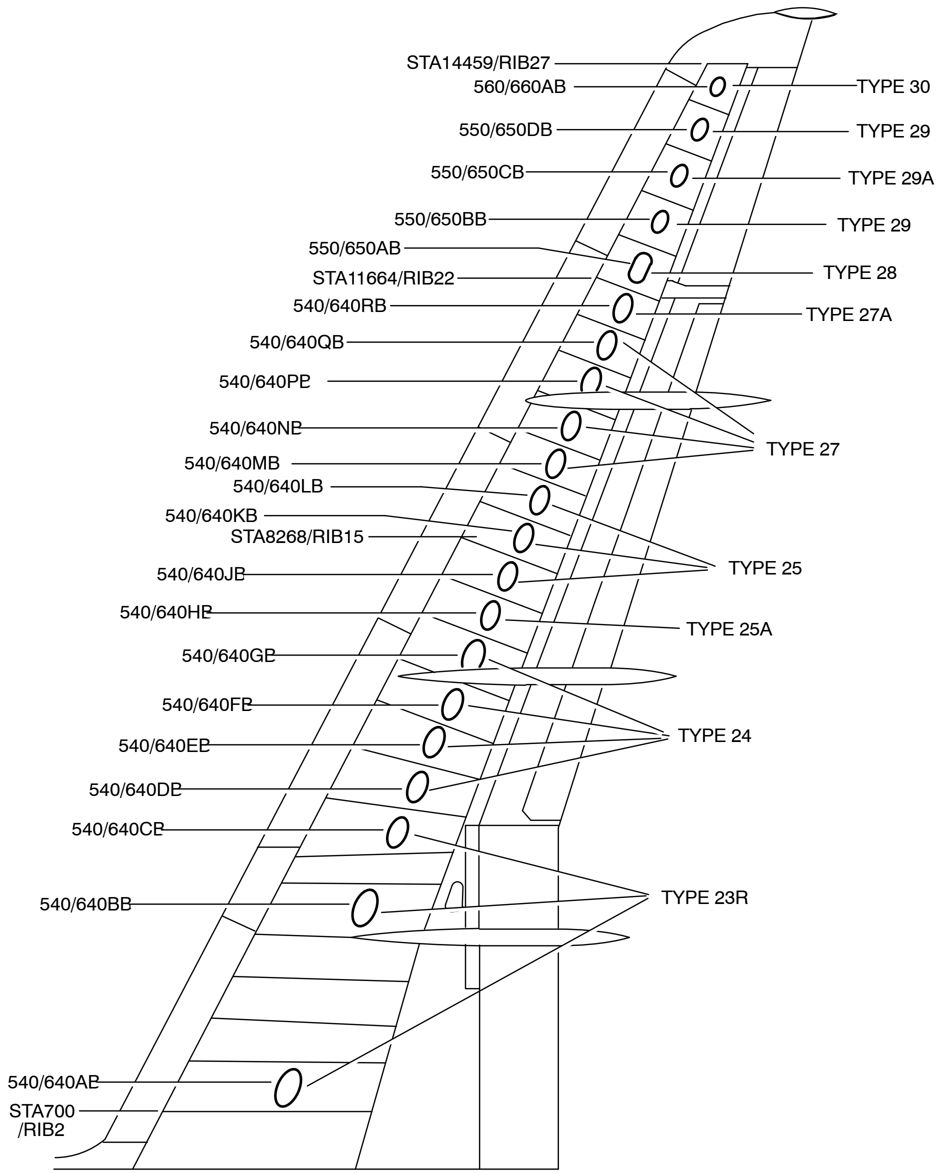
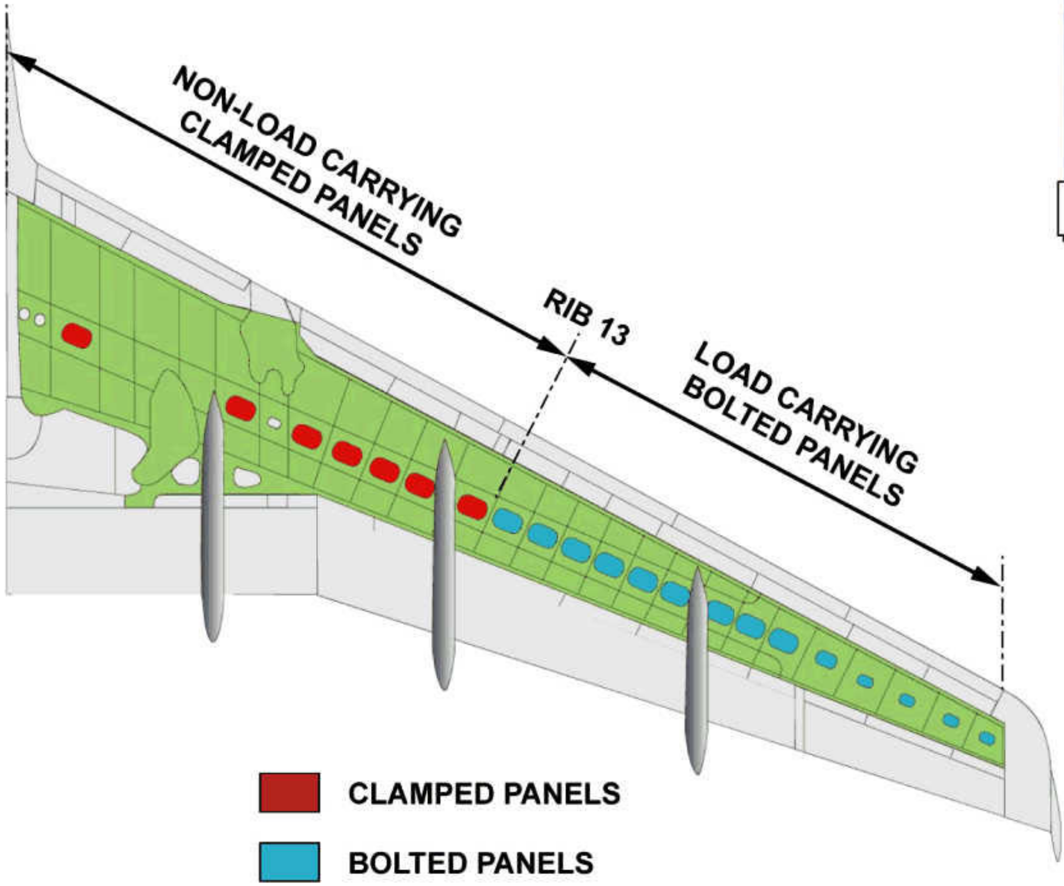


Figure 127 Type of Access Panles



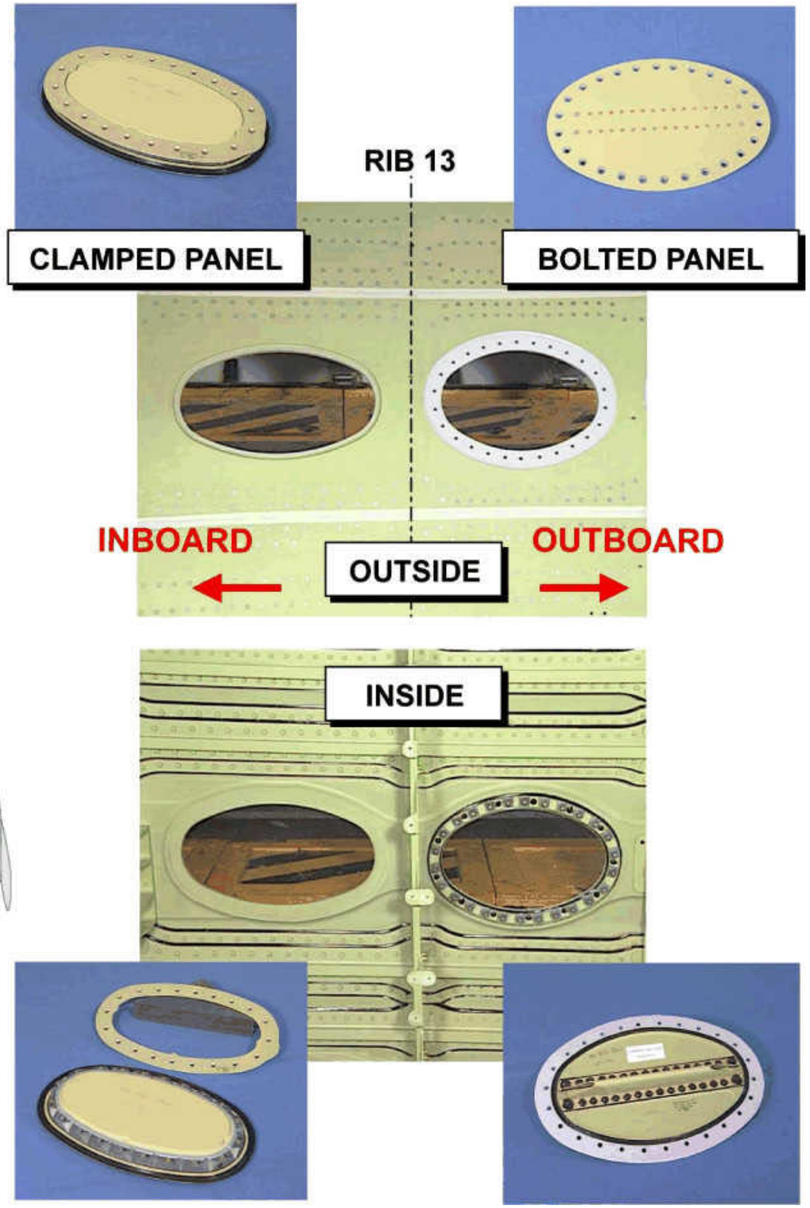


Figure 128 Outer Wing Box Access Panels

57−30 WING TIP/SHARKLET

WING TIP COMPONENT DESCRIPTION

GENERAL

The wingtip assembly is attached to the outboard end of the wingbox, at RIB27.

The wingtip assembly includes:

- the wingtip,
- the wingtip fence.

Component Description

The structure of the wingtip is made of aluminum alloy. The wingtip includes:

- two machined ribs adjacent to the wingtip fence,
- flanged sheet−metal ribs,
- an extruded trailing−edge section,
- top and bottom etched skins.

The wingtip is attached to the outboard end of the wingbox with bolts. These go through the wingtip skin and attach to straps on RIB27. Two spigots, also installed on RIB27, make sure that the wingtip is in the correct position.

Two lights are installed in the leading edge of the wingtip:

- the navigation light (ATA 33−41),
- the anti−collision strobe light (ATA 33−48).

A clear, single piece acrylic/polycarbonate glazing panel is installed on the wingtip leading edge to give protection to the lights.

A retainer for a static discharger (Ref. 23−60−00) is attached to the wingtip at the trailing edge.

There are two access holes in the wingtip:

- one access hole in the bottom skin, which is closed with the access door 534AB(634AB),
- one access hole in the closing rib adjacent to RIB27, which is closed with a closing plate.

Wingtip Fence

The wingtip fence is made of aluminum alloy. It has:

- flanged sheet−metal ribs,
- an extruded trailing−edge section,
- inboard and outboard etched skins,
- a leading edge fairing,
- leading edge skin caps and top and bottom end pieces.

The wingtip fence is attached to the outboard edge of the wingtip with bolts. These go through a machined fitting in the fence into a machined rib in the wingtip. Two spigots attached to the wingtip make sure the wingtip fence is in the correct position.

Four retainers for static dischargers (ATA 23−60) are attached to the wingtip fence at the trailing edge.

There are two access holes in the outboard skin of the wingtip fence. These give access to the attachment bolts and are closed with access doors.

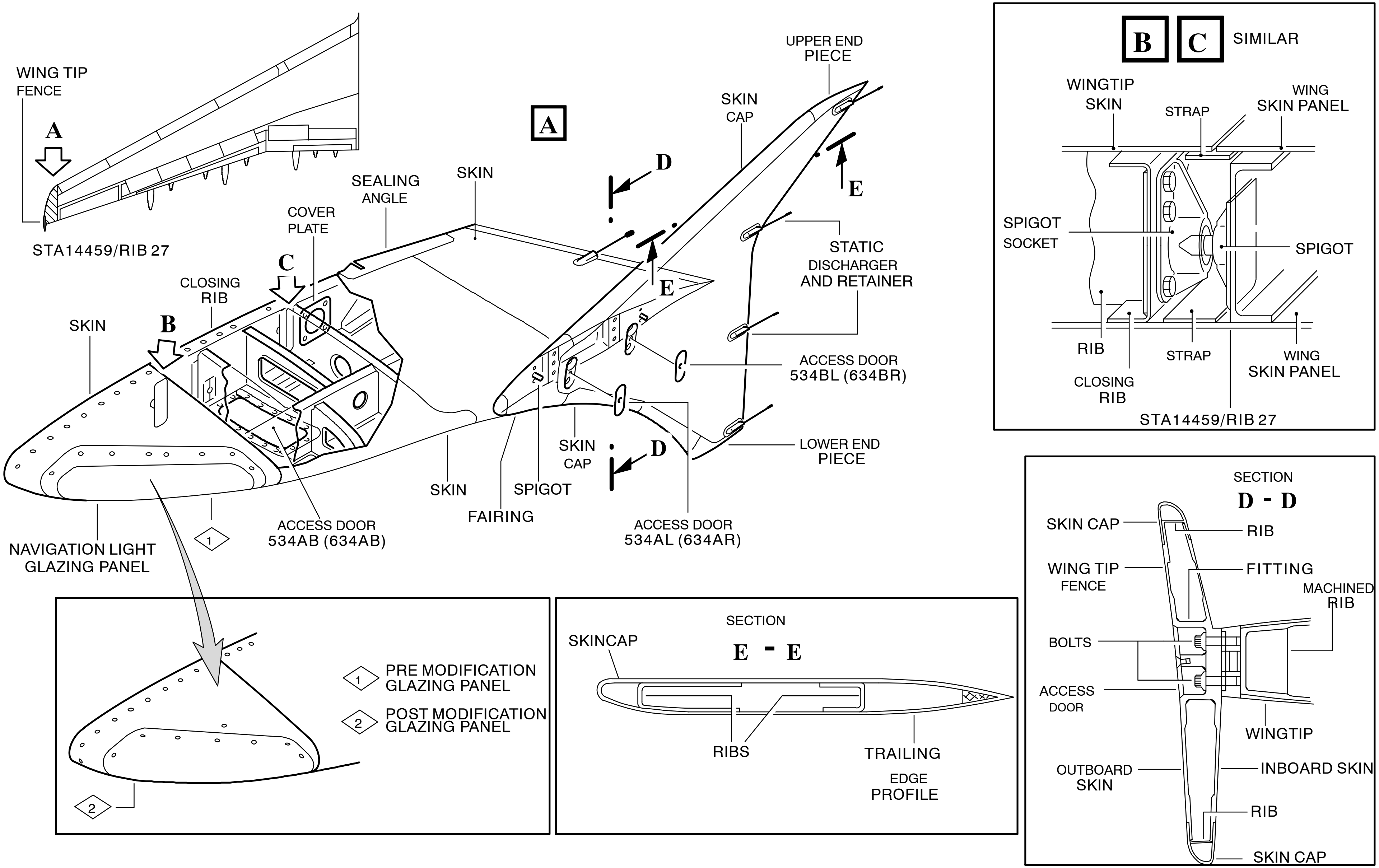


Figure 129 Wing Tip & Wing Tip Fence

SHARKLET COMPONENT DESCRIPTION

GENERAL

Sharklets are available for reinforced wings from Q4 2012 and on. From Q1 2013 all a/c are available with sharklets installed.

Flight control computers need to be updated via software upload.

Sharklet installation does not change A320 Family airport classification.

Wing span is increased from 34.10 m to 35.80 m.

Component description

The sharklet is made from laminated carbon fiber (CFRP) spars, covered by CFRP panels with honeycomb cores. Lightning strike protection strips are integrated into the structure.

The sharklet is attached to the outboard edge of the wingtip with bolts. These go through a machined fitting into a machined rib in the wingtip. Spigots attached to the wingtip make sure the sharklet fence is in the correct position.

Operational impacts

The sharklets are intended to reduce a/c fuel consumption.

Dispatch after sharklet heavy damage (out of SRM and CDL scope) is possible on Ferry Flight with damaged sharklet removed and replaced by a complete wingtip (modified spare wingtip compatible with reinforced wing). A wingtip & fence can be transported in A320 Family a/c whereas a sharklet can not.

Always check actual MEL.

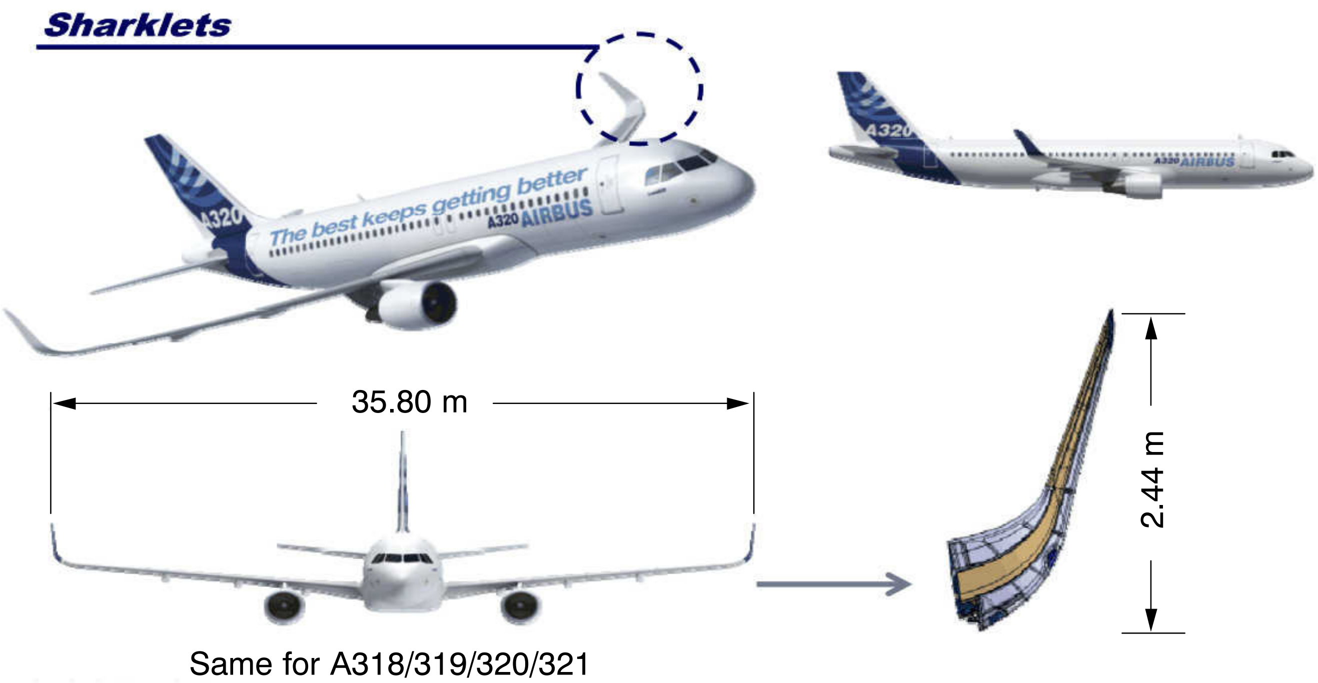


Figure 130 Sharklet General

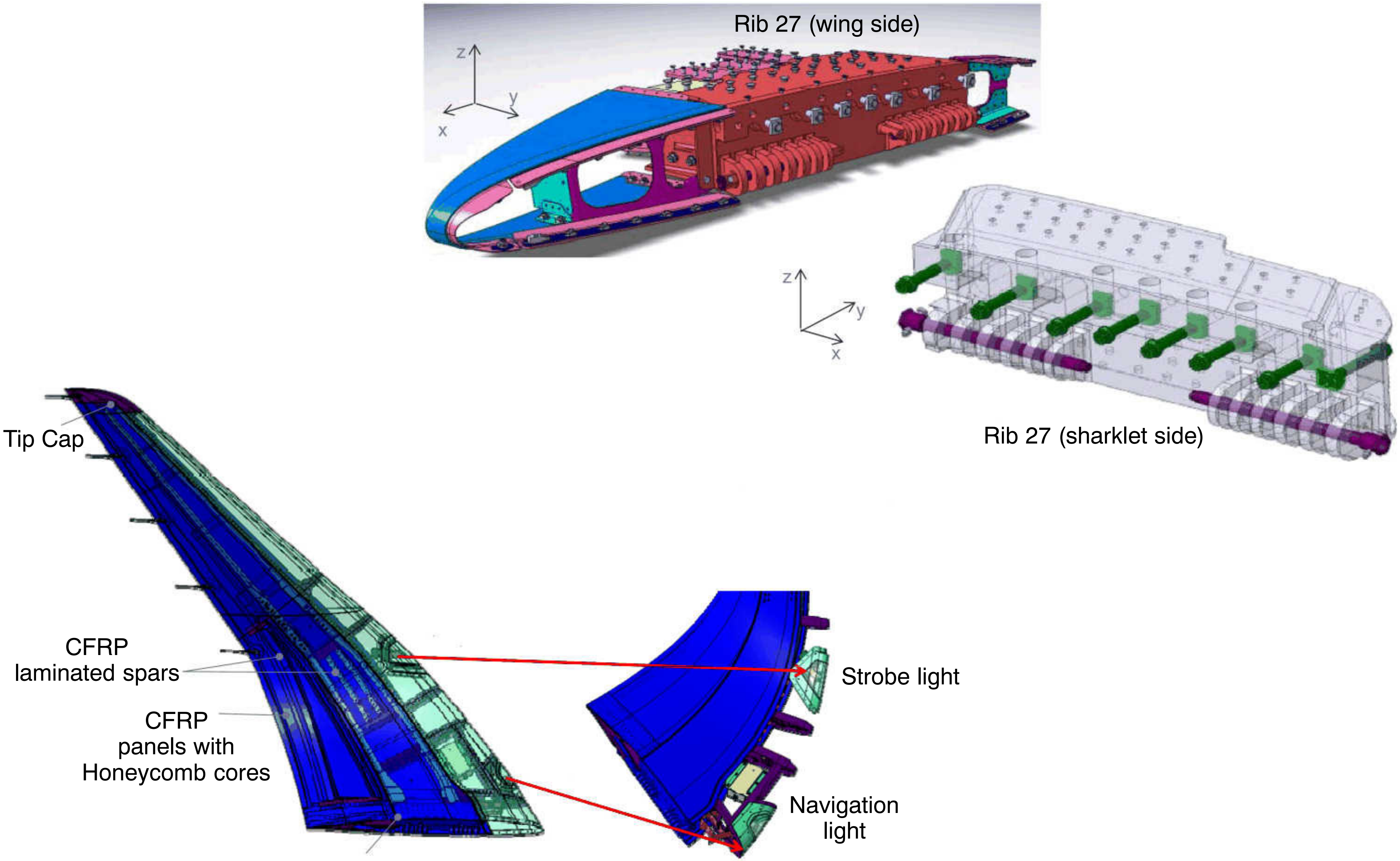


Figure 131 Sharklet Components

57−40 LEADING EDGE AND LEADING EDGE DEVICES

LEADING EDGE SLATS & TRACKS PRESENTATION

DESCRIPTION

The leading edge is forward of the front spar of the wing box, between the wing root and the wing tip. The leading edge has a fixed structure and five devices which are movable control surfaces.

The fixed Leading Edge (LE) assembly is located forward of the front spar of the wing−box.

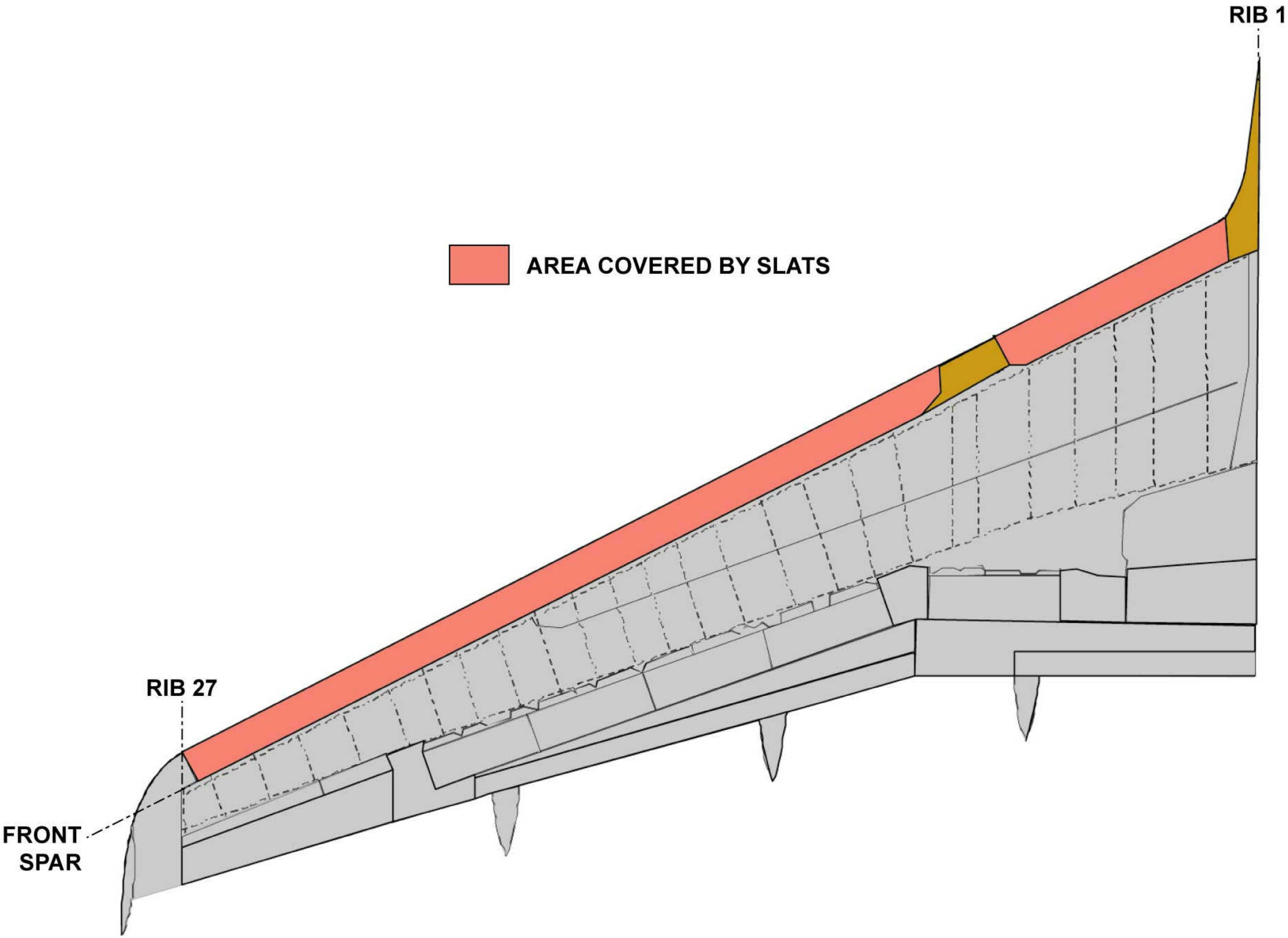


Figure 132 Leading Edge General

Component Location

The fixed structure is between RIB 1 and RIB 27.

The five movable devices are:

- Slat 1, inboard of the engine pylon,
- Slats 2 thru 5, outboard of the engine pylon.

Leading Edge

The leading edge is a fixed structure of ribs and riblets to which nose skins are attached. The structure is strengthened by sub − spars. The five slats are connected, through the slat tracks, to the fixed structure.

These systems are also installed in the leading edge:

- the drive mechanism for the slats,
- the ducting for the engine bleed air,
- electrical, hydraulic and pneumatic installations,
- the environment protection system, between the wing root and RIB 12,
- the ice protection system, which supplies Slats 3 thru 5

Slats

The five slats (slat 1 thru slat 5) are edge shaped aluminum alloy structures. They are extended or retracted to give the correct lift to the aircraft.

The drive system for the slats is electrically controlled. It uses hydraulic power to turn pinions installed in the fixed leading edge. The movement is transferred to the slats by racks attached to the slat tracks.

Each slat has a main rivetted structure of top and bottom skin panels and end ribs. The structure is strengthened by intermediate ribs, a girder and a top skin stringer. A trailing edge structure closes the aft edge of the slat and completes the aerodynamic profile. Slat track ribs give attachment points for the slat tracks.

Drains

There are drainholes in the lower surface of the wing, to drain the leading edge and other structures.

There are two sets of drainholes in the lower wing surface to drain liquid that can collect inside the leading edge.

The drainholes are:

- in some of the leading edge access panels,
- in the lower wing skin forward of the front spar,
- Single drainholes drain liquid from other areas of the wing structure.

They are:

- in the wing tip structure at the leading edge,
- between the two outer manholes,
- in the access panels 574BB (674BB) and 574AB (674AB) on each side of the No. 2 flap track fairing.

Slat Track and Dry Bay Drains

The leading−edge slat tracks go through holes in the front spar. Track cans are attached to the front spar and isolate the tracks from the wing fuel tanks. Liquid from the slat tracks collects in the cans and then flows down drain pipes to drain holes in the bottom skin.

At track 4 in both wings there is a dry bay and no cans.

Liquid from these tracks falls to the bottom skin and then flows out from the drainholes.

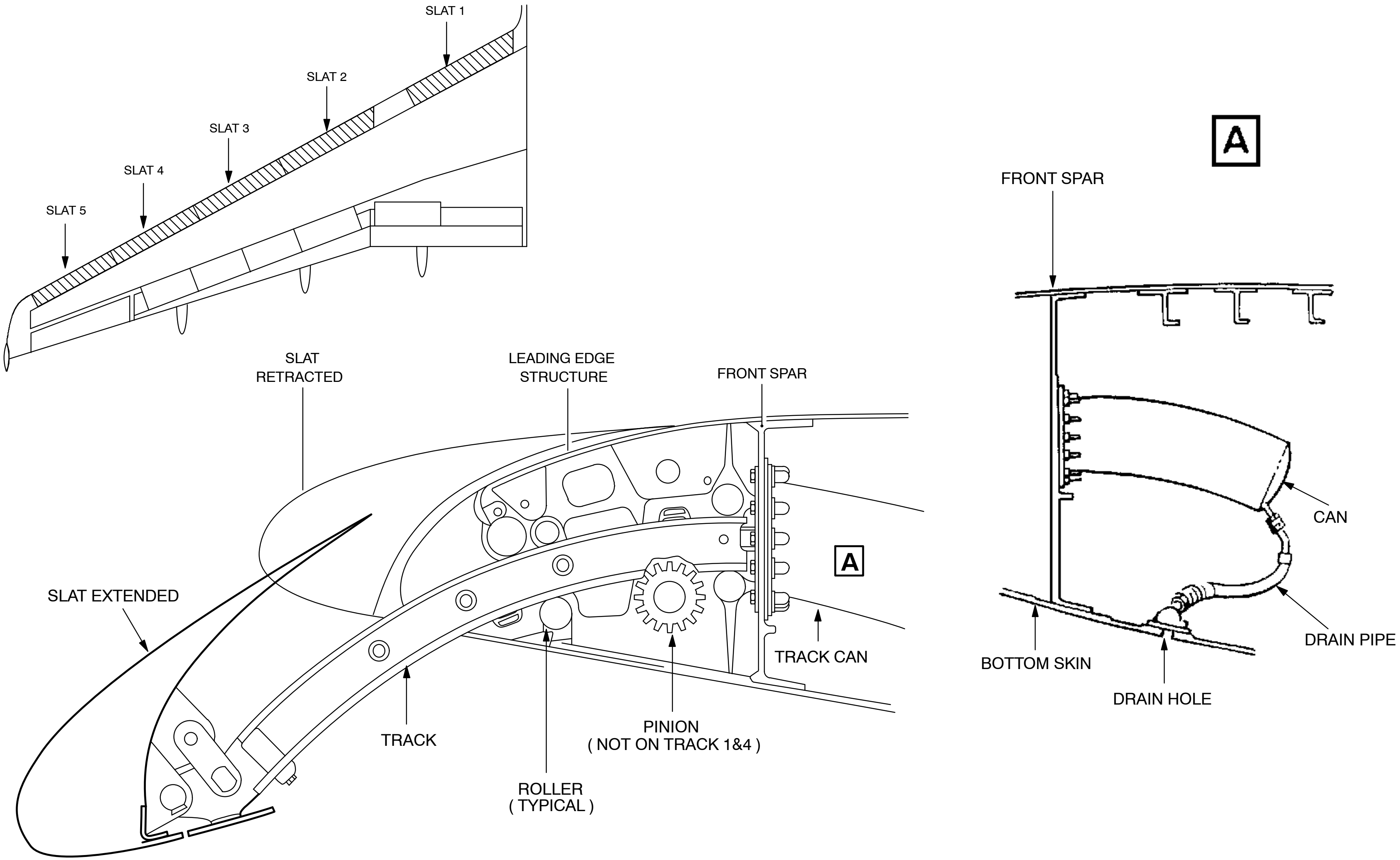


Figure 133 Leading Edge and Leading Edge Devices

COMPONENTS DESCRIPTION

FIXED LEADING EDGE

Structure Layout

The fixed leading edge assembly is made of:

- the D−nose assembly, composed of aluminum alloy parts:
  - the support ribs and riblets (riblets are installed between the wing box front spar and the LE spar),
  - the sub spar,
  - the LE skin.
  - three top surface access panels,
- bottom surface access panels, which are made of Carbon Fiber Reinforced Plastic (CFRP) sandwich construction and are attached with quick release fasteners.

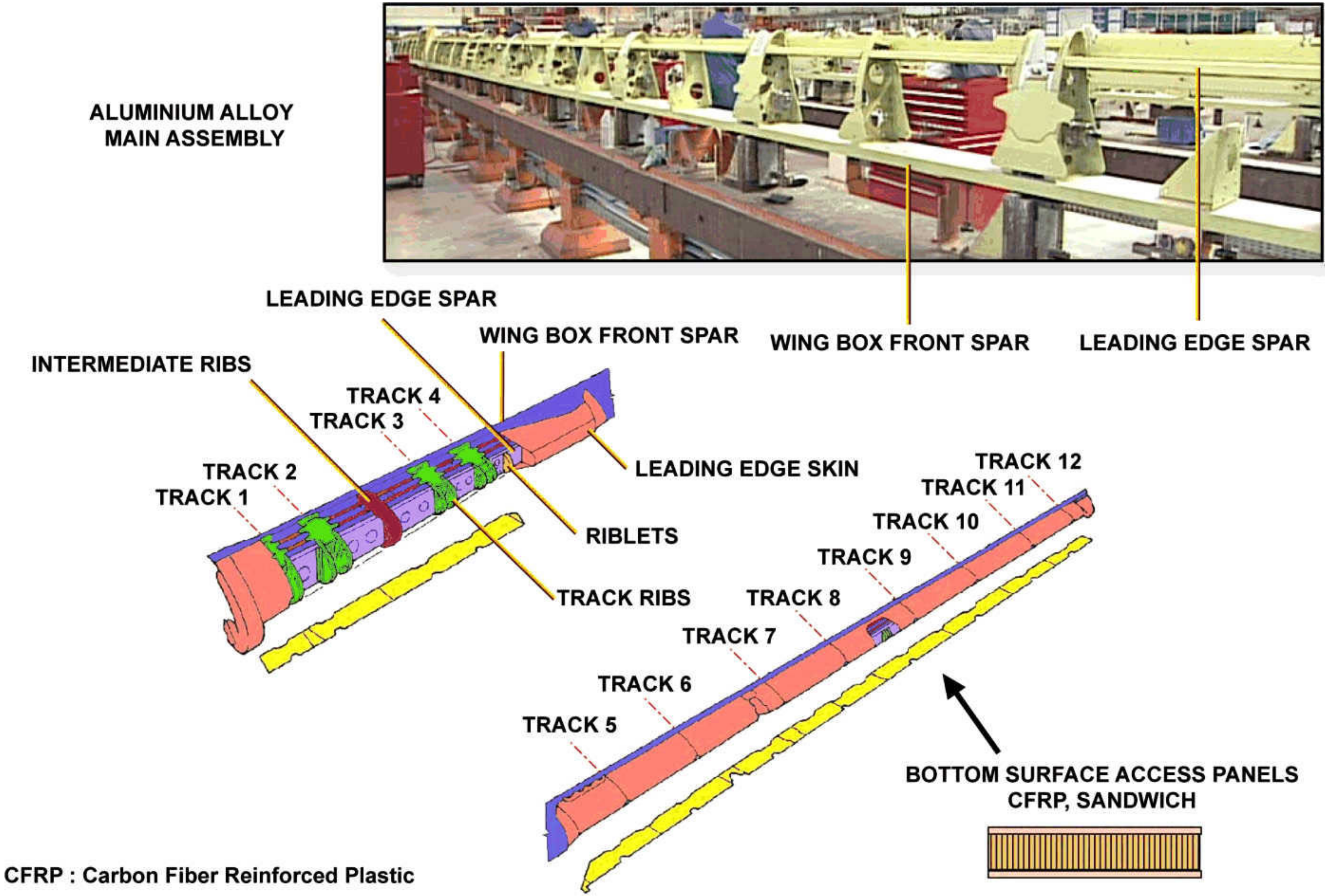


Figure 134 Fixed Leading Edge Structure

Pylon Ribs

Two pylon ribs are installed on each side of the engine pylon.

These ribs hold the pylon shroud panels.

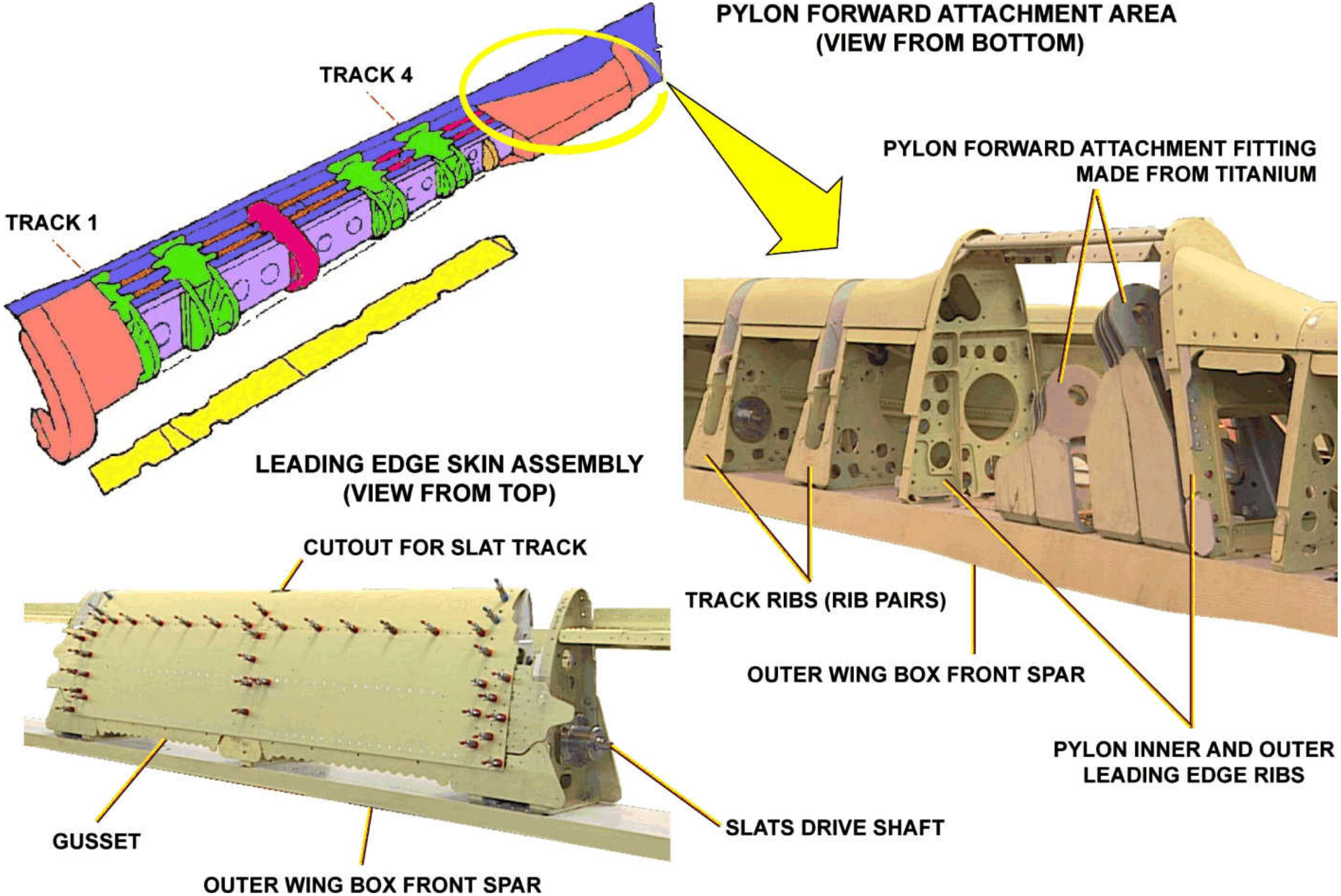


Figure 135 Pylon Attachment Area

SLATS

General

The wing leading edge is fitted of five slats, which make the movable part of the wing leading edge.

Structure Layout

Each slat has:

- a front spar or the stringers (girders),
- a rear spar,
- a girder,
- ribs,
- top and bottom skin panels,
- a trailing edge assembly.

Slat 1 is supported by 4 tracks, two of them being driven (track 2 and 3). Slats 2 to 5 are supported by two tracks, both being driven.

When the slats are in retracted position, seals prevent airflow between the slat and the wing. Slats 3 to 5 are de-iced; the hot air comes from the bleed air system and is supplied to these slats through a telescopic duct (not shown) and piccolo tubes installed in the leading edges of the slats.

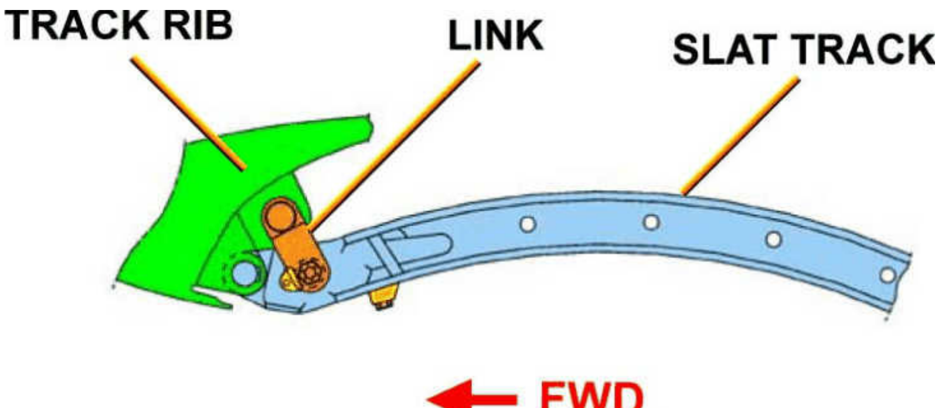


Figure 136 Typical Slat/Slat Junction Track

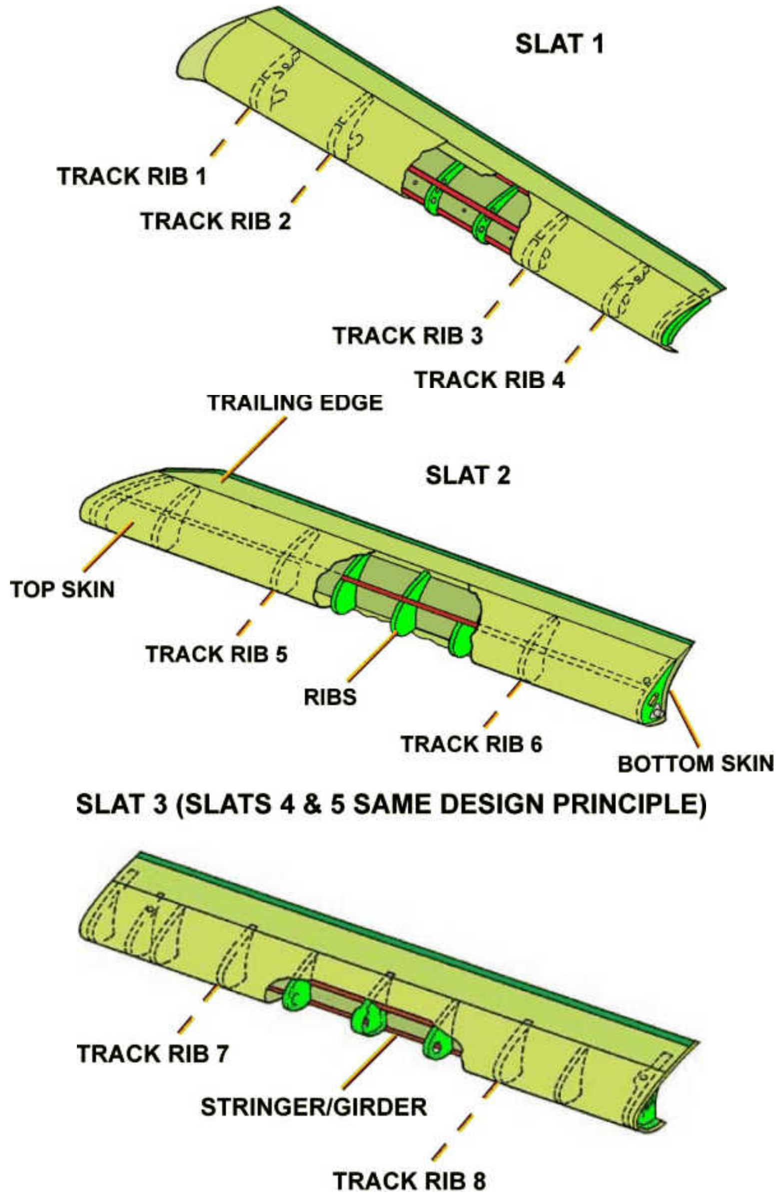


Figure 137 Slats Structure Layout

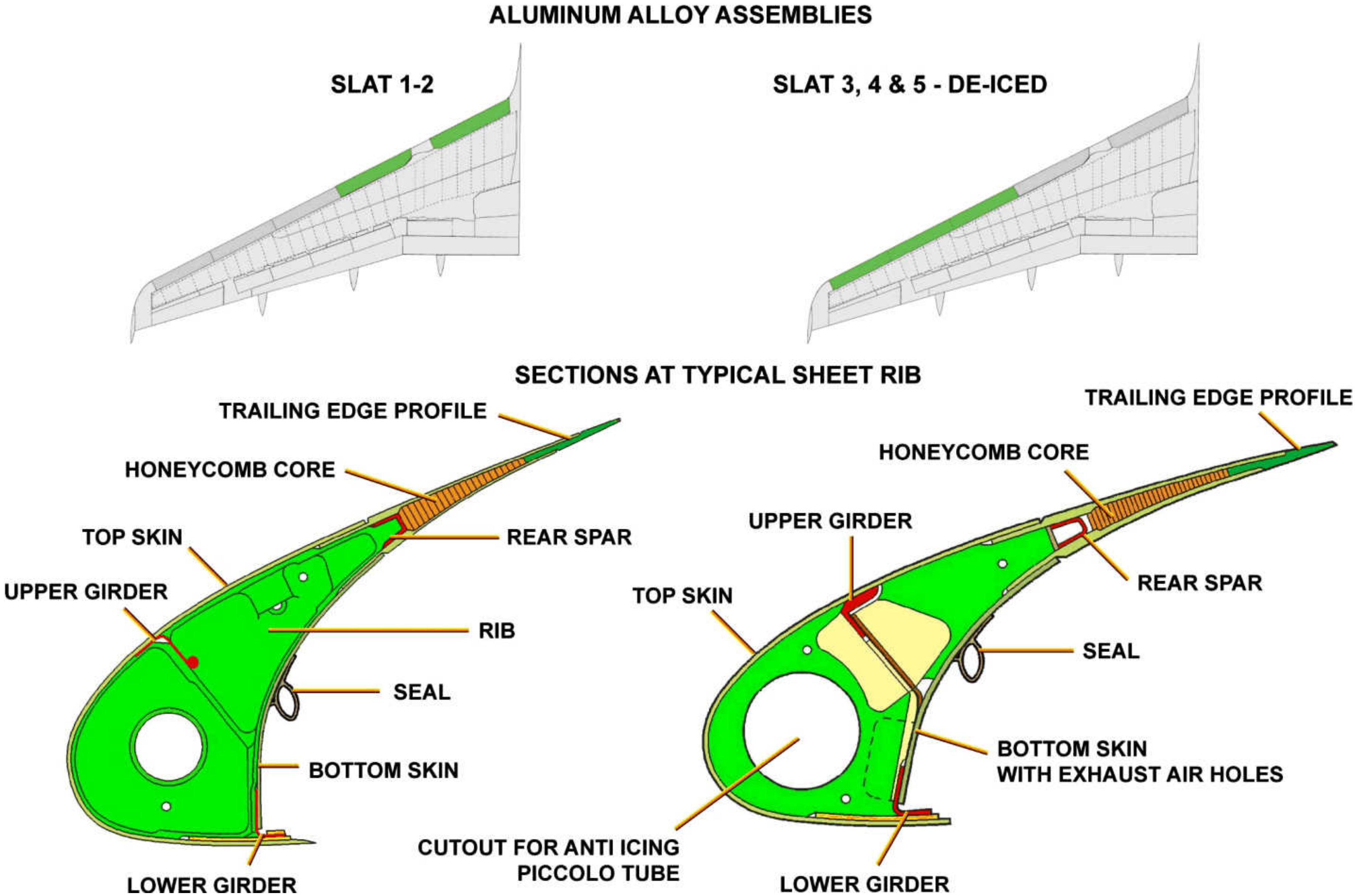


Figure 138 Slats Profile

57–50 TRAILING EDGE AND TRAILING EDGE DEVICES

FIXED TRAILING EDGE PRESENTATION

GENERAL

The trailing edge is aft of the rear spar of the wing box, between the wing root and the wing tip. The trailing edge has a fixed structure and eight movable control surfaces.

Component Locations

The fixed structure is between RIB 1 and RIB 27. It has attachments for the movable control surfaces and their drive mechanisms. The control surfaces are:

- the inboard (double-slotted) flap,
- the outboard (double-slotted) flap,
- the aileron,
- the spoilers 1 thru 5.

Trailing Edge Structure

The main components of the trailing edge structure are:

- the overwing and underwing panels,
- the fixed shroud and shroud box,
- the rear false spar.

The fixed structure also has attachments for the:

- main landing gear,
- movable control surfaces,
- engine pylon.

A318/A319/A320 Trailing Edge Devices

There are eight trailing edge devices which are movable control surfaces.

They are:

- inboard flap,
- outboard flap,
- an aileron,
- five spoilers.

The trailing edge devices are connected to brackets installed on the fixed structure.The inboard flap and the outboard flap are of the fowler type.

Each flap is attached to two carriages. There is an interconnecting strut between the flaps installed.

A321 Trailing Edge Devices

There are eight trailing edge devices which are movable control surfaces.

They are:

- the inboard double-slotted flap,
- the outboard double-slotted flap (not shown),
- an aileron,
- the spoilers 1 thru 5.

The trailing edge devices are connected to brackets installed on the fixed structure. The inboard and outboard flaps are a ”double-slotted” type, with in set tabs to increase the control surface area. The flaps are connected together by a ”Z“ coupling.

There is an interconnecting strut between the flaps installed.

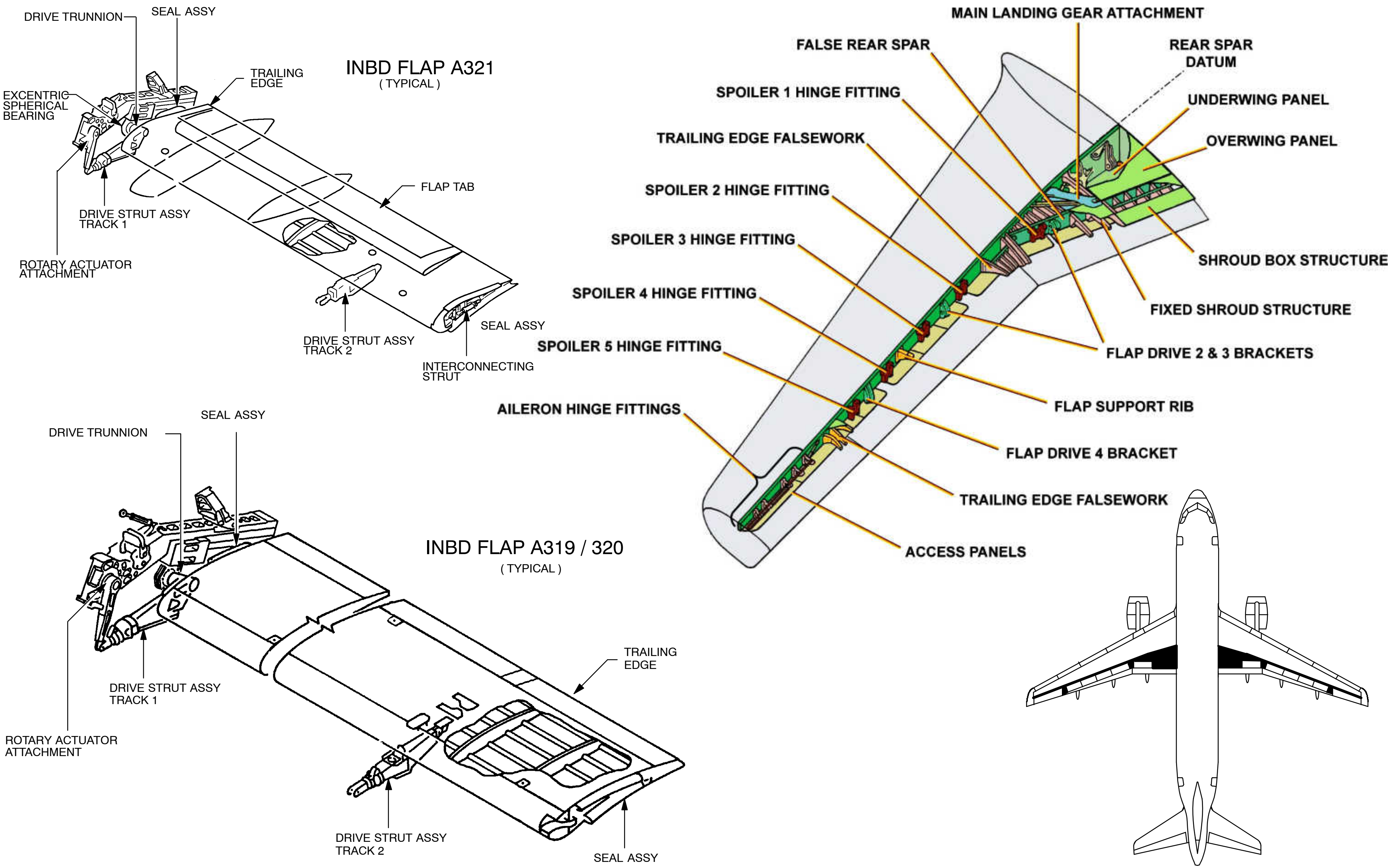


Figure 139 Trailing Edge and T/E Devices

FIXED TRAILING COMPONENTS DESCRIPTION

STRUCTURE LAYOUT

Rear False Spar

The rear false spar is aft of the inner rear spar. It is joined to the rear spar at the kink position adjacent to RIB9. The inboard end is connected to the inner rear spar by the MLG support rib.

The rear false spar has attachments for:

- the pintle (aft fitting),
- the flap track 2,
- the spoiler 1 hinges.

Support Structures for the Trailing Edge Devices

The fixed trailing edge includes two support structures. One is adjacent to RIB9, at the kink position, and gives support to the inboard and outboard flaps. This, the flap support structure, has three machined ribs and three sheet ribs. Aluminum-alloy stiffeners, diaphragms and a Z-member give strength to the structure. The top and bottom skins, and a trailing edge strip, are attached to the ribs.

The second support structure is immediately inboard of the aileron and gives support to the aileron and the outboard flap. It has two machined aluminum alloy ribs, a top shroud panel and two bottom access panels. A machined aluminum alloy track, with a steel liner, is attached to one rib. A roller bearing attached to the outboard flap goes into the track when the flaps are retracted.

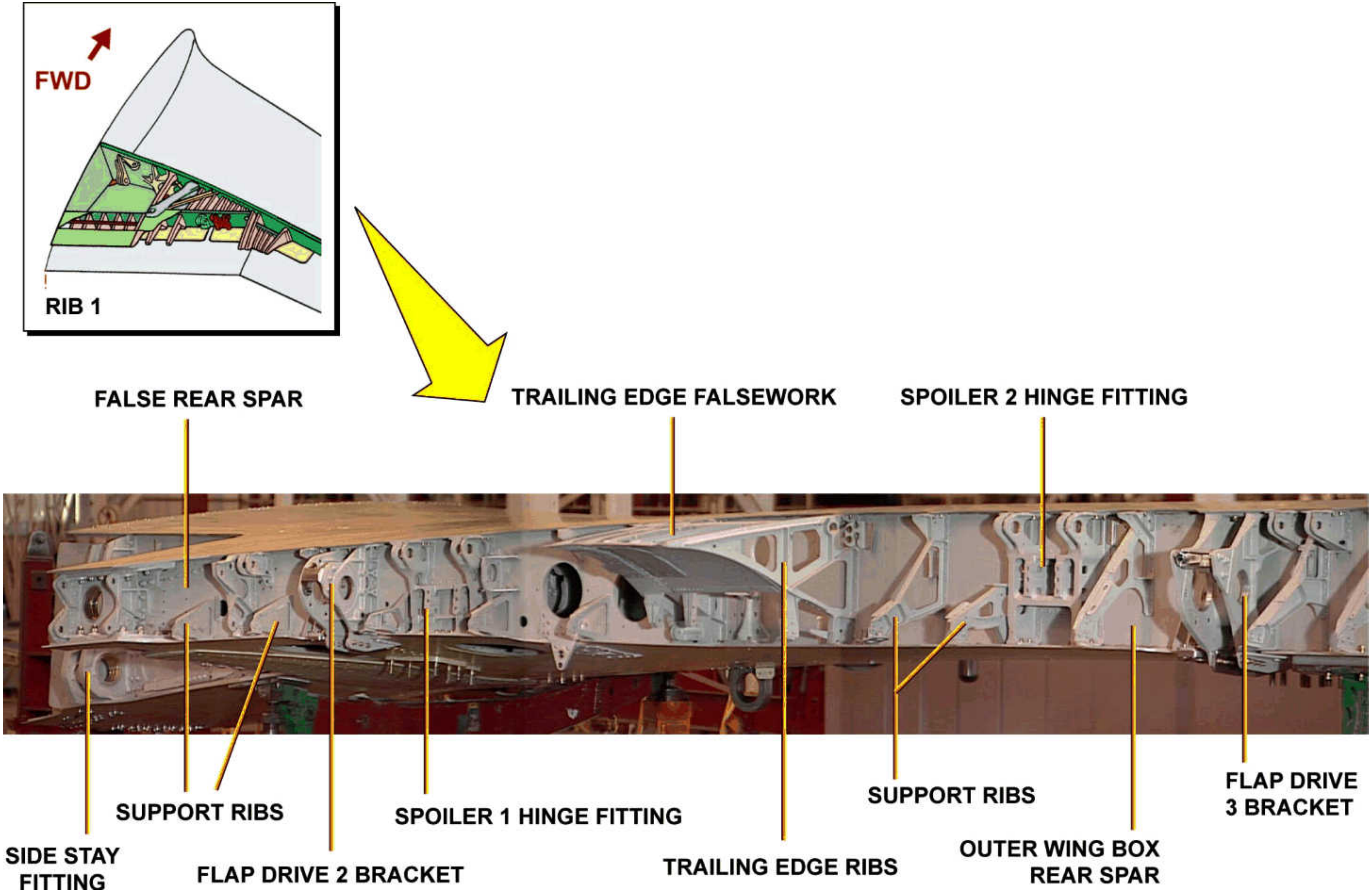


Figure 140 Trailing Edge Structure Layout

TRAILING EDGE DEVICES PRESENTATION

GENERAL

The trailing edge devices are:

- two flaps,
- one aileron,
- five spoilers.

FLAPS GENERAL ARRANGEMENT

Two flaps are installed on the TE of the outer wing.

The inboard flap is installed between Rib 1 and Rib 9 and the outboard flap is installed between Ribs 9 and 20. The flaps are connected to each other through an interconnection strut. In case of a drive station failure, this device carries the loads, which result in such failure.

SPOILERS GENERAL ARRANGEMENT

There are five spoilers on the upper surface of the wing trailing edge. Spoiler 1 is connected to the false rear spar, inboard of the kink position.

Spoilers 2 thru 5 are connected to the middle and outer sections of the rear spar, outboard of the kink position.

A rubbing strip is attached to the trailing edge of spoilers (1 & 2 only).

It prevents damage to spoilers when flaps are retracted.

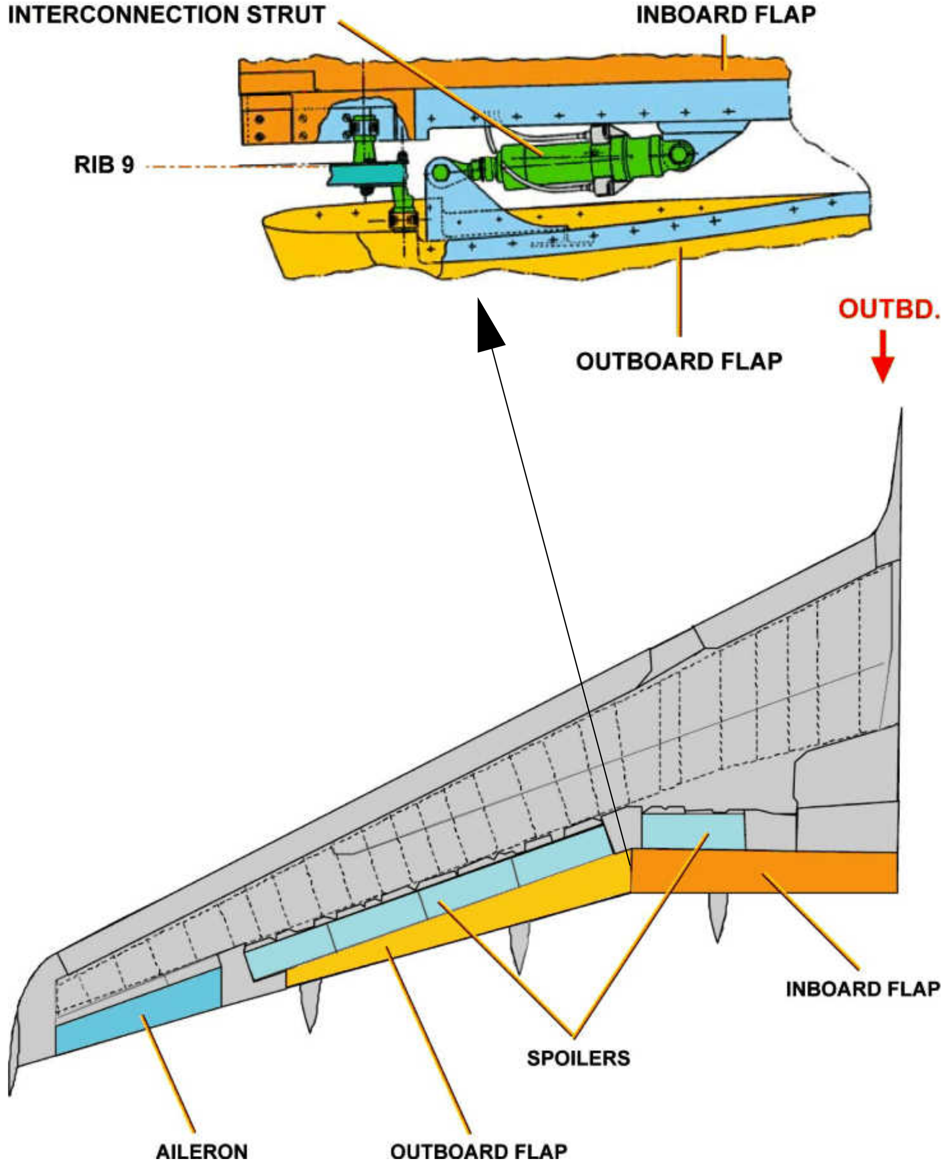


Figure 141 Trailing Edge Devices

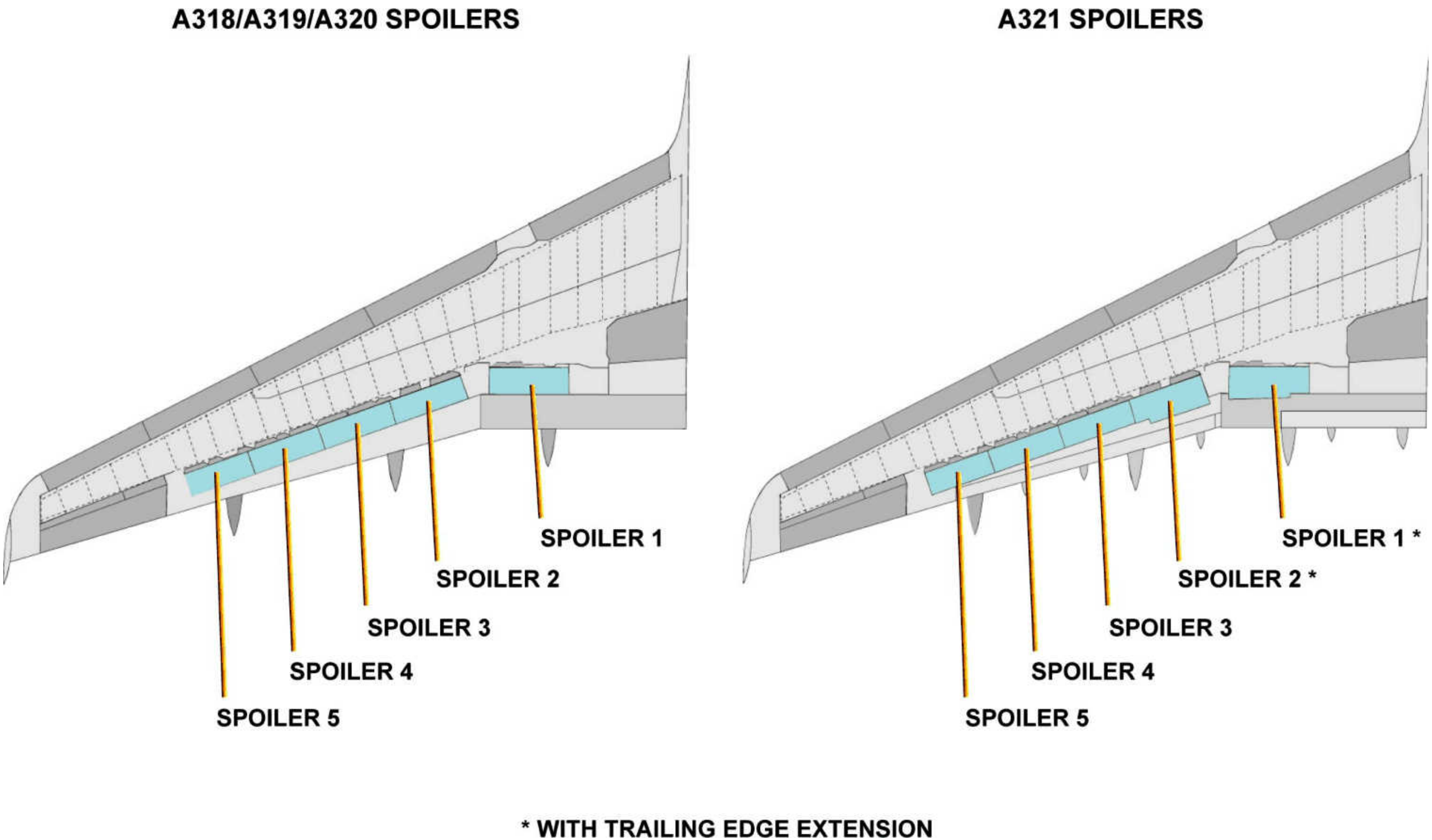


Figure 142 Spoilers General

TRAILING EDGE DEVICES COMPONENTS DESCRIPTION

INBOARD FLAP STRUCTURE (A318/A319/A320)

The inboard flap is supported and driven by a fuselage track and carriage at track 1 and a wing track carriage at track 2.

The inboard flap has:

The rear false spar has attachments for:

- a leading edge with CFRP skin,
  - a flap box with:
  - skin panels and integrated stringers made of CFRP,
  - track ribs and end ribs, made of aluminum alloy,
  - other ribs made of aluminum alloy on the A318 and A319, and made of CFRP or aluminum alloy on the A320,
  - spars made of aluminum alloy on the A318 and A319, and made of CFRP or aluminum alloy on the A320.
- a trailing edge made in an aluminum alloy sandwich construction.

A rubbing strip (not shown) made of stainless steel is bonded onto the outer surface of the top skin.

OUTBOARD FLAP STRUCTURE (A318/A319/A320)

The outboard flap is supported and driven by two wing tracks and carriages (tracks 3 and 4).

The outboard flap has:

- a leading edge with CFRP skin,
- a flap box with:
  - skin panels with integrated stringers and spars made of CFRP,
  - track ribs and end ribs made of aluminum alloy,
  - other ribs made of CFRP.
- a trailing edge of aluminum alloy sandwich construction.

A rubbing strip (not shown) made of stainless steel is bonded onto the outer surface of the top skin.

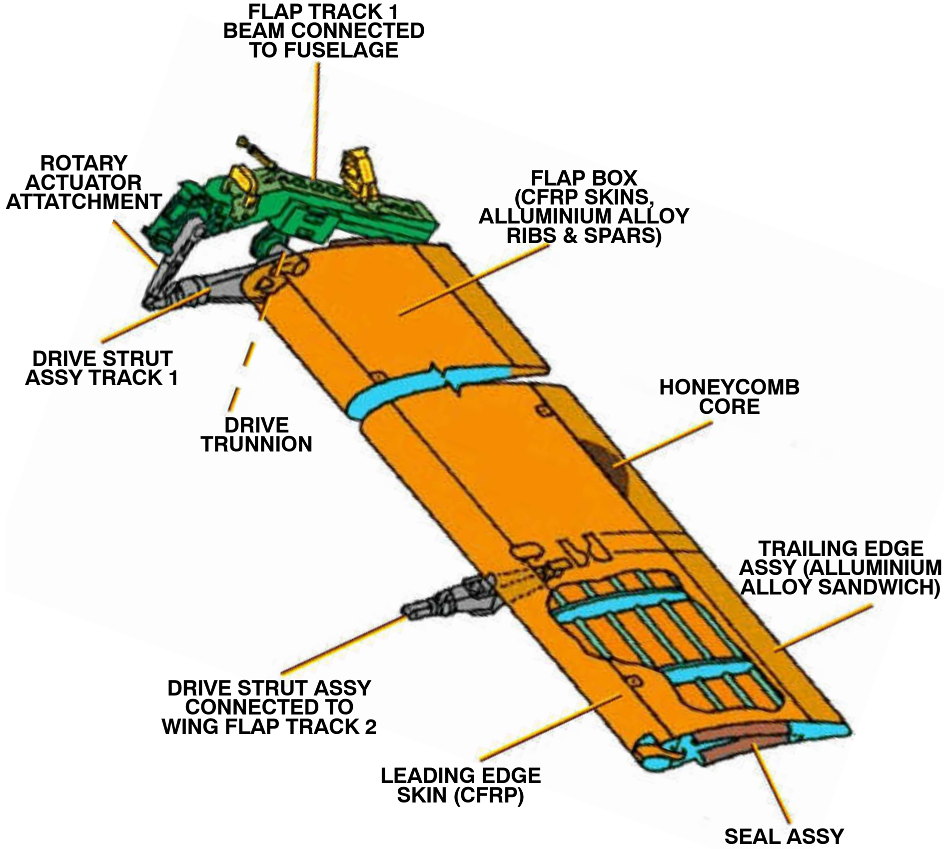
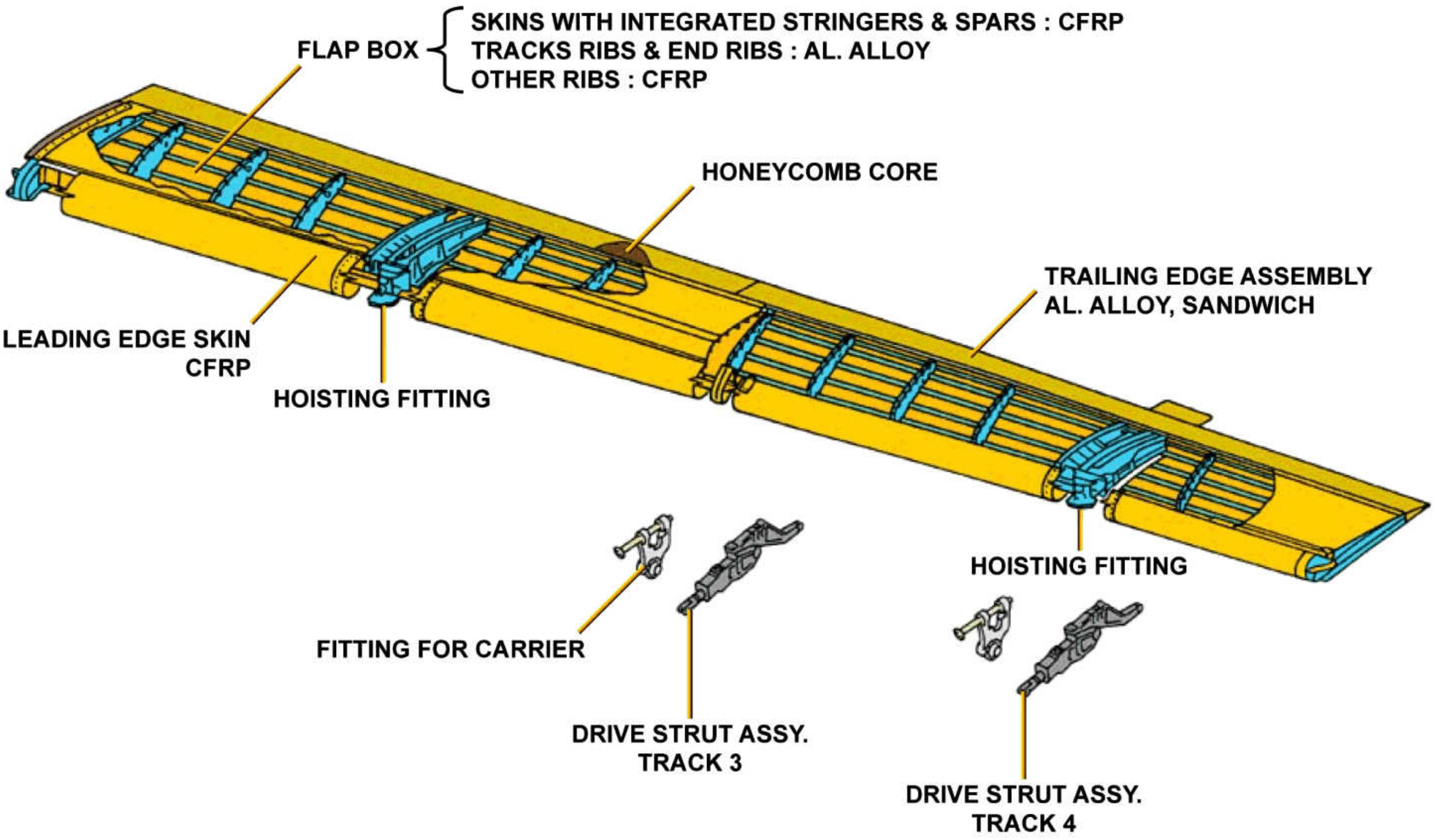


Figure 143 Inboard Flap Structure (A318/A319/A320)



CFRP : Carbon Fiber Reinforced Plastic

STAINLESS STEEL RUBBING STRIP ON TOP SKIN NOT SHOWN

Figure 144 Outboard Flap Structure (A318/A319/A320)

FLAPS STRUCTURE (A321)

The A321 flaps are fowler flaps with a tab on the trailing edge.

The inboard flap has:

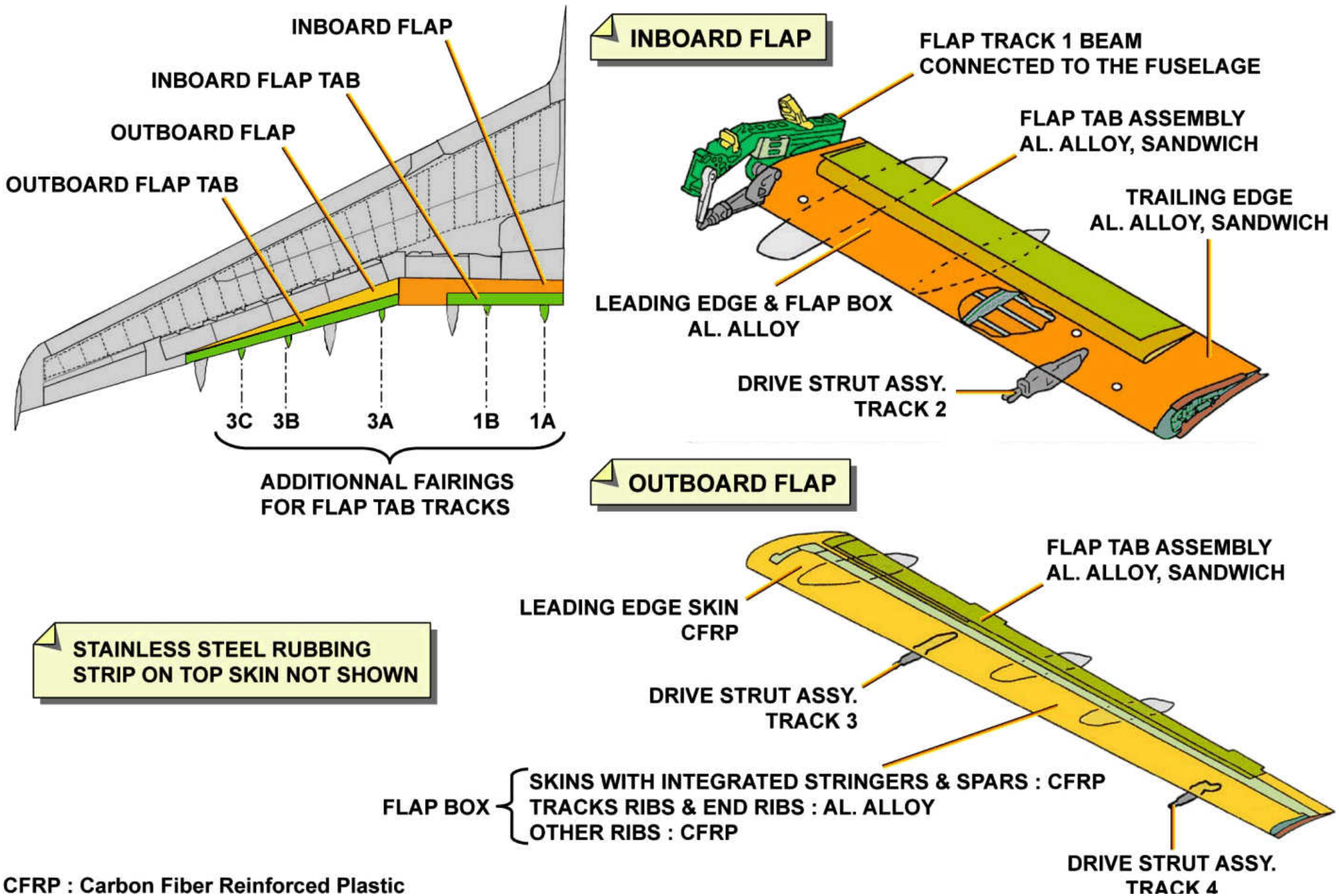
- a leading edge and a flap box made of aluminum alloy,
- a trailing edge made in an aluminum alloy sandwich construction.

The outboard flap has:

- a leading edge with CFRP skin,
- a flap box with:
  - skin panels and integrated stringers made of CFRP,
  - spars made of CFRP,
  - track end ribs made of aluminum alloy,
  - other ribs made of CFRP.

The tab is made of honeycomb core with a skin made of aluminum sheet metal.

The tab is operated by a linkage system.



CFRP : Carbon Fiber Reinforced Plastic

Figure 145 Flap Structure (A321)

57–60 AILERONS

AILERONS PRESENTATION

GENERAL

The aileron is installed on the fixed structure of the trailing edge. It is connected to the outer rear spar between RIB 22 and RIB 27.

The aileron is controlled up or down to control roll. Also spoilers 2 thru 5 extends or retracts to control roll.

The aileron drive mechanism is electrically controlled and uses hydraulic power to move the control surface.

The aileron is a wedge-shaped structure and has these resin impregnated carbon fiber components:

- inboard and outboard end ribs,
- internal ribs,
- top and bottom skins with honeycomb cores,
- spar.

Component Description

The top and bottom skins and the end ribs of the aileron make a wedge-shaped stucture.

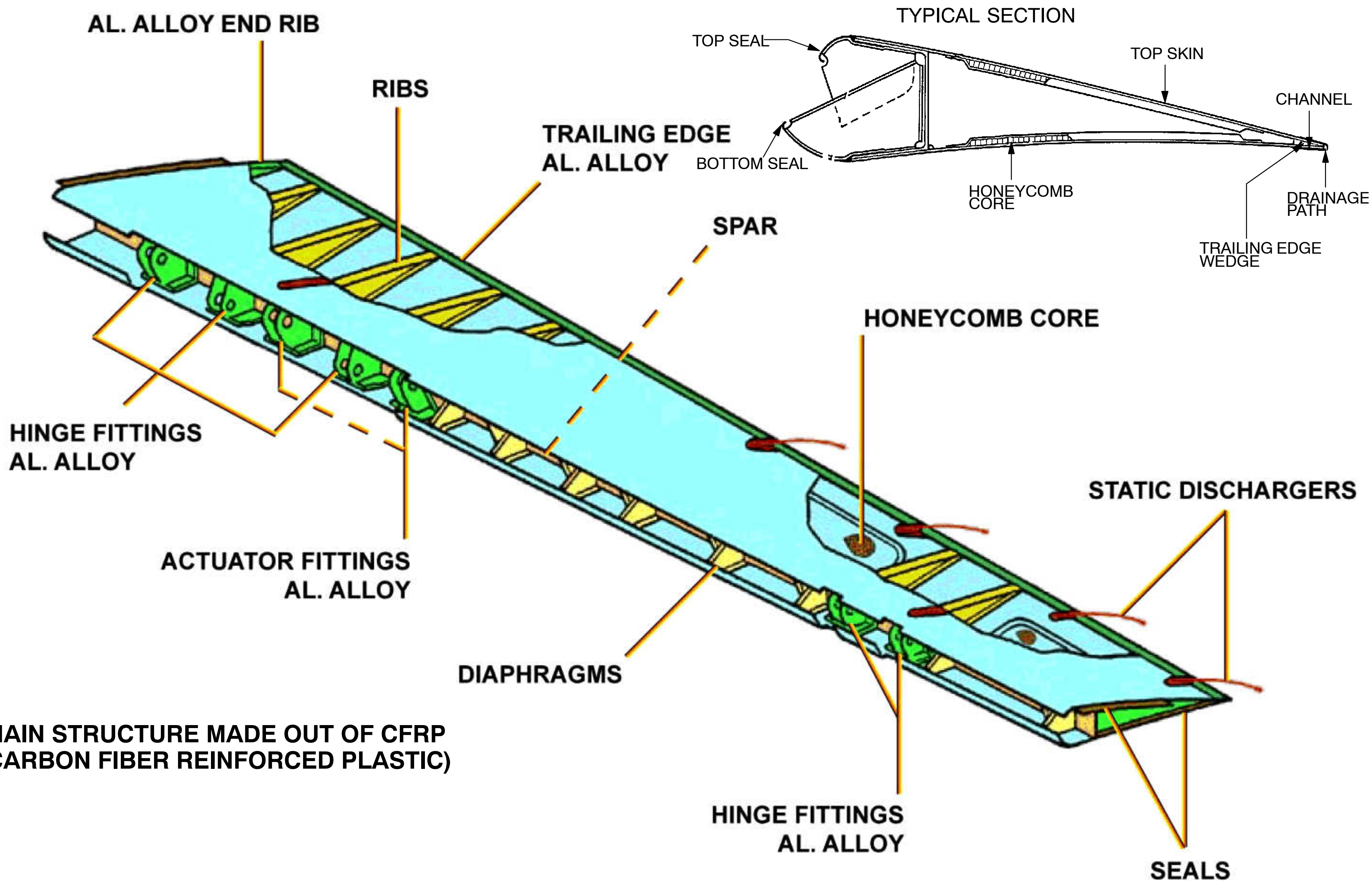
It is strengthened by the internal ribs and the spar. Seven machined aluminum alloy brackets are attached to the spar.

Two of the brackets connect to actuators which are installed on the fixed structure of the trailing edge. The other five are hinge brackets.

Also attached to the spar are aluminum alloy diaphragms and plate seals, which make a smoother air flow around the aileron.

There are two inspection holes in the spar.

On the ends of the aileron there are silicon rubber seals attached to the top and bottom skins. Four static dischargers and retainers are mounted at the trailing edge of the aileron. Gaps between the aft edges of the ribs and the channel help the aileron to drain.



MAIN STRUCTURE MADE OUT OF CFRP (CARBON FIBER REINFORCED PLASTIC)

Figure 146 Aileron

57–70 SPOILERS

SPOILERS PRESENTATION

GENERAL

There are five spoilers on the upper surface of the wing trailing edge.

Spoiler 1 is connected to the rear false spar, inboard of the kink position.

Spoilers 2 thru 5 are connected to the middle and outer sections of the rear spar, outboard of the kink position.

The spoilers are extended or retracted for these functions:

- roll function,
- speedbrake function,
- ground spoiler function.

The drive mechanism of the spoilers is electrically controlled and uses hydraulic power to extend or retract the spoiler surfaces.

Component Description

The spoilers are wedge-shaped structures. They have carbon fiber top and bottom skins, sides and a trailing edge profile, bonded to a honeycomb core.

They are connected by aluminum alloy attachment fittings and hinges to the rear spar and rear false spar.

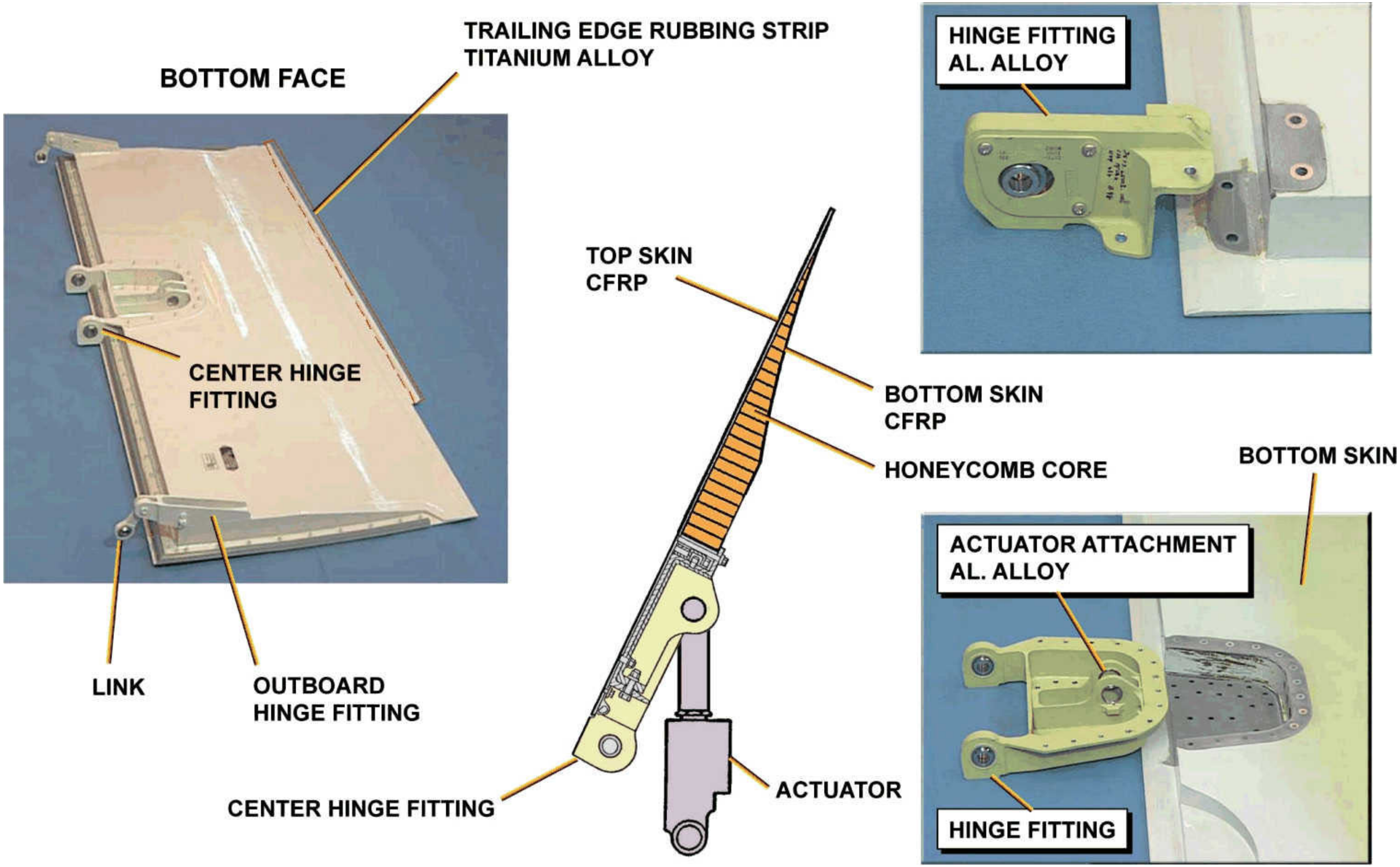


Figure 147 Spoilers Structure Layout

ATA 06 DIMENSION AND AREAS

06−10 DIMENSION AND AREAS

AIRCRAFT DIMENSION INTRODUCTION

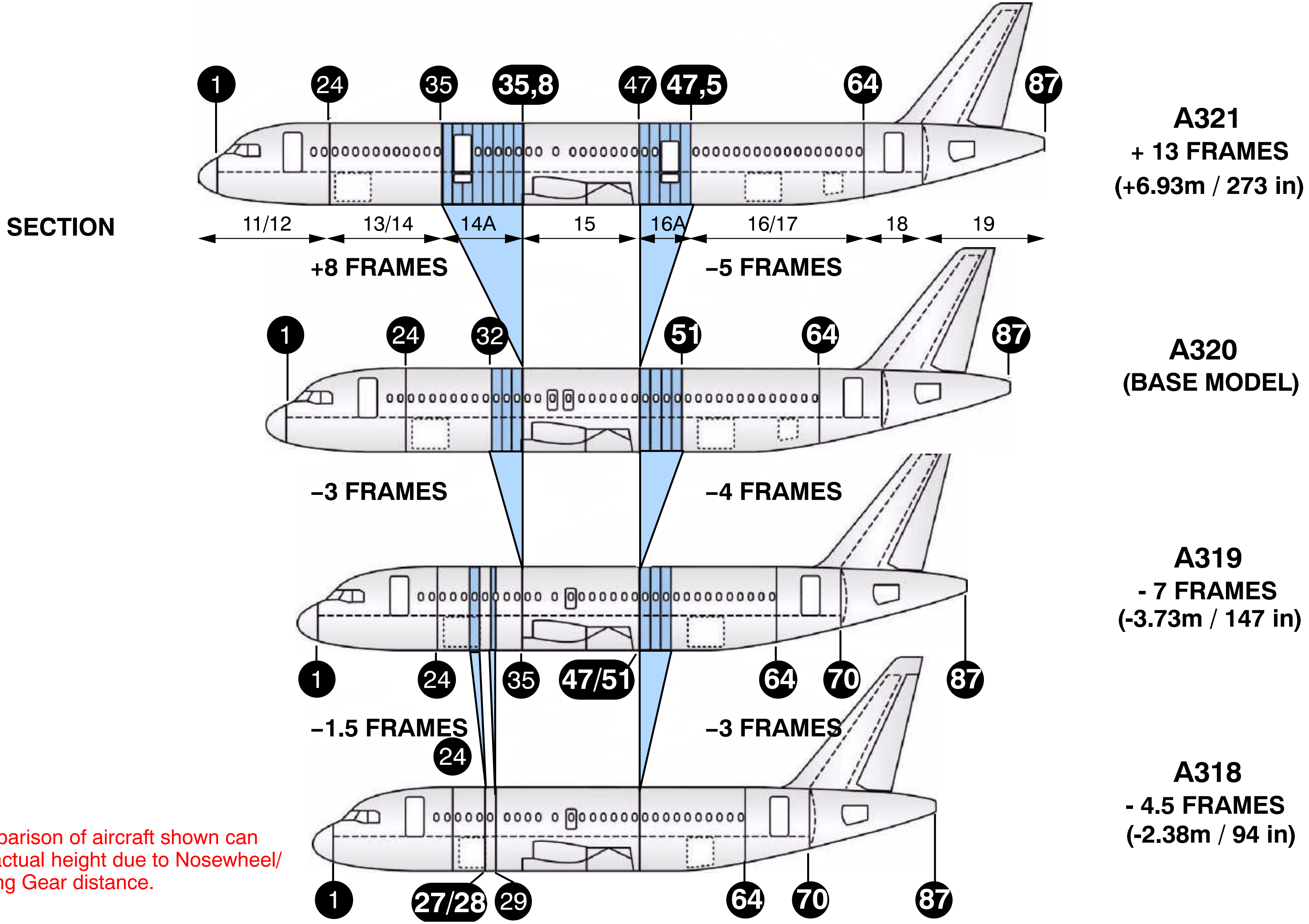
Aircraft Dimensions General

The A318 is a twin−engined short/medium range aircraft.
It is a member of the A320 family.

General Differences between A320 Family and A318

The A318 is a reduced capacity variant of the A319.
The major changes of the A318 compared to the current A319 are:

- fuselage shrinks by 4.5 frames (94 inch or 2.38 m)
- width reduction of forward and aft cargo doors (from 71.5 inch to 50.5 inch)
- fin tip extension to cope with lateral stability
- passenger capacity reduced to 107 seats in two−class seating.



NOTE:
Height comparison of aircraft shown can differ from actual height due to Nosewheel/ Main Landing Gear distance.

Figure 148 A320 Family Fuselage

DIMENSIONS

The A318 dimensions are the same as for the rest of the A320 family except for the fuselage length and the total height.

The A318 has a 31.45 m long fuselage and a 12.51 m total height.

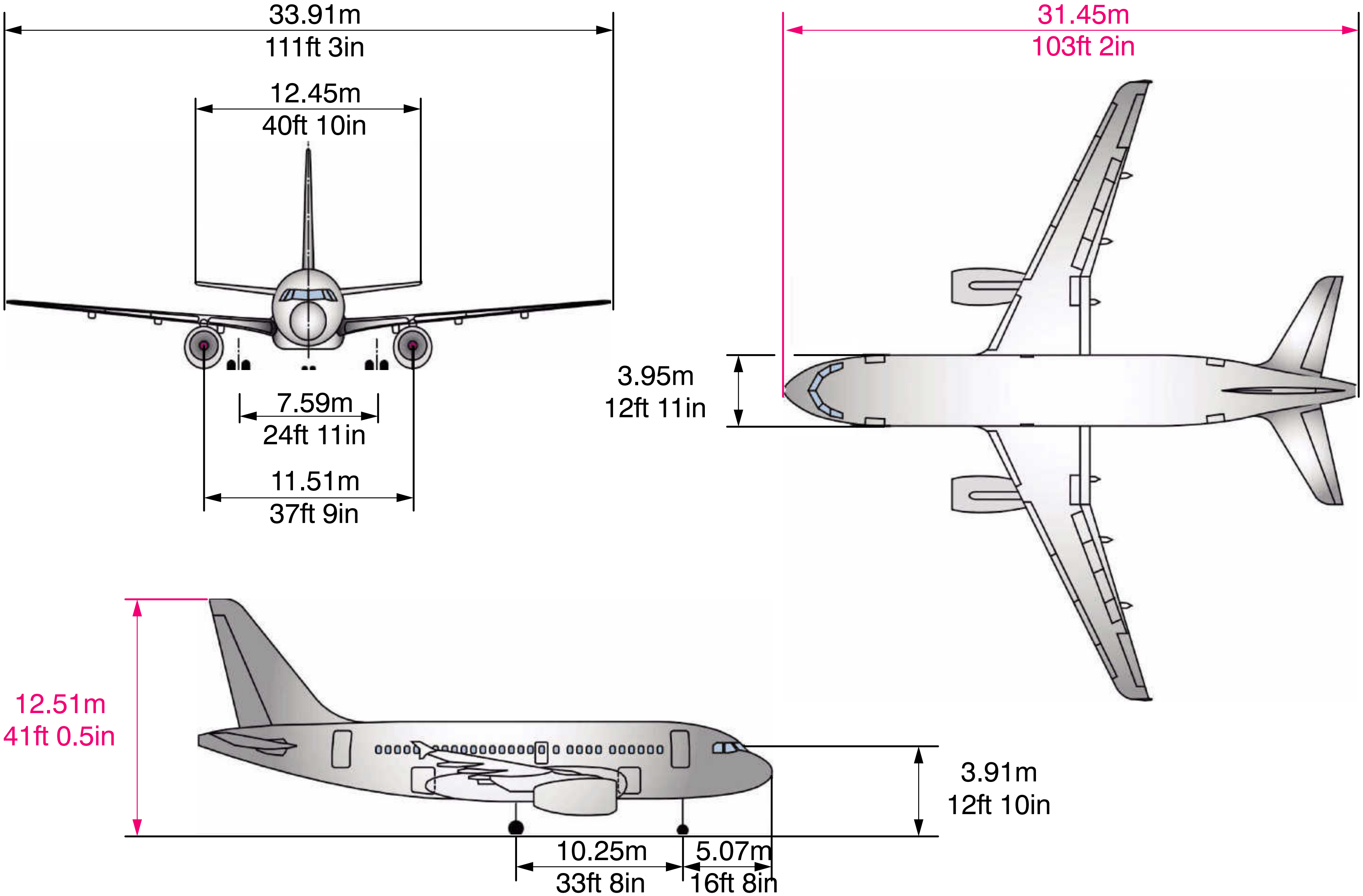
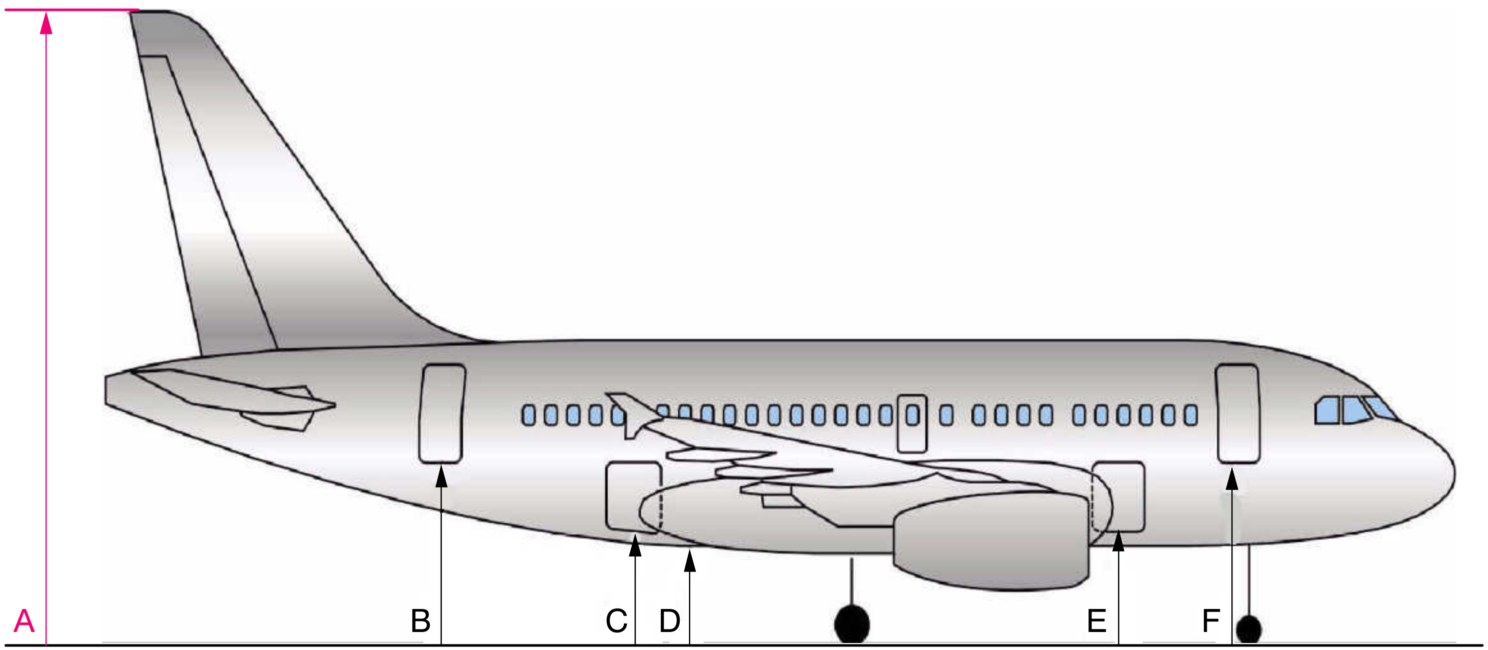


Figure 149 A318 Dimensions

DOOR HEIGHTS

The A318 doors heights are the same as for the rest of the A320 family.



A	12,51m	41 ft	Maximum Height
B	3,40m	11ft 02in	Aft Passenger Door
C	2,20m	06ft 11in	Aft Cargo Door
D	1,76m	05ft 08in	Maximum Fuselage Clearance
E	2,06m	06ft 09in	Faroward Cargo Door
F	3,42m	11ft 04in	Forward Passenger Door

Figure 150 A318 Door Heights

06–30 STATIONS

STATION NUMBERS GENERAL DESCRIPTION

FUSELAGE

The STAtion number is the distance in centimeters of a cross–section from a reference point. The station/frame numbers shown agree with the section boundaries.

Stations numbers (STA)

The station designation system is used to identify reference planes and points along those planes, providing a means of identifying the location of structure.

A station corresponds to a cross section (plane) for a given assembly group, as fuselage, engine nacelle, wing, vertical and horizontal stabilizer.

The sum of all stations gives a station diagram. Each station is a measured distance in millimeters, measured from a station point ”0”. For the Fuselage it is measured over the X – datum line, beginning 2540 millimeters in front of the radom. In addition the stations are supplemented by frame (FR) figures, e.g. STA 9500/FR 24.

Frames numbers (FR)

Frames been counted from the front bulk head to the aft within the fuselage. The distance between the frames are generally 530 millimeters. In ranges of high loads the distances is about 230 millimeters.

Depending on the frames the fuselage of A320/A319 has seven sections. The A321 has nine sections.

SECTION	DESIGNATION	STATIONS	FRAMES
11/12	Nose Fuselage	3340–9500	00–24
13/14	Forward Fuselage	9500–15367	24–35
15	Center Fuselage	15367–21361	35–47
16/17	Aft Fuselage	21361–30429	47–65
18	Aft Fuselage	30429–33655	65–70
19	Forward Tailcone	33655–36617	70–77
19.1	Aft Tailcone	36655–40113	77–87

Additional Sections A321

SECTION	DESIGNATION	STATIONS	FRAMES
14A	Forward Fuselage	15367–19634	35–35.8
16A	Rear Fuselage	5629–28296	47–47.5

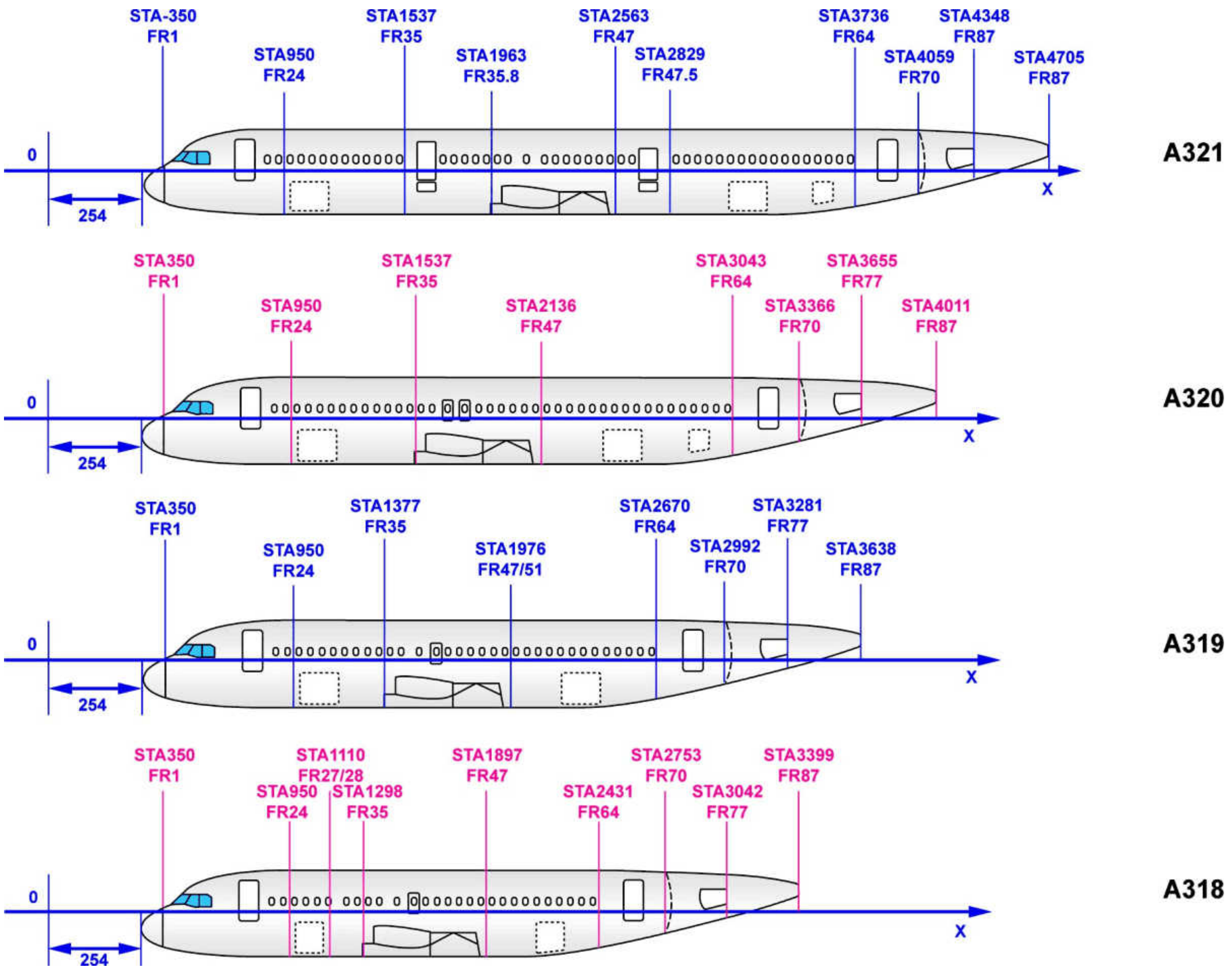


Figure 151 Fuselage Stations

VERTICAL STABILIZER SATIONS PRESENTATION

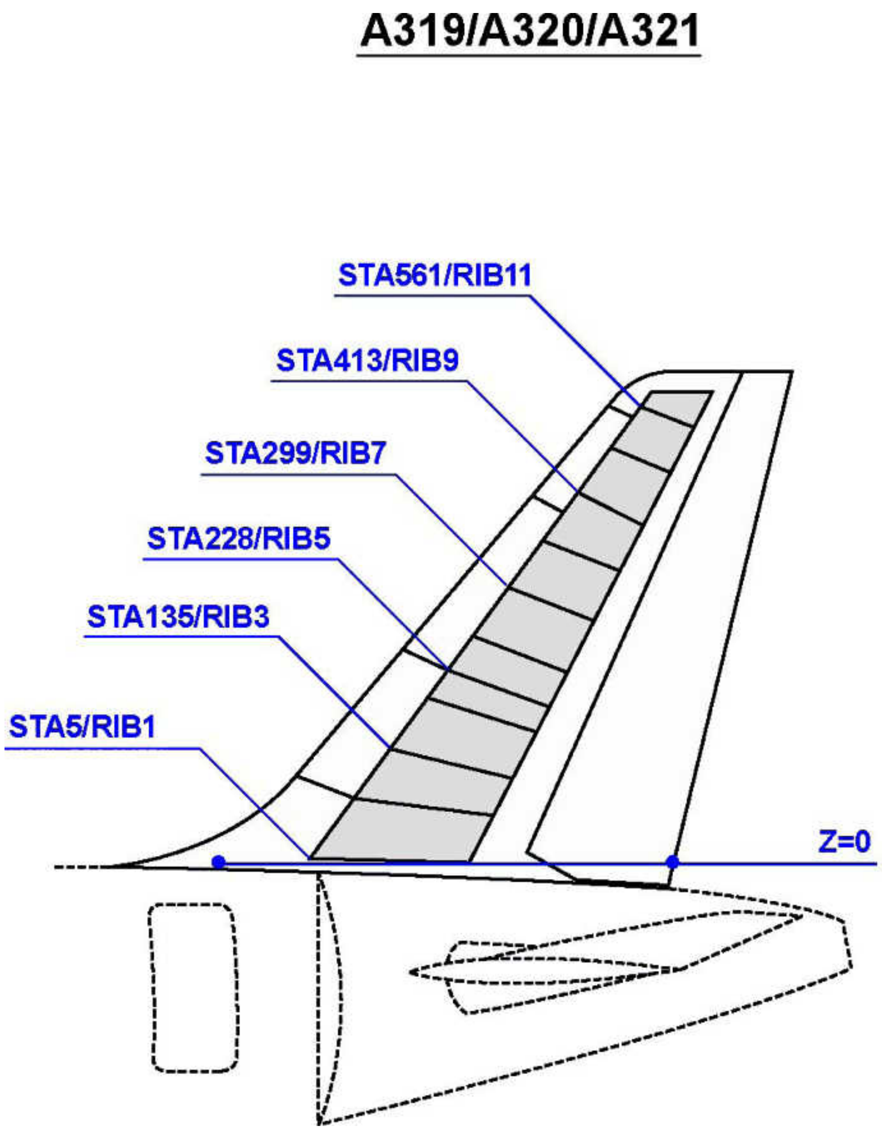
Compared with A319/A320/A321 A/Cs, the A318 vertical stabilizer fin tip is 750 mm (29,5 in.) longer.

The new developed tip is completely made of GFRP. There is an additional fin leading edge panel. There is a new spar and a new CFRP adaptor box, between the fin base and the fin tip.

The metallic rudder tip is longer by 100 mm in vertical direction. The rudder trailing edge is increased in width by 50 mm.

For the vertical stabilizer the reference station is Z=0 at the vertical Z–axis. Due to the fin tip extension, the A318 station numbers have changed.

The new additional rib 12N is on the STA597.



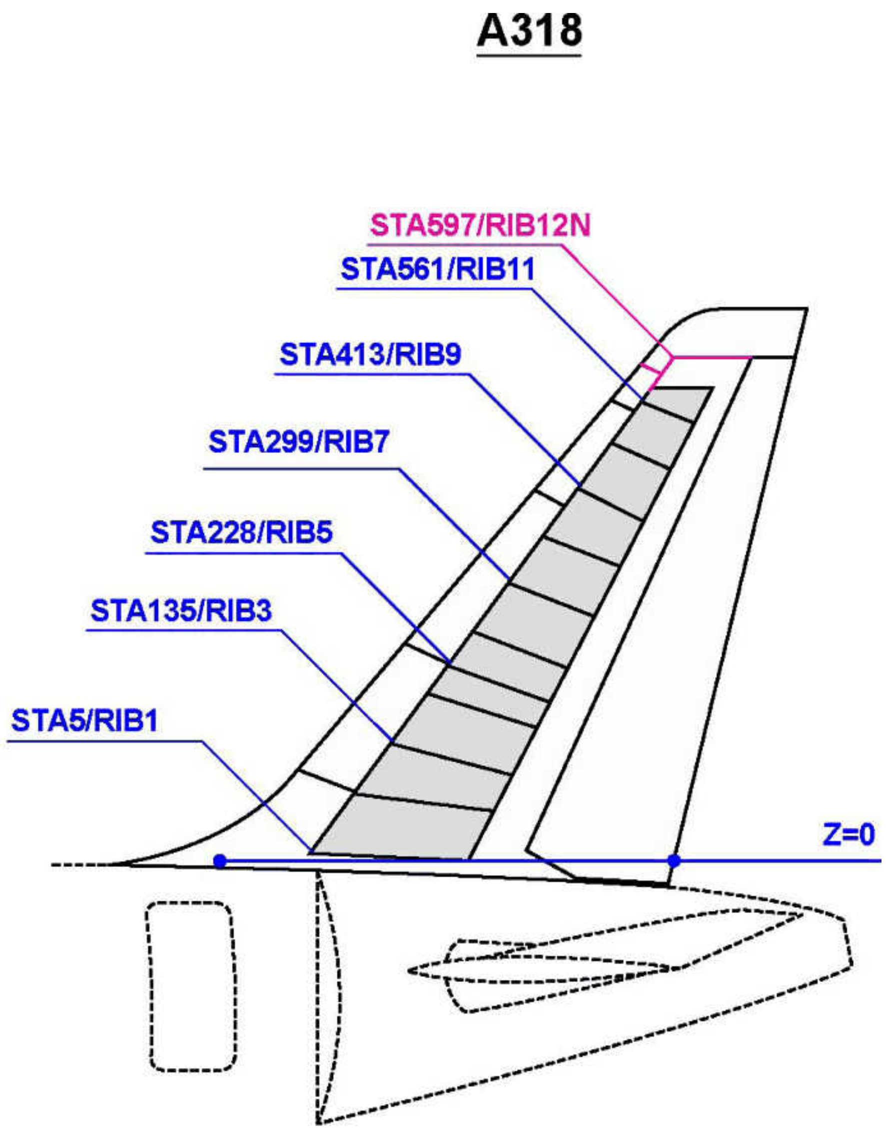


Figure 152 Vertical Stabilizer Stations

ATA 51 STRUCTURE

51–00 STANDARD PRACTICES AND STRUCTURES – GENERAL

STRUCTURE

Structure General

Main structure differences between A319 and A318 are due to the reduced length of the fuselage. There are several general structure changes.

The main differences are the laser beam welded structures and the vertical stabilizer fin tip extension.

General Structure Changes

On section 17, due to reduced length of the fuselage, the longitudinal beams, the seat rails and the Z–profiles are replaced by new ones. The crossbeams at FR52, FR53 and FR54 are removed. New crossbeams are installed between FR55 to FR64.

Due to its location in the non–cylindrical part of the fuselage, a new cargo sill box replaces the A319 one, in section 17.

The A318 fuselage is 4.5 frames shorter than the A319.

In section 13, the FR28 is removed and the FR27 becomes the FR27/FR28. The distance between the FR29 and the FR30 is reduced. On section 17, the FR52, FR53 and FR54 are removed.

On section 15, the A319 skin panels have been modified. For weight reduction the A318 skin panels are thinner than the A319s. The aft part of the belly fairing is modified due to an overlap with non–cylindrical part of fuselage. To avoid interference with cargo compartment door, the A318 belly fairing is two panels shorter than the A319s.

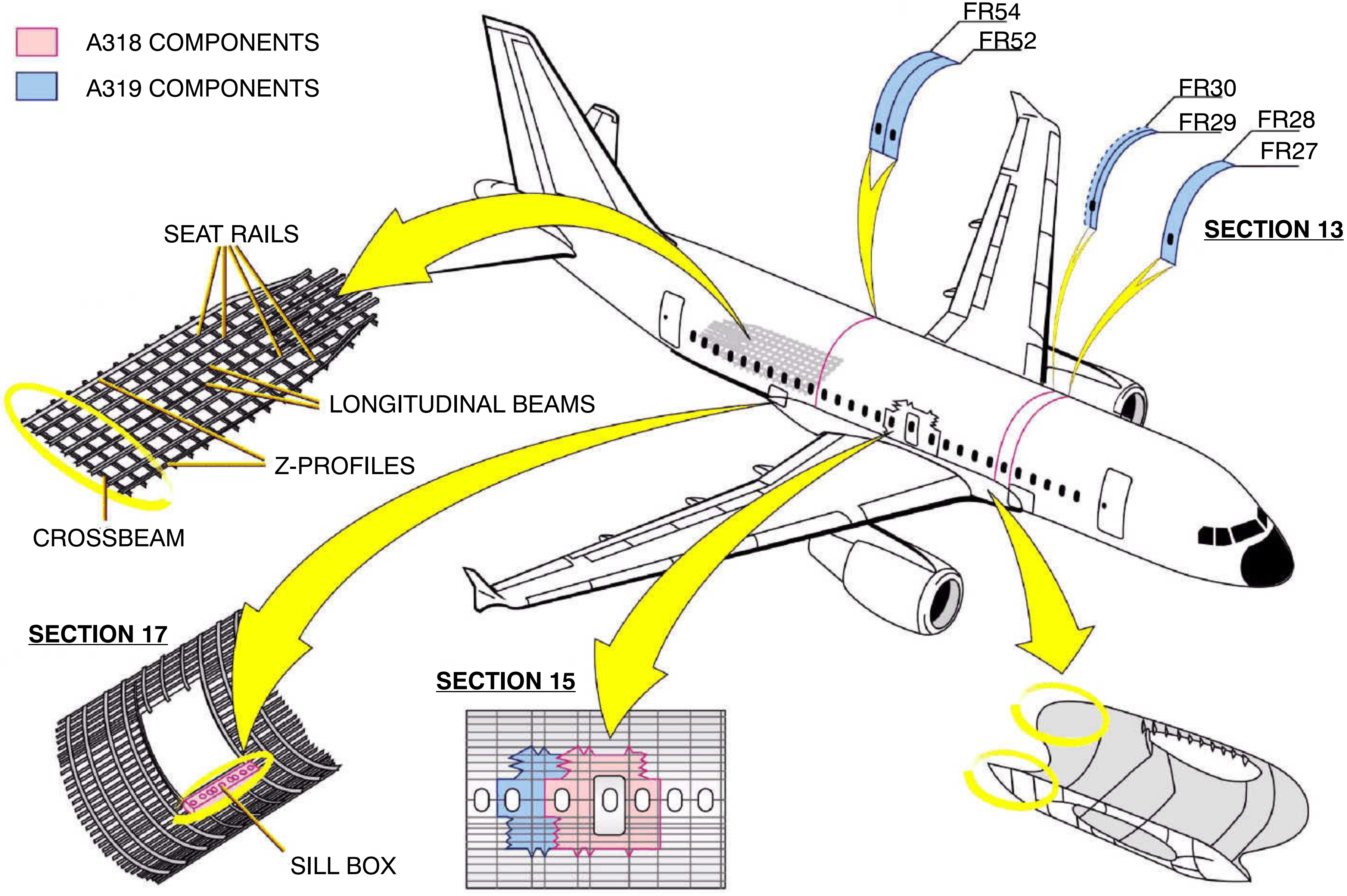


Figure 153 A318 Strcuture General Overview

ATA 53 FUSELAGE

53–00 FUSELAGE - GENREAL

LASER BEAM WELDING GENERAL DESCRIPTION

Standard frames have a common z–shape section made from formed sheet. These frames are continuous structural members attached to the skin and stringers by sheet metal cleats.

On the A318, some stringer/skin connections are welded.

The new laser beam welded skin panels are installed in:

- the sections 13/14, FR24 to FR35, stringers 18 to 32,
- the sections 16/17, FR47/54 to FR64, stringers 32 to 41.

The skin panels are made thicker where the stringers are welded to them.

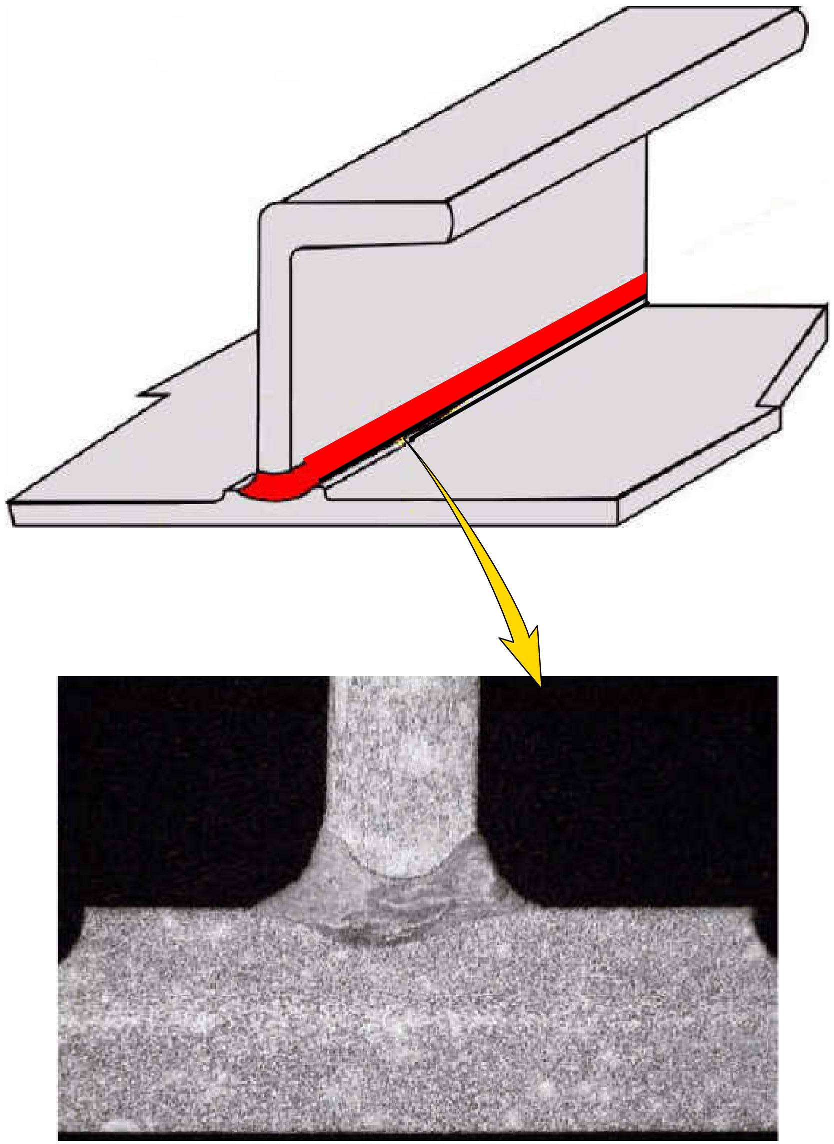
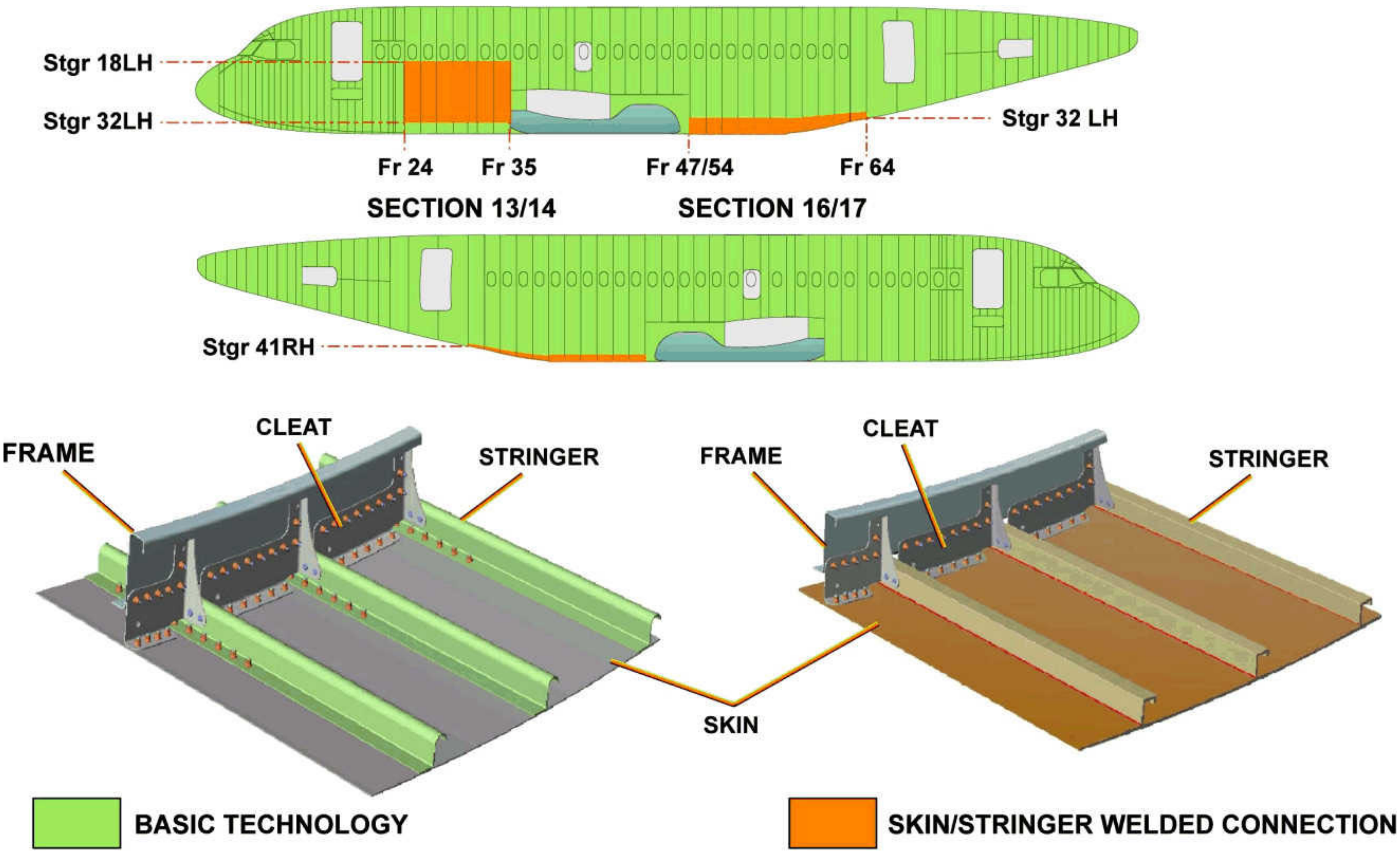


Figure 154 Laser Beam Welding



FRAME/CLEAT : RIVETED
CLEAT/SKIN : RIVETED
STRINGER/SKIN: RIVETED

FRAME/CLEAT : RIVETED
CLEAT/SKIN : RIVETED
STRINGER/SKIN: WELDED

Figure 155 A318 Welded Structure

53–40 REAR FUSELAGE

REAR FUSELAGE PRESENTATION

REAR FUSELAGE (SECTION 16/17 AND 18)

A318 General Arrangement

The rear fuselage assembly is a pressurized area, which extends from Fr 47/54 to Fr 70. It is divided into two sections:

- section 16/17 between Fr 47/54 and 64,
- section 18 between Fr 64 and 70.

The design of section 16/17 is similar to that of forward fuselage sections.

Skin panels of the lower region have support attachment structures for the belly fairing rear part. The aft cargo door cutout is located between Fr 57A and 60 on the RH side of the fuselage.

Aft passenger door cutouts are located between Fr 66 and 68.

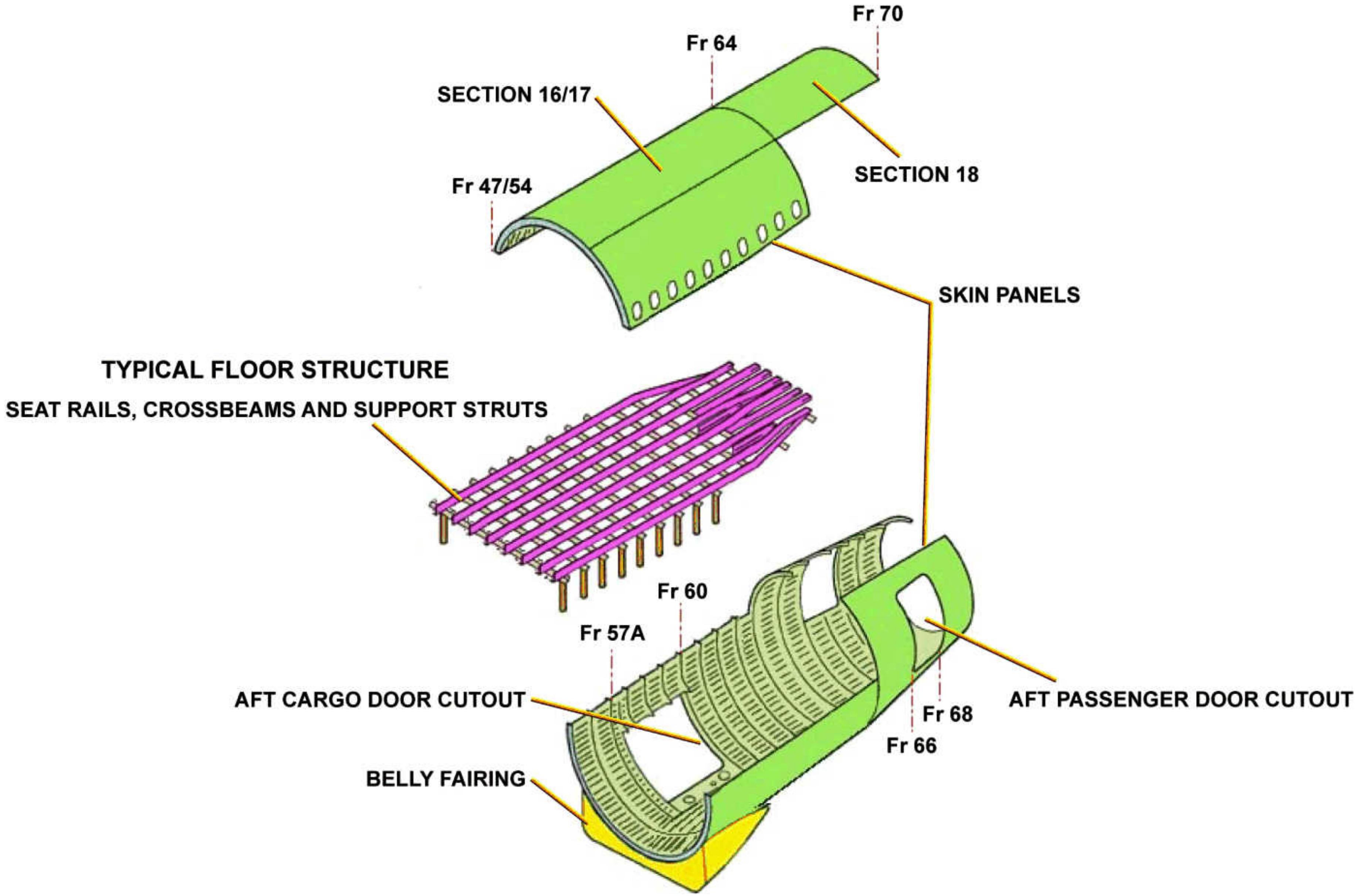


Figure 156 Rear Fuselage (A318)

ATA 52 DOORS

52-51 PASSENGER COMPARTMENT FIXED INTERIOR DOORS

COCKPIT DOOR INTRODUCTION

GENERAL

The cockpit door separates the cockpit from the cabin.

It is an armored and bulletproof door made to prevent a hijacking attempt and protect the flight compartment against an intrusion.

A Cockpit Door Lock System (CDLS) controls its electrical release and prevents an unwanted access into the cockpit.

The door also has a door escape hatch, with two pip–pins which keep the hatch in position.

Description

The purpose of the reinforced cockpit door is to prevent unauthorized access to the cockpit and protect the flight crew from intrusion attempts.

It is provided with an electromechanical locking system CDLS (**C**ockpit **D**oor **L**ocking **S**ystem) to allow access to the cockpit for authorized personnel only.

Cockpit Door Reinforcement

The door blade consists of honeycomb material in combination whit a plate of bullet proof S-glass material adhered to the door from the cockpit side.

Additonally the panel surface above the door is reinforced with S-glass.

In the lower part of the door leaf a removable panel is provided, which is to be used as secondary escape path by the flight crew.

The escape panel and its frame are reinforced with S-glass material.

Steel angles are provided on the adjacent monuments (lavatory, galley) to prevent the door hinges as well as the door gaps from bullet penetration.

The door and its attachments are capable to withstand an intrusion force of 300 Joules applied from cabin side.

A grip mould is povided in the door blade instead of a knob to operate the door from the cabin side.

Door Escape Hatch

The hatch is installed into the cut–out section of the cockpit door. Two pip–pin fittings are installed on the inner side of the hatch.

The two pip–pins engage with the related brackets of the door structure to keep the hatch in position.

Three Latch Mechanism

The top, center and bottom latch mechanism are installed on the inner side of the cockpit door. The center latch mechanism has a spring–loaded D–ring assembly which extends or retrats its internal latch tenon.

The adjustable tie–rods connect the three latch mechanisms together so that their internal tenons move at the same time. The extented tenons engage with the catch of the electrical release strikes so that the cockpit door is locked.

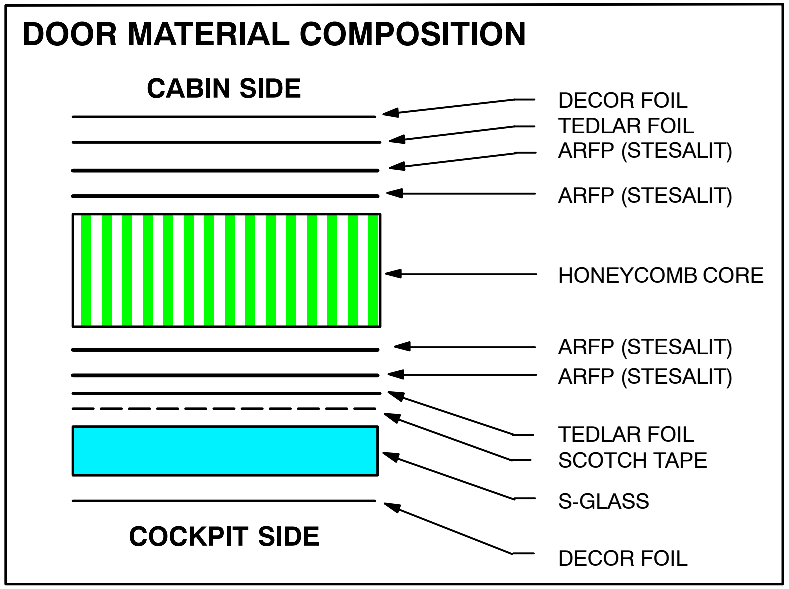


Figure 157 Door Material

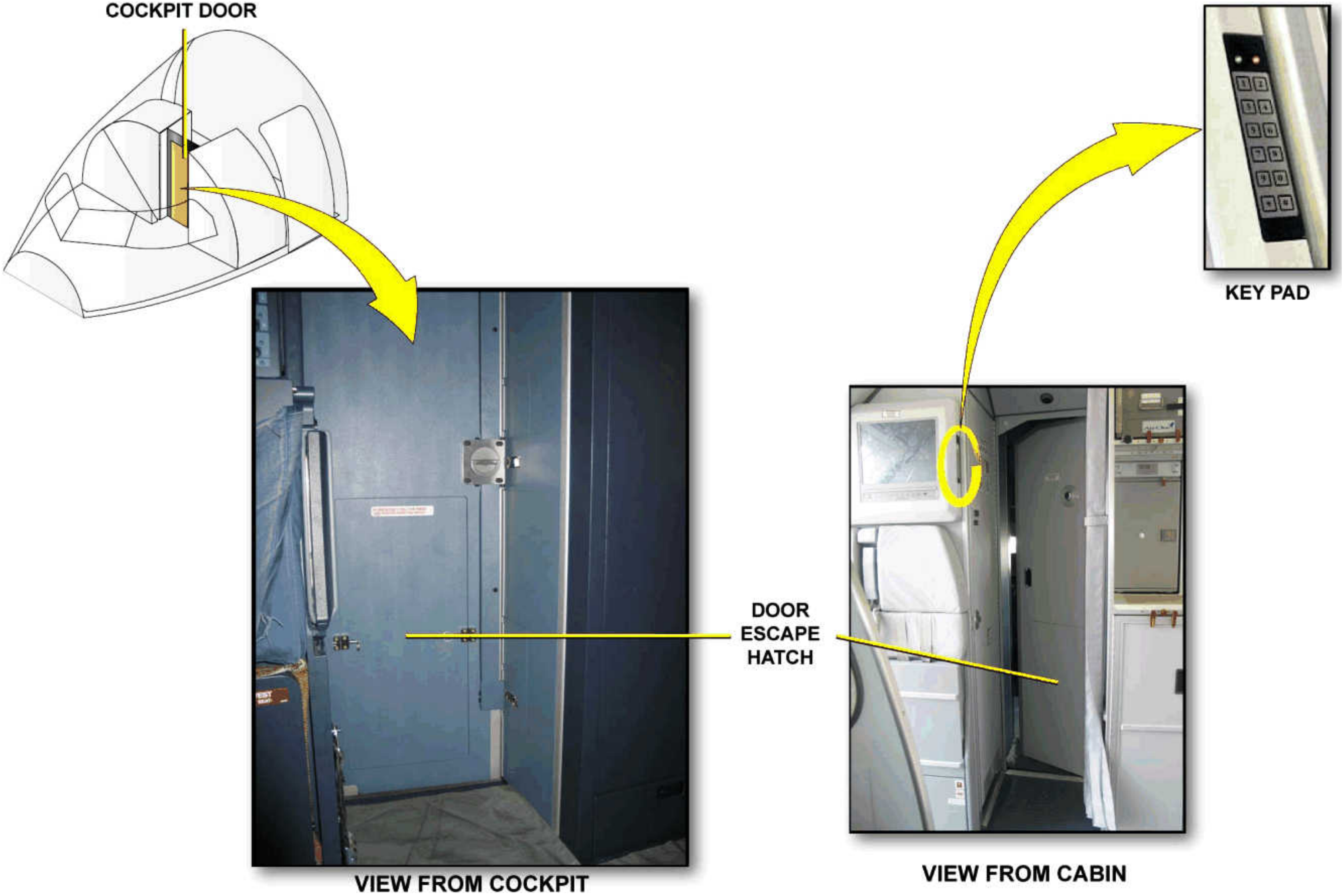


Figure 158 Cockpit Door General

DOOR ELEMENTS

The door has an escape hatch which has the same structure as the door. The hatch is manually operable only from the flight deck for pilot emergency exit in case of cockpit door jamming.

Three mechanical latches engage in electrical release strikes actuated by solenoids. The door is always locked when closed and the A/C is powered.

During maintenance activity there is a magnetic door stop to keep the door fully open.

Description

The cockpit door opens into the flight direction and a magnetic door stop keeps it in its fully open position. The cockpit door structure is a honeycomb core bonded between pre-impregnated sheets.

Two aluminum plates with the same decor as the passenger cabin lining are installed on each side to prevent damage.

On the cockpit door there is an upper hinge, which is attached with screws to the cockpit structure. The bottom of the cockpit door has an attachment fitting which engages with the floor structure.

There is a cut-out section in the door structure for the door escape hatch. In case of emergency the cockpit crew can leave the cockpit through this door escape hatch. The door escape hatch structure is the same as the door. There are two pip-pin fittings installed on the inner side of the hatch. The two pip-pins engage with the related bracket of the door structure to keep the hatch in position.

The manually operated three-latch mechanism keeps the cockpit door in the closed position. It is installed on the inner side of the cockpit door. It has a spring-loaded D-ring assembly which extends or retracts the three-latch tenons.

The tenons engage with the catch of the electrical release strikes installed opposite in the lavatory wall. The cockpit door has a door handle and a spyglass.

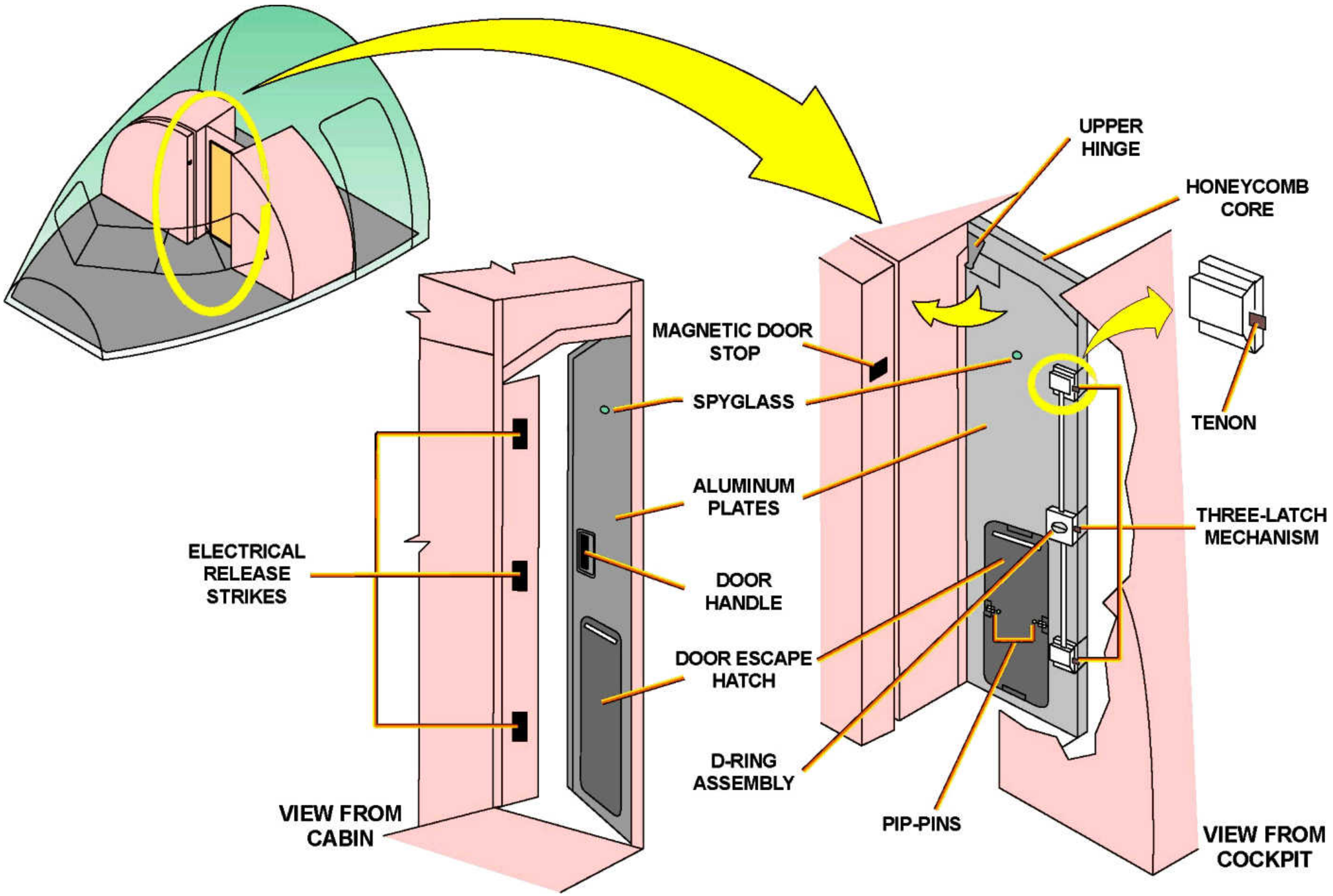


Figure 159 Cockpit Door Elements

COCKPIT DOOR LOCK SYSTEM

The CDLS controls the locking and unlocking of the cockpit door. It also monitors the door locking and unlocking system for faults.

The system has different parts:

- the control unit on the overhead panel with an integrated pressure sensor part for cockpit decompression detection and integrated maintenance lights,
- the cockpit door panel on the center pedestal with a toggle switch to control the cockpit door and a fault indicator,
- the buzzer on the overhead panel,
- the keypad in the cabin for cockpit access authorization,
- three electrical release strikes,
- an optional back−up system may be installed to override an inadvertent mal function of the CDLS. It has an additional control unit, and a back−up control panel with a back−up switch and a fault light.

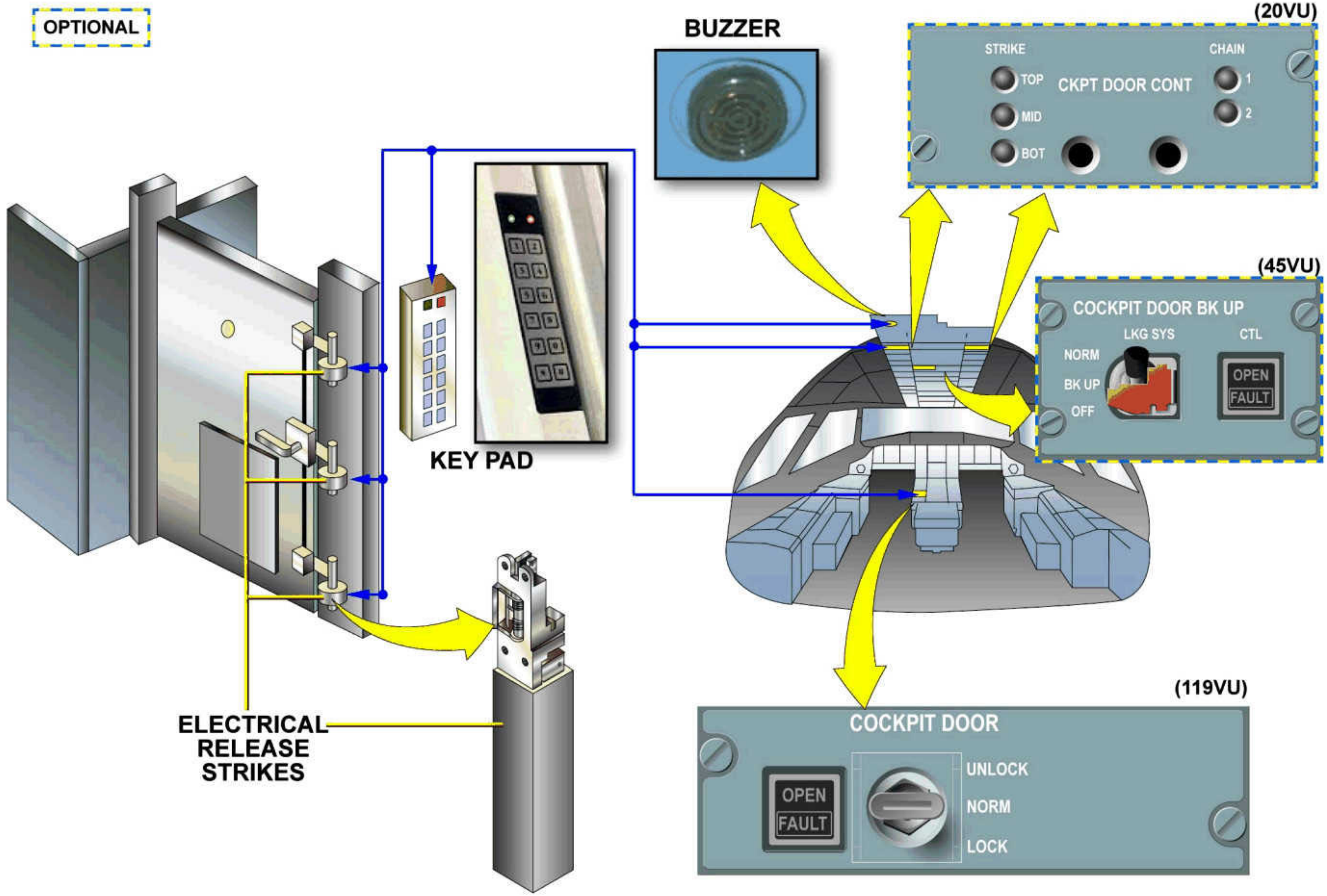


Figure 160 Cockpit Doors System Components

COCKPIT DOOR LOCKING SYSTEM DESCRIPTION

General

The CDLS (**C**ockpit **D**oor **L**ocking **S**ystem) is responsible for the cockpit access handling and the door release in case of rapid decompression in the cockpit.

The system consists of the following Components:

- three electrical strikes,
- a control unit, located in the overhead panel,
- a keypad (codepad) located in the cover of the FWD attendant panel,
- a door bolting system for mechanical override attached to the cockpit door,
- one indicator light at the center pedestal (FAULT and OPEN),
- one toggle switch on the center pedestal (LOCK/UNLOCK),
- one buzzer for acoustical indication if access is requested, located in the maintenance panel

Description

Normally the cockpit door is in the locked condition when the CDLS is energized with electrical power. This electrical power comes from the normal busbar 204PP through the circuit breaker 1MQ at the 122VU.

If the CDLS is not energized with electrical power the cockpit door is in the unlocked condition (fail safe open).

The operation of the key pad installed in the forward attendant panel 120RH causes the buzzer to operate. This tells the cockpit crew that a person requests access to the cockpit.

The toggle switch on the center pedestal panel 119VU sends a signal to the control unit when it is in the UNLOCKED positon.

The control unit in the overhead panel 20VU then produces an output signal as long as the toggle switch is pressed to the UNLOCK position.

This signal de-energizes the solenoids of the three electrical release strikes so that the cockpit door can be opened from the cabin side.

- A green LED on the key pad will indicate the allowed access.

Releasing the toggle switch to the NORM position will automatically lock the cockpit door.

- A red LED on the key pad indicates remaining LOCK position of the door,
- the key pad and buzzer are inhibited for a preselected time (5-15 min, programmable by airline maintenance)

The cockpit door can also be opened by a mechanical override in any case at any time. This item is provided from the door bolting system.

If there is a sufficient loss of cabin pressure in the cockpit, pressure sensors in the control unit 24MQ operate. Then the electrical release strikes de-energize and the cockpit door is UNLOCKED in the case of a rapid decompression.

Indications

The indication light 22MQ is installed in the COCKPIT DOOR panel 119VU of the center pedestal, it is divided in the OPEN legend and the FAULT legend.

The OPEN legend comes on in amber when the cockpit door is opened, the FAULT legend comes also on in amber when there is the malfunction in the CDLS.

- the amber FAULT indication light and the LED’s CHAN 1 or CHAN 2 on the control box show that the applicable pressure sensor is unserviceable.
- the amber FAULT indication light and the LED’s TOP, MID or BOT STRIKE show that the applicable electrical release strike is unserviceable.

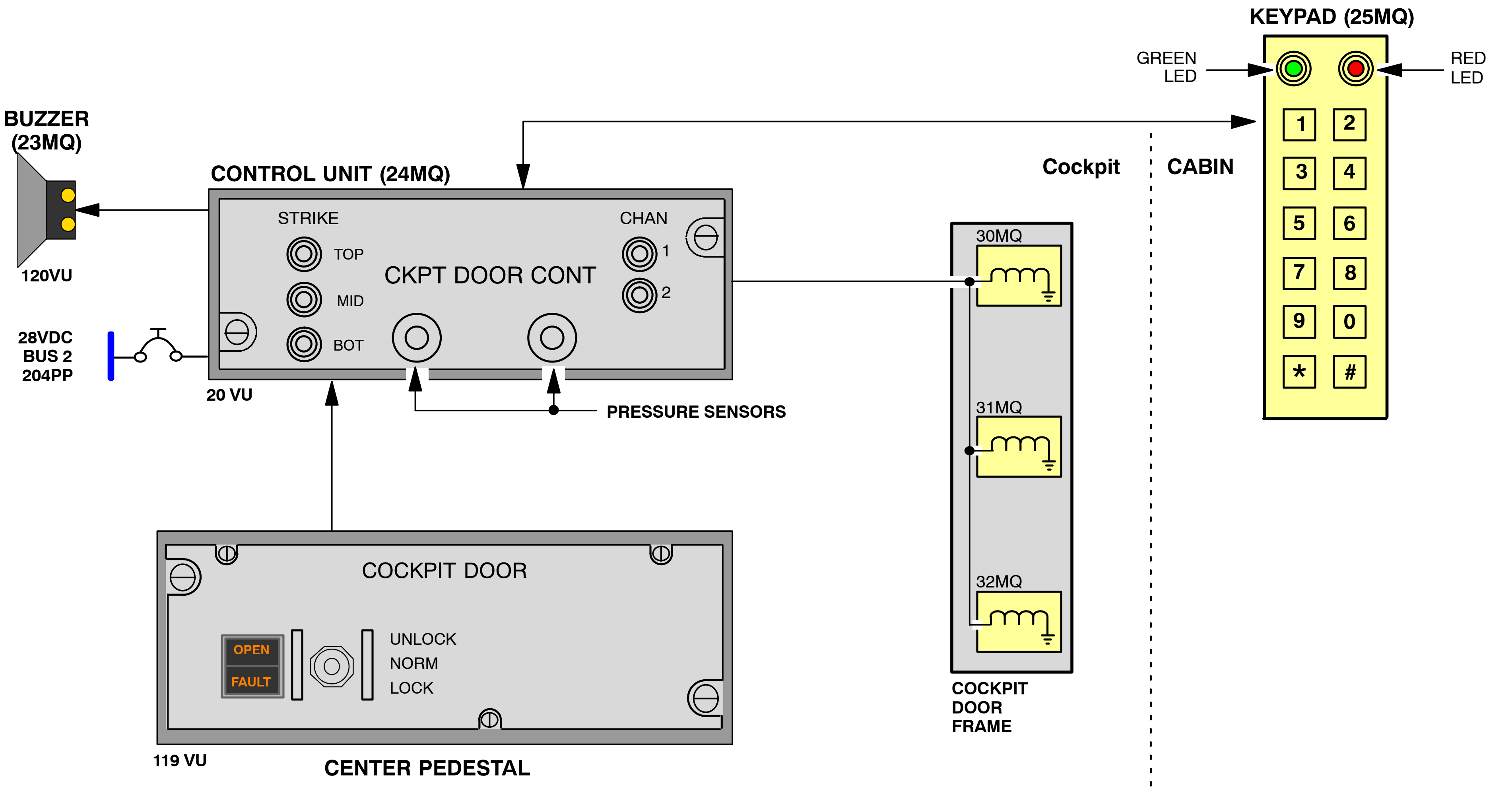


Figure 161 Cockpit Door Locking System

BACK-UP SYSTEM (OPTIONAL)

The cockpit door locking back-up system is an optional system activated under Master Minimum Equipment List (MMEL) conditions when the normal CDLS has failed. It ensures that the cockpit door release system can operate.

The fault indication of one system is automatically inhibited when the other system is selected.

If the optional back-up control unit is installed, an additional toggle switch lets you do the changeover to the back-up unit. This switch also lets you completely disconnect the system during maintenance.

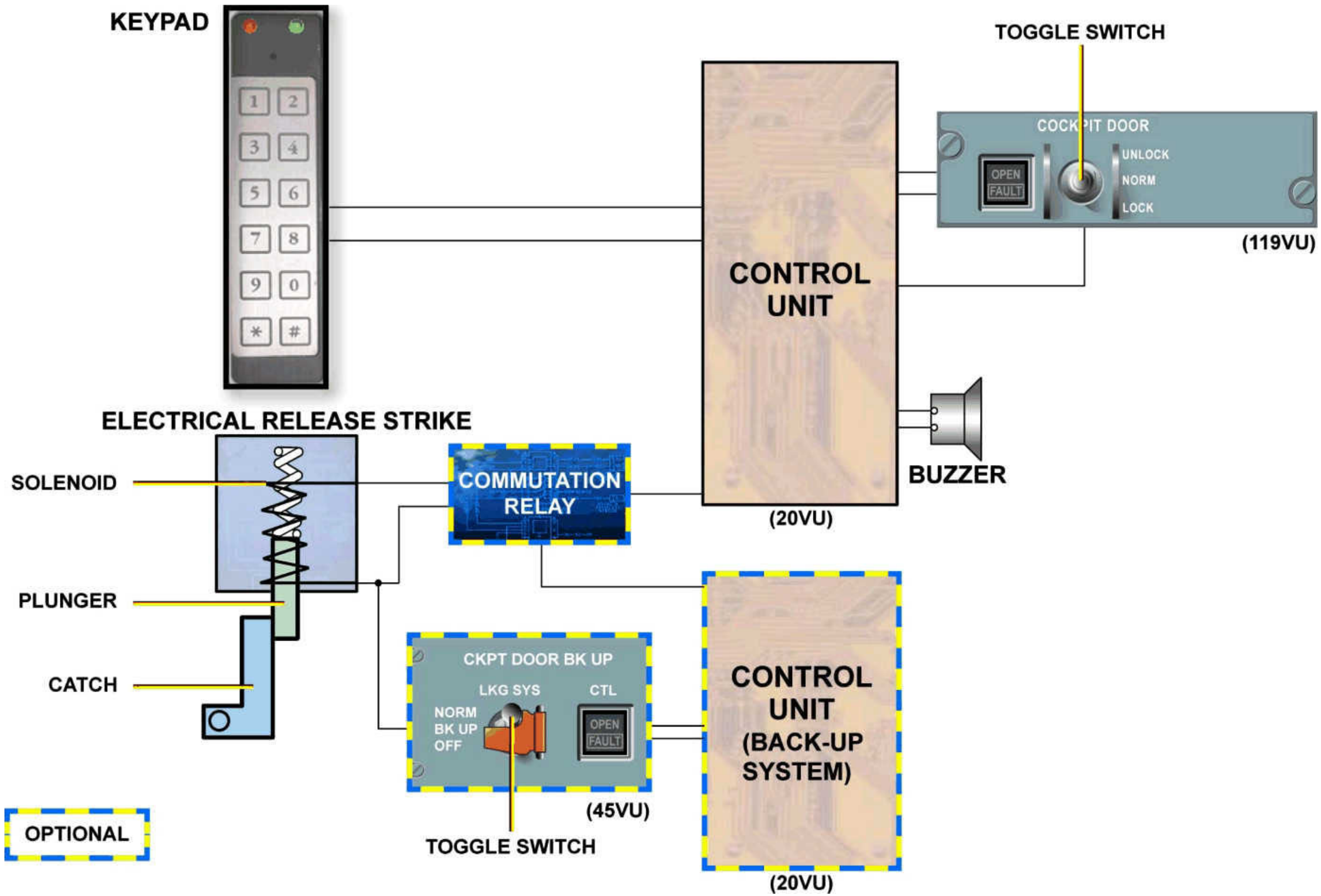


Figure 162 Cockpit Door Optional Back-Up System

COCKPIT DOOR SYSTEM FUNCTION

COCKPIT DOOR OPERATION

Routine Access from the Cabin Side

Push the ”#” pushbutton or enter a numbered pushbutton plus the ”#” pushbutton on the key pad. Then the buzzer comes on which tells the flight crew that an access into the cockpit is requested.

When the flight crew sets the toggle switch on the COCKPIT DOOR panel 119VU to the UNLOCK position this causes:

- the control unit to energize the solenoids of the electrical release strikes.

  This causes the plungers to retract so that they do not block their catches.
- the control unit to send a signal to the key pad so that its green LED comes on.

  The green LED on the key pad shows that:
  - the cockpit door is unlocked and access into the cockpit is available.

Push the cockpit door into the flight direction unitl the magnetic stop keeps it in its fully open position. Then the amber OPEN indication light on the COCKPIT DOOR panel 119VU comes. This shows that the cockpit door is open.

When the flight crew sets the toggle switch on the COCKPIT DOOR panel 119VU to the LOCK position this causes:

- the control unit not to energize the solenoids of the electrical release strikes.

  So their plungers remain extended and block their catches,
- the control unit to send a signal to the key pad so that its red LED comes on.

  The red LED on the key pad shows that:
  - the cockpit door is locked, an access into the cockpit is not given. In this case the operation of the key pad and the buzzer is prevented during a defined time (adjustable between 5min. and 15 min.).

The flight crew can cancel this function when by setting the toggle switch from the LOCK to the UNLOCK position.

NOTE: Cockpit Door Surveillance System see ATA 23–72.

Emergency Access from the Cabin Side

Enter the selected, four digit code plus the ”#” pushbutton on the key pad . This causes the buzzer to come on continuously and the green LED on the key pad to flash. Furthermore the OPEN indication light on the COCKPIT PANEL 119VU flashes in amber.

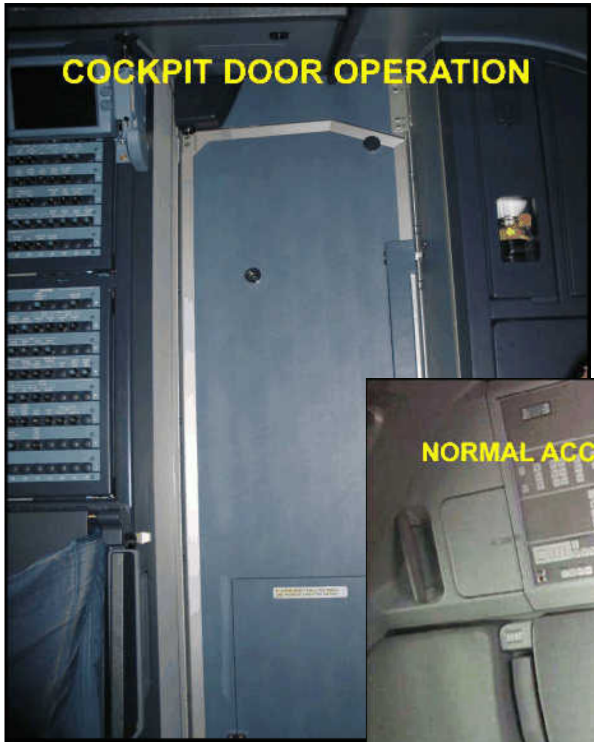
When the flight crew does not operate the toggle switch on the COCKPIT DOOR panel within a defined time (between 15 sec. and 2 min) this causes:

- the control unit to energize the solenoids of the electrical release strikes.

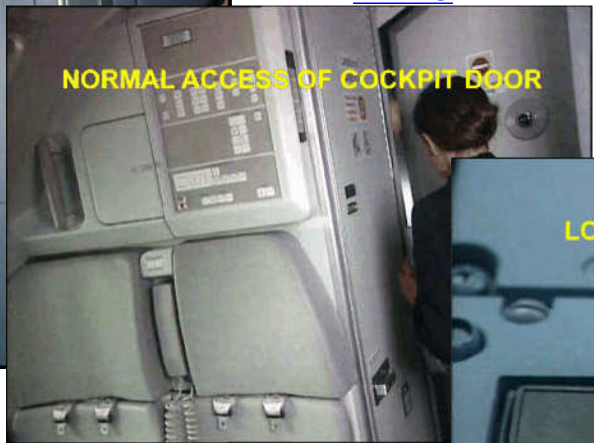
  This causes the plungers to retract so that they do not block their catches for 5 sec,
- the control unit to send a signal to the key pad. This causes the green LED to come on for 5 sec,
- –the OPEN indication light to come on in amber for 5 sec,
- the buzzer to go off. The green LED on the key pad shows that the cockpit door is unlocked and an access into the cockpit is possible.

Push the cockpit door into the flight direction until the magnetic stop keeps it in its fully open position. The OPEN indication light on the COCKPIT DOOR panel comes on to show that the cockpit door is open.

VIDEO



VIDEO



VIDEO

VIDEO

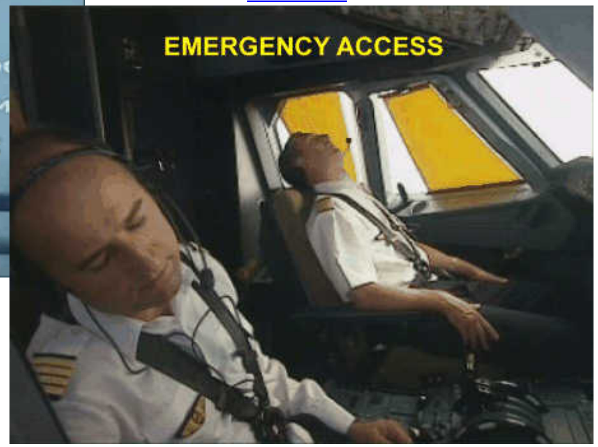
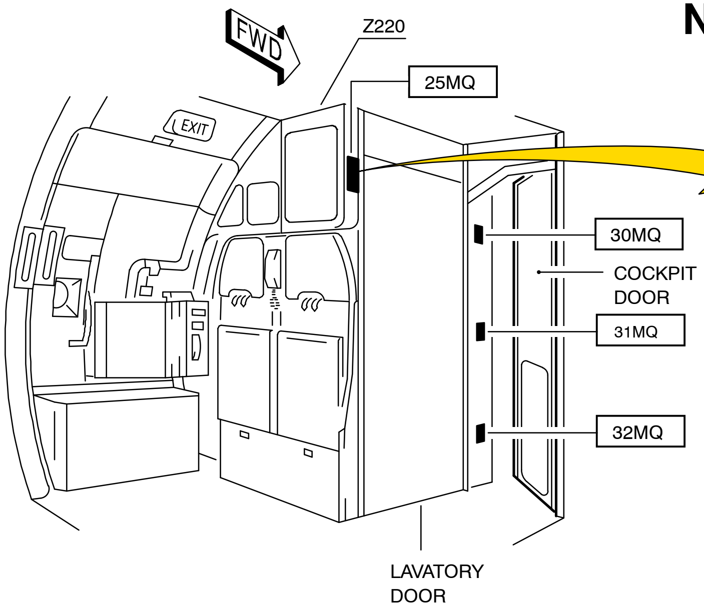
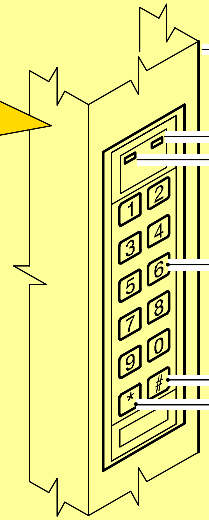


Figure 163 Cockpit Door Presentation



NORMAL ROUTINE ACCES



KEYPAD

“PRESS“
 # OR CODE (0 - 7 DIGITS) + #

PILOT CHECK AND DESCISION

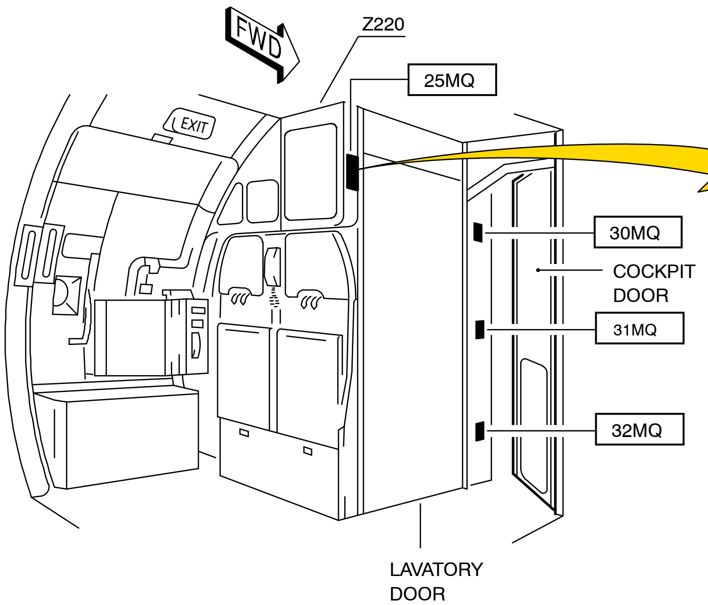
**2 SECONDS
BUZZER
(DEFAULT)**

UNLOCK
- **KEYPAD GREEN LED “ON“**
- **DOOR CAN BE PUSHED OPEN WHEN THE UNLOCK POSITION IS MAINTAINED**
- **OVERRIDES PREVIOUS ACTION**

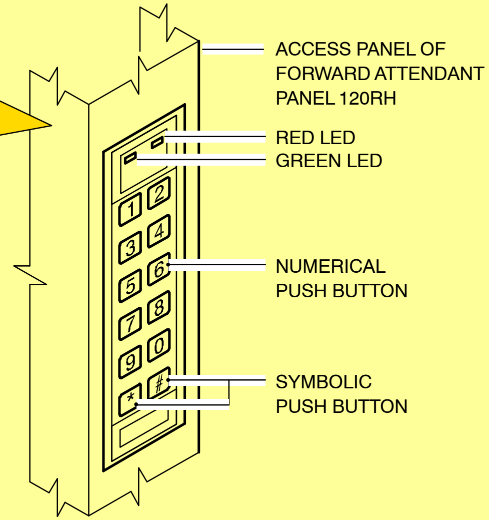
LOCK
- **KEYPAD RED LED “ON“**
- **DOOR REMAINS LOCKED**
- **KEYPAD AND BUZZER INHIBITED FOR A SET PERIOD**

NO REACTION
- **DOOR REMAINS LOCKED, OTHER TRIES POSSIBLE**
- **EMERGENCY ACCESS PROCEDURE CAN BE DECIDED BY CABIN CREW**

Figure 164 Normal Access of Cockpit Door



EMERGENCY ACCESS



KEYPAD

“PRESS“ CODE (4 DIGITS AIRLINE SECURITY CODE) + #

CONTINIOUS BUZZER

PILOT CHECK AND DESCISION

TIME OUT

LOCK
- KEYPAD RED LED “ON“
- DOOR REMAINS LOCKED
- KEYPAD, BUZZER AND EMERGENCY ACCESS INHIBITED FOR A SET PERIOD

NO RESPONSE
- 15 SEC TO 2 MIN TIMER STARTS
- GREEN LED FLASHES ON KEYPAD
- OPEN INDICATION FLASHES IN THE COCKPIT (CONTROL PANEL)
- BUZZER SOUNDS UNTIL PILOT RESETS OR DOOR OPENS

UNLOCK
- DOOR UNLOCKS FOR 5 SEC
- KEYPAD GREEN LED “ON“
- BUZZER STOPS

Figure 165 Emergency Access Of Cockpit Door

COCKPIT DOOR OPENING FROM COCKPIT SIDE

Opening of the Door from the Cockpit Side

Cockpit crew switches door to open by using the toggle switch. The power is cut off to the solenoids mounted on the electrical strikes. The strike solenoid coils magnetic field collapses allowing the plungers to move free of the catches.

The catch is now allowed to swing freeing the latch bolts. A simple push or pull of the door will allow the door bolts to overcome the catch return springs on the electrical strikes and allow the door to open.

In a rapid decompression event the same principle applies. The signal to 'switch of the solenoids comes from decompression sensors in the control unit.The airflow will swing the door to open.

The cockpit door can also be opened by a mechanical override in any case at any time. This item will be provided from the door bolting system.

A D-Ring has to be turned about 90°, this retracts the springloaded bolts on the three latches. Once the bolts are free from the catches of the electric strikes, the door can be pulled open.

Decompression Features

Part of the cockpit door locking system is a redundant pressure sensor located in the control unit, for an immediate door release in case of a sudden pressure loss in the cockpit.

The door surface then is used as a decompression panel.

- the airflow will swing the door open and allow venting between cockpit and cabin

This part of the system is designed without the use of software.

Furthermore additional ventilation surface is provided by replacement of cockpit floor panels underneath the center pedestal for the case of rapid pressure loss in the cockpit.

If the door cannot be opened normally, you can remove the door escape hatch:

- disengage the two pip-pins from the pip-pin brackets of the cockpit door to release the door escape hatch,
- then push it in the rear direction so that the cut-out section of the cockpit door is free.

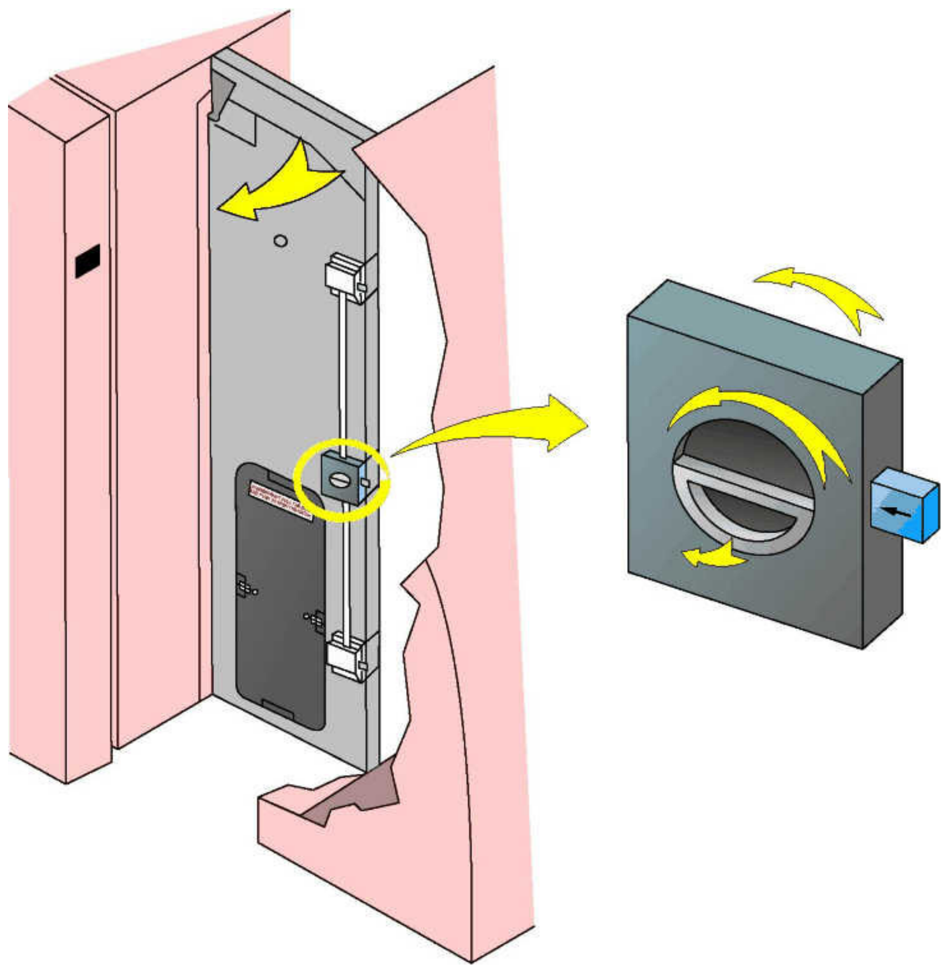


Figure 166 Normal Opening From Cockpit

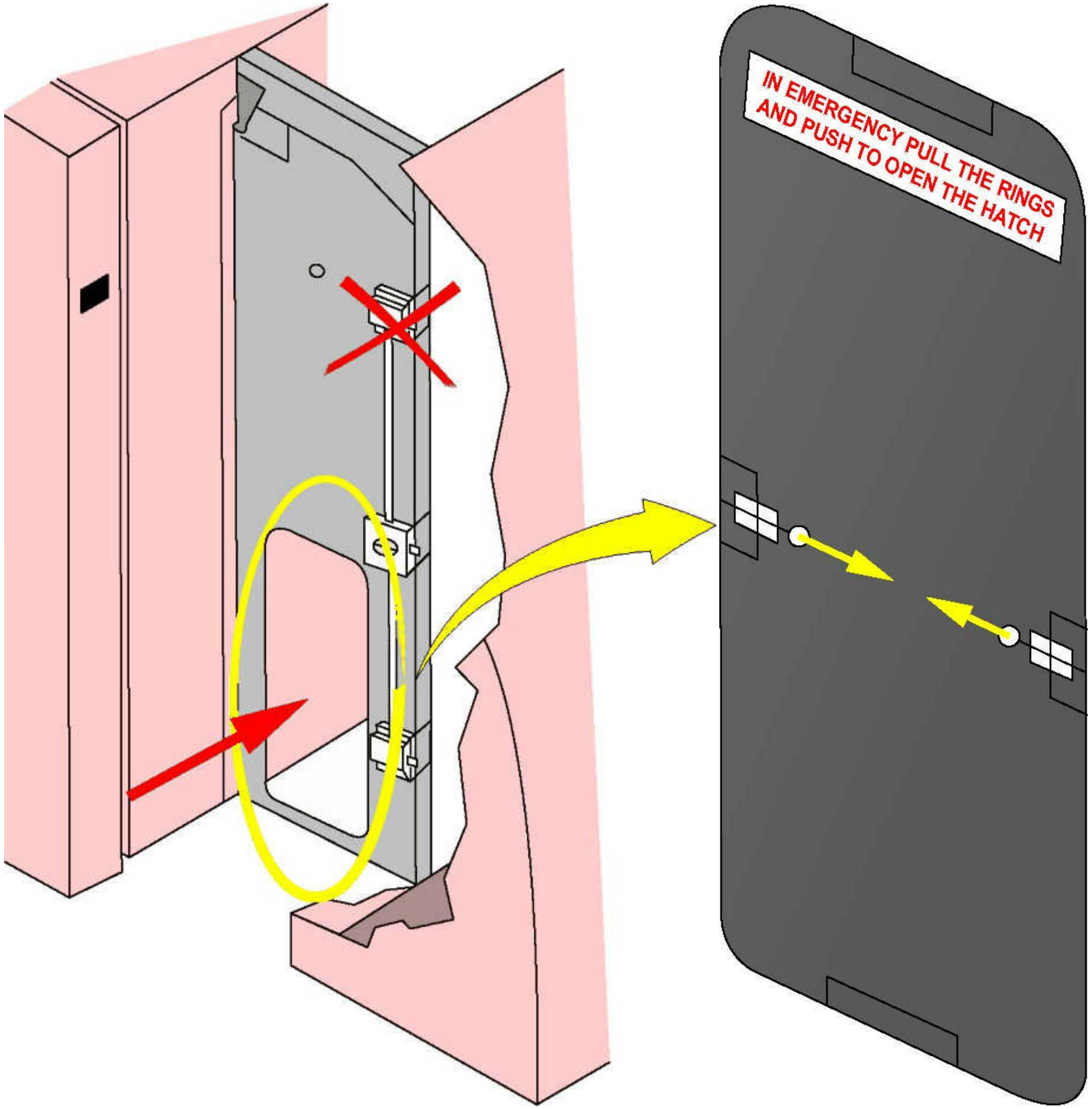


Figure 167 Cockpit Door Emergency Opening

COCKPIT DOOR COMPONENT DESCRIPTION

COCKPIT DOOR LOCKING SYSTEM (CDLS) GENERAL

For cockpit security, the cockpit door is equipped with an electro-mechanically operated release system: the CDLS. A keypad is installed on the Forward Attendant Panel (FAP) side. On the front face there are two red and green LEDs and twelve P/BSWs with the legends 0 to 9, "*" and "#". A buzzer is installed in the cockpit ceiling panel. A signal from the control unit operates the buzzer for a minimum of 2 seconds.

A toggle switch is installed on the cockpit door panel on the center pedestal. It is a three-position switch: UNLOCKed, NORMal and LOCKed. It is spring-loaded so that it returns automatically to the NORM position. This is the neutral position in which the closed cockpit door is automatically locked.

An indication light is installed on the cockpit door panel. The indication is an OPEN legend and a FAULT legend. The OPEN legend comes on amber when the cockpit door is opened. The FAULT legend also comes on amber when there is a malfunction in the CDLS.

Three electrical release strikes are installed on the lavatory sidewall opposite the door latch mechanism. Each of the electrical release strikes has a micro switch activated by the latch when the solenoid is operated. The plunger then extends so that the catch is blocked, or retracts so that the catch is free. The center electrical release strike has an additional micro switch that monitors the condition of the center latch mechanism. When its tenon does not engage with the catch, the OPEN indication light comes on.

NOTE: A deadbolt closes the door manually from the cockpit side in case of total CDLS lost to insure A/C operation under MMEL conditions.

The control unit is installed on the overhead panel. It has the legends CocKPiT DOOR CONTrol, STRIKE TOP, MIDdle and BOTtom and CHANnel 1 and CHAN 2. This unit manages the fault indications, time delays and door access control of the CDLS. To ensure functionality of the CDLS under Minimum Equipment List (MEL) conditions, a second, optional control unit can be installed on the overhead panel, as a back-up system. They have two internal pressure sensors that operate if a rapid decompression occurs in the flight compartment, which de-energizes the solenoids. The microprocessor receives signals from the toggle switch and the keypad. It sends a signal to operate the buzzer, the indication light, the green or red LED of the keypad and the solenoids of the electrical release strikes.

If a fault occurs in the pressure sensors, the related CHAN 1 or CHAN 2 LED comes on, and the amber FAULT light comes ON on the cockpit door panel. If a fault occurs in the electrical release strikes, the related strike LED comes on and the amber FAULT light comes ON on the cockpit door panel and the back-up control unit takes over.

NOTE: If a rapid decompression occurs, the door is blown open by the flow of air through the A/C.

The CKPT DOOR BacK UP panel is a back-up system which is activated via an override switch named LocKinG SYStem, under one of the following conditions:

- FAULT illuminated on the basic system due to CHAN 1 and CHAN 2 fault,
- basic system malfunction.

COMPONENTS OF THE COCKPIT DOOR LOCK-SYSTEM

Indication Light 22MQ

The indication light 22MQ is installed in the COCKPIT DOOR panel 119VU of the center pedestal. The indication light 22MQ is divided into the OPEN legend and the FAULT legend.

The OPEN legend comes on in amber when the cockpit door is opened. The FAULT legend also comes on in amber when there is a malfunction in the CDLS.

Key pad 25MQ

The key pad 25MQ is an electronic unit, installed at the forward attendant panel 120RH. There are two LED's (red and green) and twelve pushbutton switches with the legends 0 thru 9, '*' and '#' on the front face. The logic of the key pad is divided into the "Routine Access" and the "Emergency Access".

For the "Routine Access" you must enter the "#" pushbutton (or a numbered pushbutton plus the "#" pushbutton) to announce the access to the cockpit.

For the "Emergency Access" you must enter the numerical emergency entry code and the "#" pushbutton. The green LED comes on when the flight crew allows entry into the cockpit. The red LED comes on when the flight crew does not allow entry into the cockpit.

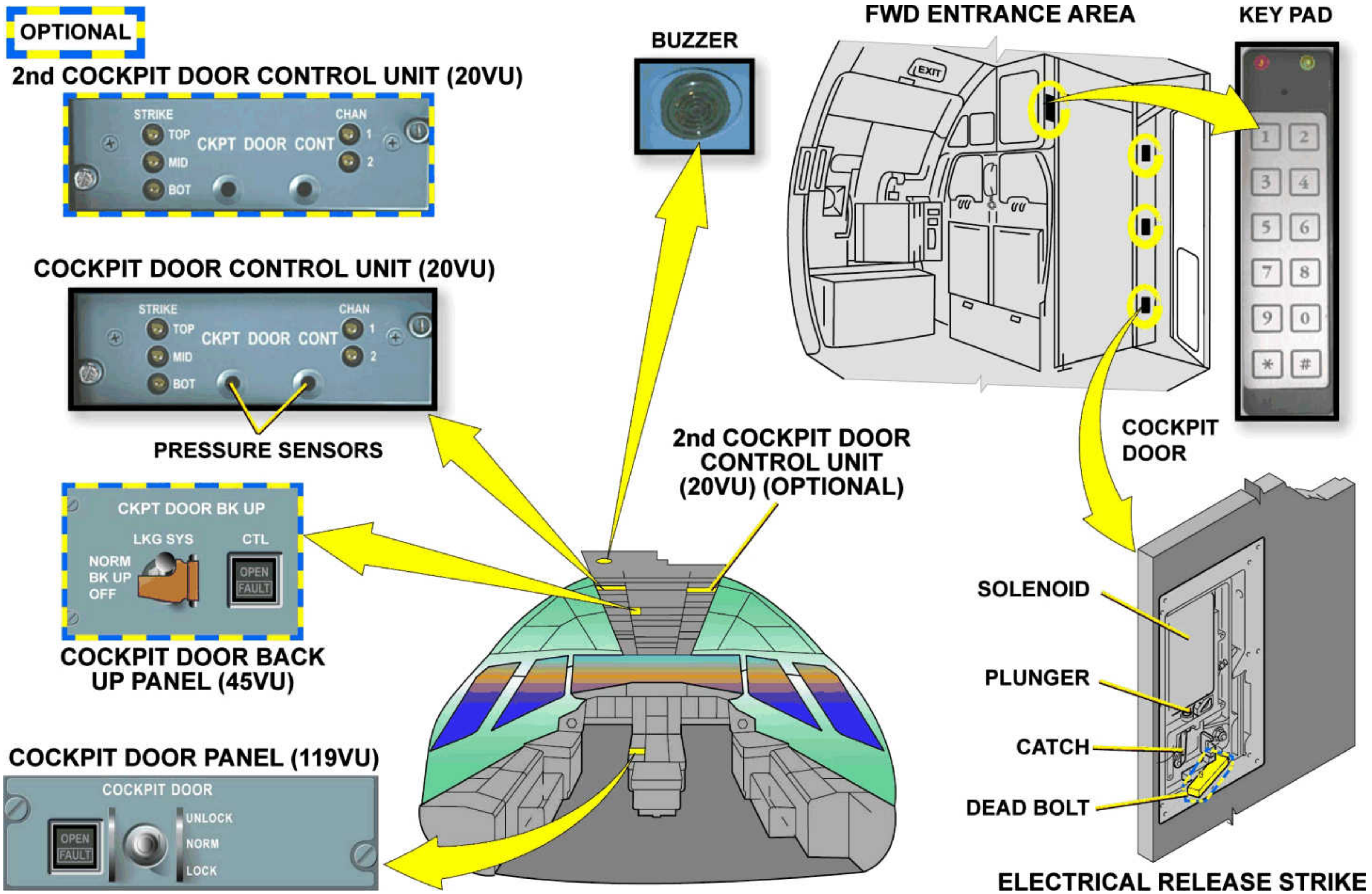


Figure 168 CDLS Description

Buzzer 23MQ

The electrical buzzer 23MQ is installed in the ceiling panel 211HC of the cockpit. A signal from the control unit 24MQ operates the buzzer.

Toggle Switch 26MQ

The toggle switch 26MQ, installed in the COCKPIT DOOR panel 119VU is a three position switch (UNLOCK, NORM and LOCK). The toggle switch is spring-loaded so that it returns to the NORM position automatically. The position NORM is the neutral position in which the closed cockpit door is automatically locked. In the UNLOCK position, the cockpit door is released so that you can push it open.

When you select this function it overrides or resets any previous operations. In the LOCK position the operation of the buzzer 23MQ and the keypad 25MQ is cancelled. After a pre-selected time between 5 min. and 15 min. the operation is possible again.

Top, Center and Bottom Electrical Release Strikes 30MQ, 31MQ & 32MQ

Each electrical release strike has an aluminium housing which includes the solenoid, the plunger, the catch and the Polymer Positive Temperature -Coefficient (PPTC) assembly.

The solenoid has two coils and one high-energy spring:

- one coil (referred to as the push coil) pushes the plunger to the extended position,
- the other coil (referred to as the hold coil) holds the plunger in the extended position,
- the high-energy spring pulls the plunger to the retracted position, when the hold coil is de-energized.

When the push coil is energized, the plunger extends and puts a load on the high-energy spring. If the plunger is fully extended, the push coil is de-energized and the hold coil is energized to hold the plunger in this position.

When the hold coil is also de-energized, the high-energy spring retracts and the plunger moves quickly to the retracted position.

All the electrical release strikes have an internal sensor, which operates the solenoid when it receives an applicable signal. Then, the plunger extends and the catch is blocked or it retracts and the catch is free.

The PPTC assembly is a thermal fuse that prevents an overheat condition of the solenoid. This malfunction can occur during a blockage of the catch if the push coil stays energized.

The center electrical release strike (31MQ) has two external microswitches installed on the housing. One microswitch monitors the closed and locked condition of the center latch mechanism. When its tenon disengages from the catch,this causes the OPEN legend of the indication light 22MQ to come on.

The other microswitch monitors the position of the catch to show an incoorectly locked condition. This can occur if the still extended plunger blocks the operated catch and prevents its movement.

Control Unit 24MQ

The control unit 24MQ is installed in the overhead panel 20VU. This panel has the white legends CKPT DOOR CONT, the STRIKE TOP, MID and BOT and the CHAN 1 and CHAN 2. The control unit controls the logic (fault indications, time delays and door access control) of the cockpit door lock-system. It has two internal pressure sensors which starts the fault logic sequence if a rapid decompression in the cockpit occurs. This can also occur during the pressurization test of the fuselage.

The microprocessor of the control unit receives signals from:

- the toggle switch 26MQ,
- the key pad 25MQ.,

The microprocessor sends a signal to operate:

- the buzzer 23MQ,
- the indication light 22MQ,
- the green or red LED of the key pad 25MQ,
- the solenoids of the three electrical release strikes 30MQ, 31MQ and 32MQ.

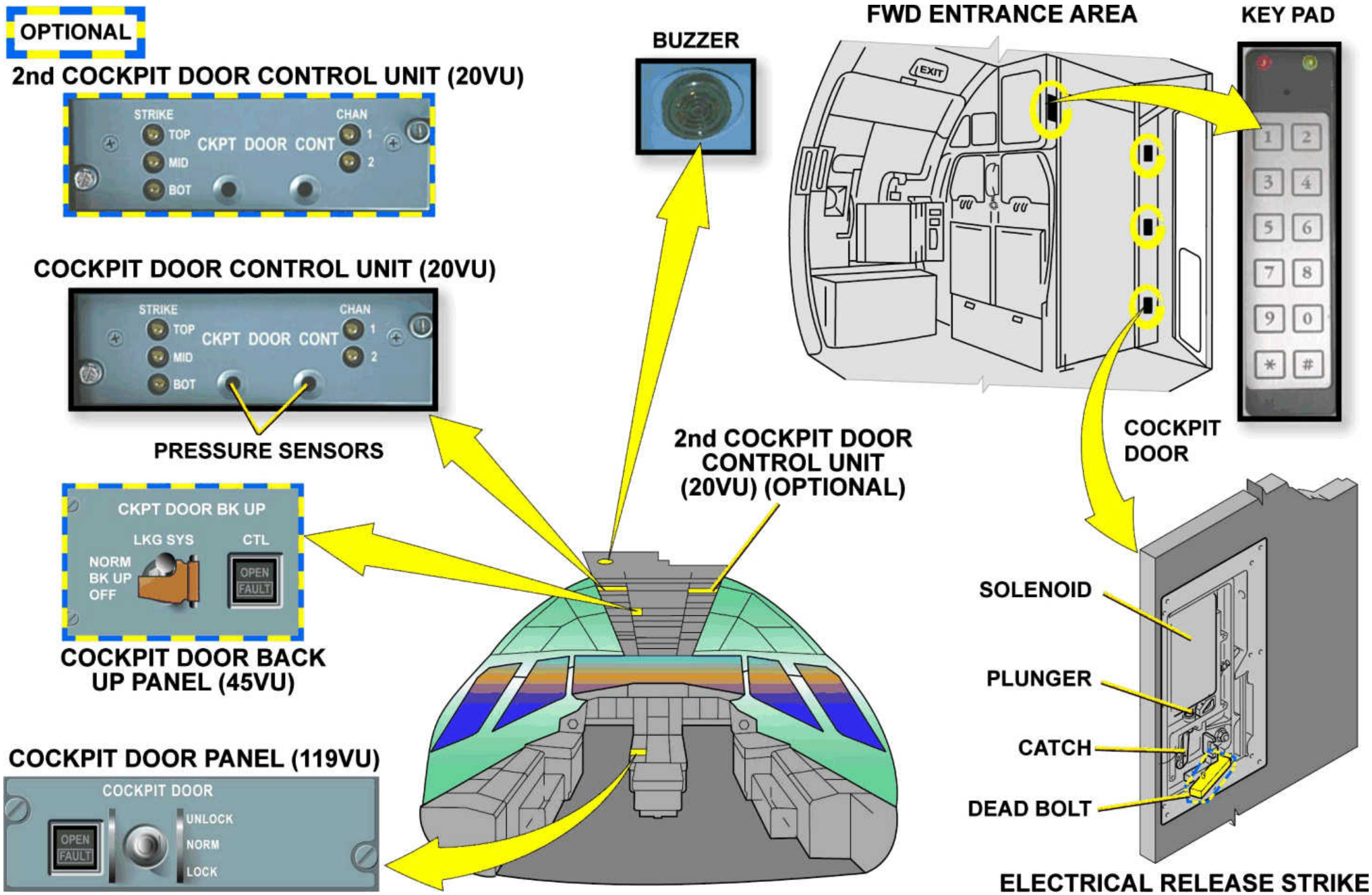


Figure 169 CDLS Components

52–30 CARGO

CARGO DOORS GENERAL

Differences Between A318 and A319–A321

The A318 forward and aft cargo doors are smaller.

The new cargo door width is reduced from 1.82 m (71.5 in) to 1.28 m (50.5 in).
The underfloor cargo offers a usable volume of 21.21 m3.

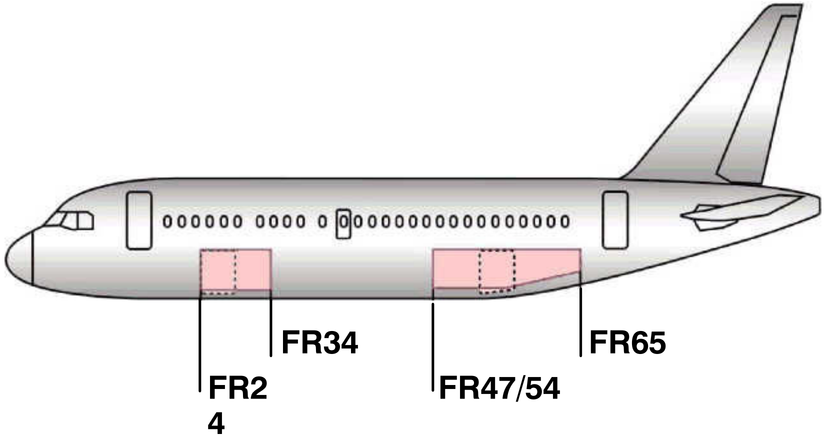
There is no containerized cargo system option.

**A320 FAMILY
FWD CARGO DOOR**

**A320 FAMILY
AFT CARGO DOOR**

**A320 FAMILY CARGO DOORS SIZE:
WITDH 1.82 m / HEIGHT 1.24 m**

**A318 CARGO DOORS SIZE:
WITDH 1.28 m / HEIGHT 1.24 m**



**A318
FWD CARGO DOOR**

**A318
AFT CARGO DOOR**

**A318 CARGO COMPARTMENT
USABLE VOLUME:**

FWD:	**6.51 m^3**
AFT:	**14.70 m^3**
TOTAL:	**21.21 m^3**

Figure 170 Cargo Doors

ENHANCED CARGO DOOR HYDRAULIC SYSTEM OPERATION

GENERAL

The cargo−compartment door hydraulic−system controls the operation of the FWD and aft cargo−compartment doors. The hydraulic system of each door has a hydraulic actuator and a manual selector valve, but the yellow electric pump, the electric selector valve, the hand pump and the double check valve are common to both cargo doors.

NOTE: The double check valve depressurizes the cargo door system after operation and prevents loss of reservoir pressure and hydraulic fluid after a leak.

Normal Opening

CAUTION: BEFORE OPENING A CARGO DOOR, IT IS NECESSARY TO MAKE SURE THAT THE APPROPRIATE CARGO−COMPARTMENT DOOR IS UNLOCKED AND UNLATCHED.

To operate the door hydraulic system, set the door operation lever on the control panel to the OPEN position and hold it. This moves the manual selector valve to the extension position. Then, a signal is sent through the Landing Gear Control and Interface Unit (LGCIU) 2 which starts the yellow electric pump to supply the hydraulic fluid.

The electric selector valve is energized open and releases the pressure to the manual selector valve.

The door actuator extends and opens the cargo compartment door outwards. When the cargo compartment door is fully opened, the green indicator light on the control panel comes on to indicate that the door actuator is mechanically locked in its extended position.

Normal Closing

Before operating the door hydraulic system make sure that the door sill latches are lifted. The door sill latches operate micro switches which either enable cargo door operation when in the raised position, or cargo loading system operation when lowered.

The door operation lever is turned towards the CLOSE position and it stops in the intermediate position then the pump starts.

The electric selector valve is energized open to release the pressure to the manual selector valve.

The intermediate position is a safety position. The door actuator is first pressurized on both sides to prevent a sudden movement of the door when the actuator mechanical lock is released, what could cause a damage of the lock.

When the pressure is then sufficient the blocking piston retracts and the manual selector valve can be moved further to the fully close position.

NOTE: The manual selector valve remains in the intermediate position until the pressure reaches 20 bars (290 psi) in the blocking piston.

The manual selector valve can move to supply the door actuator for closing.

NOTE: The door must be latched and locked within a minute to prevent re−opening due to internal leakage.

Manual Operation

With no electrical power available on the aircraft the yellow electric pump is not available, and the manual selector does not energize the electric selector valve. In this case the hand pump on the yellow hydraulic panel must be used to operate the door hydraulic system manually.

A second person is needed to operate the hand pump. The operating handle for the hand pump has to be taken from the green hydraulic system service panel. The further operation for opening and closing is identical with the door normal operation.

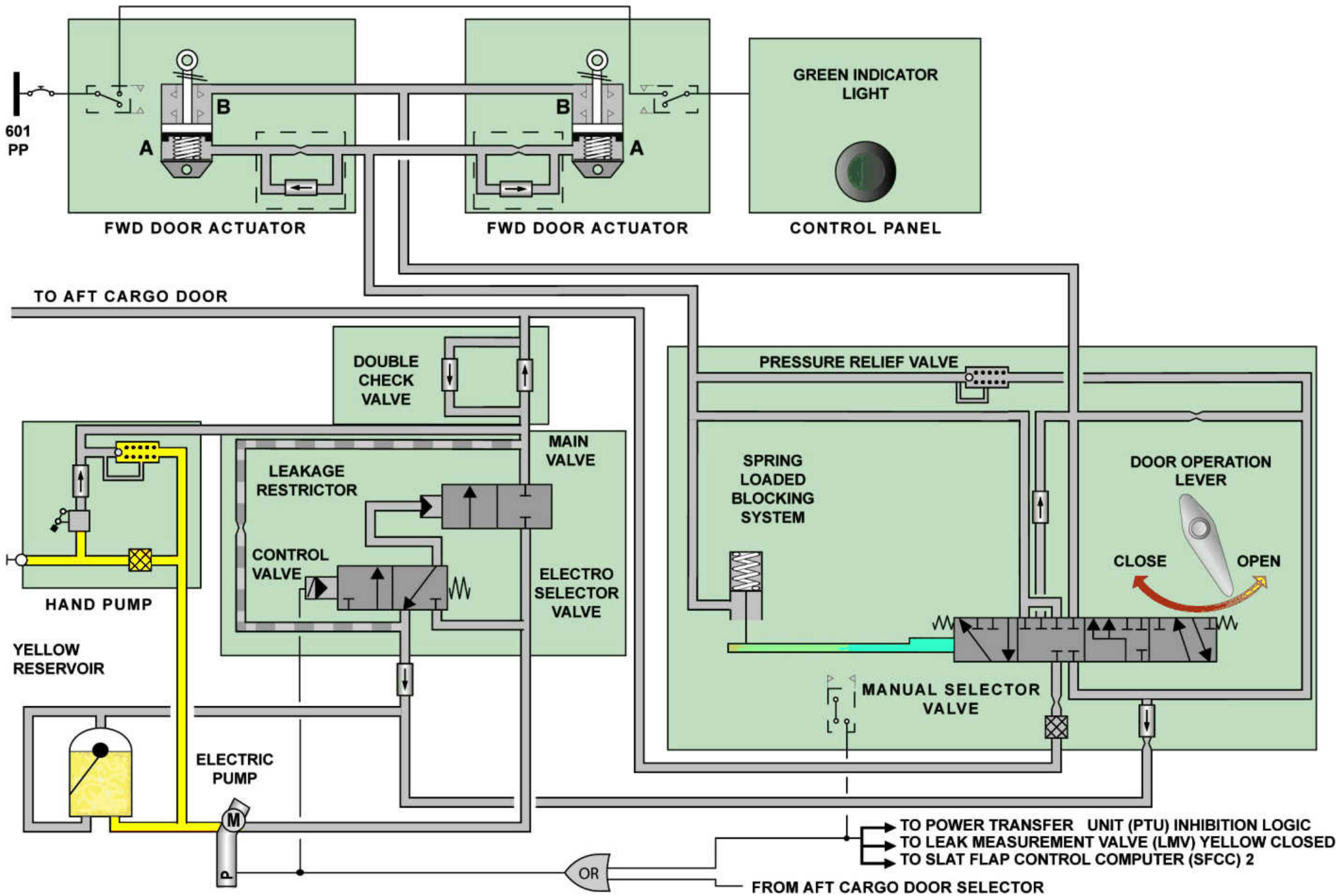


Figure 171 Cargo Door Enhaced Hydraulic Schematic

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