MPC 75

MPC AIRCRAFT

SYSTEM DEFINITION

MPC 75

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2103 Hamburg 95
West-Germany
JET-E System Engineering
Ref: EE-T-90/025
September 1990

Released:

DRAFT

MPC AIRCRAFT

CONTENTS

ABBREVIATIONS

MPC AIRCRAFT

A	Attendant Seat
AC	Alternating Current
ACARS	ARINC Communication Addressing and Reporting System
ACMS	Aircraft Conditioning Monitoring System
ACP	Audio Control Panel
ACU	APU Control Unit
ADF	Automatic Direction Finding
ADM	Air Data Module
ADS	Air Data System
AFT	Afterward
Ah	Ampere-hour
AHRS	Attitude Heading Reference System
ALT	Altitude
AMM	Aircraft Maintenance Manual
AOA	Angle of Attack
APU	Auxiliary Power Unit
ATC	Air Traffic Control
B	Blue
BAT	Battery
BFE	Buyer Furnished Equipment
BITE	Built-in Test Equipment
BMC	Bleed Air Monitoring Computer
BRT	Bright
BSCU	Brake and Steering Control Unit
CAA	Civil Aviation Authority
CAB	Cabin
CAPT	Captain
CAUT	Caution
CDU	Control Display Unit
CFDS	Centralized Fault Display System
CIDS	Cabin Integrated Data System
CMC	Centralized Maintenance Computer
CMS	Centralized Maintenance System
COND	Condition
CPM	Computer Modules
CSM/G	Constant Speed Motor/Generator
CTL	Control
CU	Control Unit
Cu.ft	Cubic Feet
DC	Direct Current
DET	Detection
DEU	Decoder/Encoder
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
DMP	Display Management Processor
DU	Display Unit
ECAM	Electronic Centralized Aircraft Monitoring
ECS	Environmental Control System
ECU	Engine Control Unit
EE(E/E)	Electronic/Electrical
EFCS	Electronic Flight Control System
EFIS	Electronic Flight Instrument System
EIS	Electronic Instrument System
EIVMU	Engine Interface Vibration Monitoring Unit
EIU	Engine Interface Unit
ELAC	Elevator Aileron Computer
ELEV	Elevation
ELS	Electronic Library System
EMERG	Emergency
ENG	Engine
ESS	Essential
E/WD	Engine/Warning Display
EXT	External
FAC	Flight Augmentation Computer
FADEC	Full Authority Digital Engine Control System
FBW	Fly-By-Wire
FCGC	Flight Control and Guidance Computer
FCU	Flight Control Unit
FDIU	Flight Data Interface Unit
FL	Flight
FMC	Flight Management Computer
FMGC	Flight Management and Guidance Computer
FMS	Flight Management System
F/O	First Officer
FQCC	Fuel Quantity Control Computer
FQIC	Fuel Quantity Indication Control
FQMS	Fuel Quantity Measuring System
FSDU	Fire Source Detection Unit
FWD	Forward
FWS	Flight Warning System
G	Galley
G	Green
GCU	Generator Control Unit
GLC	Generator Line Contactor
GPCU	Ground Power Control Unit
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GRD	Ground
GS	Glide Slope
H	High
h	hour
HF	High Frequency
HP	High Pressure
HS	High Speed
HYDR	Hydraulic
ICAO	International Civil Aviation Organisation
IDG	Integrated Drive Generator
ILS	Instrument Landing System
in	inch
IOM	Input and Output Modules
IPC	Illustrated Parts Catalog
IRS	Inertial Reference System

ABBREVIATIONS

MPC AIRCRAFT

L	Lavatory
l	litre/liter
LA	Linear Accelerometer
lb	Pound
LCD	Liquid Crystal Display
LDG	Landing
LGCIU	Landing Gear Control Interface Unit
LH	Left Hand
LOC	Localizer
LP	Low Pressure
LRU	Line Replaceable Unit
LT	Light
M	Motor
MAGN	Magnetic
MCDU	Multipurpose Control Display Unit
MCU	Modular Concept Unit
MDDU	Multipurpose Disk Drive Unit
MEL	Minimum Equipment List
MKR	Marker
MLI	Magnetic Level Indicator
MLS	Microwave Landing System
MSU	Mode Selector Unit
NAI	Nacelle Anti Ice
NAV	Navigation
ND	Navigation Display
NiCd	Nickel Cadmium
OMS	On-Board Maintenance System
PCU	Power Control Unit
PFD	Primary Flight Display
Ph	Phase
PSM	Power Supply Module
PSU	Passenger Service Unit
PWR	Power
QAR	Quick Access Recorder
RA/RALT	Radio Altimeter
RAT	Ram Air Turbine
RF	Radio Frequency
RH	Right Hand
RMCU	Remote Magnetic Compensation Unit
RMP	Radio Management Panel
RS-232	Seviell Data Bus Standard
S	Stowage
SATCOM	Satellite Communication
SD	System Display
SEC	Spoiler Elevator Computer
SEL	Select
SELCAL	Selective Calling
SERV	Servo
SFCC	Slat and Flap Control Computer
TAS	True Air Speed
TAT	Total Air Temperature
TDB	To-Be-Determined
TCAS	Traffic Collison Alert and Avoidance System
THS	Trimable Horizontal Stabilizer
TLA	Throttle Lever Angle
TRU	Transformer Rectifier Unit
US	United States
USgal	United States gallon
VHF	Very High Frequency
VOR	VHF Omnidirectional Range
V/S	Vertical Speed
W	Wardrobe
W	Width
WAC	Warning Acquisition Concentrators
WAI	Wing Anti Ice
WXR	Weather Radar
Y	Yellow

Contents

Air conditioning pack schematic

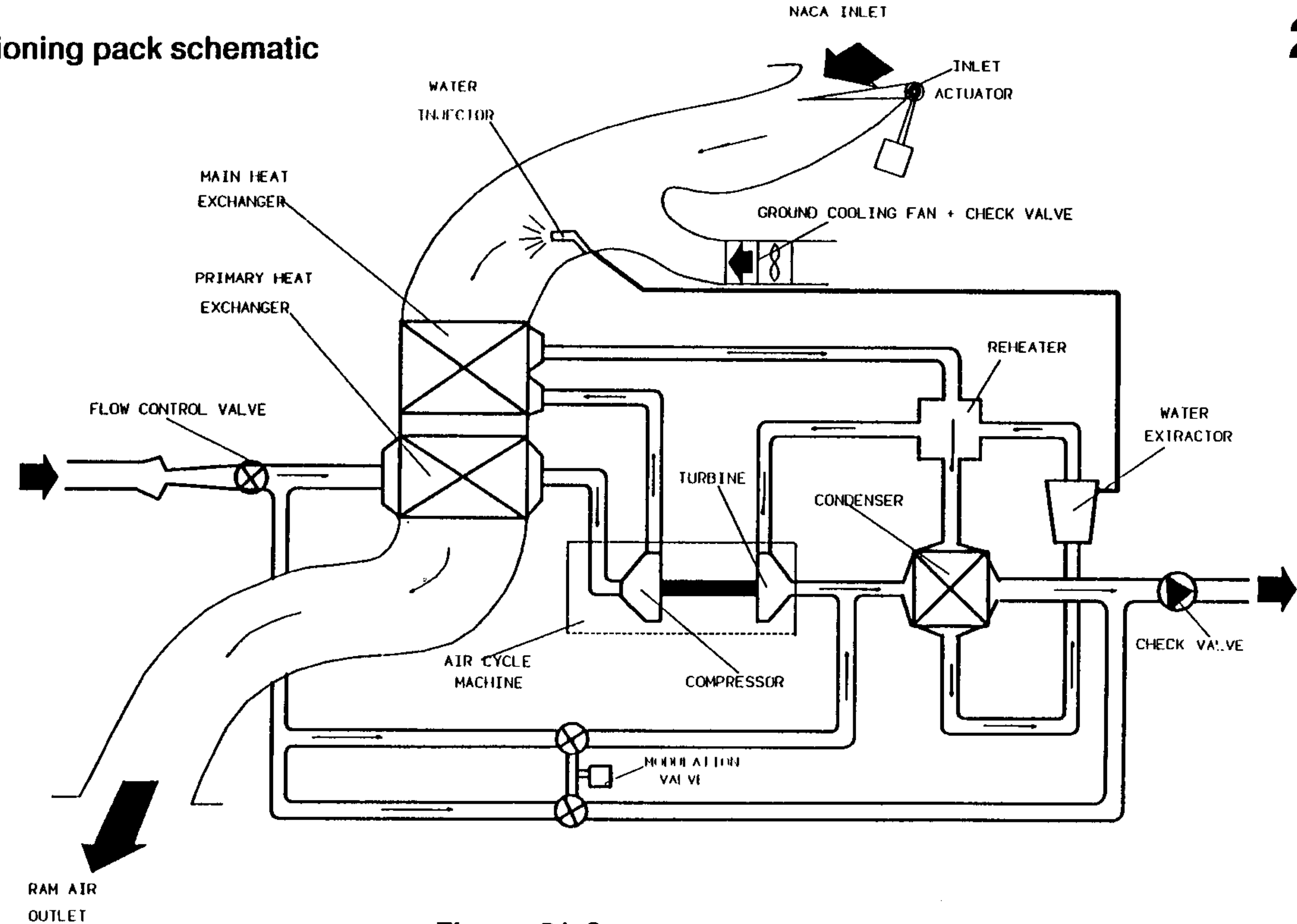


Figure 21-2

Air distribution

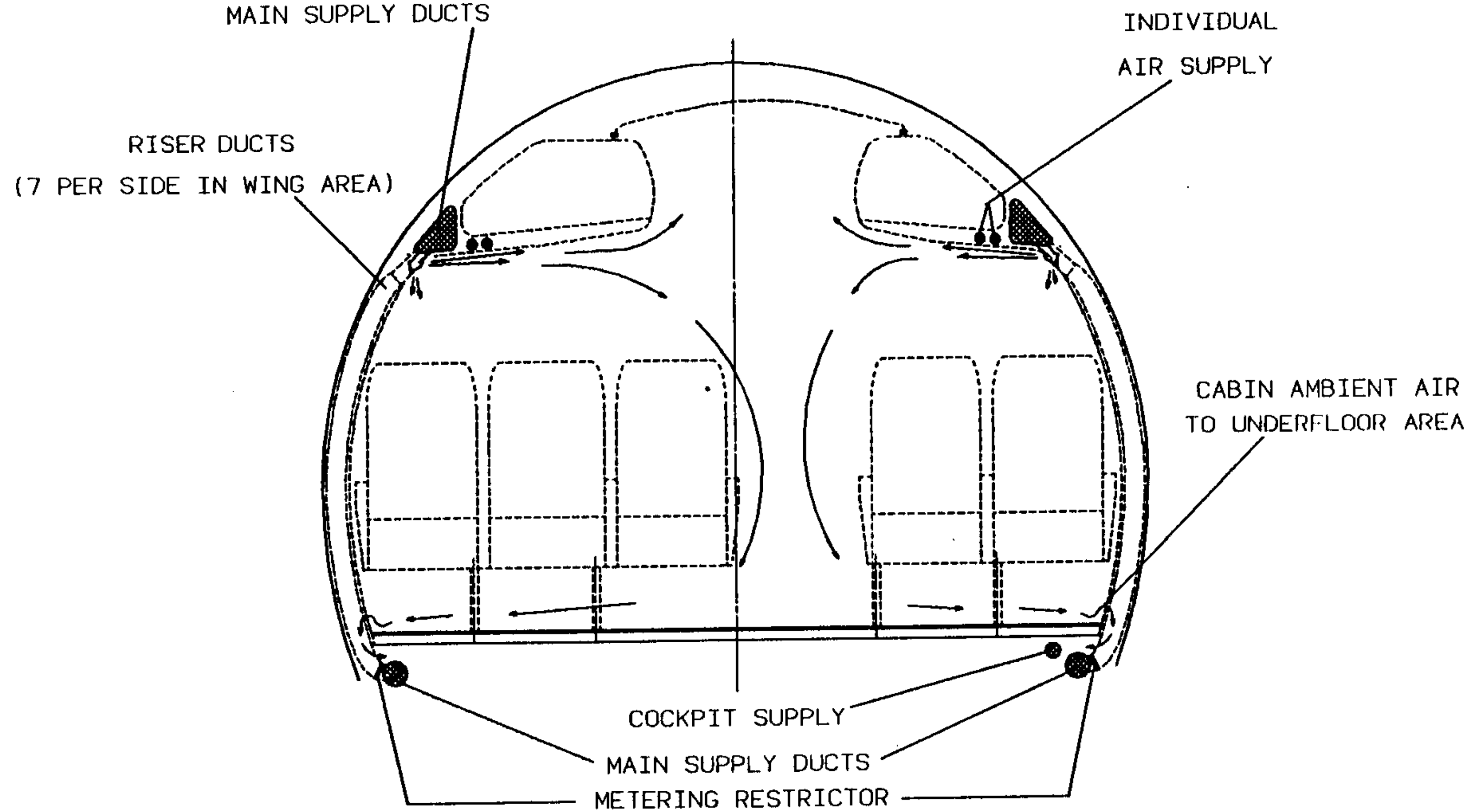


Figure 21-3

2 – Cabin pressure control system

The cabin pressure control system controls the cabin pressure and the change rate to provide maximum passenger comfort and safety.

The pressure control system consists of an automatic system and a manual standby system to control the outflow valve.
Provision for an optional second pressure controller is provided (see figure 21-4). Excessive positive or negative cabin overpressure is prevented by two pneumatically controlled safety valves.
Automatic prepressurisation to prevent sudden pressure fluctuation (bumps) on take off and landing, is provided in AUTO mode.

Cabin pressurisation control schematic

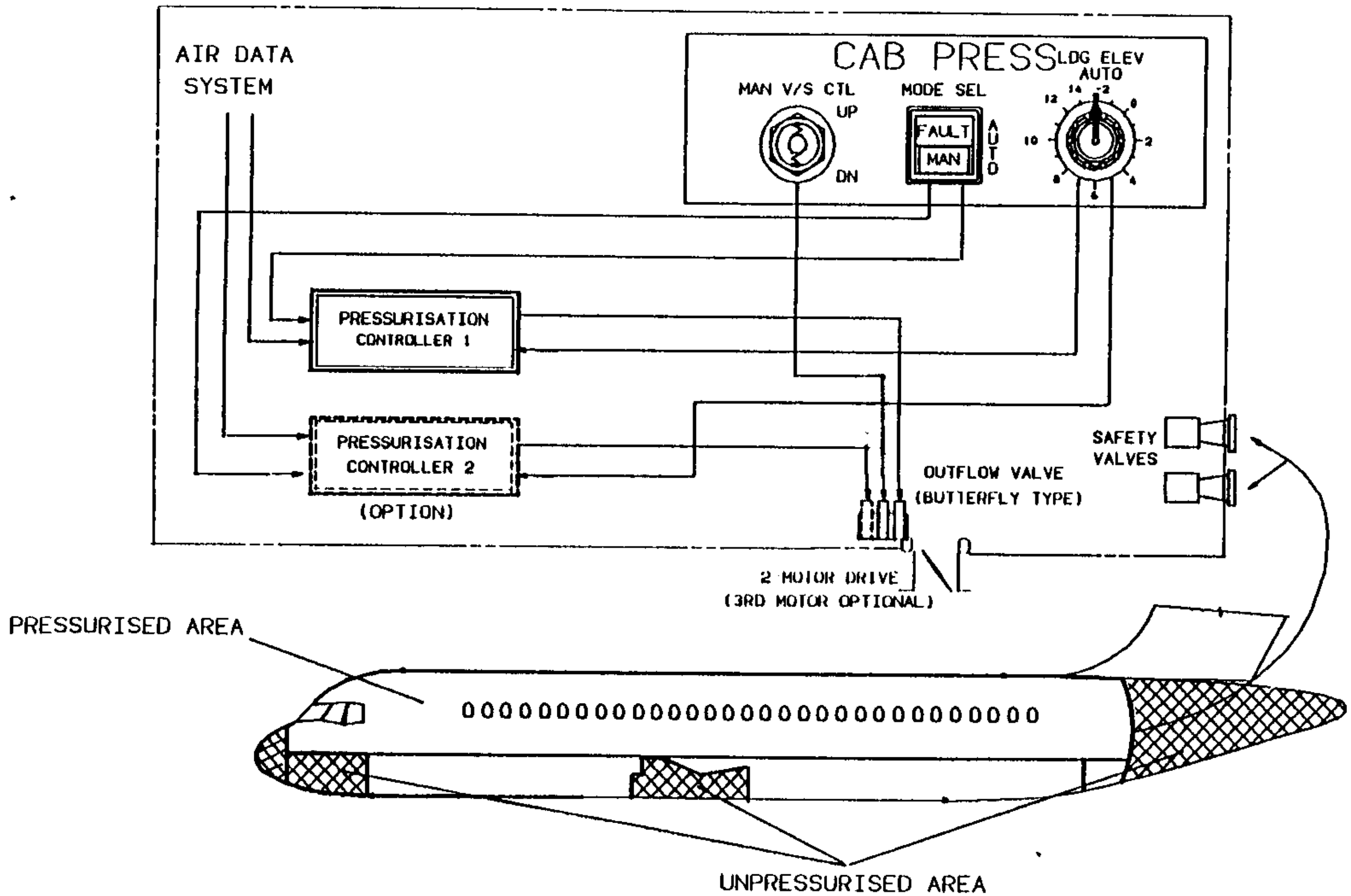


Figure 21-4

Contents

Auto Flight Modes - General

- AP/FD can either be selected at the flight control unit (FCU)

  or provided by the FMS according to active flightplan

- Basic Flight Control mode is always in accordance with the electrical flight control system (EFCS) and always engaged

Autopilot / Flight Director Modes

Selectable upper modes

1. Longitudinal Modes

- altitude hold	ALT
- altitude acquire	ALT ACQ
- flight level change	FLCH
- profile	PROF
- climb	CLB
- descent	DES
- flight path angle	FPA

2. Lateral Modes

- heading	HDG
- track	TRK
- navigation (incl. VOR)	NAV

3. Approach Modes

- approach	APPR
- go around	GA
- take-off	TO
- localiser	LOC

Autothrust Modes

- A/THR permanently armed
- Autothrust modes in association to autopilot / flight director mode

AP / FD	A/THR modes
ALT, ALT ACQ, FPA	SPD/MACH
DES, CLB, PROF	SPD/MACH, THR
FLCH	THR
APPR - FINAL	SPD
- G/S	SPD
- FLARE	RETARD
TO/GA	A/THR function overridden

- SPD / MACH speed/mach mode selectable

  THR thrust mode, limit thrust according to selected thrust rating

- Alpha Floor Protection overrides all modes with GA limit thrust if A/C flight envelope is exceeded

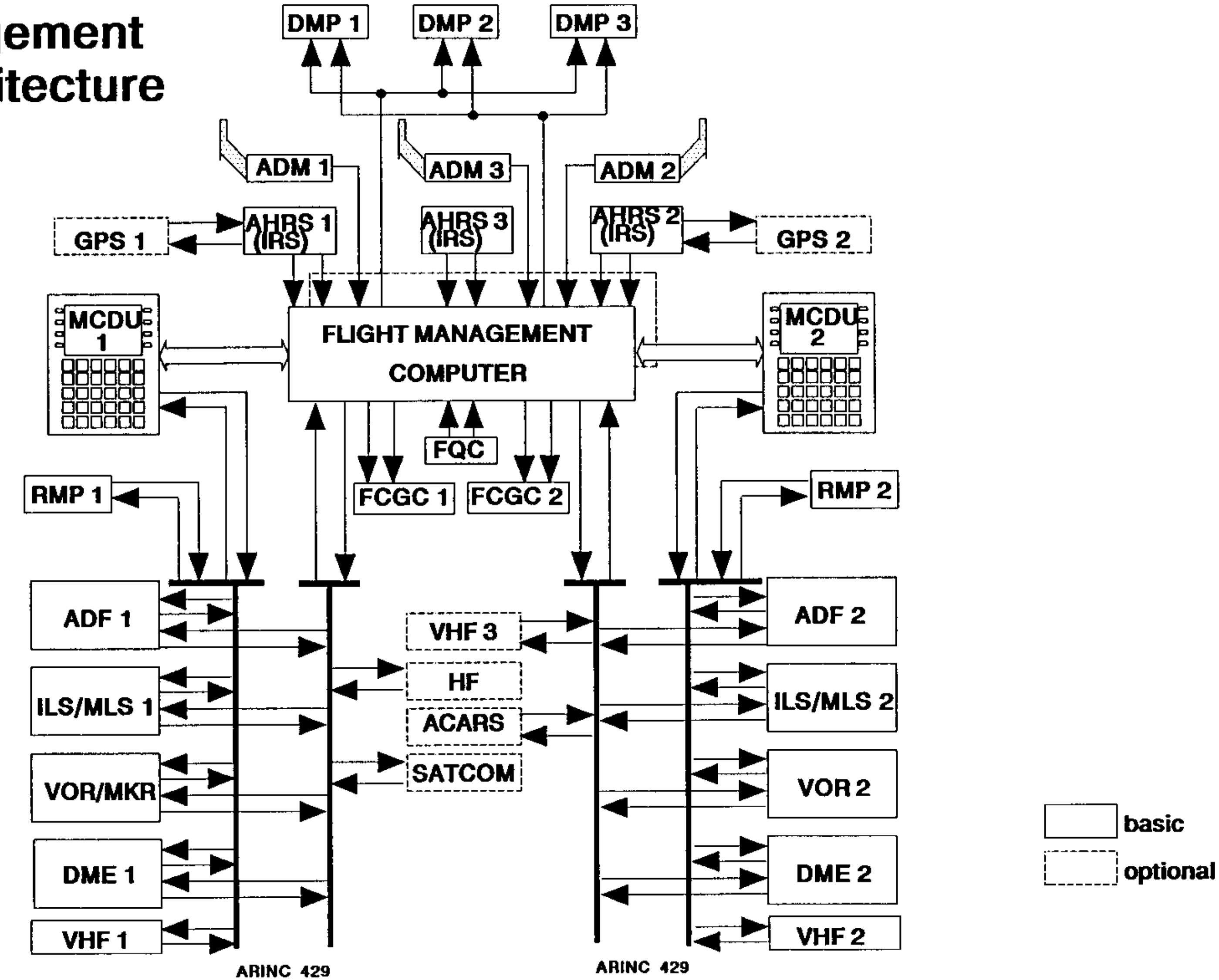
Flight Management System (FMS)

- The aircraft is equipped with a single Flight Management System, with a second Flight Management Computer available as an option.
- The system is controlled via two Multipurpose Control and Display Units (MCDU). Many frequent and complex tasks are performed by the Flight Management Computer to increase safety and punctuality of the flights.

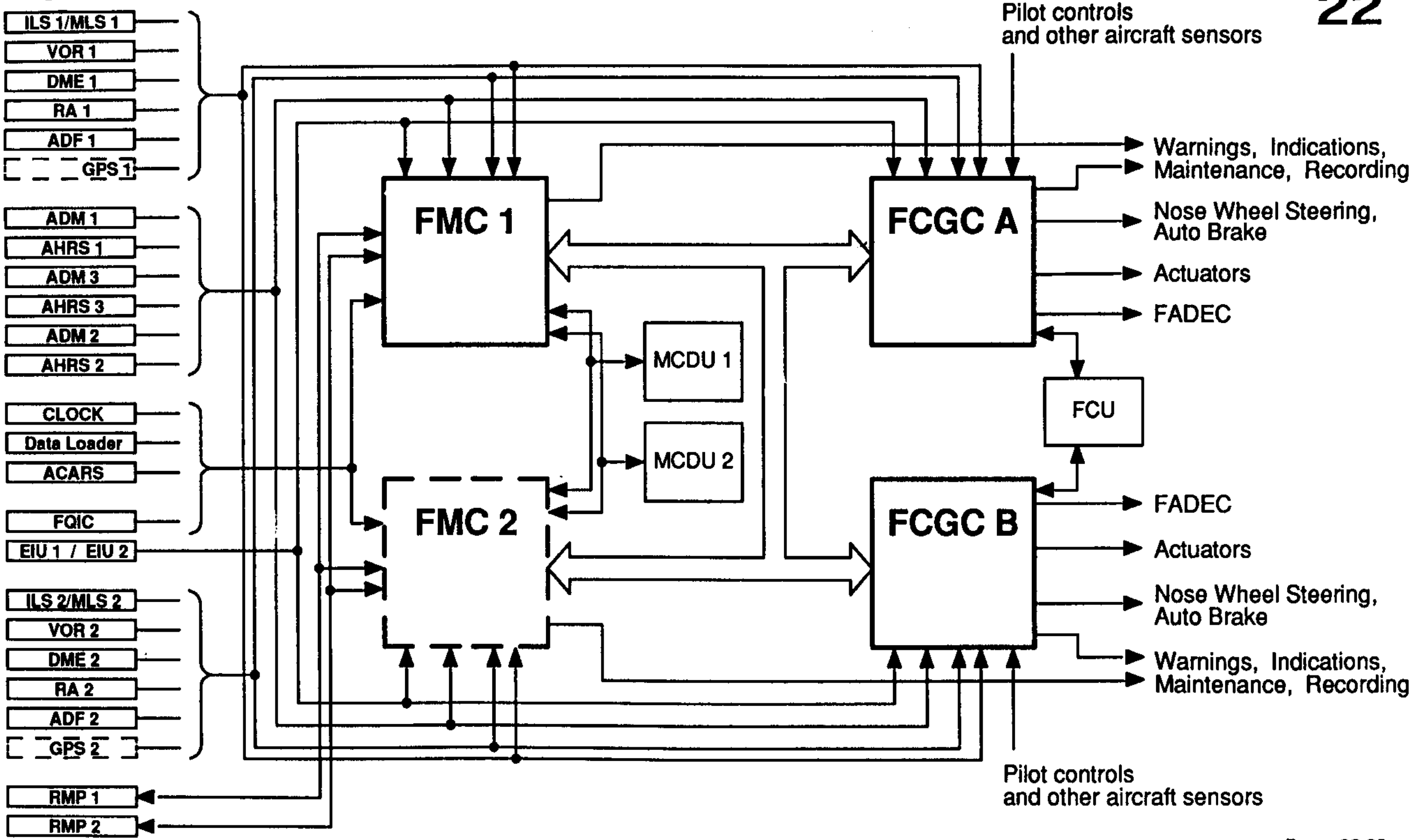
  - Flight Planning / Flight Plan Execution
  - Take-off and Landing Data/Cruise Speed Calculation
  - Radio tuning / Radio navigation
  - On-board Maintenance System (OMS) support
  - Data link function (ACARS)

In case of failure of the flight management computer, the MCDUs have to perform a back-up function for navigation tasks, such as radio navigation.

Flight management system architecture



System architecture



Contents

- RF communication
- Audio communication
- Cabin communication
- Antenna location

1 - RF communication:

Main components are two VHF tranceivers and two Radio Management Panels (RMP). A third VHF transceiver and an HF transceiver are options, just as the Aircraft Communication Addressing and Reporting System (ACARS) and a Satcom system. The ACARS uses only the third VHF.
The Radios will be tuned via the two RMPs. Also tuning through the Flight Management System (CDU) is possible.
Bussystem is to the standard ARINC 429 norm.

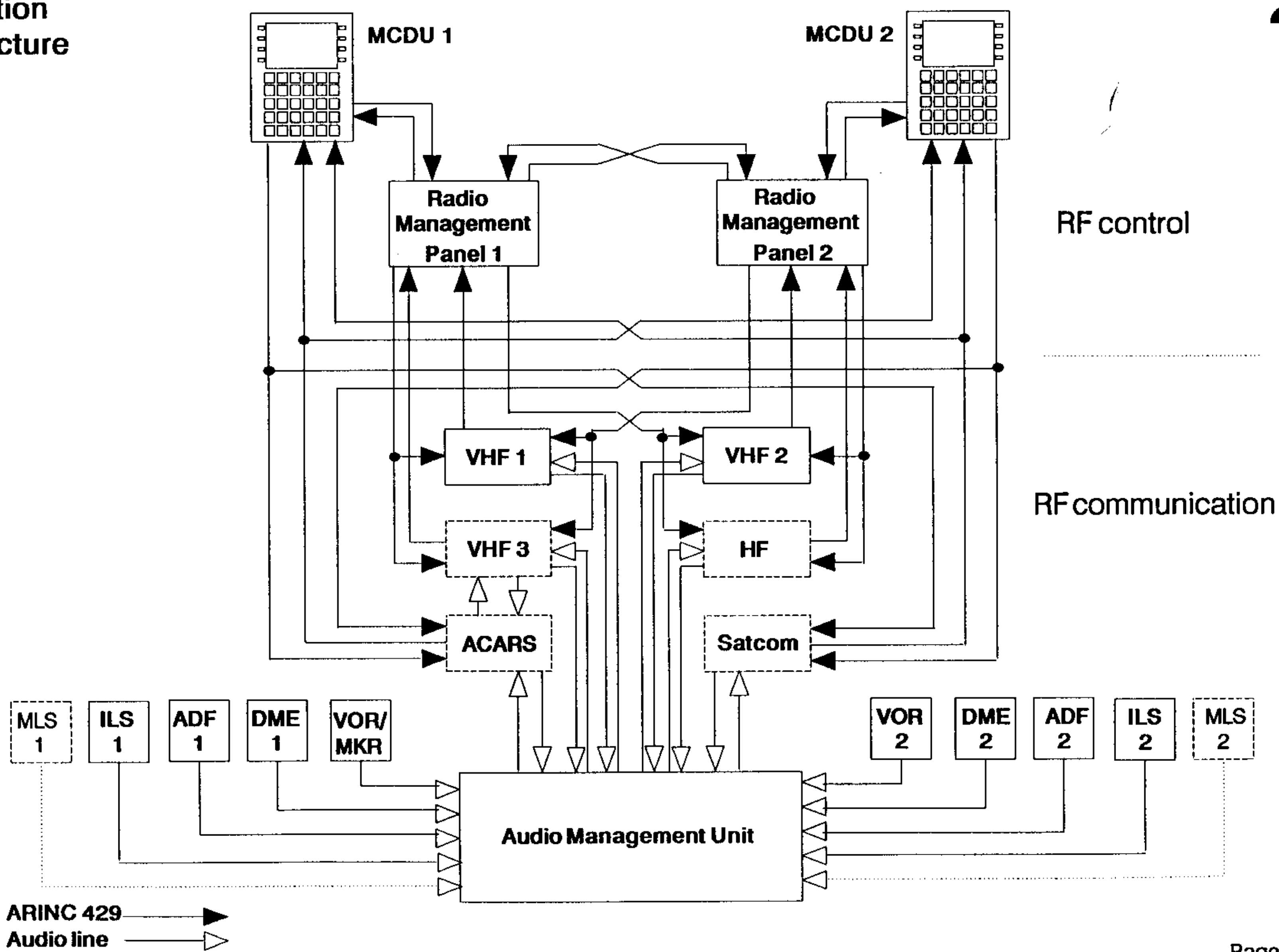
2 - Audio communication

The audio management unit handles all audiosignals.The system is controlld by three Audio Control Panels (ACP), where transceiver selection, volume control and other functions are possible. The signals from all microphones (except Cockpit Voice Recorder microphone) and from other sources are collected in the Audio Management Unit and distributed to loudspeakers or, for cabin communication, to CIDS.

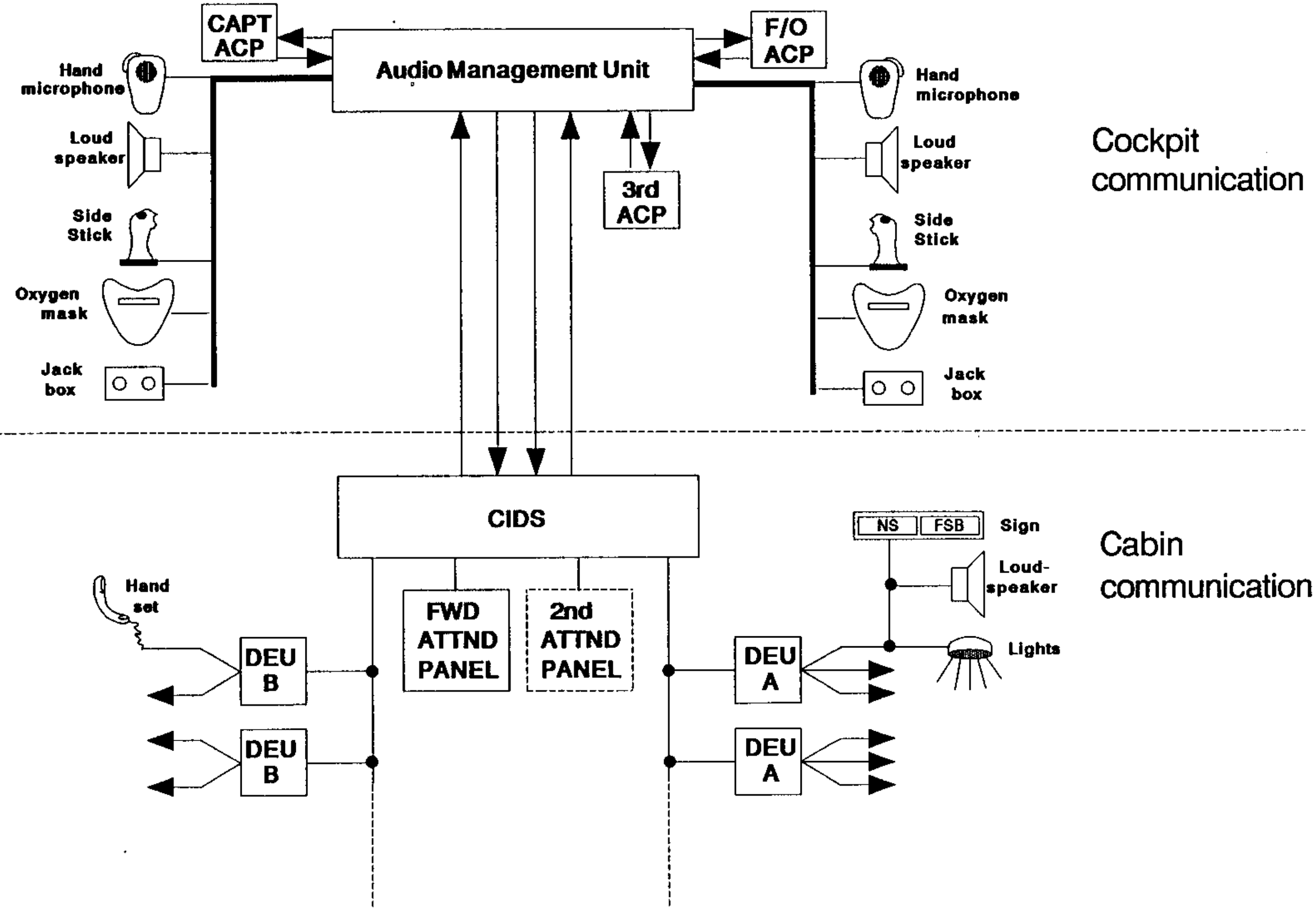
3 - Cabin communication

The cabin communication mainly is done through a Cabin Integrated Data System (CIDS). The signels are transceived in a digitizform ed in a databus system between the Decoder/Encoder Units (DEU) and the CIDS director located in the avionic bay. The CIDS director also interfaces with the audio management units for interphone functions.
The system is controlled via the attendant panel. A second attendant panel is available as an option.

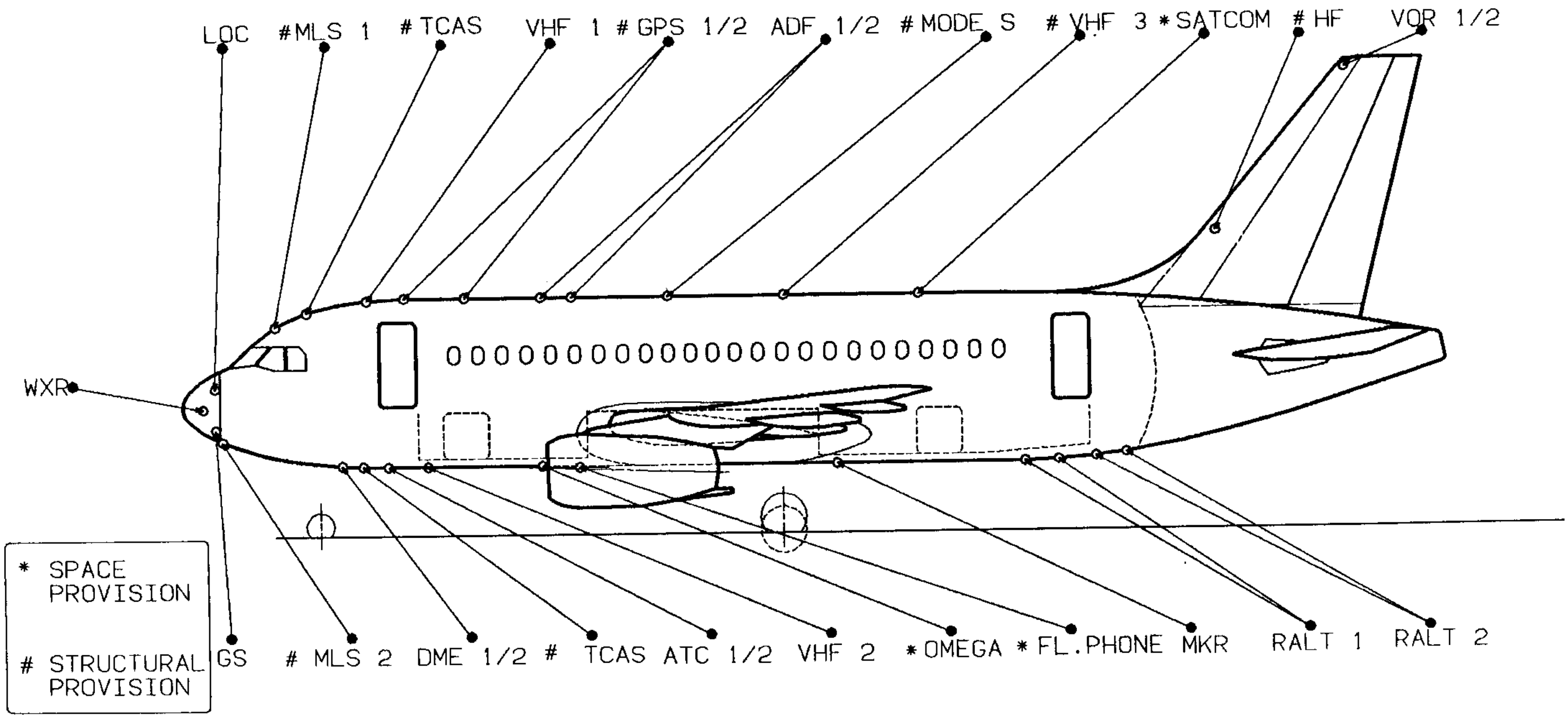
RF communication system architecture



Audio communication system architecture



Antenna location MPC 75-100



Contents

1. General:

The electrical generation network consists of the following units:

AC Generation:

- 2 main integrated drive generators (IDG), one per engine, nominal 60 kVA. The IDG provides a 115 / 200 V, 400 Hz AC supply. It consists of an oil spray cooled three states AC generator driven at constant speed by a hydromechanical constant speed drive.
- 1 APU generator, nominal 60 kVA, to provide a self contained source of ground power. This generator may also be used in flight to compensate the loss of main generators.
- 1 ground power connector, nominal 60 kVA.
- 1 emergency hydraulic driven generator (CSM/G), nominal 5 kVA.
- 1 static inverter, nominal 350 VA, single phase 115V/ 400 Hz to provide a source of AC power from the batteries.

DC Generation :

- 3 transformer rectifier units (TRU) , nominal 100 A at 28 V DC. Two of them are used to feed a DC main distribution system. A third TRU supplies via the AC essential power the DC essential network.
- 2 NiCd - batteries, nominal capacity 40 Ah each, provided for autonomous power for APU starting, DC equipment during transient switching of electrical power.

2. Normal flight configuration:

In normal flight condition each IDG supplies an AC distribution network via generator line contactors (GLC). These two networks are not parallel / isolated mode.

Under normal conditions:
Distribution network No. 1 comprises:

- AC MAIN BUS 1
- AC ESS BUS , which is supplied by AC MAIN BUS 1
- GALLEY BUS 1
- DC MAIN BUS 1 via a TRU

Distribution network No. 2 comprises :

- AC MAIN BUS 2
- GALLEY BUS 2
- DC MAIN BUS 2 via a TRU

Two 40 Ah batteries are connected to the DC EMERGENCY BUS.
Each battery has its own busbar (BAT BUS 1 and BAT BUS 2) which are permanently connected.

3. Abnormal flight configuration:

Any one of the three generators is able to supply the total technical load and part of the commercial load. In case of total loss of all main AC power generation a hydraulic driven emergency generator (CSM/G) with 5 kVA provides power for no limitation on usable time . (CSM/G driven by the green hydraulic circuit / engine driven pump or RAT).

4. Aircraft ground supply:

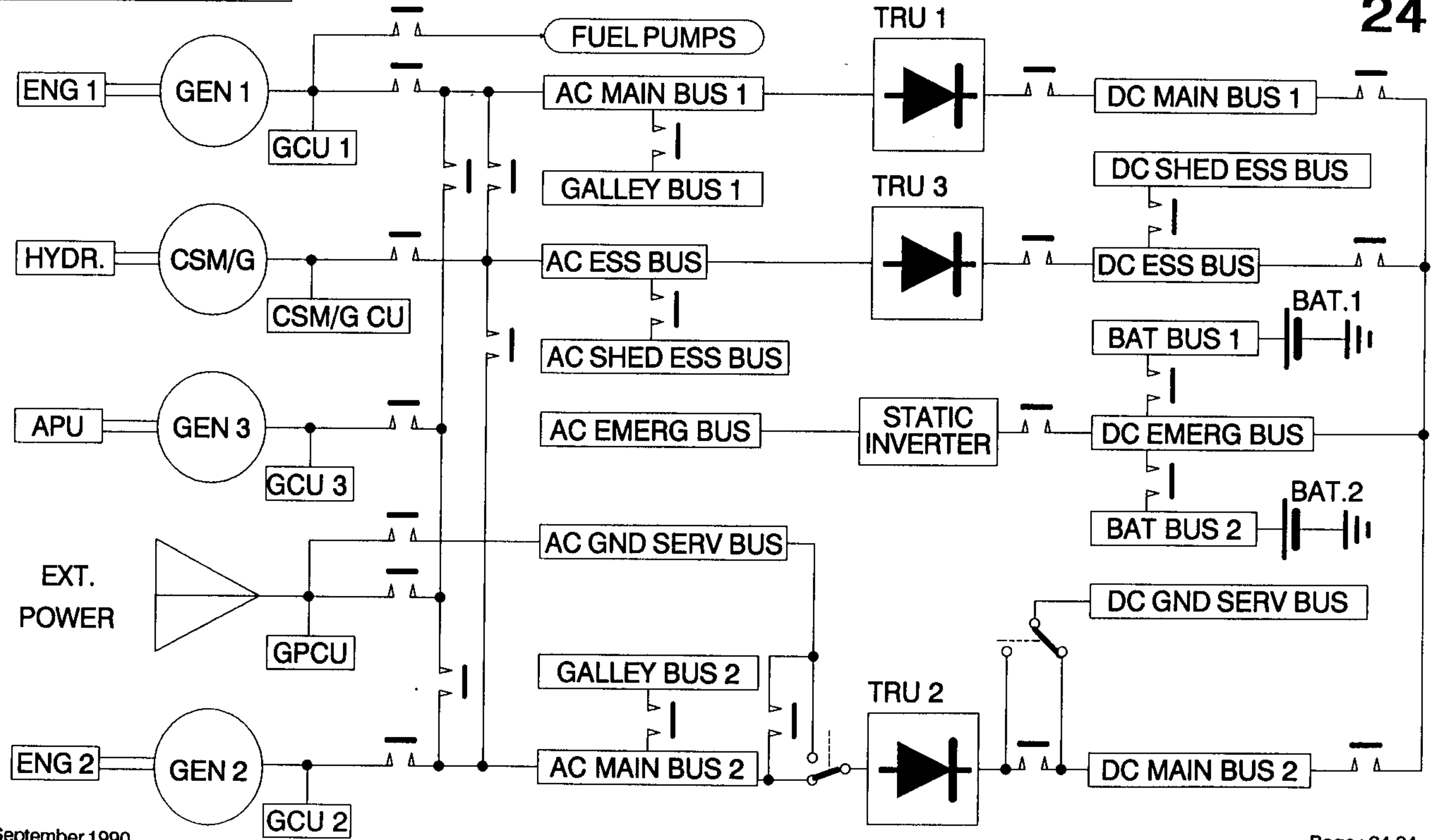
On ground the complete network can be supplied either from the APU generator or from the ground power unit (EXT - PWR) up to a maximum of 60 kVA
For ground servicing operation, it is possible to supply only the GND SERV AC / DC BUS direct from the EXT - PWR connection.

5. Electrical power generation controls:

The electrical power generation and distribution control, indication and monitoring is operated through the Electronic Centralized Aircraft Monitoring system (ECAM) and the overhead control panel.

MPC AIRCRAFT

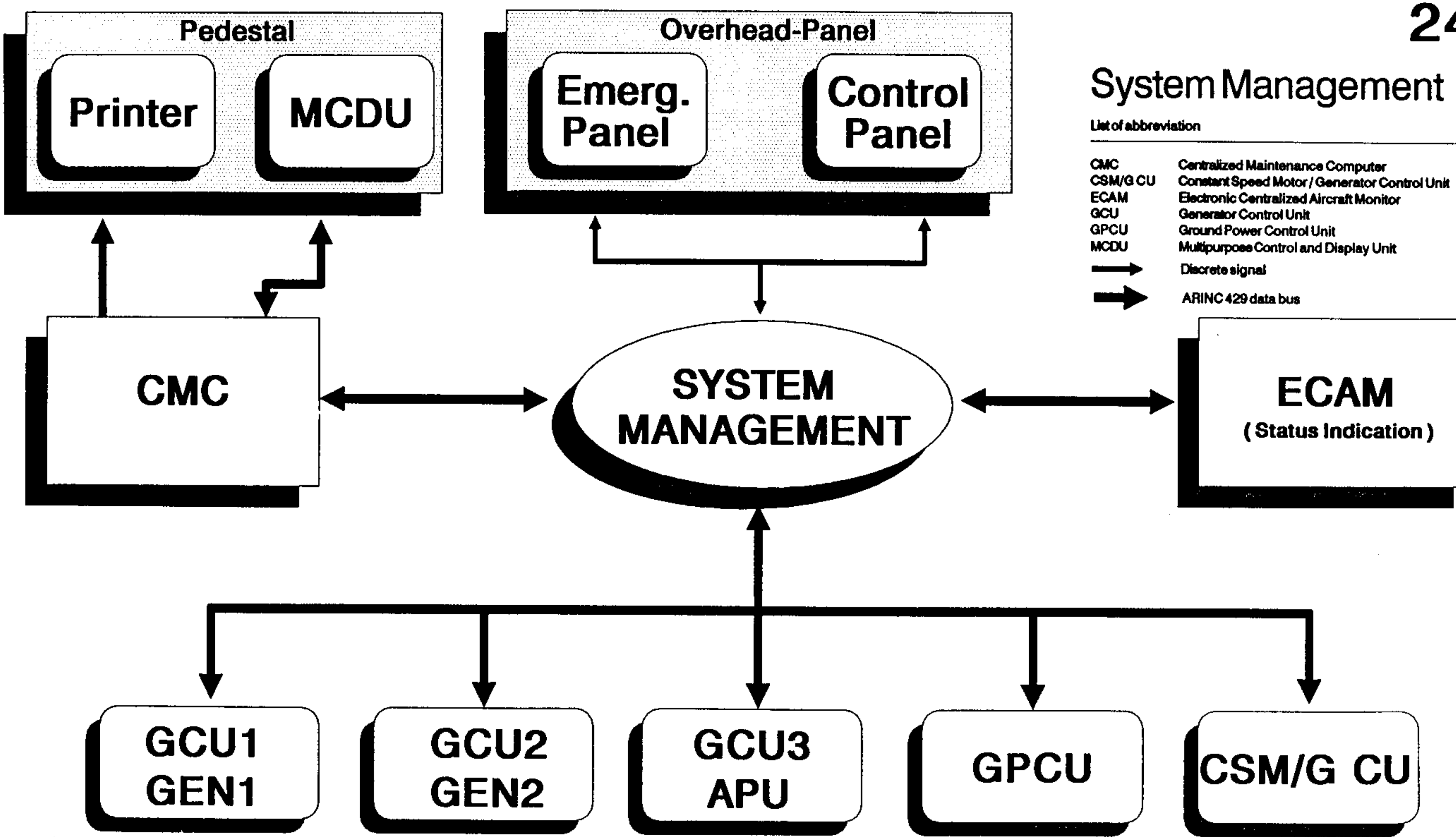
System Architecture



System Management

List of abbreviation

CMC	Centralized Maintenance Computer
CSM/G CU	Constant Speed Motor / Generator Control Unit
ECAM	Electronic Centralized Aircraft Monitor
GCU	Generator Control Unit
GPCU	Ground Power Control Unit
MCDU	Multipurpose Control and Display Unit
→	Discrete signal
➡	ARINC 429 data bus



Contents

1. General

The MPC75 interior equipment/furnishings have been designed to provide a comfortable environment for the flight crew and passengers.
This has been achieved by giving special attention to three main areas as

- passenger comfort and cabin styling
- carry-on baggage capacity
- underfloor compartment capability.

The major parts are provided within the pressurized section of the fuselage, as follows:

- cockpit
- cabin
- underfloor cargo holds

2. Cockpit

The cockpit has been designed for two-man operation with facilities for a third occupant.
The flight compartment arrangement is shown in Fig. 25-1.
The captain and first officer seats are seat rail mounted and fully adjustable in all directions.
Each seat is fitted with an inertia-type five-point harness that allows a pilot to reach all aircraft controls without discomfort.

An observer seat is provided which occupies a position aft of the pedestal when in use but is normally stowed against the right-hand aft wall of the flight compartment.
The seat is provided with a fixed-type three-point harness.

The planview of the cockpit is shown in Fig. 25-2.
For detail of the instrument panels refer to chapter 31.


CLOCK

Cockpit Design

The main features:

- Sidestick controllers leave the main instrument panel unobstructed
- EFIS/ECAM/FWS integration
- Improved flexibility through switching of six Flat Panel Display Units
- Standby instrument display with similar images

Most features evolved directly from A 320 such as:

- "Lights out" philosophy on overhead panels
- "Need to know" concept for information presentation
- Monitoring of systems through the ECAM-system
- Monitoring of computers through Centralized Maintenance System (CMS, CFDS in A 320)

All control panels are within easy reach of the two crew members

A 3rd crew member seat aft of the pedestal offers maximum visibility over all panels

Fig. 25-1 Forward view

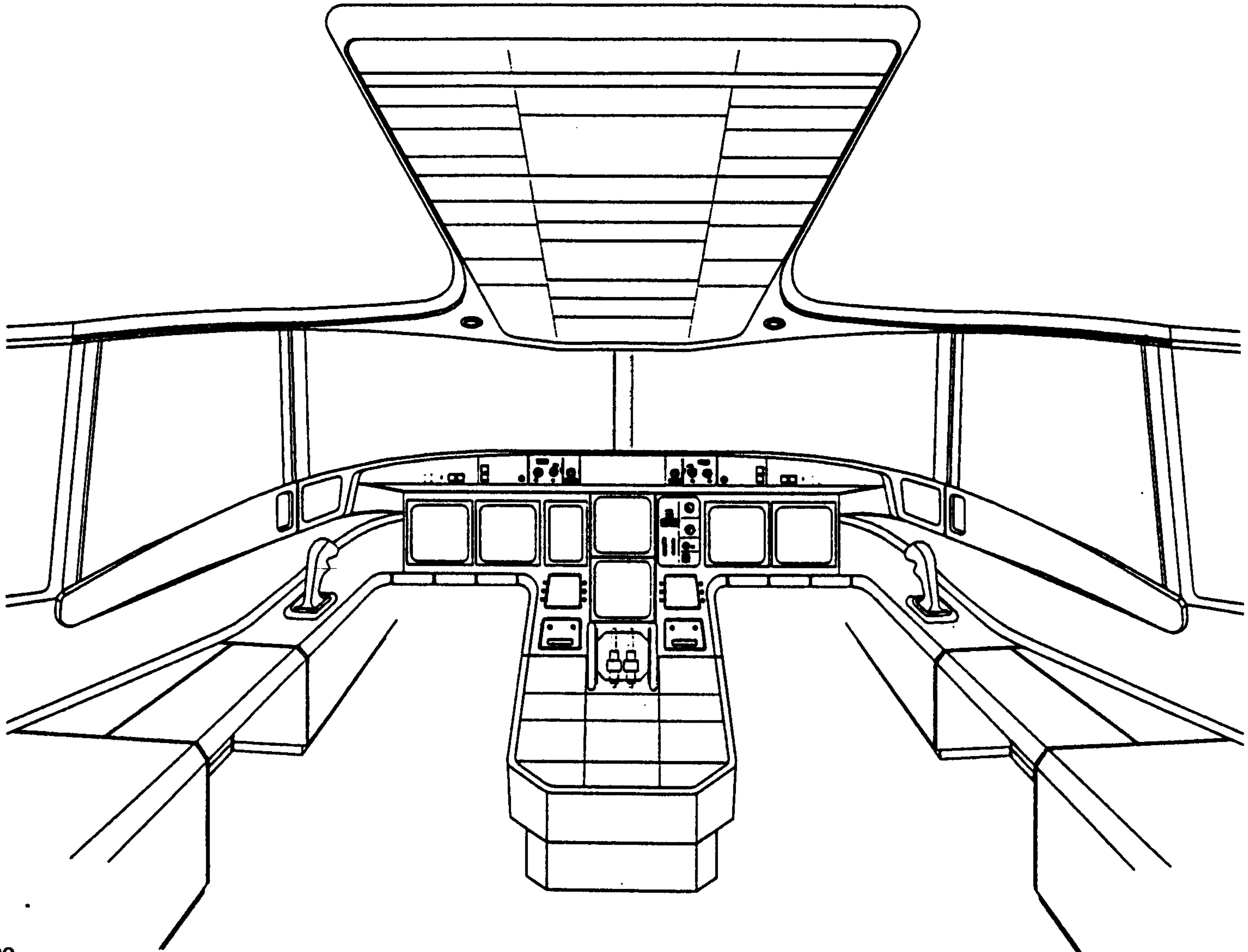
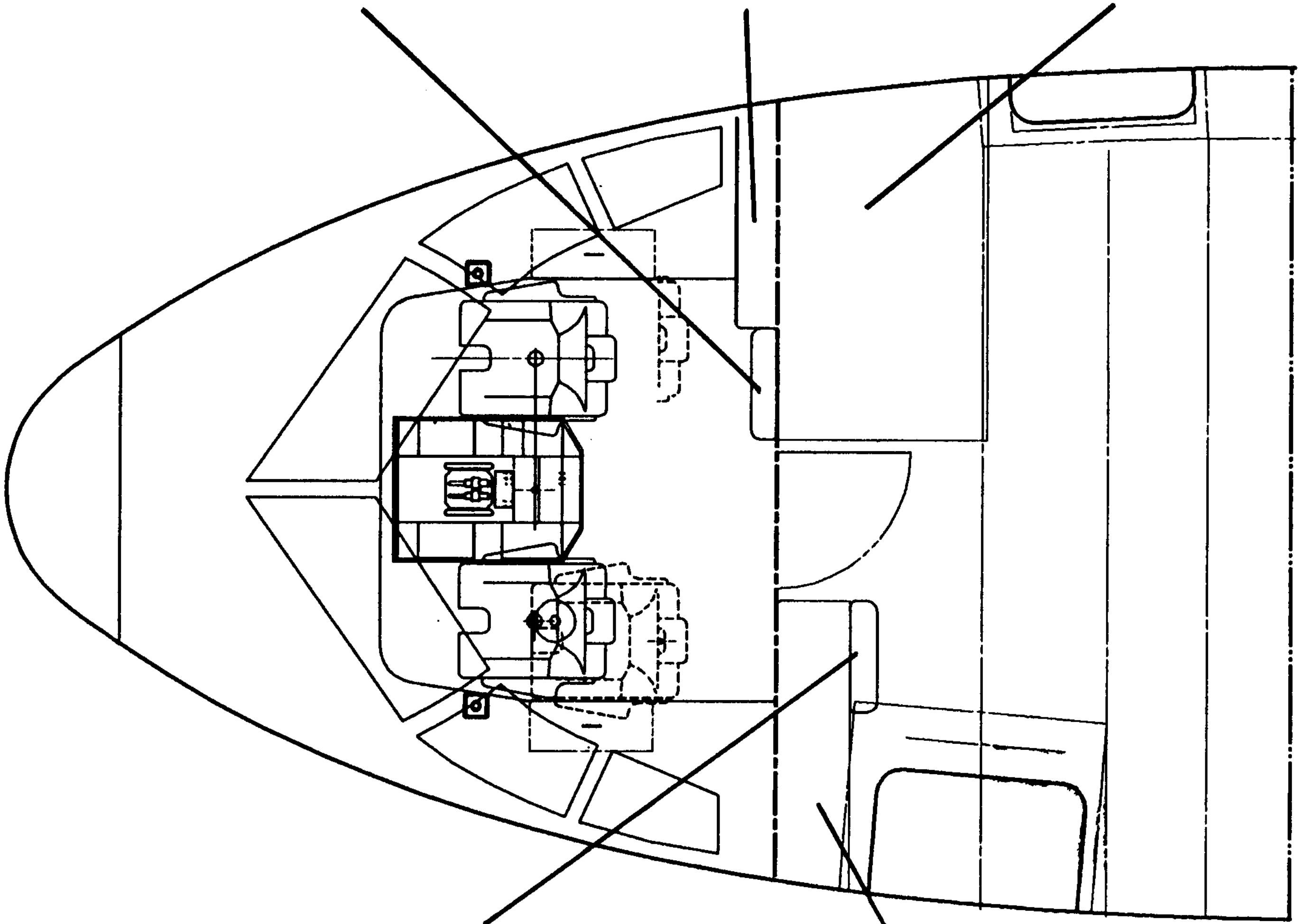


Fig. 25-2 Planview



3. Cabin

The aim in the design of the standard cabin has been to offer a higher standard of comfort relative to existing single-aisle aircraft in that class.
This target, combined with the requirement to carry lower and upper deck cargo either in bulk form or in containers, results in the choice of a blended-double bubble fuselage cross-section having a width of 3.45 m (135.8 in) and a height of 3.67 m (144.5 in).

The passenger cabin itself has a maximum width of 3.23 m (127 in) and a height of 2.10 m (82.in).

The MPC75 cabin interior has been designed according to the latest industrial design concepts which makes the cabin particularly spacious.
All functional and decorative items such as windows, side-walls and ceiling panels and overhead stowage compartments have been longitudinally divided into two frame pitch (40 in) units. The fact that the cabin is parallel over most of its length and with a constant frame pitch, except around the wing box area, results in a minimum number of different furnishing panels.

Standard Seat Layout

In its baseline configuration, the MPC75 provides single-class accommodation for 91 passengers at 32" pitch in a single-aisle, five-abreast, arrangement (see Fig. 25-3).

Other interior configurations are available for enhanced cabin flexibility.

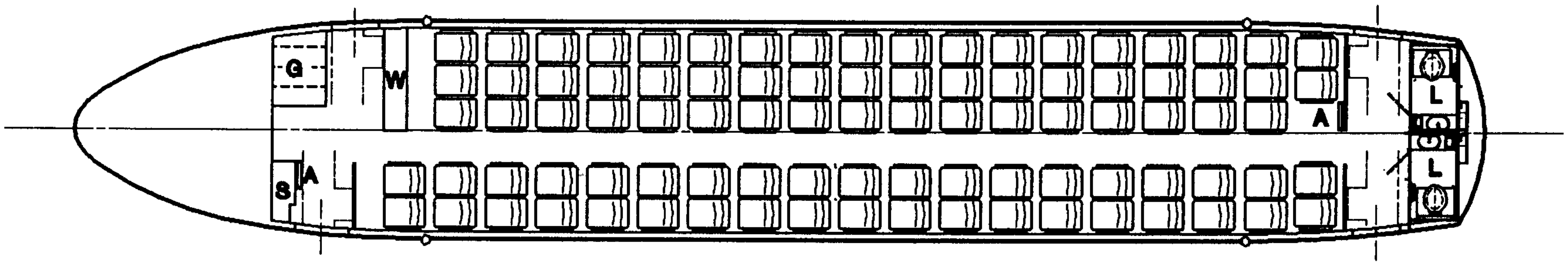
The four seat rails running the length of the cabin allow 4 or 5 abreast seating (see Fig. 25-4). Standard and optional toilet and galley positions are provided at each end of the cabin either side of the entrance areas (see Fig. 25-6 and Fig. 25-7).

The seat rails are spaced apart so as to give approximately equal space under each seat, in 5 abreast seating, for carry-on baggage (see Fig. 25-5).

Fixed galleys and lavatories are attached to the aircraft structure by bolts at hard points.

Lavatories are manufactured as preassembled wet cells with an integrated floor panel designed as a bowl for leakage protection.

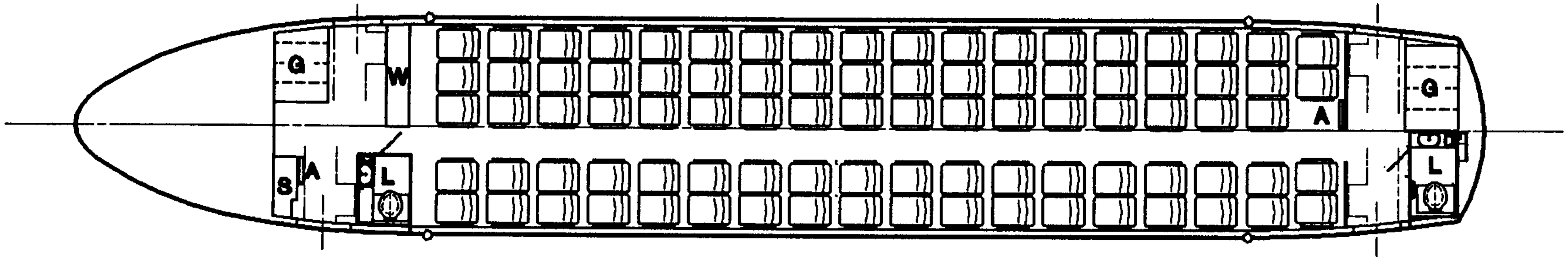
Fig. 25-3 Standard seat layout



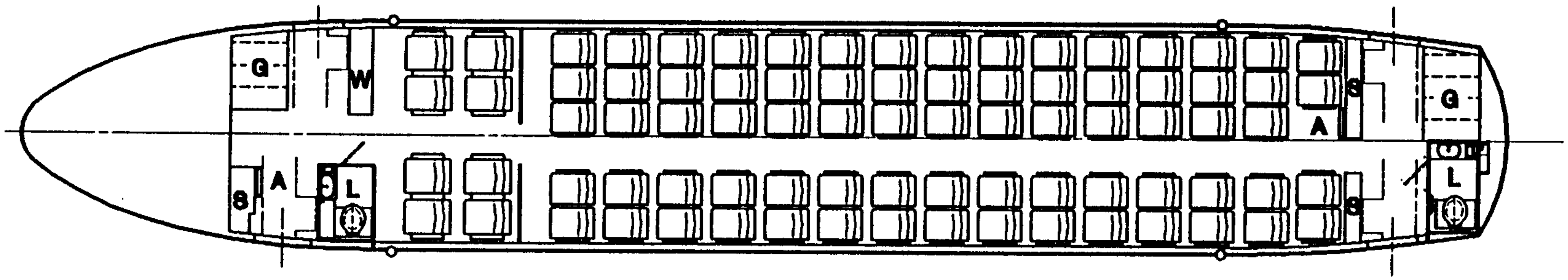
Baseline seat layout: 91 seats 32" pitch

A : Attendant seat
G : Galley
L : Lavatory
S : Stowage
W : Wardrobe

Fig. 25-4 Alternative seat layouts



Economy seat layout : 89 seats 32" pitch



Mixed class layout : 8 seats 36" pitch
74 seats 32" pitch

A : Attendant seat
G : Galley
L : Lavatory
S : Stowage
W : Wardrobe

Cabin cross-section

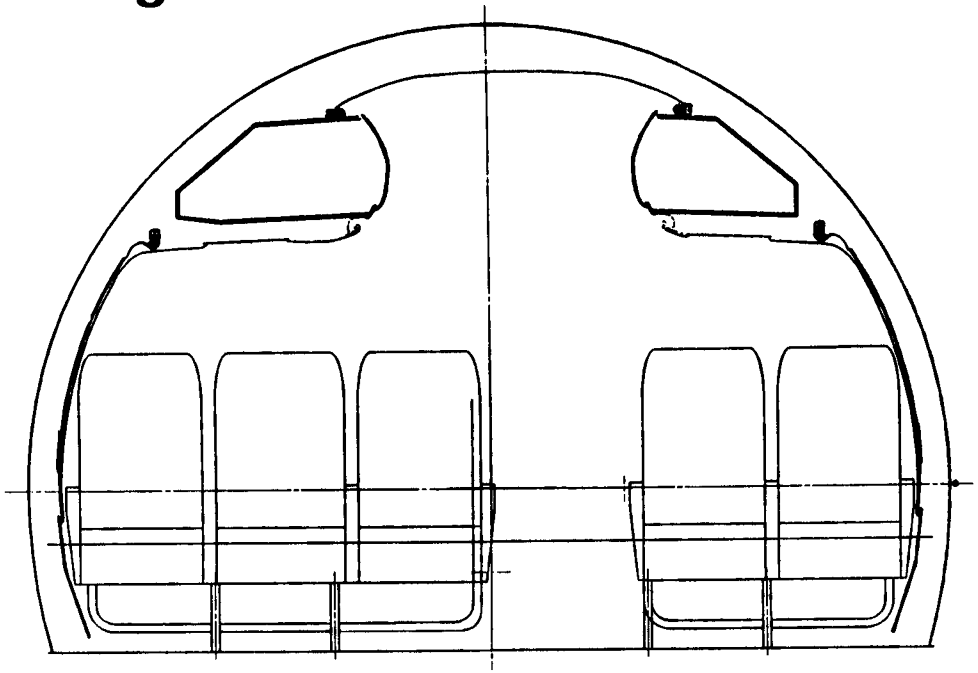
Each seat is fitted with a two-point seat belt and gives a high degree of comfort with the following features:

- Lightweight aluminium structure
- Reclineable back
- Full width table
- Ashtray built into the armrest
- Seat back pocket
- Stowage for lifevest.

Passenger service and information panels are provided above each seat row and are designed and installed with special consideration for passenger convenience.
The panels are fully adjustable to match variations in seat pitch where optional cabin layouts are chosen. The features provided on each panel are:

- Reading light
- Individual air outlets
- Attendant call buttons
- Fasten seat belt/no smoking sign
- Loudspeakers
- Emergency oxygen.

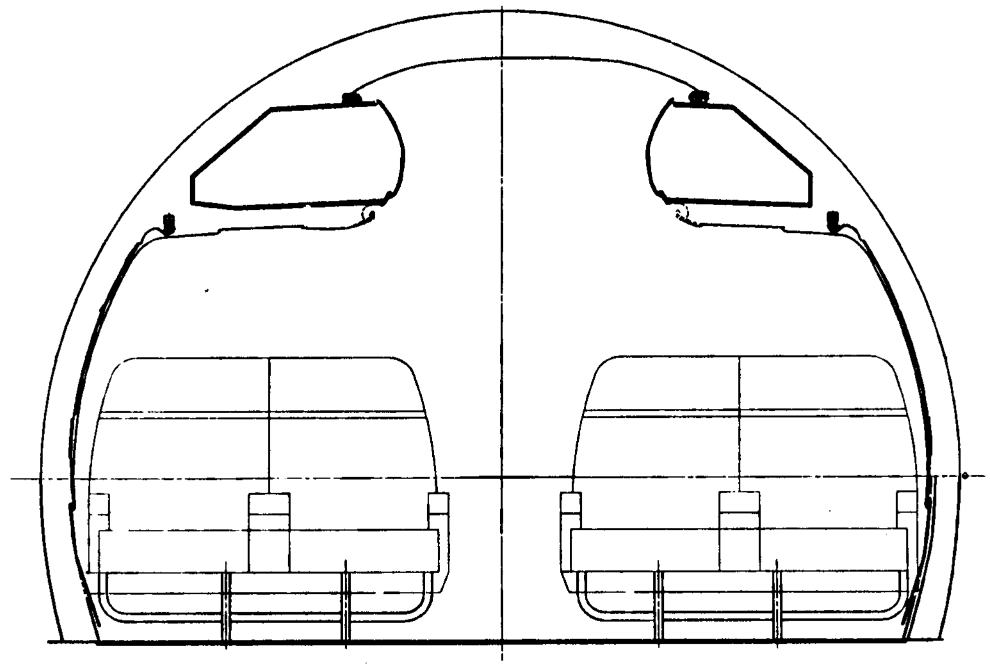
Fig. 25-5 Cross-section



5 - abreast arrangement

all-economy class

63 " - 20 " - 42 "



4 - abreast arrangement

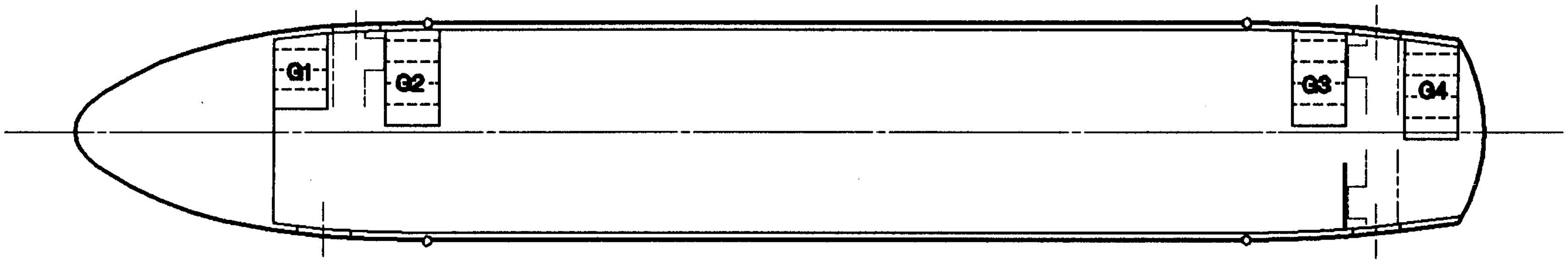
first-class

50 " - 23 " - 50 "

Fig. 25-6 Location of galleys

The standard aircraft is equipped with one galley in the forward cabin (G1).

Standard options are located in the forward cabin (G2) and in the aft cabin (G3, G4).



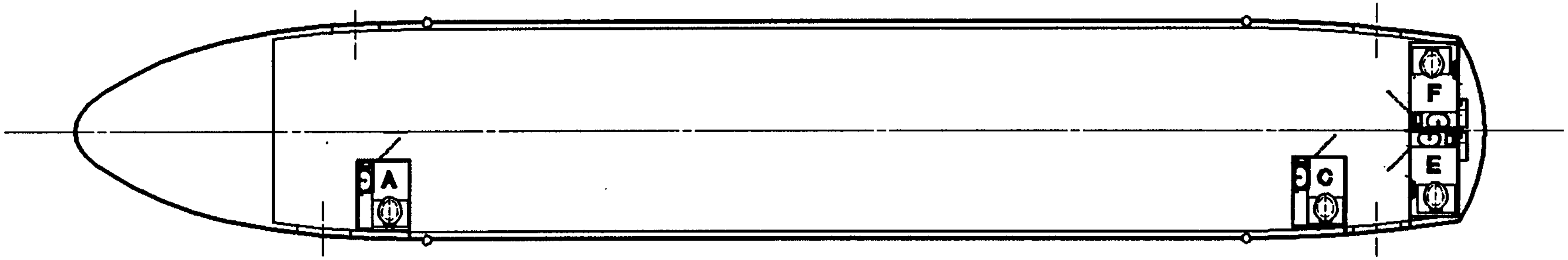
Standard - G1

Option - G2, G3, G4

Fig. 25-7 Location of lavatories

The standard aircraft is equipped with two lavatories, both in the aft cabin.

Standard options are located in the forward and rear cabin areas.

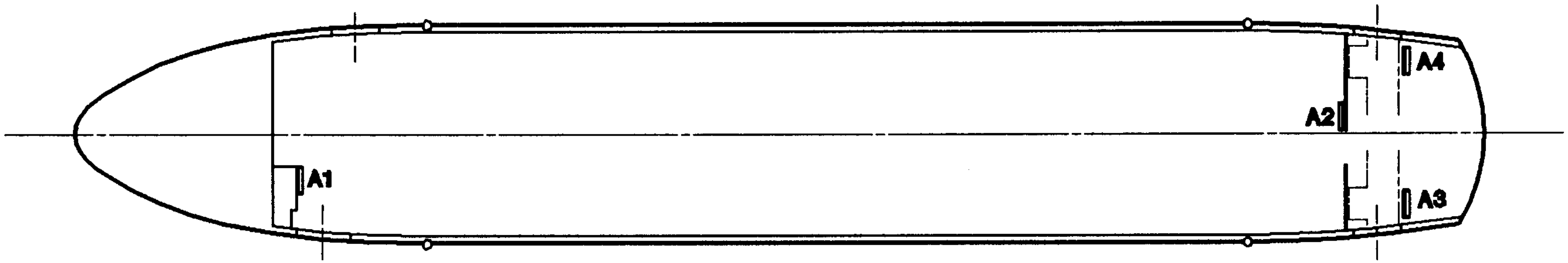


Standard - E,F
Option - A,C

Fig. 25-8 Location of cabin attendant seats

The standard aircraft is equipped with two cabin attendant seats, one forward cabin (A1) and one in the aft cabin (A2).

Standard options are located in the aft cabin areas (A3,A4).



Standard - A1, A2
Option - A3, A4

Overhead stowage compartments

For passengers' carry-on luggage the cabin is equipped with lateral overhead stowage compartments running along each side of the cabin above the passenger seating area. Each compartment is approximately 80" (2032 mm) and can carry a load of TBD lb (TBD kg).

In the standard all-economy seat layout with 91 passengers the total stowage volume is approximately 184 cu.ft. (5.2 m^3). Thus there ist approximately 2 cu. ft. and TBD lb (TBD kg) per seat.

A handrail is incorporated into each stowage compartment.

The optional overhead stowage bin has in the standard all-economy seat layout with 91passengers a total stowage volume of approximately 217 cu. ft. (6.14 m^3). Thus there is approximately 2.4 cu.ft. and TBD lb (TBD kg) per seat.

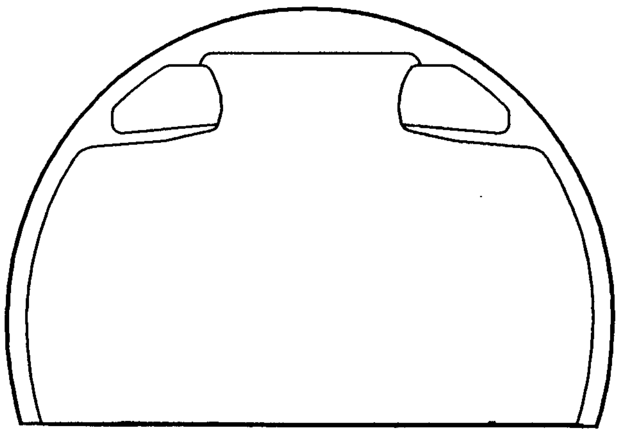


Fig. 25-9 Standard bins

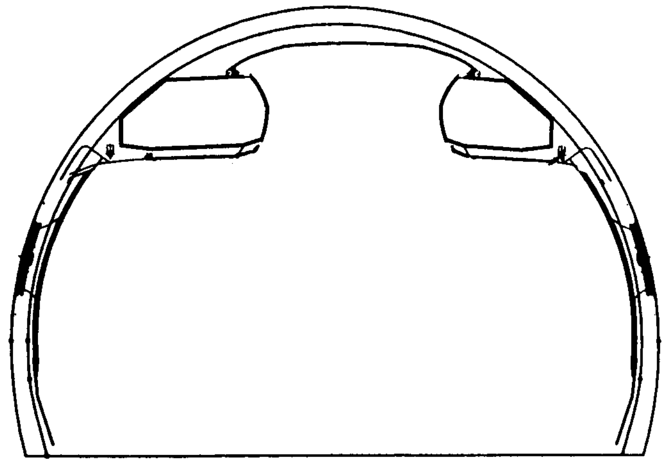


Fig. 25-10 Optional bin

Emergency equipment provisions

The MPC 75 meets the JAR/FAR safety requirements for passenger emergency evacuation.

The speed of evacuation is enhanced by:

- 20" wide aisle
- 72" (H) x 34" (W) door fwd. left side and 55" (H) x 30" (W) door fwd. right side
- 72" (H) x 30" (W) door aft left side and 55" (H) x 30" (W) door aft right side

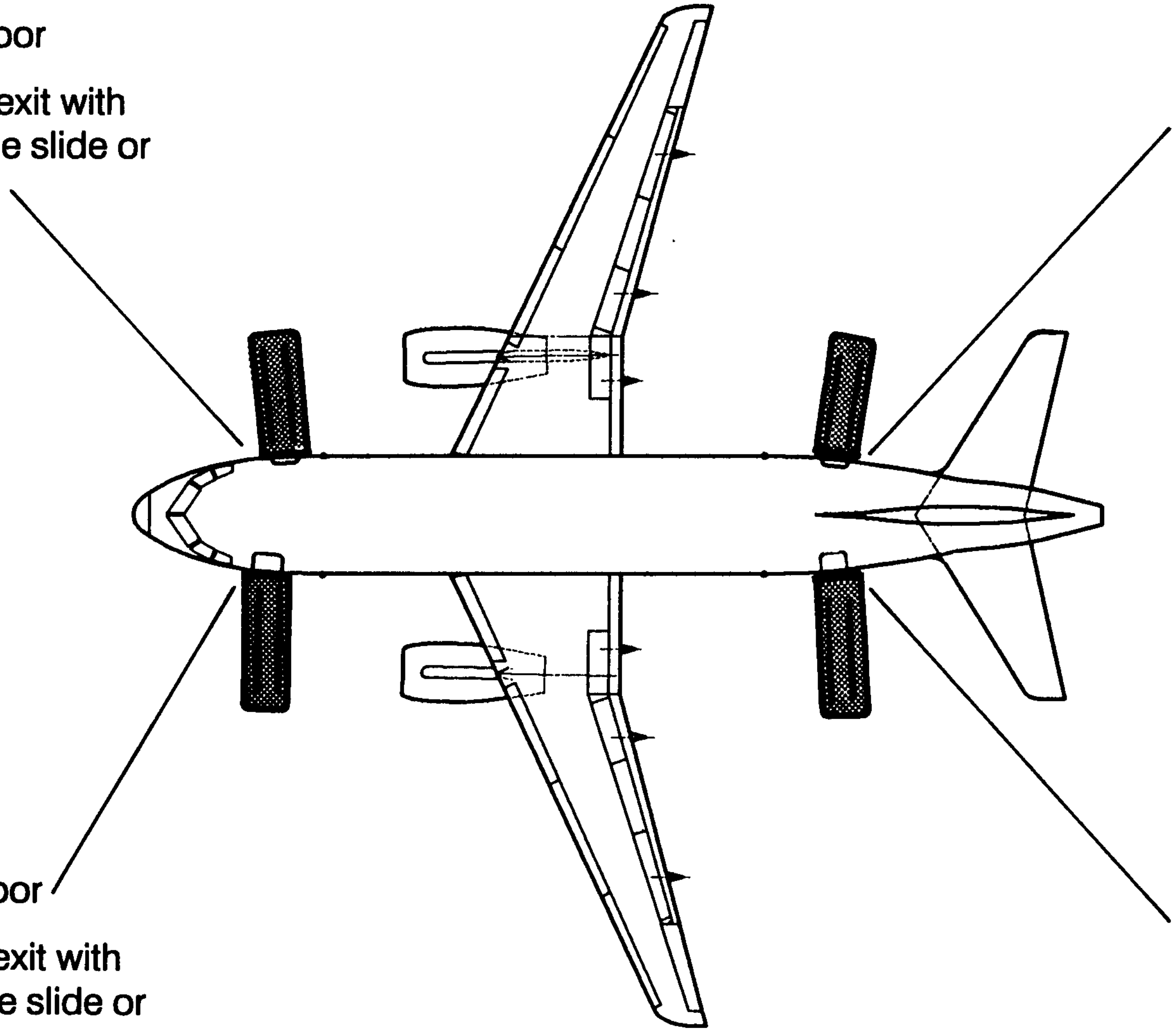
The main doors are fitted with single lane slides. All slides are of inflatable type using cylinder compressed air. Escape slide illumination is achieved with lights integrated into the slides and powered from the aircraft emergency lighting system.

As an option, all passenger/service doors can be equipped with slide rafts instead of escape slides, which are furnished with survival kits. The slide rafts can be disconnected from an inoperative door, moved to another door and mounted to the structural slide raft fittings.

In easily accessible positions in the passenger compartment, the following safety equipment is installed:

- fire extinguishers,
- protective breathing equipment,
- portable oxygen units,
- flashlights,
- crash axe,
- life vests,
- megaphone,
- first aid kits, etc.

Fig. 25-11 Escape slide arrangement



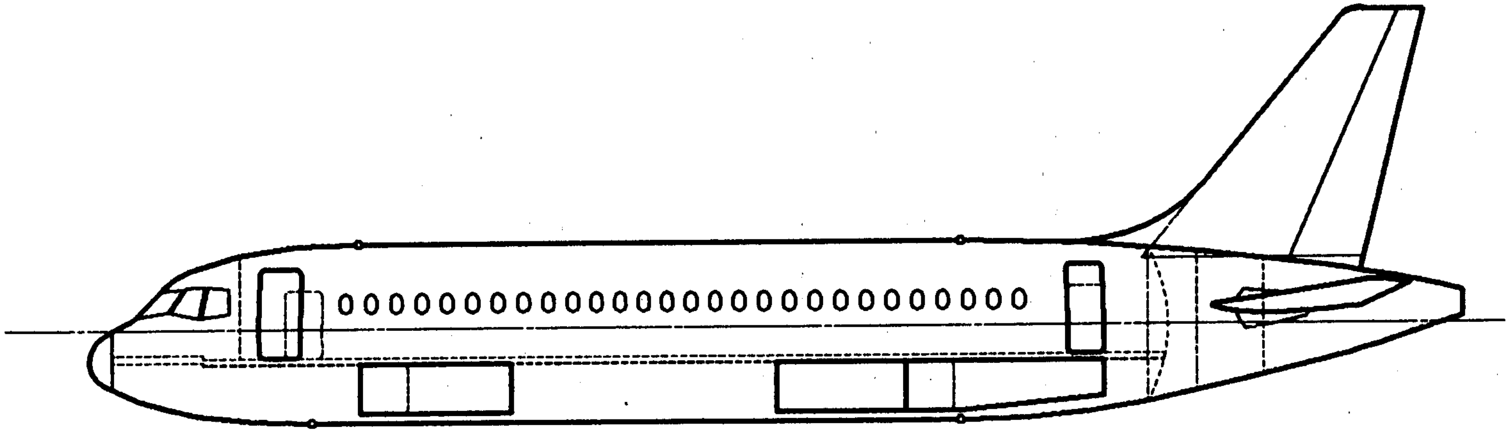
4. Underfloor cargo holds

The forward and aft cargo holds are designed for bulk loading and to meet the requirements of "class D" regulations. Smoke warning system is available as an option, as well as a cargo ventilation system.

The basic doors are outward opening.

A semi automatic "sliding carpet" cargo loading system is available as an option.

Fig. 25-11 Location of cargo hold compartments



Contents

1. General

Aircraft fire and smoke protection systems are provided for:

- Engine and APU, fire detection and extinguishing systems
- Electronic bay smoke detection system
- Automatic waste bin fire extinguishing system and smoke detectors in lavatories

Portable fire extinguishers are installed in the flight deck and the passenger cabin.

2. Fire Protection Engines and APU

2.1 Detection

The detection loops for the engines and the APU are of pneumatic type. All detection loops are duplicated (Loops A and B). The Fire Source Detection Units (FSDU 1/2) 'acts' as the 'central manager' between the systems and the EIS as well as the overhead panel control and indication devices.

2.2 Extinguishing

The extinguishing system for each engine consists of two extinguisher bottles (APU one bottle), installed in the pylon area (engines). The APU extinguishing bottle installation is close to the APU compartment. The bottles can be discharged by means of wired cartridges.
The APU fire extinguishing system is provided with an automatic sequence for fire extinguishing in an emergency case on ground if qualified personnel is not present in the cockpit.
Extinguishing agent: HALON 1301

3. Smoke Detection Electronic Bay

Smoke in the electronic bay is detected by ionisation type smoke detectors, installed in the air extraction duct. The smoke detector is connected to the FSDU and warnings are given on the Smoke Detection Panel (Overhead Panel) and associated information will appear on the EIS.

4. Cargo Hold Smoke Detection

Can be provided as an option.

5. Portable Fire Extinguishers

Portable fire extinguishers are installed at appropriate location in the flight and passenger compartment. Extinguishing agent will be HALON 1211.

6. Lavatory Fire Protection

A smoke detector is installed in the air extraction duct from each lavatory. The detectors are connected to the FSDU. Audio and visual warnings of lavatory smoke are provided in flight compartment and at the attendants panel.
Fire extinguishers will discharge automatically.

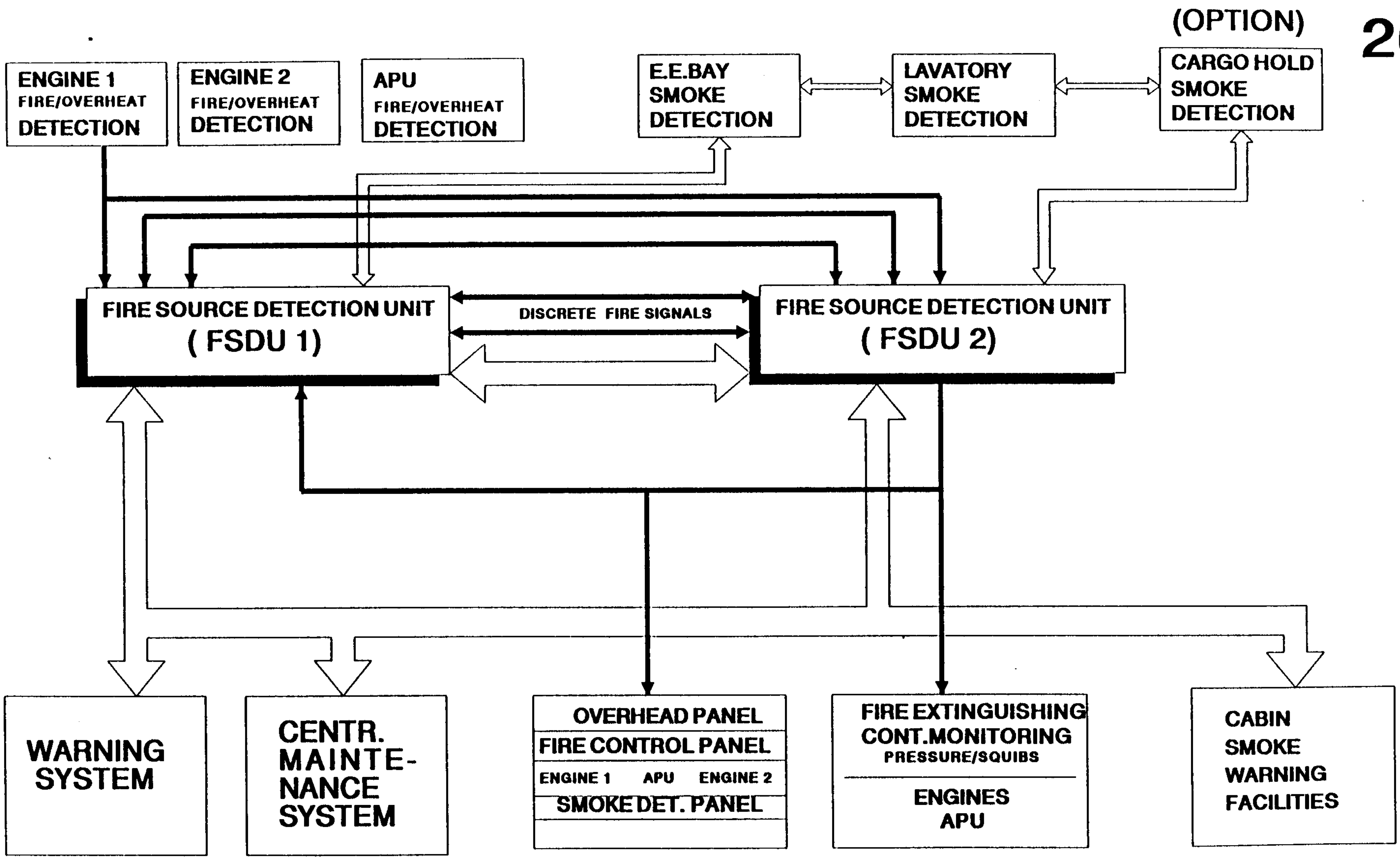


FIG. 26-00 Fire Protection

Contents

- General
- Architecture
- Flight control and guidance computers
- Computer volume comparison

General

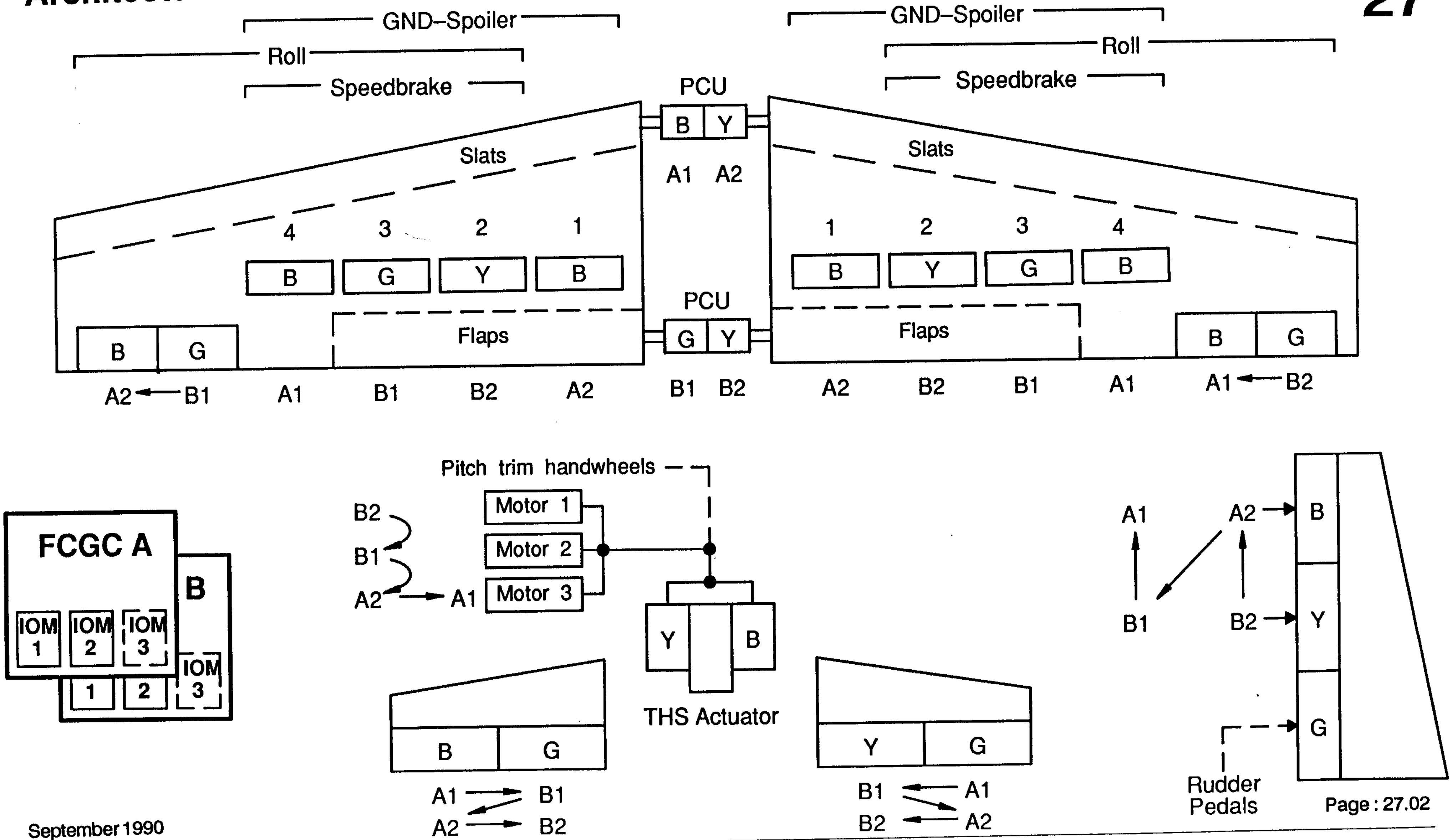
MPC flight control is achieved by conventional surfaces which are fully powered by hydraulic actuators. The flight control system is designed as a Fly–By–Wire (FBW) system based on two different types of digital computers.

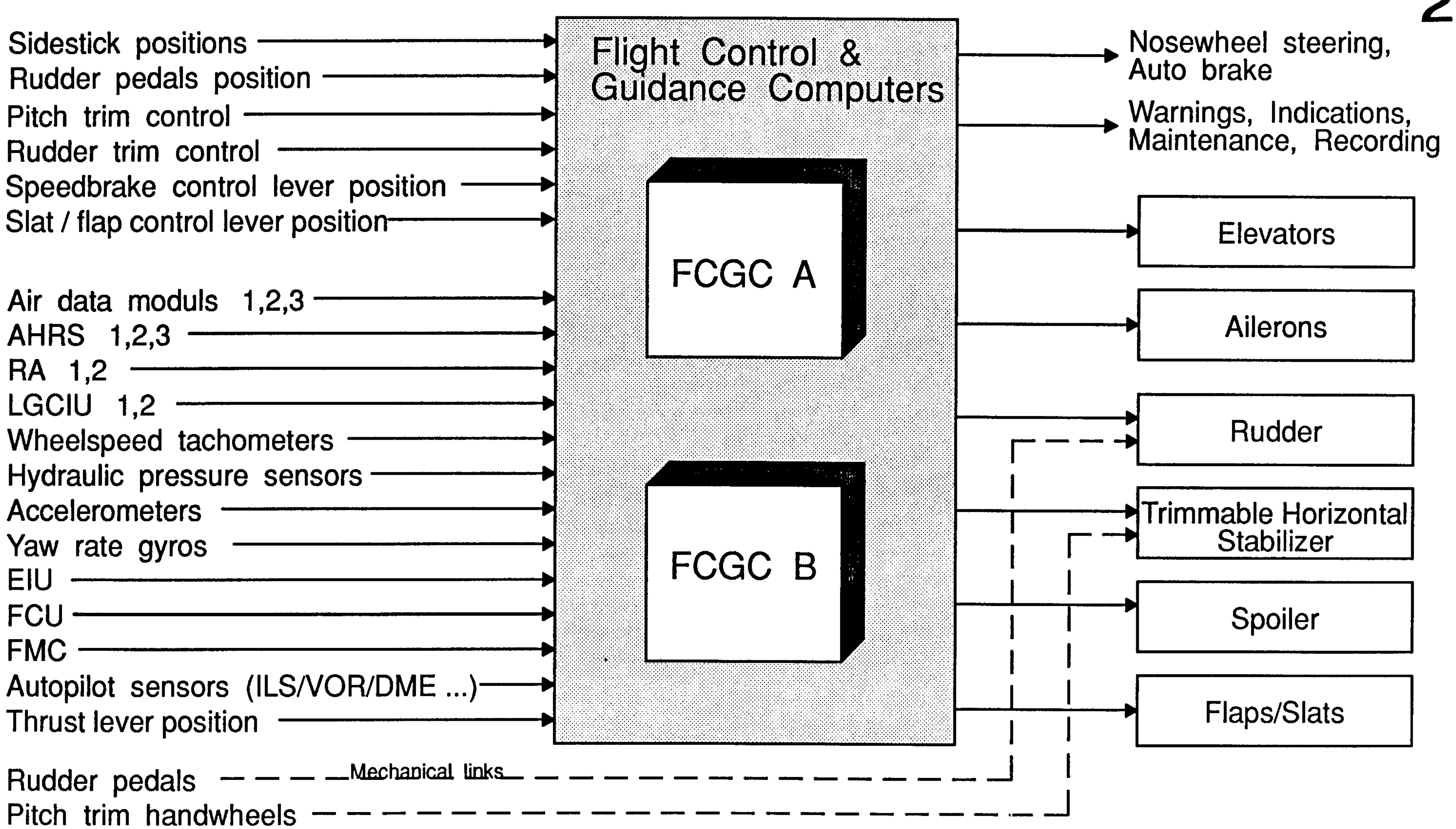
The aircraft' s primary flight control systems – ailerons, roll spoilers, elevators, Trimmable Horizontal Stabilizer (THS) and rudder – control pitch, yaw, and roll flight attitudes. The secondary system comprises leading edge slats and trailing edge flaps for high lift configuration, speed brakes for deceleration, and lift dumpers to improve braking efficiency.

Some selected features of MPC flight control are:

- 3–axes FBW in pitch, roll, and yaw.
- Mechanical linkage to one rudder actuator and the THS
- Modern cockpit design with side stick controller.
- Modern control laws for improved handling and safety.
- Aircraft dispatchable after any single electrical flight control computer failure or any single failure affecting aileron, spoiler or THS control.
- No operational reduction after a single hydraulic failure in flight.
- Easy identification of system failures with ECAM / Flight Warning System
- High concentration of computer tasks in each computer module reduces EFCS–complexity. Flight control computer capacity can be reconfigured.

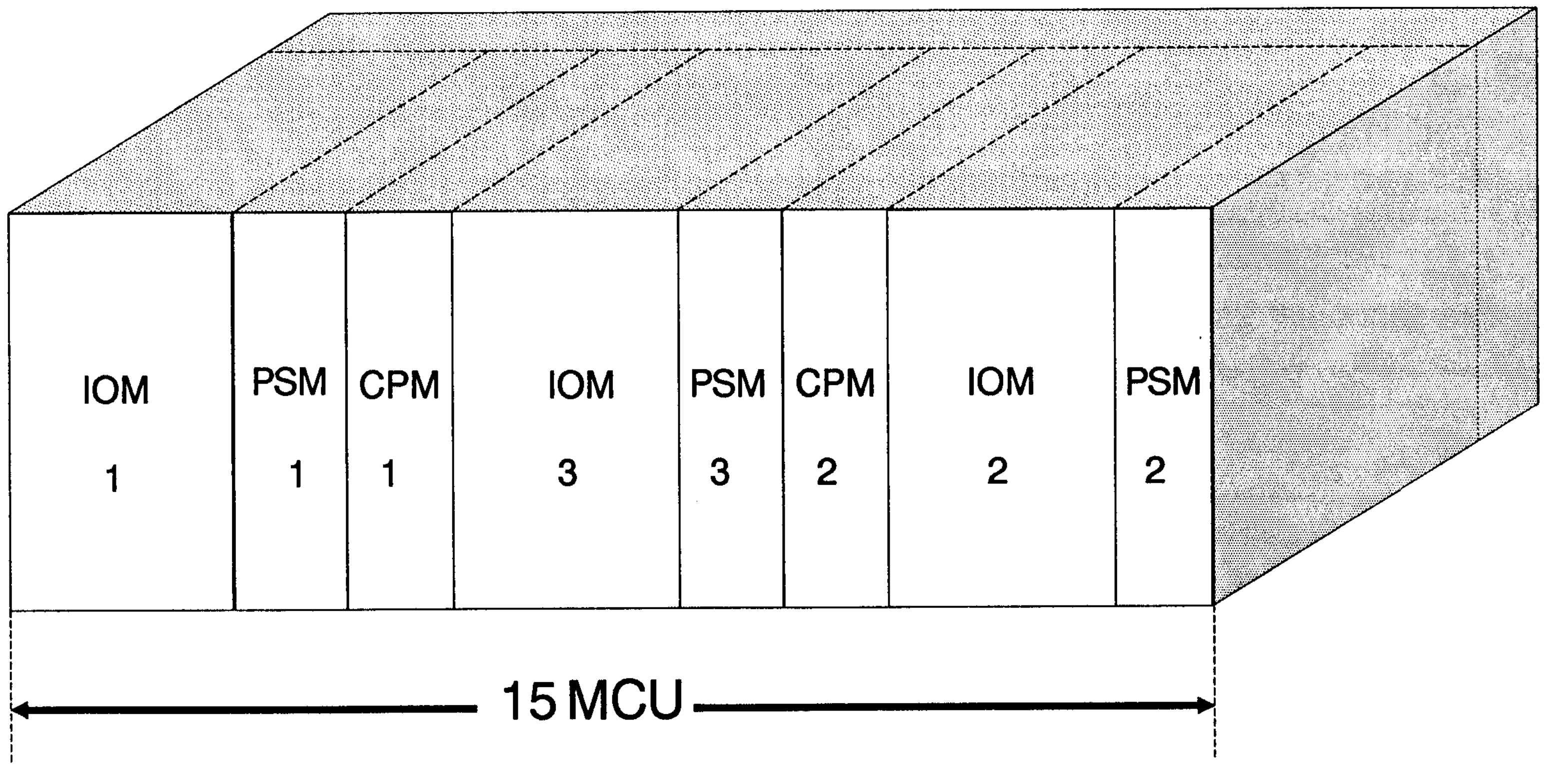
Architecture





Sidestick positions
Rudder pedals position
Pitch trim control
Rudder trim control
Speedbrake control lever position
Slat / flap control lever position
Air data moduls 1,2,3
AHRS 1,2,3
RA 1,2
LGCIU 1,2
Wheelspeed tachometers
Hydraulic pressure sensors
Accelerometers
Yaw rate gyros
EIU
FCU
FMC
Autopilot sensors (ILS/VOR/DME ...)
Thrust lever position
Rudder pedals
Mechanical links
Pitch trim handwheels
Flight Control & Guidance Computers
FCGC A
FCGC B
Nosewheel steering, Auto brake
Warnings, Indications, Maintenance, Recording
Elevators
Ailerons
Rudder
Trimmable Horizontal Stabilizer
Spoiler
Flaps/Slats

Flight Control and Guidance Computer (FCGC)

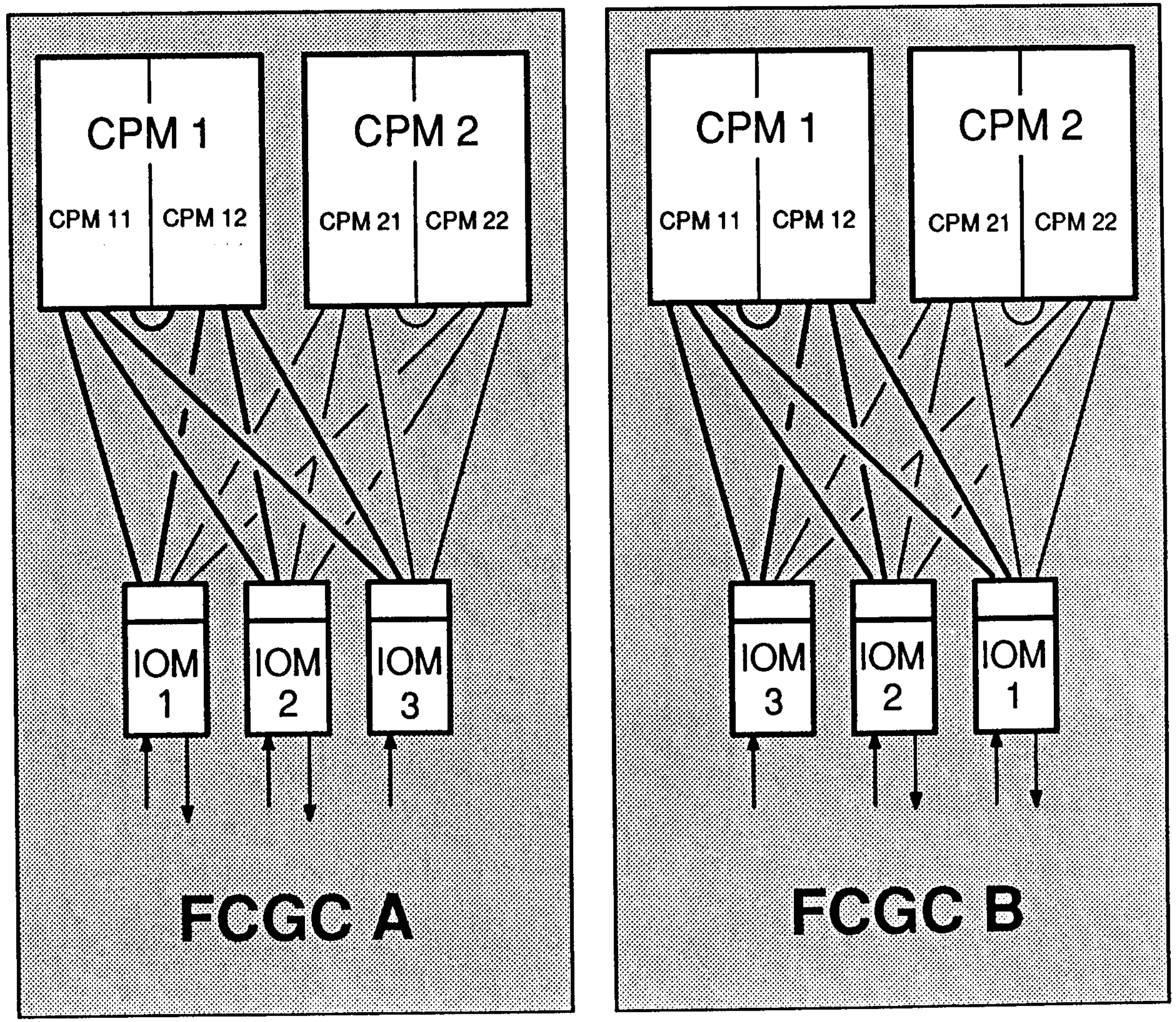


Flight control and guidance computers

Flight control, envelope protection and flight guidance computation is achieved by two dissimilar computer systems: FCGC A and FCGC B.

Each FCGC comprises two Computer Modules (CPM) each of them similar in hardware but dissimilar in software, and three I/O–Modules (IOM) which connect the FCGC to the pilot' s controls the actuators, and the other aircraft systems and sensors.

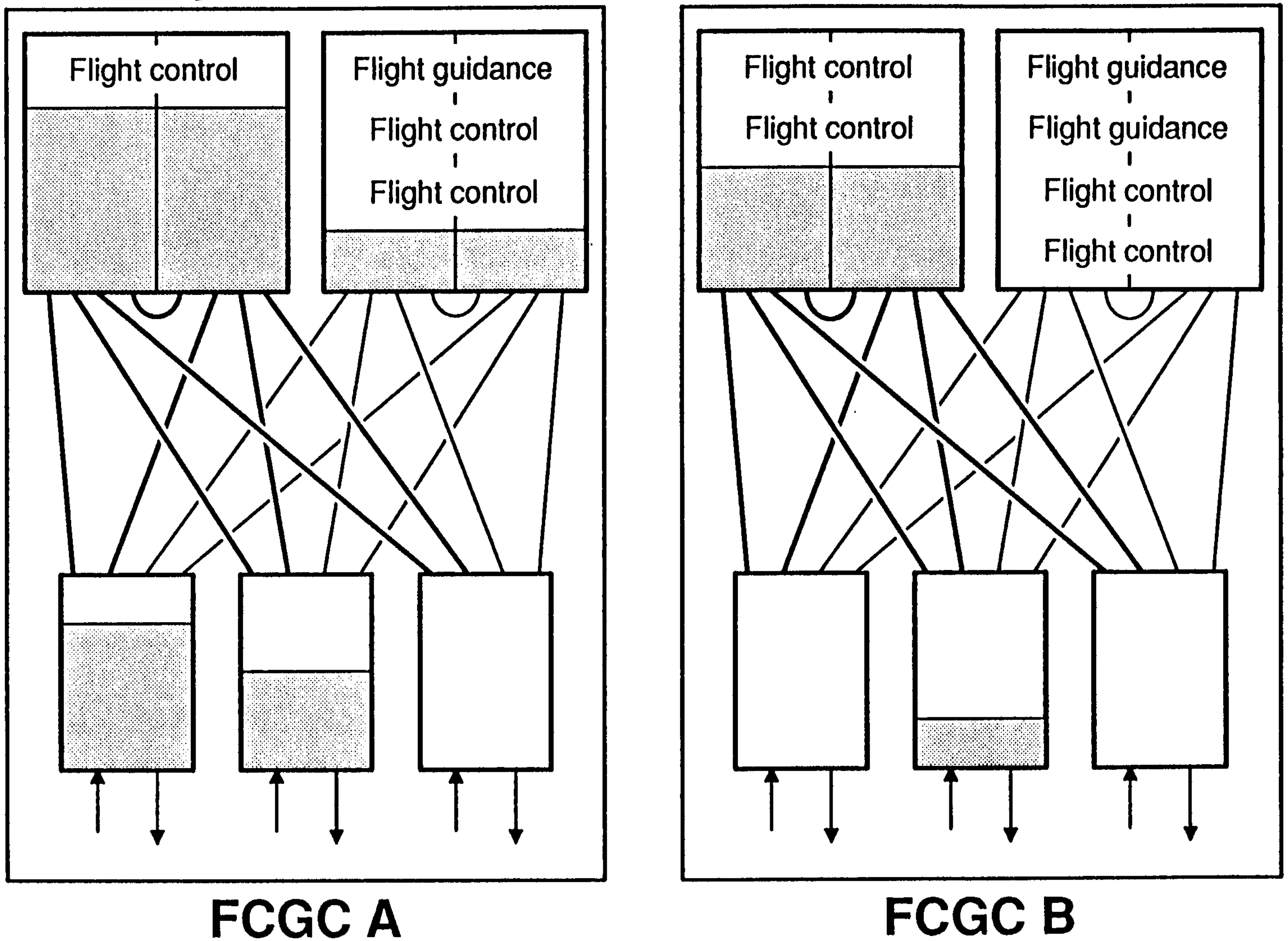
Each CPM consists of two computing lanes which check each other.



FCGC failure analysis

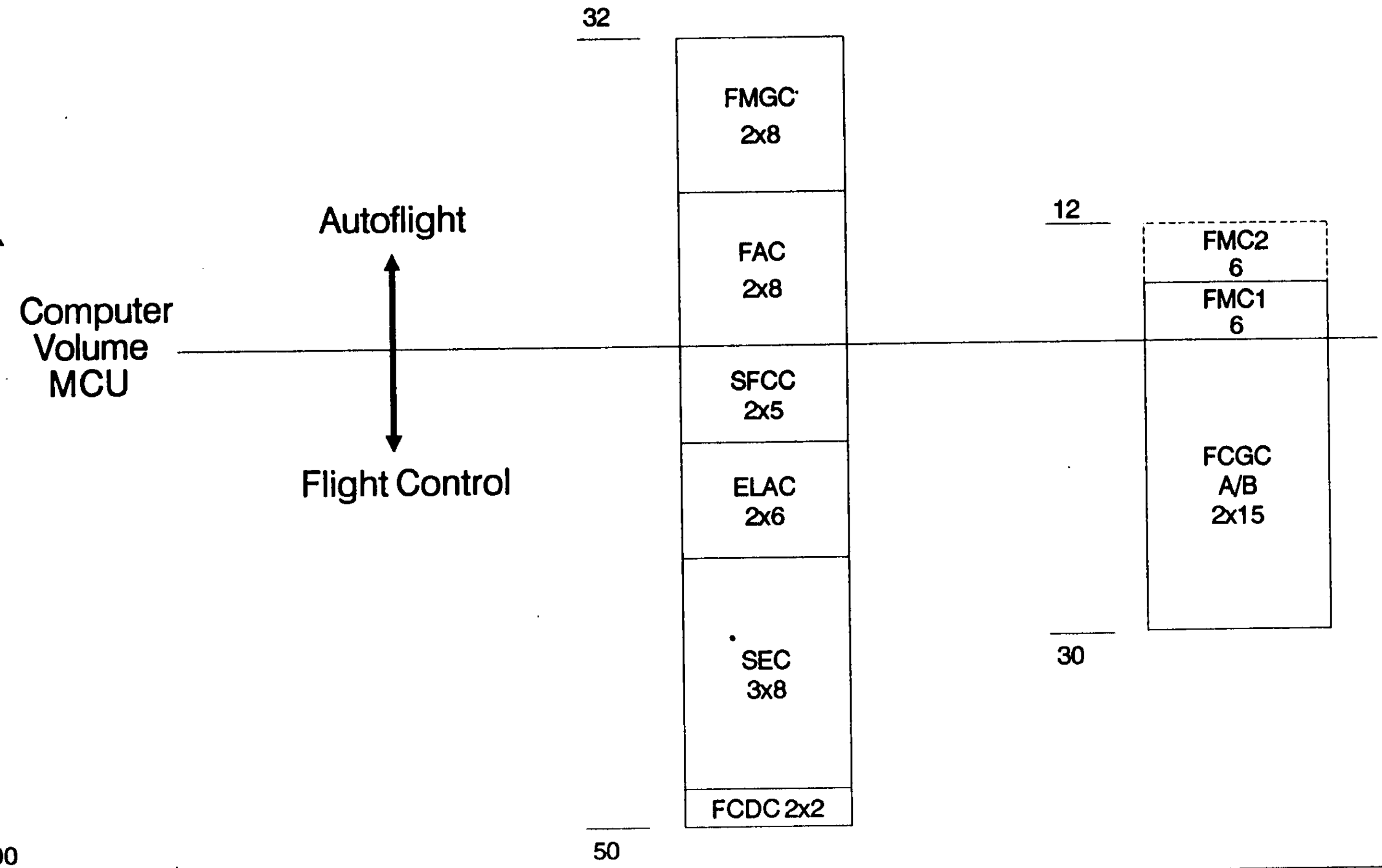
Normal operation
1st Failure
2nd Failure
3rd Failure

Normal operation
4th Failure
5th Failure
6th Failure

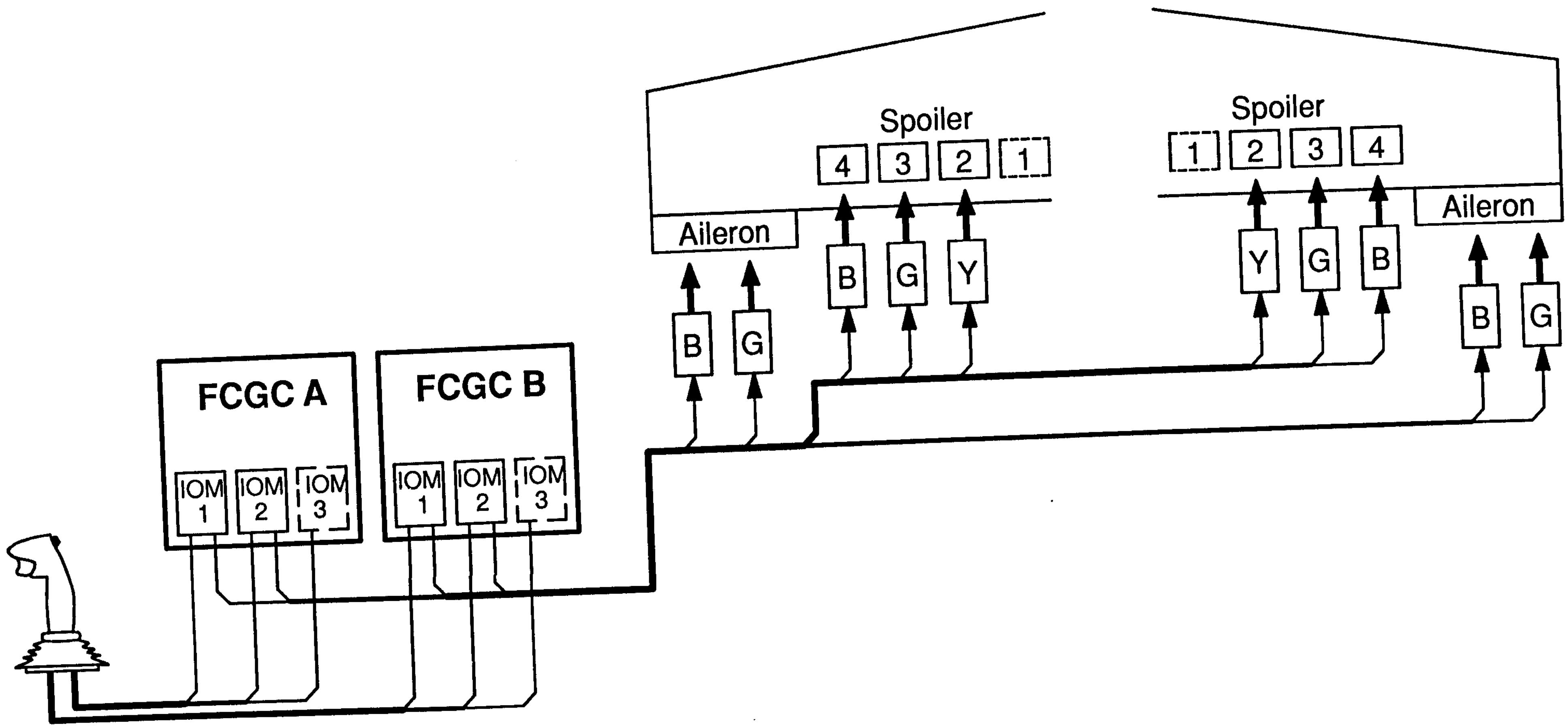


Computer volume comparison

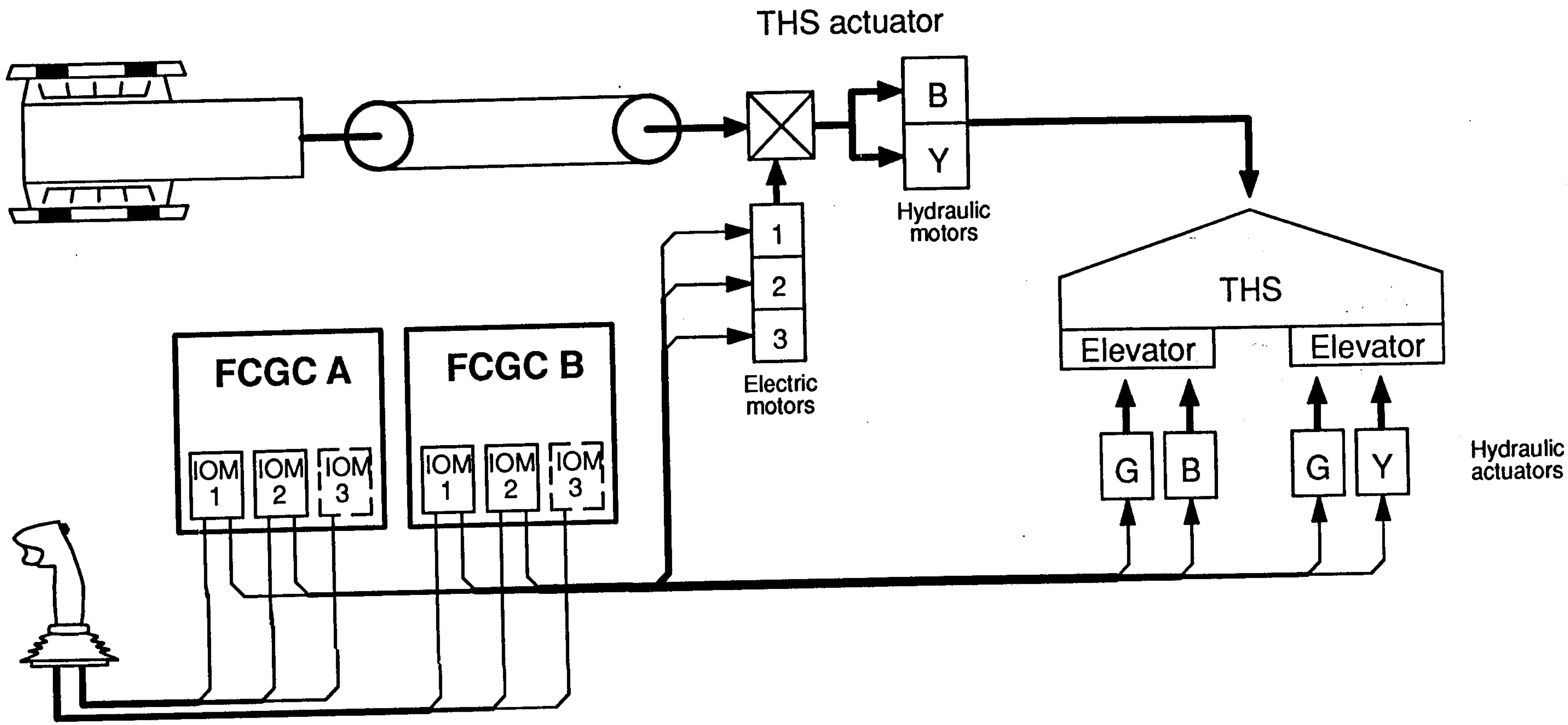
	A320	MPC75
MCDU	2	2
FCU	1	1



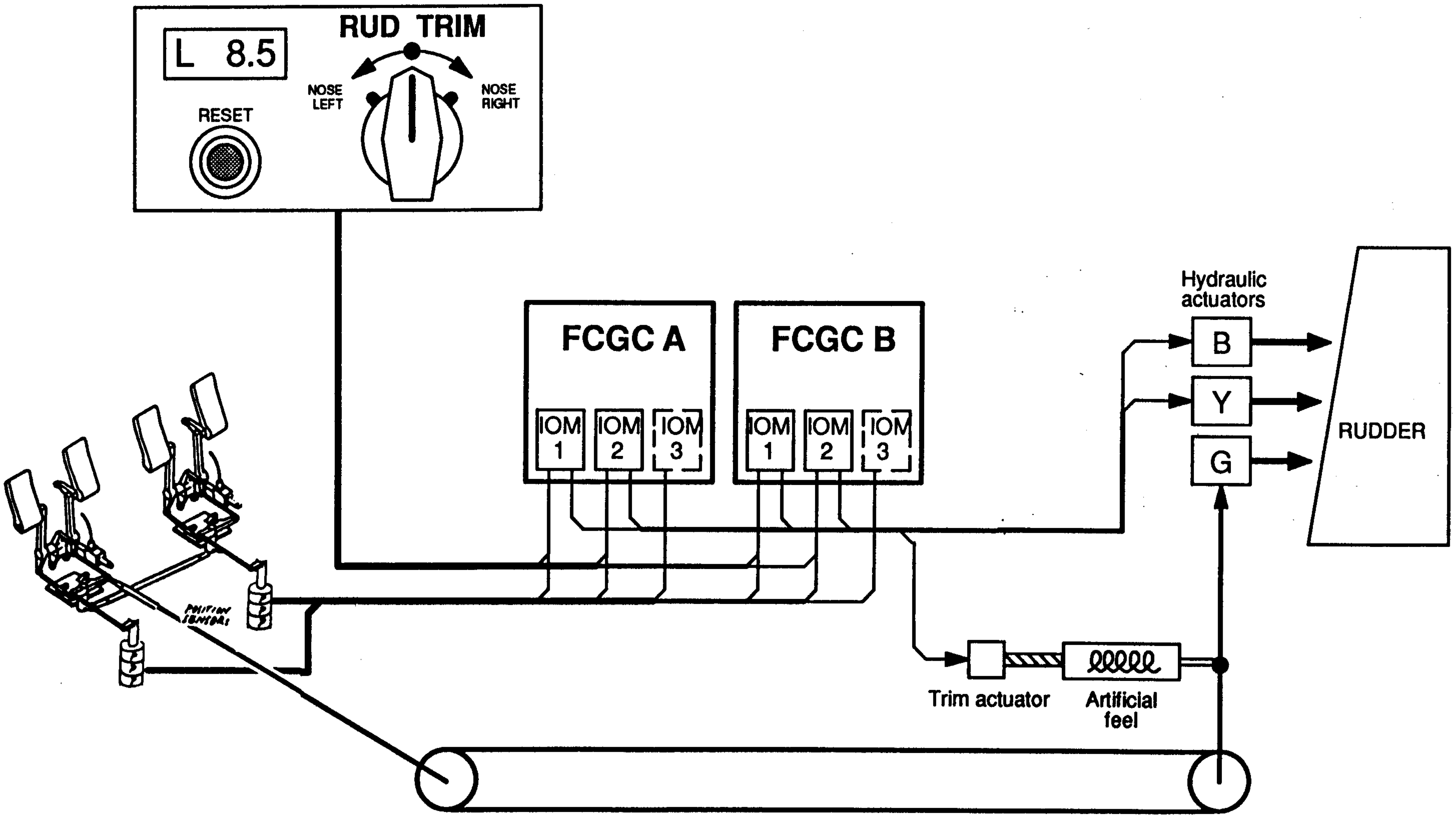
Roll control



Pitch control

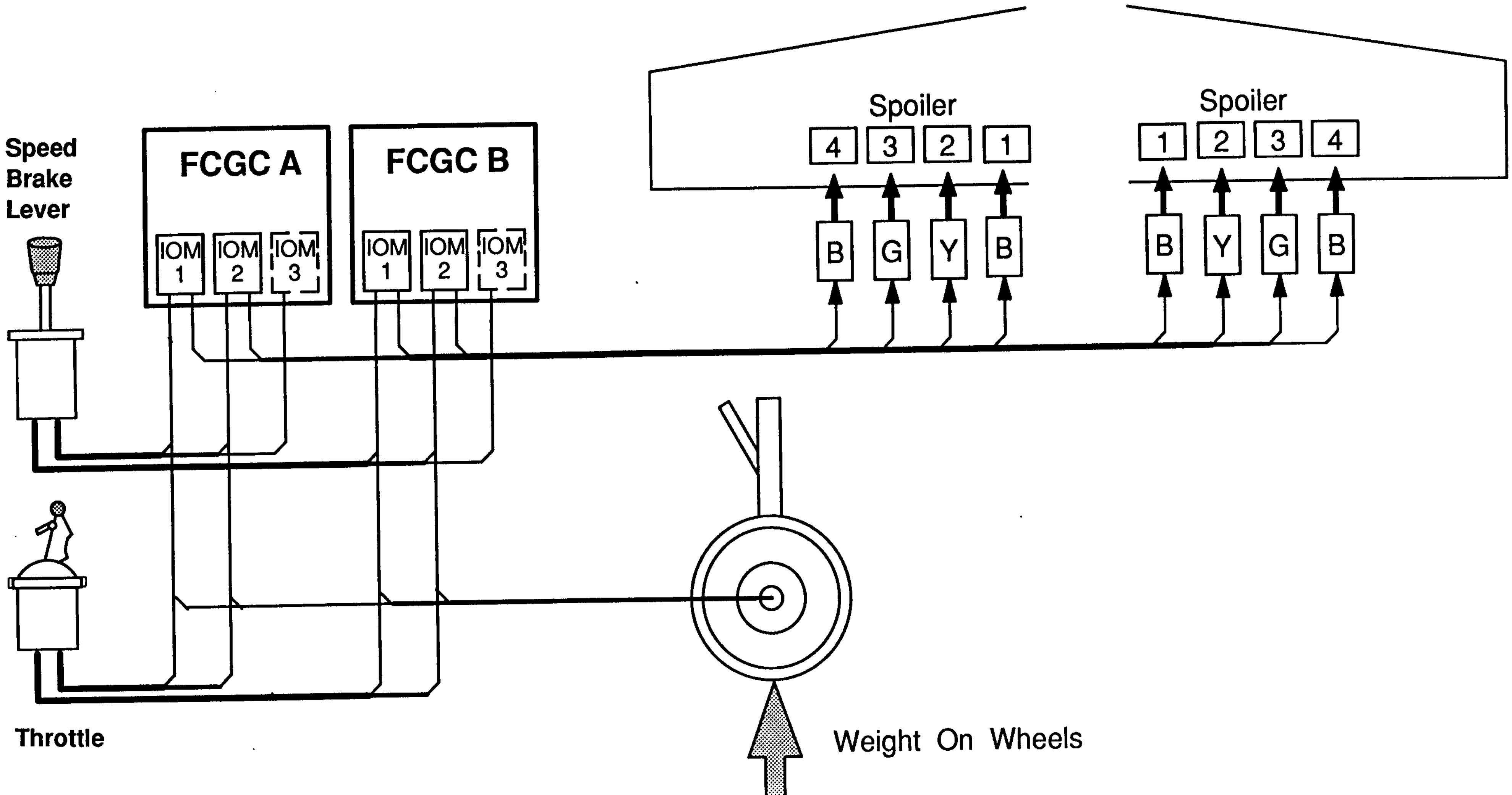


Yaw control

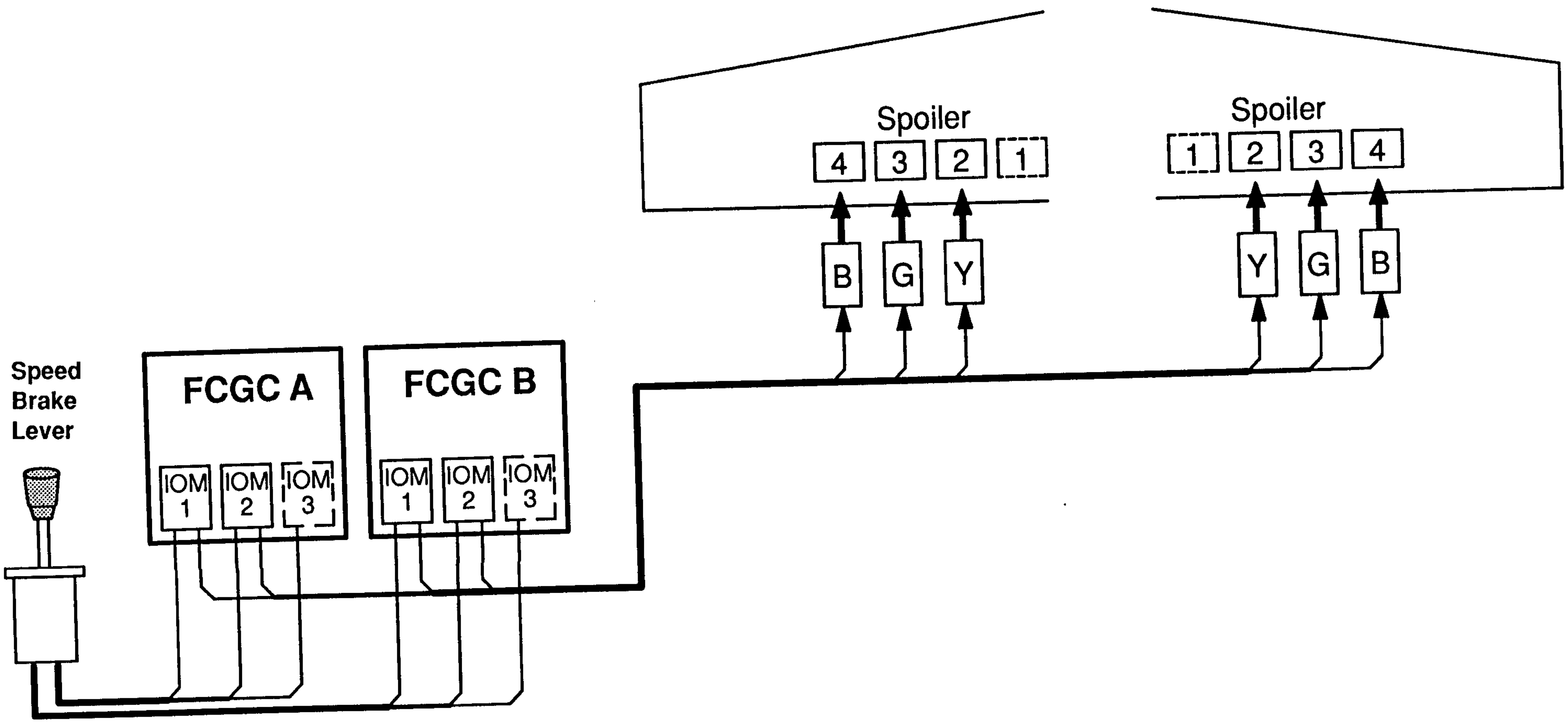


RUD TRIM
L 8.5
RESET
NOSE LEFT
NOSE RIGHT
FCGC A
FCGC B
IOM 1
IOM 2
IOM 3
IOM 1
IOM 2
IOM 3
Hydraulic actuators
B
Y
G
RUDDER
Trim actuator
Artificial feel

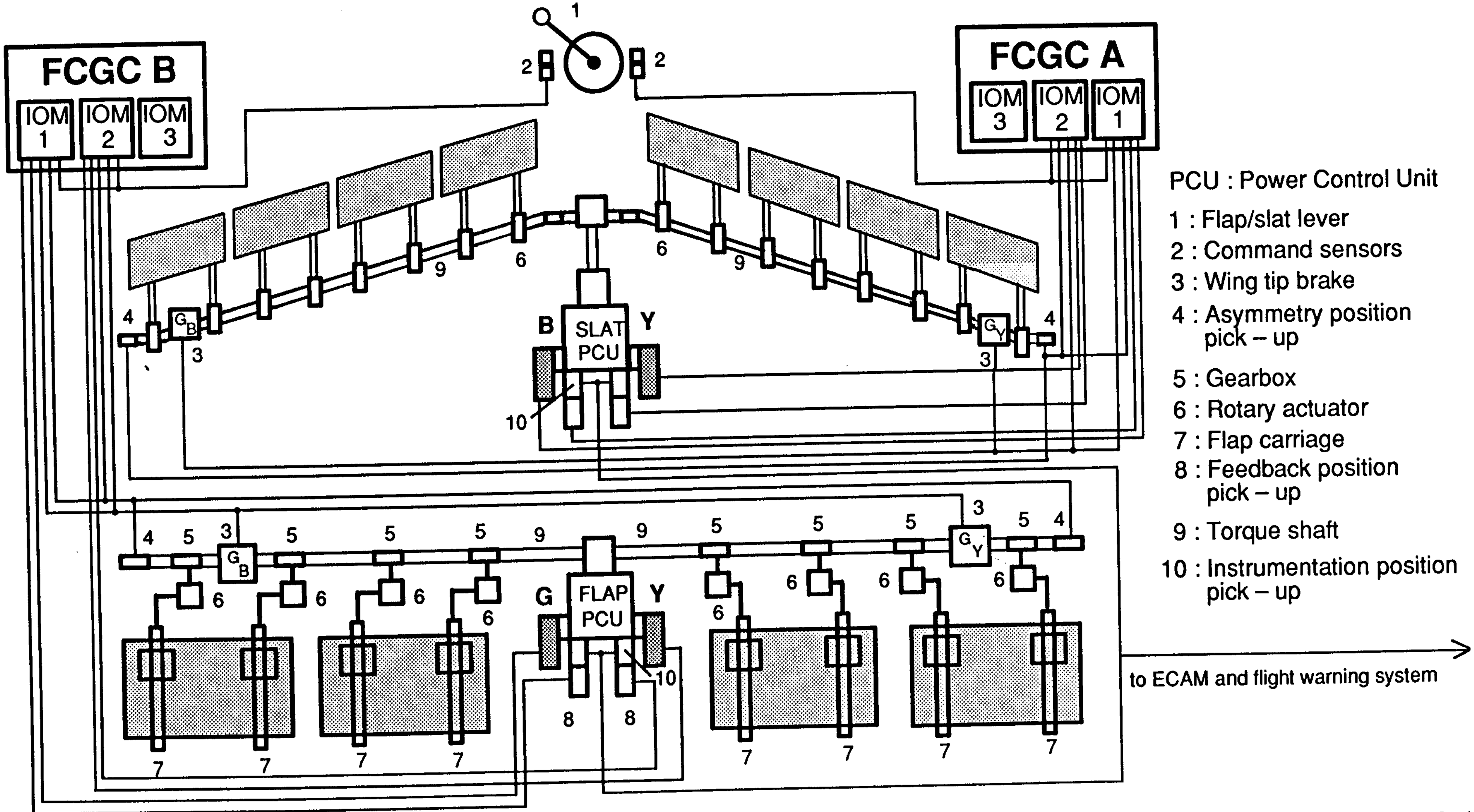
Ground spoiler control



Speed brake control



Slat / flap control



PCU : Power Control Unit

1 : Flap/slat lever
2 : Command sensors
3 : Wing tip brake
4 : Asymmetry position pick – up
5 : Gearbox
6 : Rotary actuator
7 : Flap carriage
8 : Feedback position pick – up
9 : Torque shaft
10 : Instrumentation position pick – up

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Contents

1. Storage

Fuel is stored in two tanks, one in each outer wing spar box. The tanks are an integral part of the wing structure.
2% expansion space is provided in each tank.
The engines are fed from collector tanks between rib 1 and rib 2, which are protected by flapper valves.
Water drain valves are installed at the lowest points of each tank.
A vent surge tank is located near each wing tip, which collects fuel spilled into the vent system.

Total wing fuel: 10,000 l (8,000 kg; density: 0.8 kg/l)

The centre wing box is free for a later capacity enlargement.

2. Vent System

Open vent system with non-icing NACA air inlet in outboard vent surge tank.
Flame arrestors protects surge tanks against ground fire.
Fuel spilled into the surge tanks is discharged back into the main tanks.

Optional centre tank vented via left hand vent surge tank.

3. Distribution

Each engine is fed from two electrical booster pumps (115 V AC 3-Ph.) located in the adjacent collector tank.
Pumps are canister housed for removal without draining the tanks.
One pump can supply one engine under all conditions.
Pumps are controlled by pushbuttons on the overhead fuel control panel and monitored by pressure switches, sensing at the outlet of each pump.
Fuel shutoff valves with double electrical actuators are mounted at the front spars. The isolation of an engine is controlled by the engine master switch and the fire pushbutton.

A crossfeed valve with a double electrical actuator allows fuel supply from both tanks to one engine or from one tank to both engines. The crossfeed valve is controlled by a pushbutton on the overhead fuel control panel.

Optional center tank with two pumps. Pumps identical to the wing tank pumps.

The APU is supplied from the LH supply system. On ground, a battery powered APU starter pump can be used.
The pump is canister housed. Pump control automatically by pressure switch.
The APU fuel line is shrouded in pressurized areas of the fuselage and drained overboard.
An APU shut-off valve with double actuator is mounted at the rear spar. Valve control is by the APU master switch and the APU fire pushbutton.

System control on overhead fuel control panel.
System status and failure indication on Electronic Instrument System (EIS) displays.

4. Refuel / Defuel

Single pressure refuel coupling (2.5" standard) under RH wing leading edge.
Max. refuel rate 1200 l/min with 50 psig nominal pressure at the coupling.
Refuel valves are solenoid actuated with manual override. Refuel valves canister housed.
No fuel remaining in refuel pipe due to air inlet valve.

Automatic refuel distribution by use of Fuel Quantity Measuring System.
Independent refuel shut-off by 'High Level' sensors.
Refuelling possible by using battery power only.

Refuel panel located in RH wing fairing. It contains refuel and defuel valve control switches, fuel preselector, digital indicators for preselected fuel, total fuel and fuel in each tank and 'High level' indication lights.

Cockpit refuel panel optional, allows preselection of required fuel quantity.

Defuel valve electrically actuated, manually controlled from refuel panel.
Defuelling and fuel transfer from one tank to another possible by using the booster pumps.

Gravity filling point provided for each wing tank.

5. Quantity Indication

Fuel Quantity Indication

Capacitance type measuring system with linear probes.
Computation by dual channel Fuel Quantity Control Computer (FQCC).
Densitometer in each wing tank.
Individual connection of all probes with FQCC for BITE function.
ARINC 429 connection to Refuel Panel and aircraft systems.
Digital indication of fuel quantity on EIS and Refuel Panel
Digital indication of fuel temperature on EIS, one temperature sensor located in each wing tank.

Level Sensing

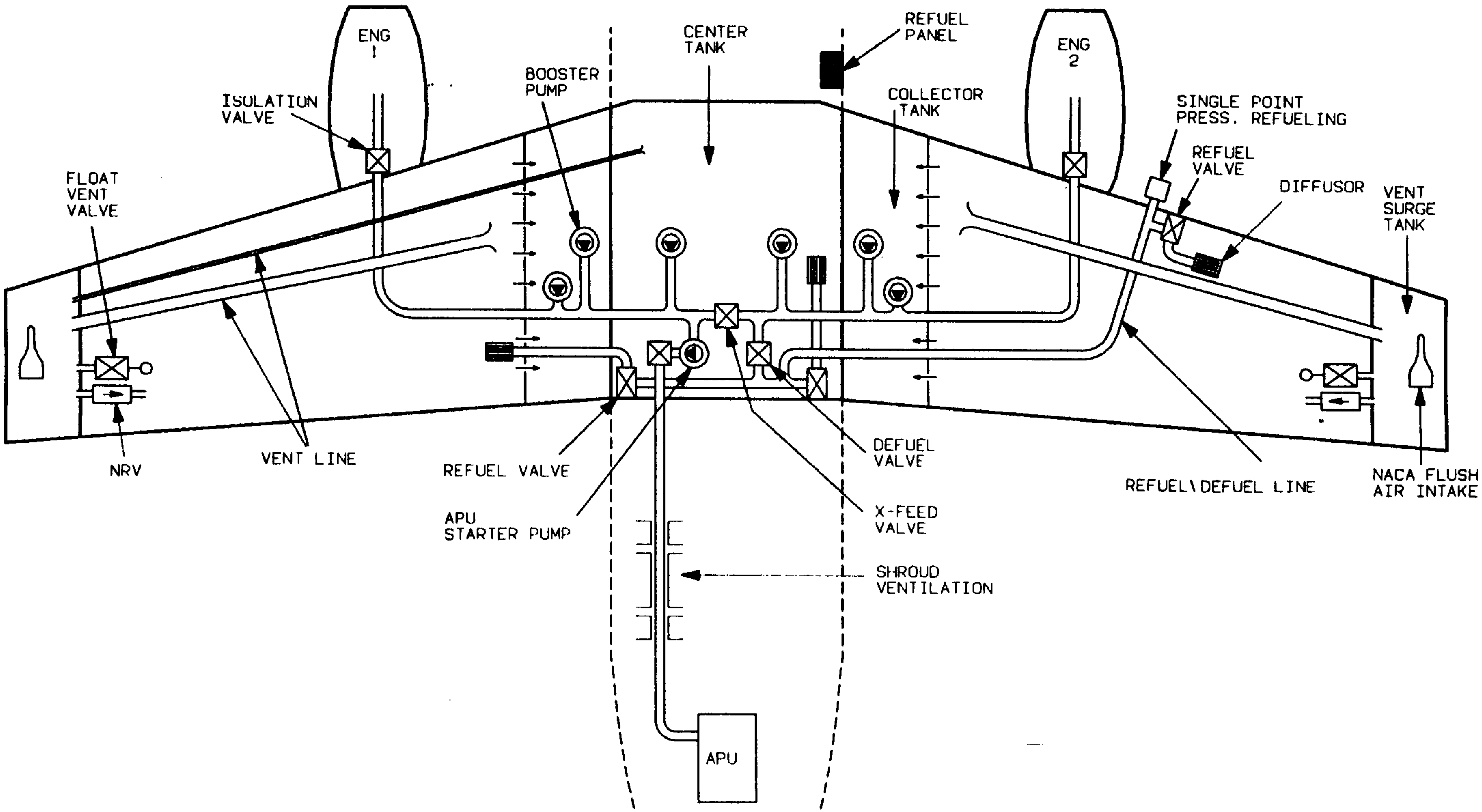
'Low level' warning and 'high level' refuel shut-off controlled by independent level sensing stage, integrated in FQCC. One 'low level' sensor and one 'high level' sensor in each tank.
Independent power supply.
Sensor BITE control via FQCC.

Secondary Fuel Quantity Indication

Magnetic Level Indicators (MLI) can be used on ground in connection with an attitude monitor and correction charts.

Provision for centre tank equipment similar to wing tanks (except temperature measurement).

Fuel System Schematic



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Contents

1 - General

The hydraulic system powers the hydraulic actuation for the flight control system, the landing gear and the braking system. It consists of three fully independent hydraulic circuits, as there is no manual mode for the flight control .

The system failures including dormant failures shall not prevent continued safe flight and landing unless they are extremely improbable.

3000 psi supply pressure is delivered from piston pumps with variable displacements. All pumps are of conventional types.

The fire-resistant hydraulic fluid is of phosphate ester type.

2 - Hydraulic system description

Three independet hydraulic circuits - called No.1 / green system, No.2 / blue system and No.3 / yellow system are continuously operating and supply power to their respective sub systems as shown on the page 29.08.

No. 1 system / green derives primary power from one engine driven pump (EDP) mounted on the left engine . Additional power is provided by an electric driven pump .

No. 3 system / yellow is similar, except that the EDP is mounted on the right engine . The system includes also an electric driven pump .

No. 2 system / blue is powered from a continuously operating electric driven pump .

Each hydraulic system has an air pressurized reservoir .

In case of double engine failure,emergency hydraulic power will be provided via a ram air turbine (RAT) to the blue system .

The primary flight control servos are protected against high flow consumers by priority valves .

High pressure filters are installed in each pump delivery line providing a continuous cleaning of the hydraulic fluid .The return and the case drain lines are equipped with low pressure filters .

The high pressure lines of all hydraulic circuits are protected against overpressure by relief valves .

3- Installation and distribution

In order to meet the segregation requirements the three hydraulic circuits are separated in such a manner that at least one system remains undamaged at any one failure .
This consideration includes all components and the pipe routing located in the areas exposed to damage i.e. due to engine desintegration, tyre burst or accumulator burst .

The hydraulic consumers are distributed to the three hydraulic circuits in a way to provide a well balanced and efficient system with adequate redundancy .

Provision is made for the installation of manifolds in each hydraulic circuit . These manifolds include hydraulic components which help to minimize the number of pipes and unions and provide easy maintenance .

Different materials for the pipes are considered :
- Titanium alloy for all high pressure pipes .
- Aluminium alloy , corrosion protected , for all low pressure pipes such as return , suction and drain pipes .
- Stainless steel for all high and low pressure pipes installed in the fire exposed areas and for coiled pipes.

4- Indication and control

Indication is provided on the ECAM displays and on the overhead panel for the following parameters :

- Reservoir low pressure level
- Reservoir quantity
- Reservoir low air pressure
- High system pump pressure
- Low system pressure
- Fluid temperature

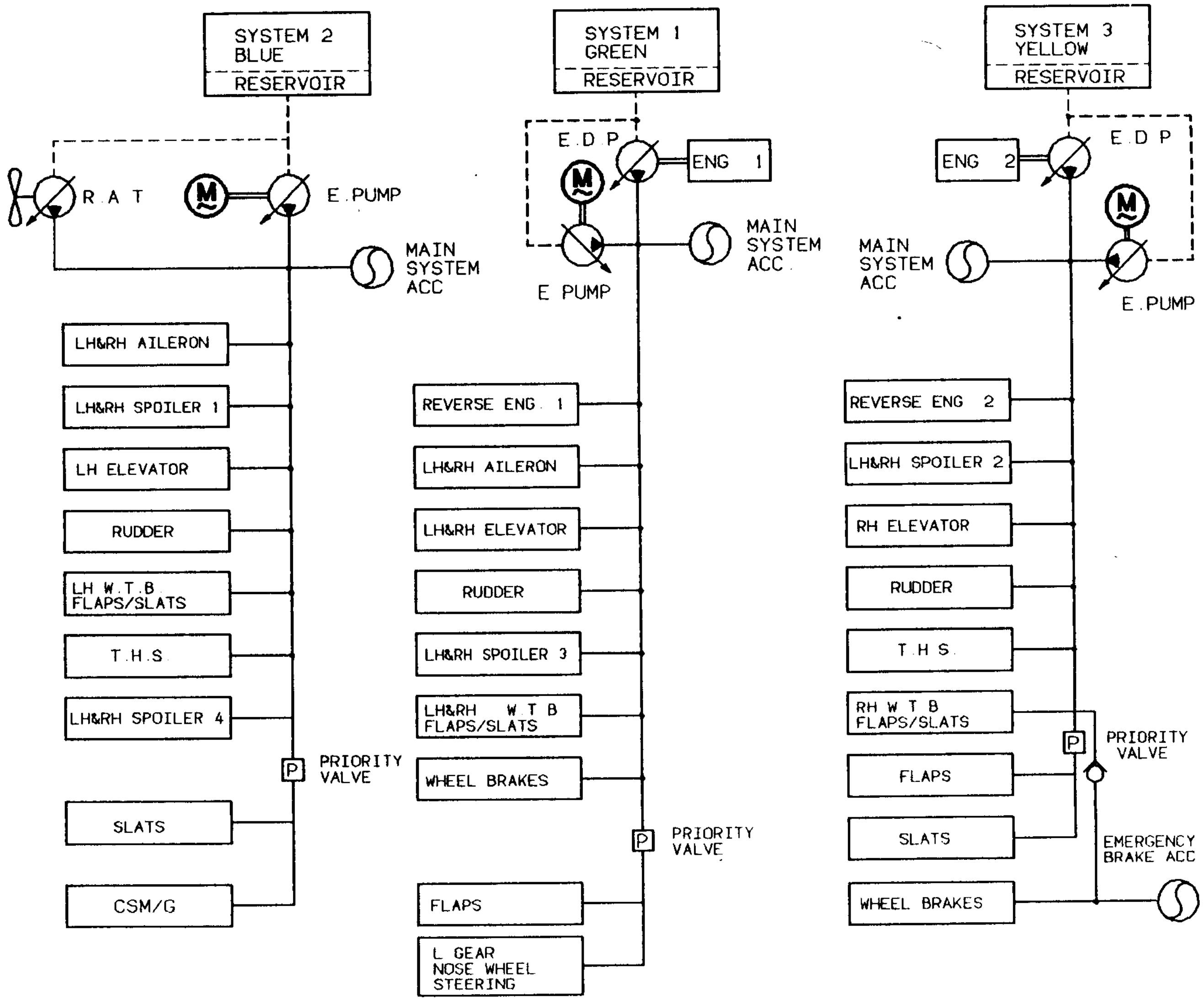
The two engine driven pumps, the electric driven pumps , the deployment of the RAT and the EDP-depressurizing valves are controlled by push buttons .
The fire shut-off valves are controlled by the engine fire handles .

5- Ground handling

Reservoir refilling is provided by means of a hand-pump and refilling selector valve which allows to select the reservoir to be refilled .

External ground connections for the electric and hydraulic power supply are available .

The three hydraulic reservoirs can be externally air pressurized by means of a separate centralized connection .



SYSTEM 2
BLUE
RESERVOIR
R.A.T
M
E.PUMP
MAIN
SYSTEM
ACC
LH&RH AILERON
LH&RH SPOILER 1
LH ELEVATOR
RUDDER
LH W.T.B
FLAPS/SLATS
T.H.S
LH&RH SPOILER 4
P
PRIORITY
VALVE
SLATS
CSM/G
SYSTEM 1
GREEN
RESERVOIR
E.D.P
ENG 1
M
E PUMP
MAIN
SYSTEM
ACC
REVERSE ENG. 1
LH&RH AILERON
LH&RH ELEVATOR
RUDDER
LH&RH SPOILER 3
LH&RH W.T.B
FLAPS/SLATS
WHEEL BRAKES
P
PRIORITY
VALVE
FLAPS
L GEAR
NOSE WHEEL
STEERING
SYSTEM 3
YELLOW
RESERVOIR
E.D.P
ENG 2
M
MAIN
SYSTEM
ACC
E.PUMP
REVERSE ENG 2
LH&RH SPOILER 2
RH ELEVATOR
RUDDER
T.H.S
RH W.T.B
FLAPS/SLATS
P
PRIORITY
VALVE
FLAPS
SLATS
EMERGENCY
BRAKE ACC
WHEEL BRAKES

Contents

1. General

Critical areas of the aircraft are protected against ice by hot air systems or electrical heating. The ice protection system permits unrestricted aircraft operation in ice and rain conditions.

1.1 Hot Air Systems

- The slats outboard the engines of each wing
- The engine air intakes

1.2 Electrical Heating Systems

- The flight compartment windows
- The air data probes and sensors
- The waste water drain mast

1.3 Rain Removal

- The front windshields by wipers
- Rain repellent fluid system (Option)

2. Wing Anti Ice (WAI) system

2.1 Description

The slats outboard the engines are protected by means of hot air. The air is taken from the pneumatic system and the supply to each wing is controlled by shut-off/pressure reducing valves. A flow limiter (orifice) is fitted downstream of the valve.
A telescope duct feeds the piccolo tube in the slats. The hot air passes through slots and exhausts via holes along the slat rear skin and discharges through gaps between the slat trailing edge and the fixed wing.

2.2 System operation

The system will be controlled automatically by the ICE DETECTION CONTROL LOGIC, which is connected to two ice detectors. In case of one ice detector failure indication on the EIS is shown and manual system control is possible (Pushbuttons on the overhead panel).

3. Nacelle Anti Ice (NAI) system

Description:
The engine nacelles are anti-iced by hot air. The control valve (ON/OFF) is operated automatically from the Ice Detection Control Logic or manually by the use of the pushbuttons on the overhead panel.

4. Ice Detection System

The ice detection system is a primary system with 'AUTO'-control for WAI and NAI. Therefore two ice detectors are installed and connected to the Ice Detection Control Logic.
In case of one ice detector failure information will be given on the EIS and system operation control for WAI and/or NAI is manually possible.

5. Cockpit Windows

The windshields and side windows are protected against fogging and icing by electrical heating whereas the windshields are additionally demisted by conditioned air.
Control and monitoring units on each side monitor, control and regulate the system. On each side temperature control of front and lateral windows are independent.
Engine starting automatically initiates the system functioning.

6. Probe Heating

Air data probes and sensors (TAT) are electrically heated.
In order to allow correct operation of the aircraft after a major electrical power supply failure, one system is supplied from the emergency electrical supply.

7. Waste Water Drain Mast Heating

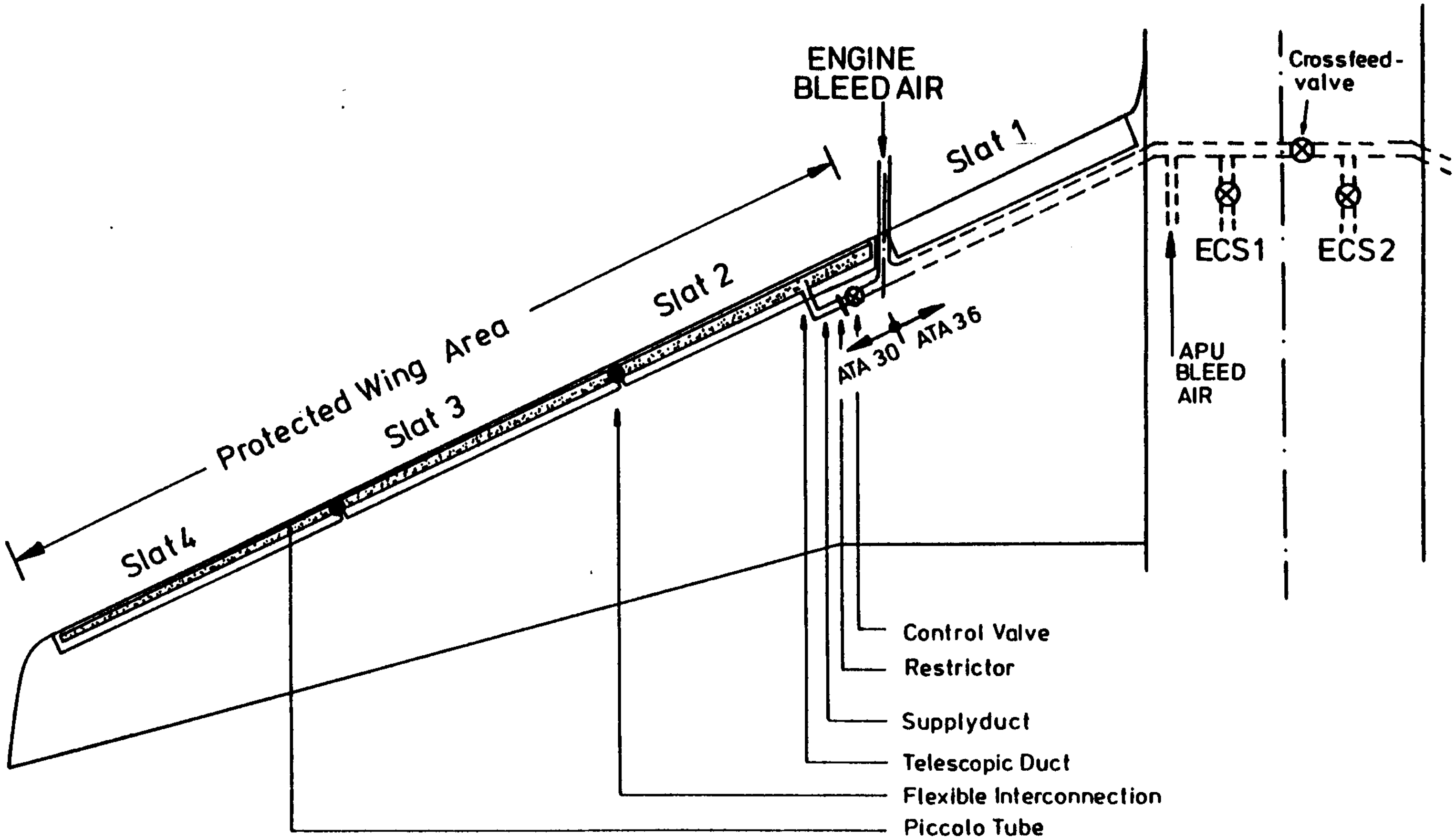
The lavatory/galley waste water drain masts are electrically heated to prevent ice formation. The heating level is automatically reduced when the main landing gear is extended. Heating is operative as long as power is available.

8. Rain Removal System

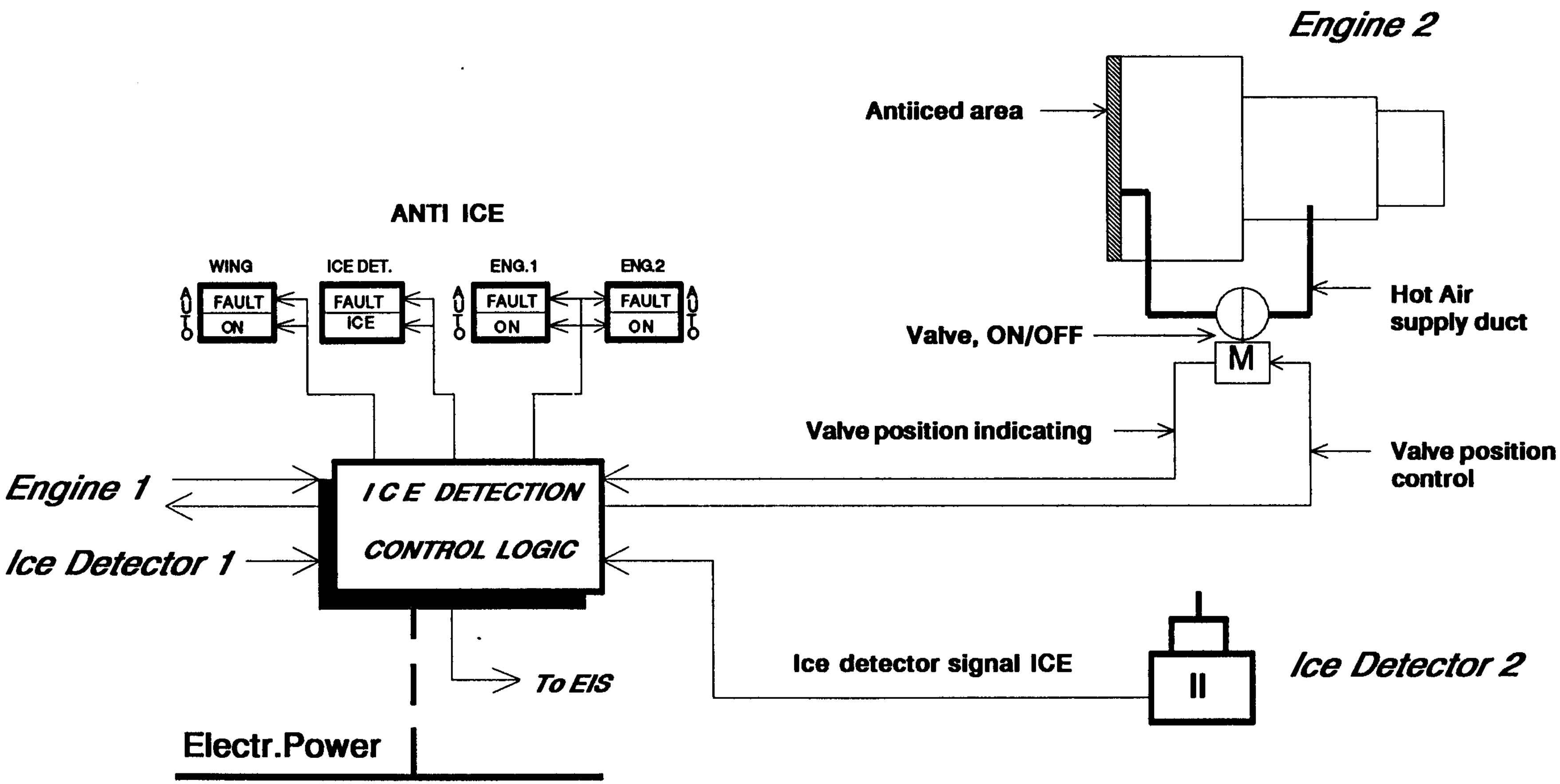
Each front windshield is equipped with a two speed electric wiper. A rain repellent system can be installed optionally.

MPC AIRCRAFT

Wing Anti Ice



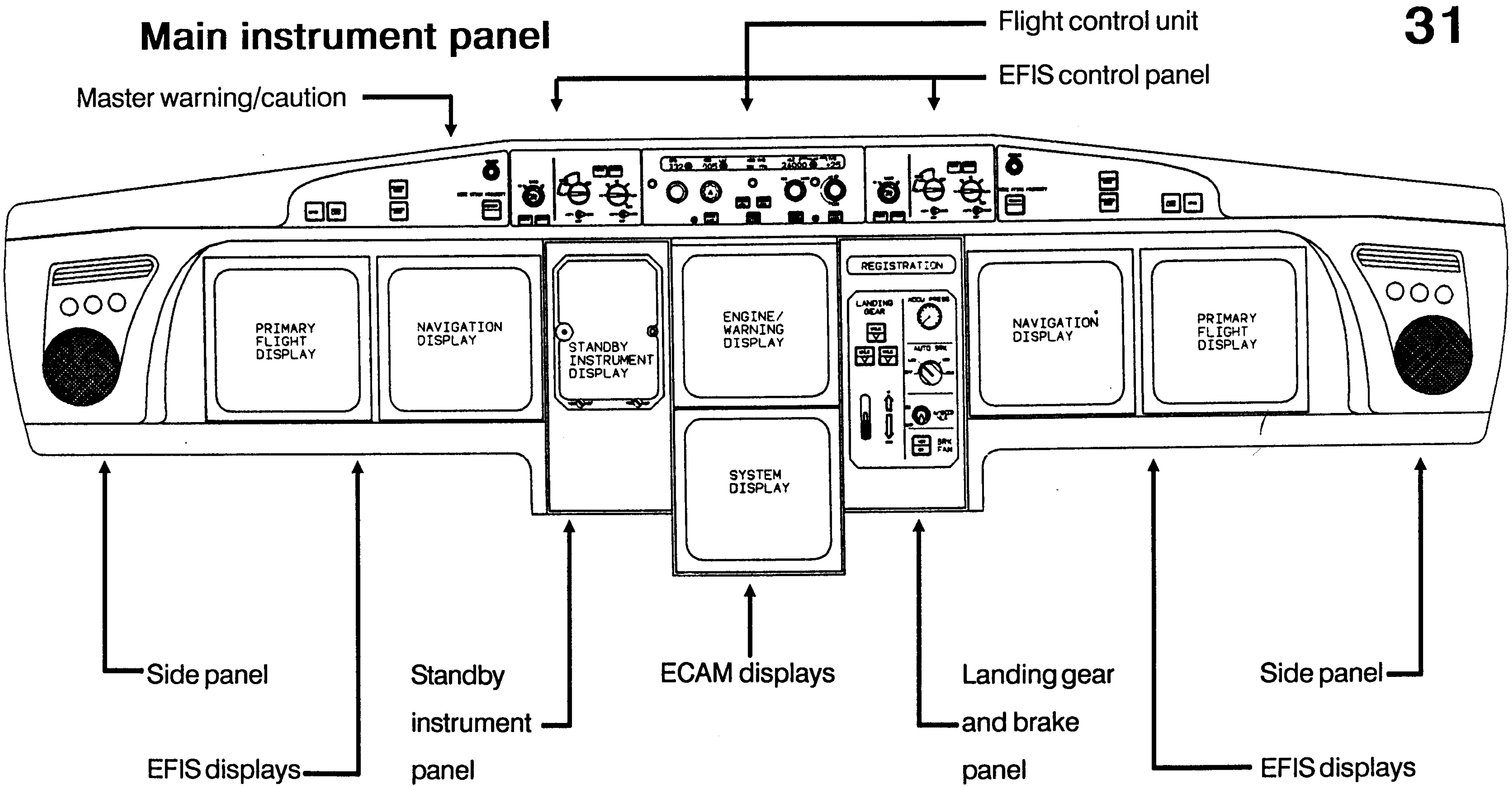
Nacelle Anti Ice and Ice Detection



Contents

1 - Cockpit panels

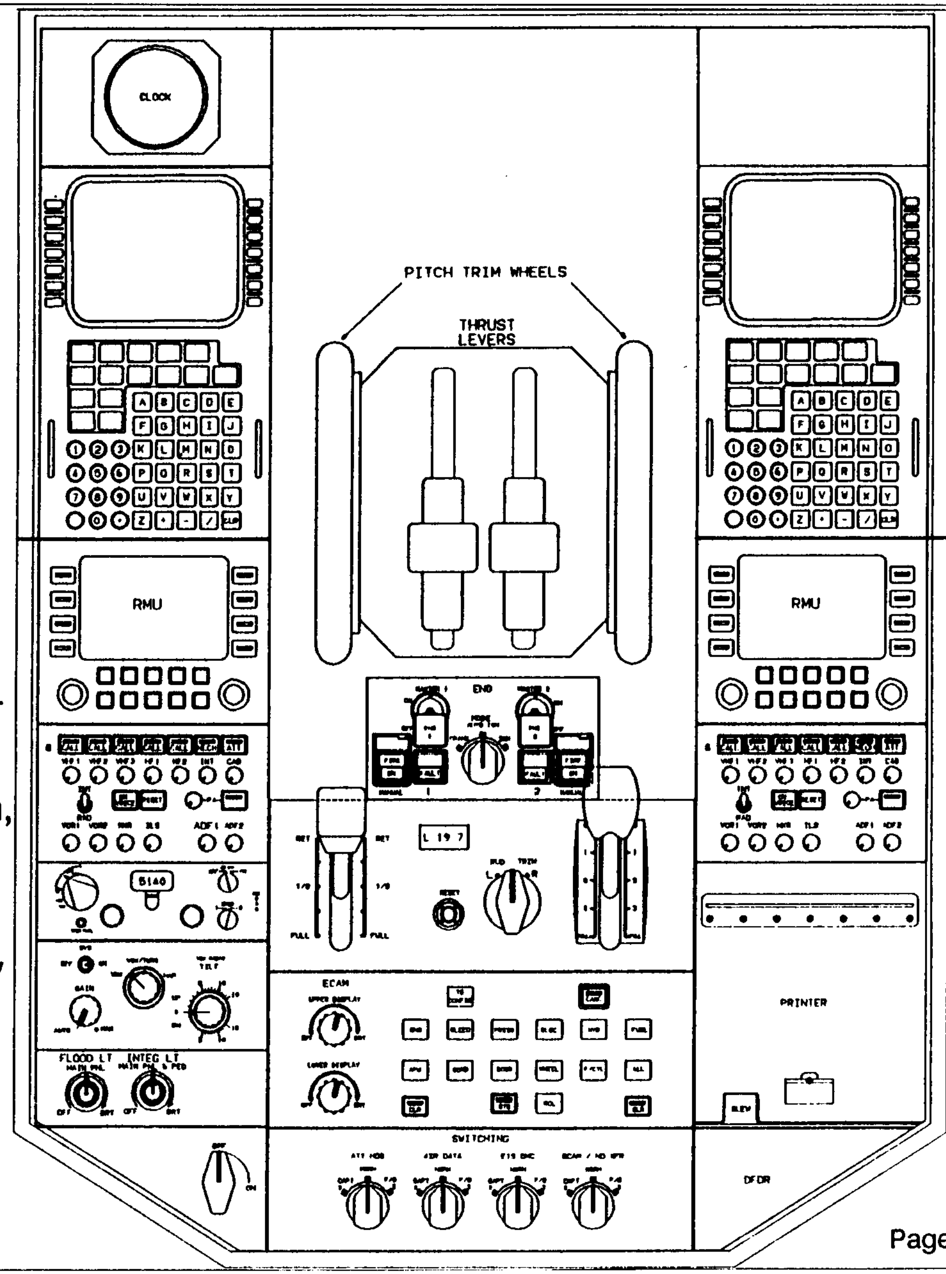
Main instrument panel



Pedestal

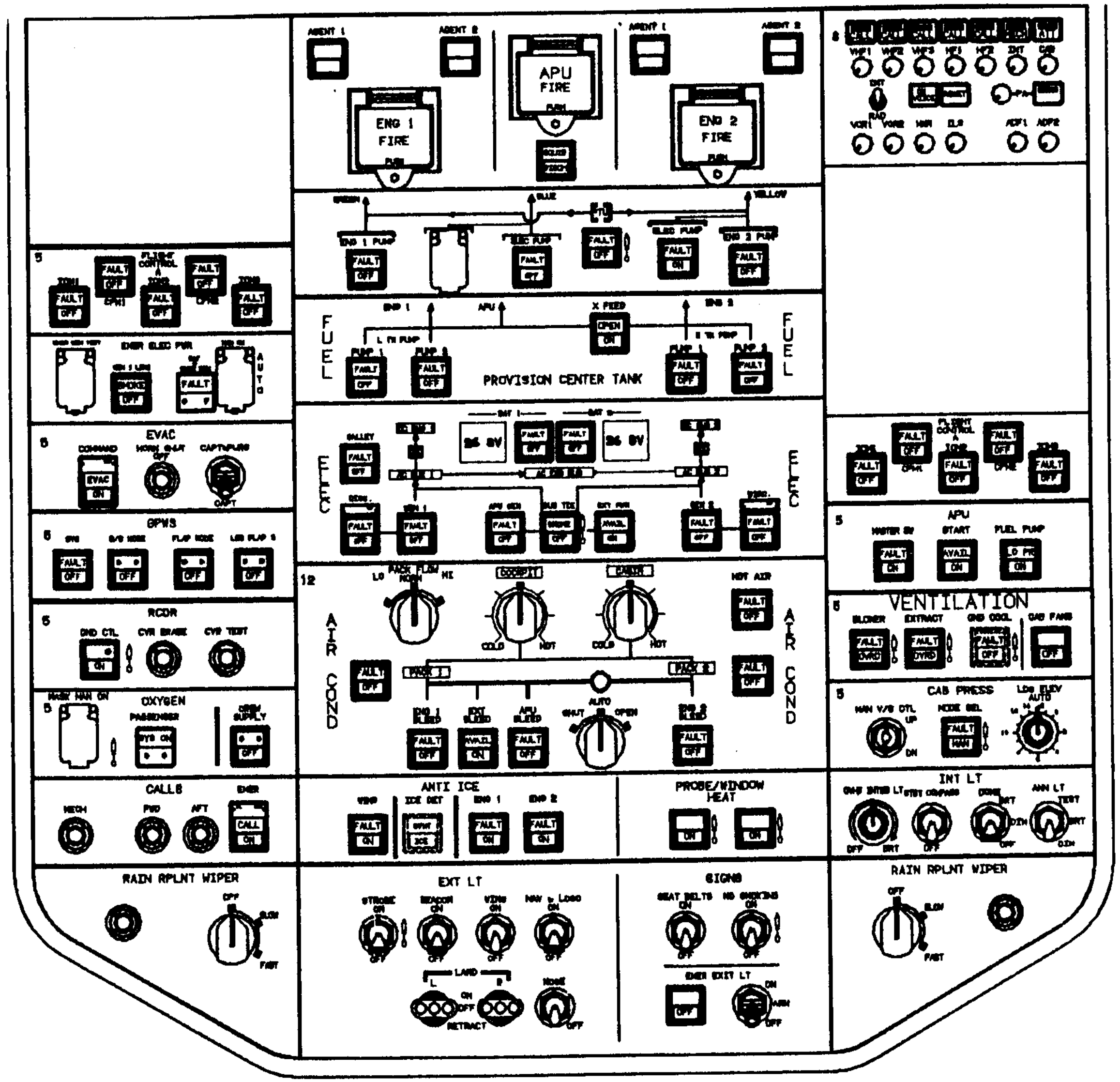
In addition to the thrust levers and engine control functions the main features are:

- Pitch trim wheels
- Flap/slat control lever
- Airbrake control lever
- Rudder trim panel
- Multipurpose Control and Display Units (MCDU) for flight management, maintenance,data link, etc.
- Radio Management Panels (RMP) for communication and navigation control function
- Audio Control Panel (ACP) for intercommunication, transmitting/receiving function
- Lighting Control Panel
- Gravity landing gear control handle for emergency function



Overhead panel

The overhead panel has a three-row arrangement with the main engine related systems in the centre line. The lower section is for frequently used systems, where the upper section is reserved to handle any abnormal situations.



2 - Electronic Instrument System (EIS)

EIS components

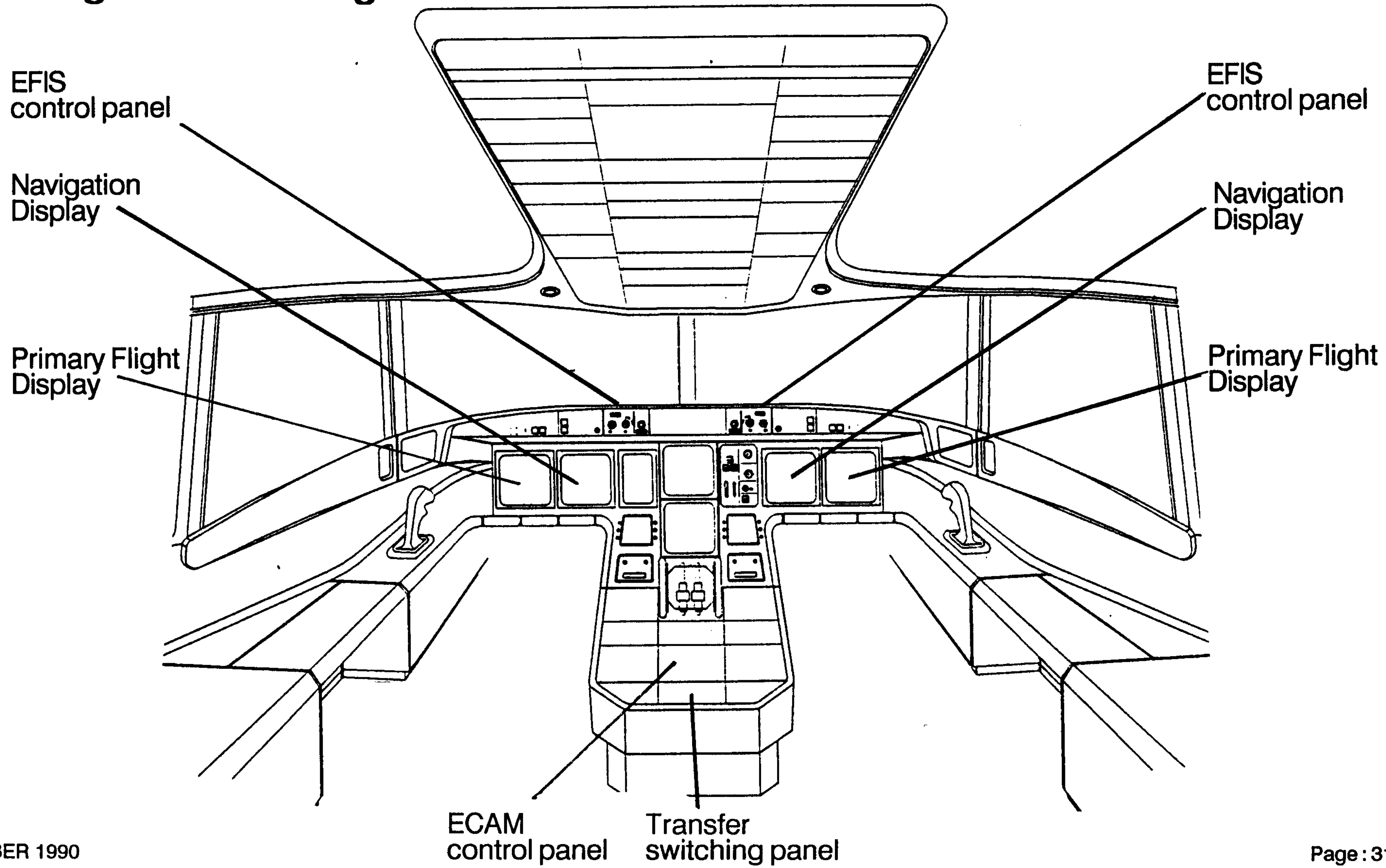
- Six identical flat panel Display Units (DU)
  Size 7.25" x 7.25", full colour, high resolution
  Integrated graphic generator
  Internal source switching (DMP)

- Three Display Management Processors (DMP)
  Digital High Speed (HS) data link to display units
  No.3 DMP may replace either No.1 or No. 2

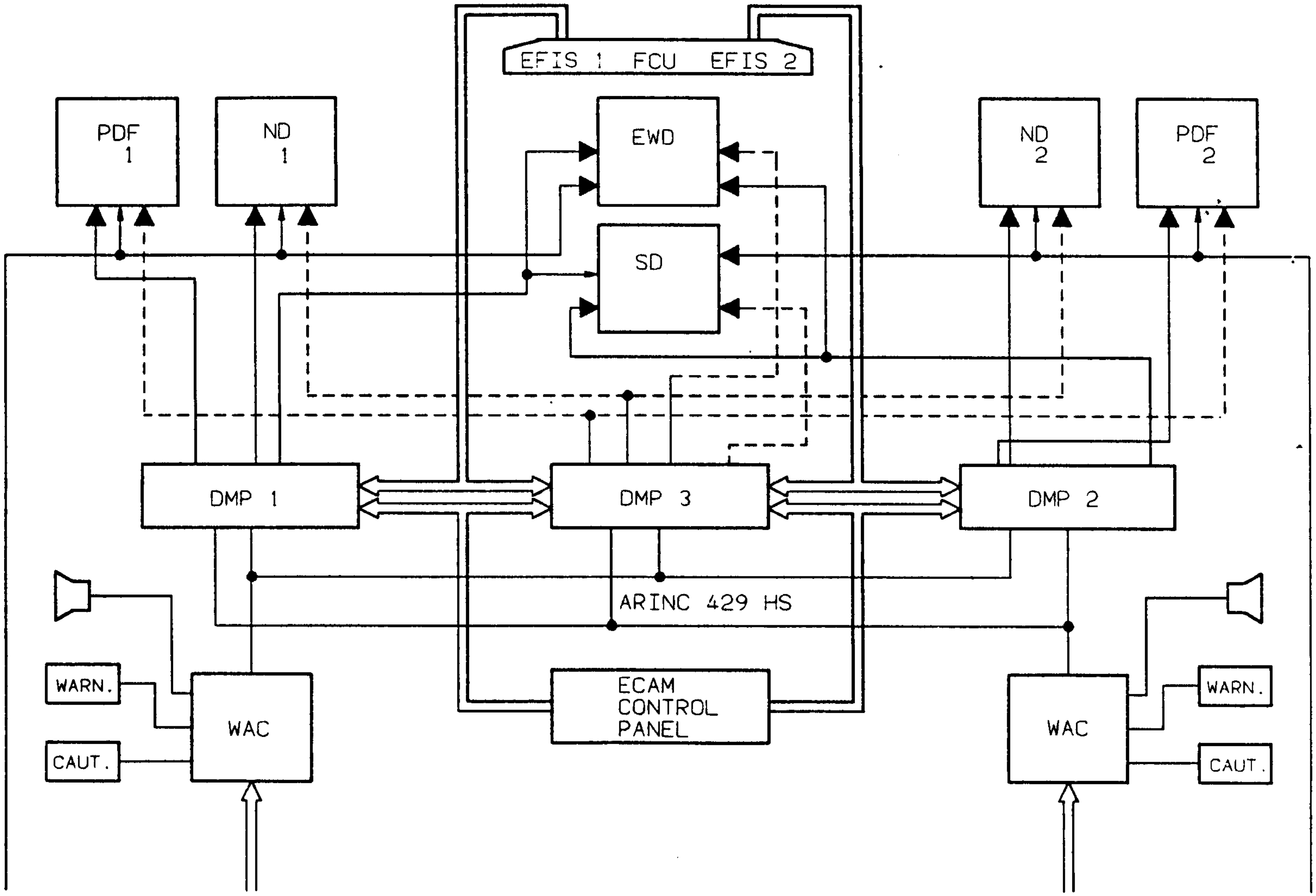
- Flight Warning processing integrated in the DMP's
  Fully redundant warning/caution generation

- Two Warning Acquisition Concentrators (WAC)
  Fully redundant system data acquisition

EIS general arrangement



Electronic Instrument and Flight Warning System



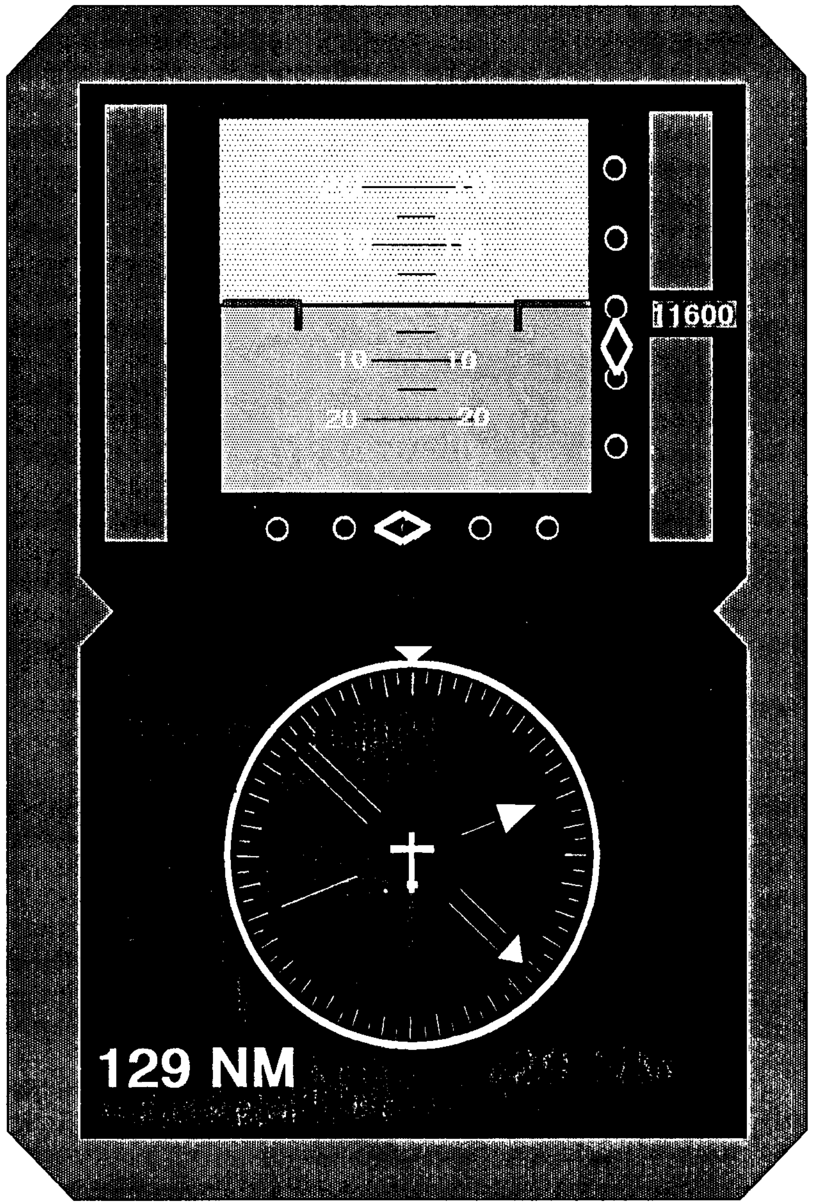
3 - Standby instrument

Air Data

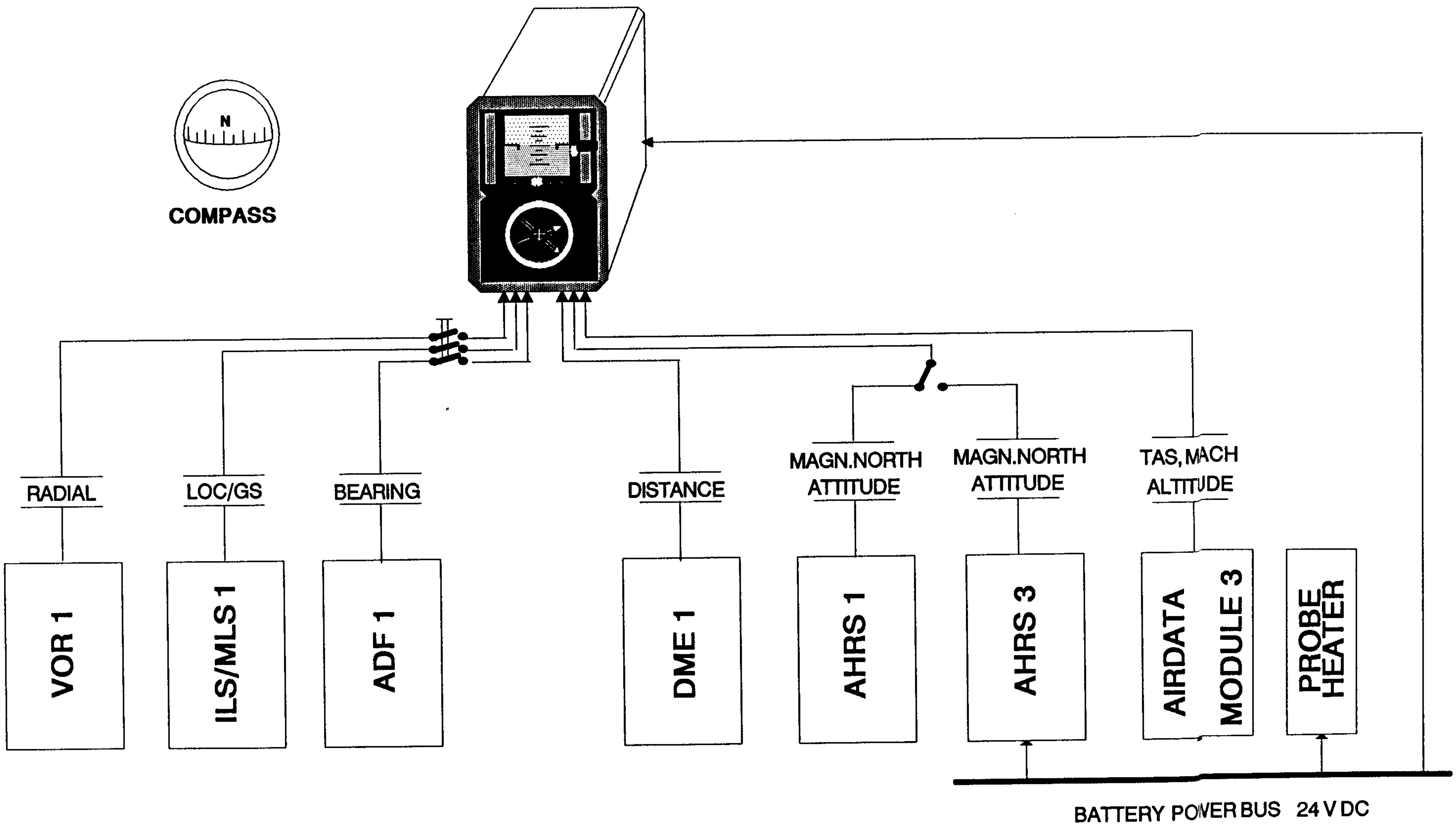
Modern design with smart probes, i.e. transducer and electronic modules are integrated in one airdata module and assembled directly at the aerodynamically compensated probes. Through serveral wholes P_{tot} , P_{stat} and AOA can be measured. With an input from a TAT probe the module calculates TAS, MACH and ALT.

Advantage:
- No more tubing
- TAS indication, also MACH is possible
- Indication in a symbology similar to PFD

Standby LCD-Display

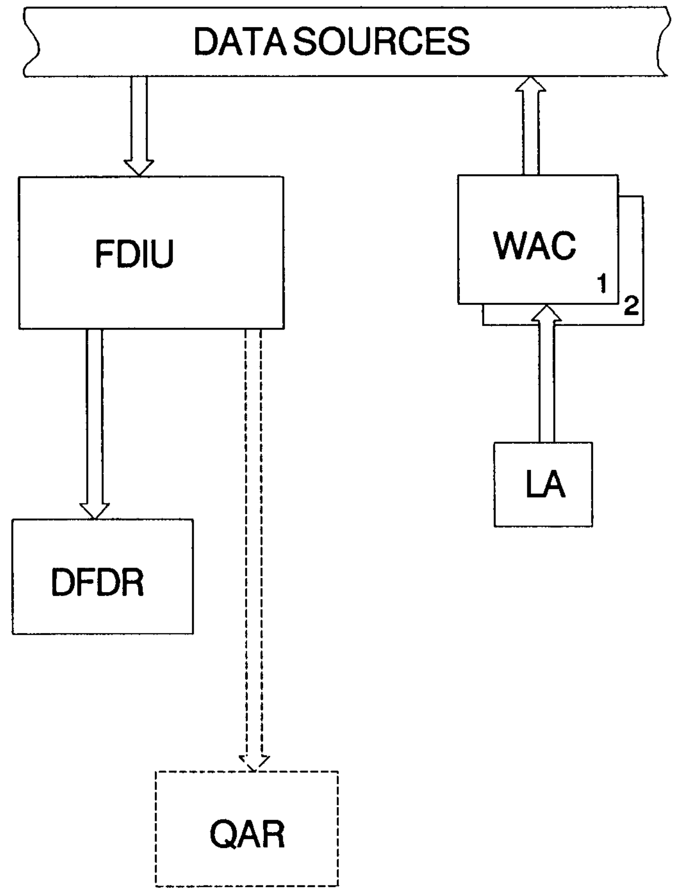


Standby instruments



4 - Recording system

Mandatory recorder system to fullfill all applicable airworthiness authorities requirements :
- ICAO Annex 6
- CAA Spec No.10A
- EUROCAE ED-55



Use of basic available aircraft avionic system data collection and validation capacities.

<u>Equipment</u>

- Flight Data Interface Unit (FDIU)

- Linear Accelerometer (LA)

- Digital Flight Data Recorder (DFDR) (optional as Solid State Flight Data Recorder)

- optional Quick Access Recorder (QAR) with same data set as DFDR or free programmable

Contents

General

The MPC 75 landing gear is of the conventional retractable tricycle type with direct action shock absorbers. The main landing gear is wingmounted and retracts sideways into the fuselage. The nose landing gear retracts forward into the fuselage.

All tires shall be of the radial type. The main gear tire size is H40x14-R19 and the nose gear tire size is 24x7.7-R10. Bias tires shall be also available in the same size as an option.

Landing gear operation

The nose and main landing gears are operated by hydraulic actuating jacks. The landing gears are mechanically locked in the fully extended and retracted positions.
The sequence of the gears is electrically controlled by duplicated systems incorporated in a Landing Gear Control and Interface Unit (LGCIU) which utilises proximity switches to detect the various gear positions. An emergency extension system shall be installed.
There are conventional lighted annunciators on the centre instrument panel and a second display on ECAM to provide visual monitoring of the gear operation and position.

Braking system

The braking system incorporates four braking modes, besides an antiskid and an automatic braking system (autobrake). The main landing gears are equipped with carbon brakes. Steel brakes shall be optional available. The brake temperature is indicated on ECAM. Provisions are provided for installation of optional brake cooling fans.

The normal braking mode is supplied by the green hydraulic system. The control computation is done in a fully digital Brake and Steering Control Unit (BSCU) which signals a servovalve for each wheel. For redundancy the BSCU has two identical channels with two separate electrical power supplies.

The alternate braking mode is supplied by the yellow hydraulic system. The pressure is controlled by a hydraulic metering valve and antiskid function is provided through one alternate servovalve for each wheel (signalled by BSCU). The autobrake system is not available in this mode.

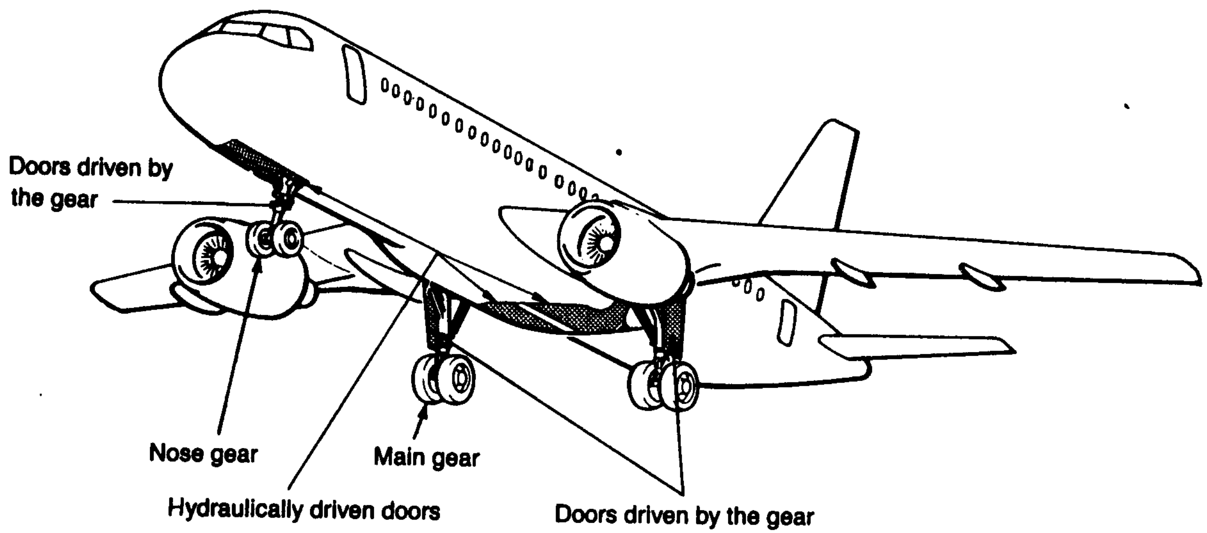
The alternate braking without antiskid mode is similar to the alternate mode with the exception that the antiskid function is not available.

The parking brake mode is activated by an electrical switch. Switching on the parking brake deactivates all other braking modes. Hydraulic pressure is supplied from the yellow system or from the brake accumulator.

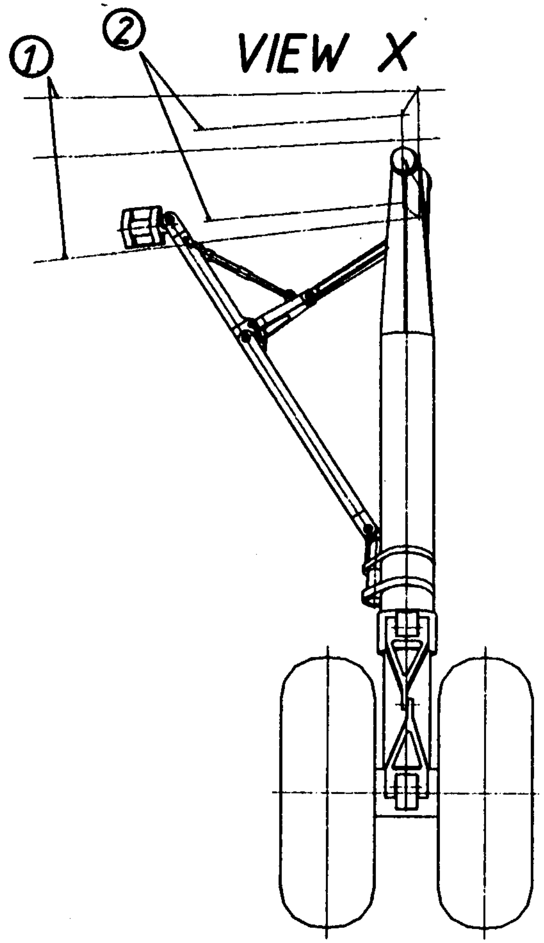
Steering system

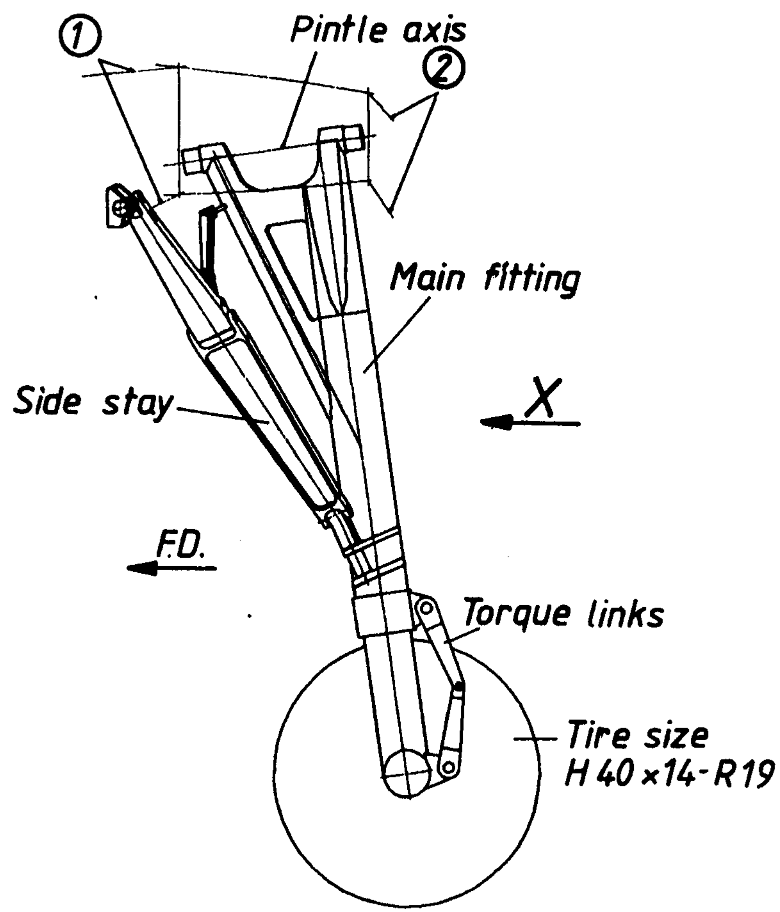
The nose wheel steering is a hydraulic servo system, electrically controlled from the flight deck via the BSCU. Hydraulic pressure is provided by the green system.
In case of loss of hydraulic pressure steering control can be achieved by differential braking or by differential engine thrust. Steering is controlled by two handwheels (± 75deg.) or by the rudder pedals (± 5deg.).
An internal cam mechanism returns the wheels to the center position (during shock absorber extension) after take-off.
If a rollout guidance system is needed, the BSCU can be signalled to provide automatic steering.

Landing gear arrangement



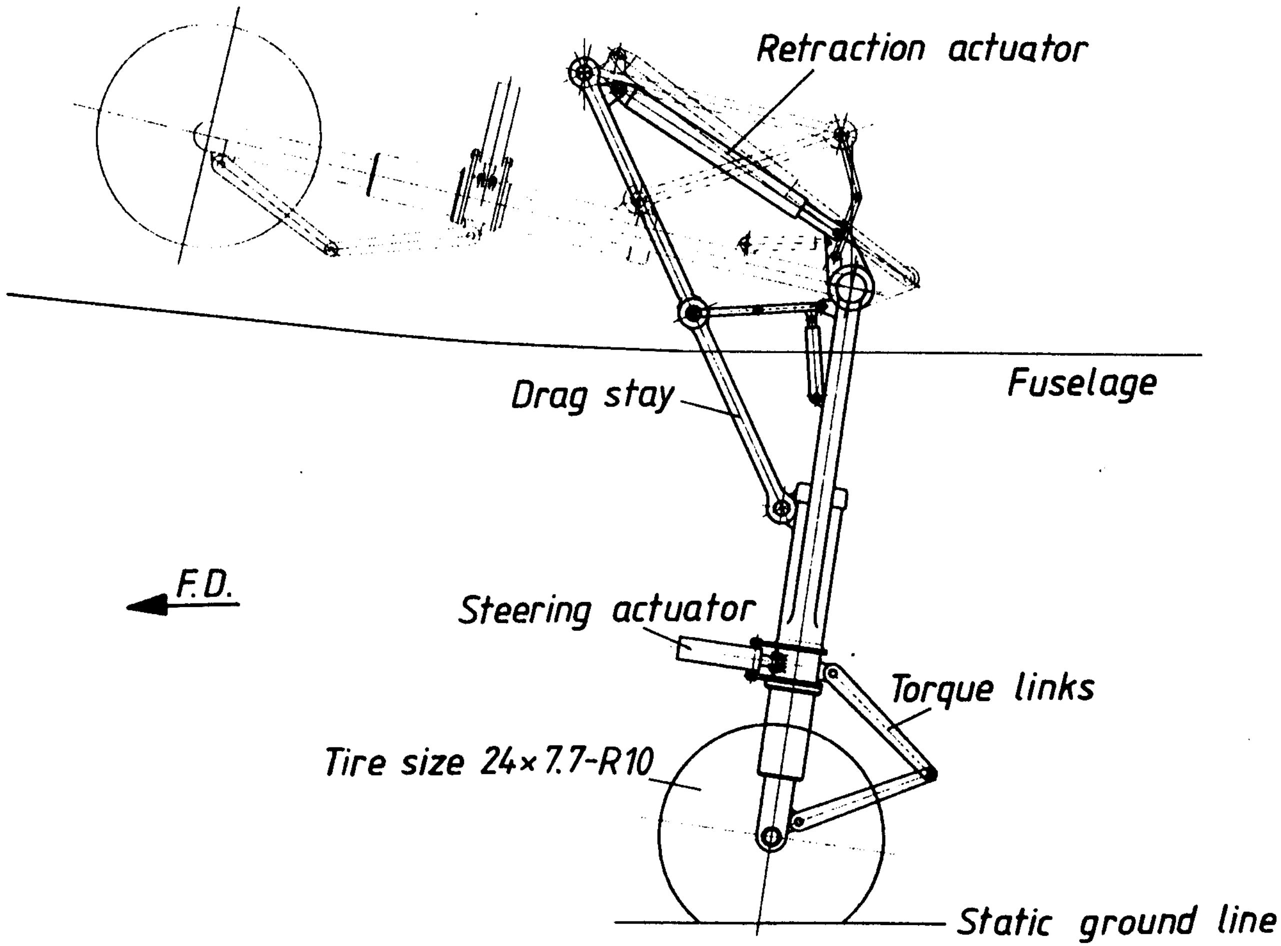
Main landing gear





fully extended

Nose landing gear



Contents

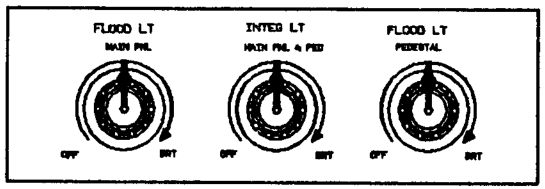
1- General

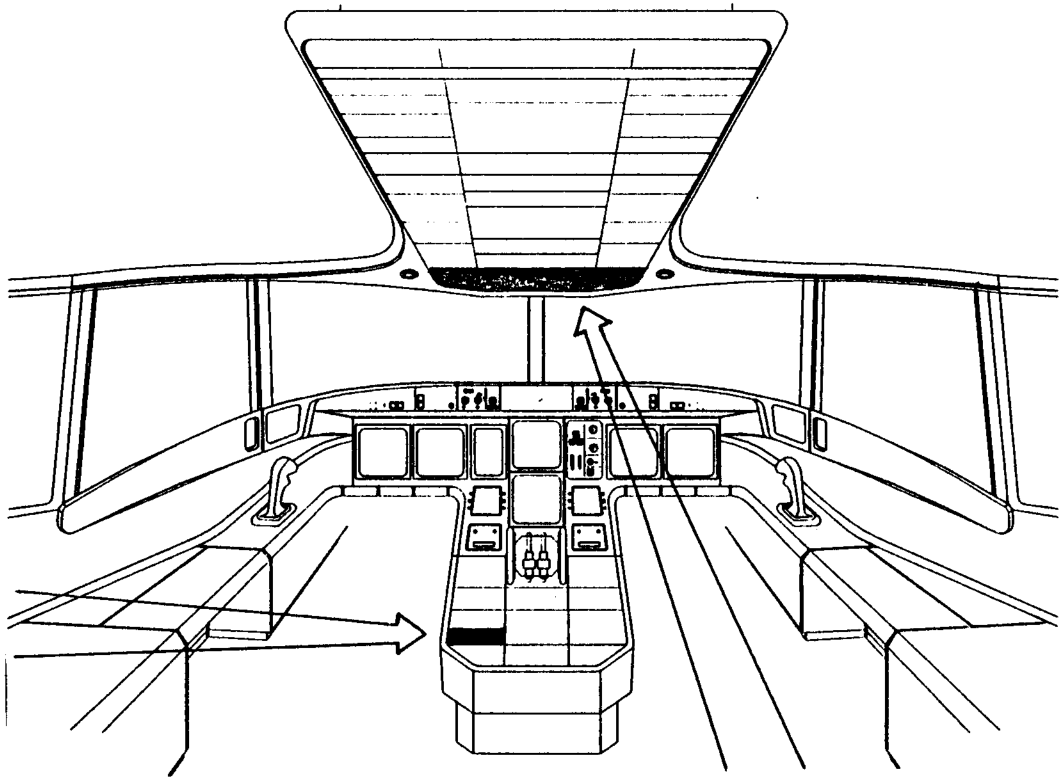
- Sufficient illumination is provided to passengers, crew and ground service.
- Lights system is designed to comply with requirements of JAR relevant items.
- White lighting is used for cockpit illumination. The cockpit lighting is designed to comply with the dark cockpit principle.
- The state-of-the-art technology is applied to lights system.
- The lights panel is located on the overhead panel in the cockpit.

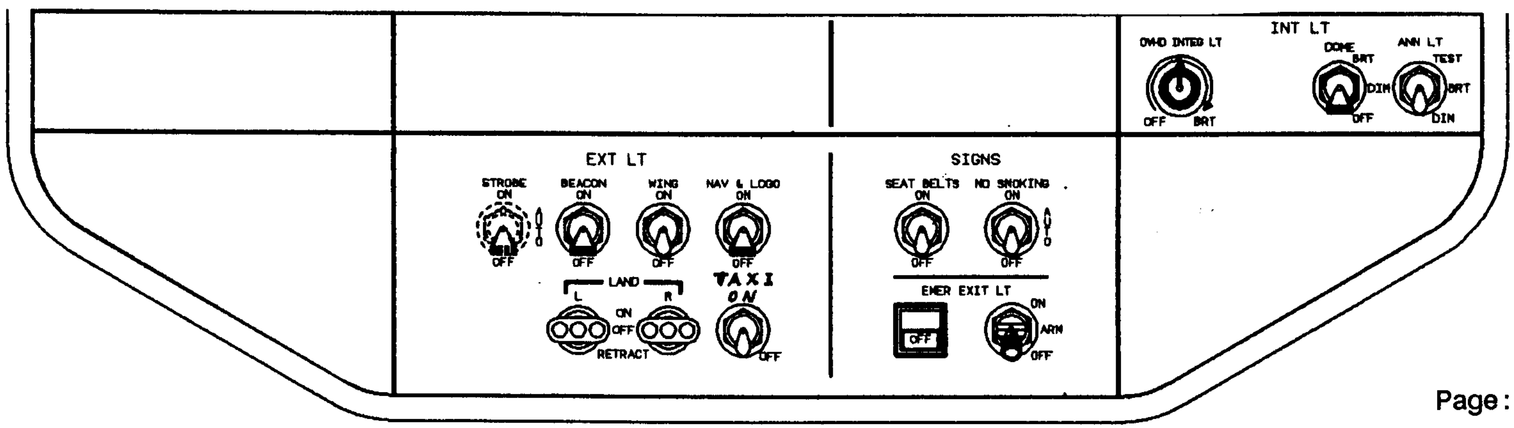
2-Cockpit

- Two dome lights with dimming control are installed to provide cockpit general illumination.
- Side consoles and its briefcase stowage and map holder lights are installed on each side console.
- Floor lights are located beside crew seats.
- Instrument and panel integral lighting with remote stepless dimming control are provided.
- Flood lights provide illumination for instrument panel and pedestal.
- Adjustable reading lights for the captain and first officer are installed in the ceiling. The pedestal flood light is also used for the third occupant.
- Annunciator light dimming and test function are provided.

Lights panel





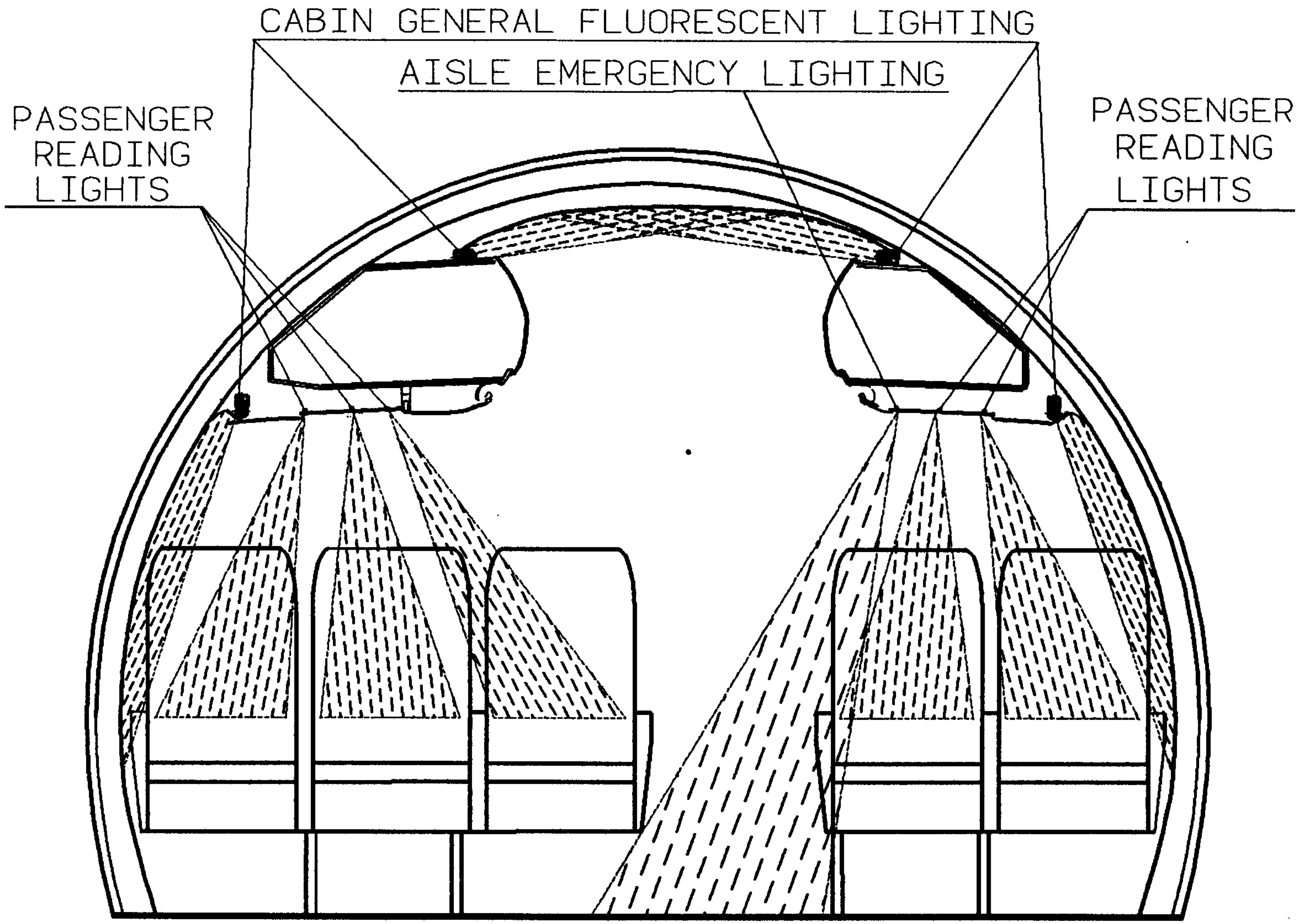


3-Cabin

- Four strips of fluorescent tubes with dimming control are used for passenger compartment general illumination.
- Two fluorescent tubes are installed in each entrance area ceiling.
- Call lights are prepared for passengers and crew.
- Fluorescent light is provided in each lavatory to illuminate the wash basin and mirror.
- A reading light is provided for every passenger seat on the PSUs.
- Lighted NO SMOKING, FASTEN SEAT BELT and EXIT signs are provided in the passenger cabin. A RETURN TO SEAT sign is provided in each lavatory. The TOILET OCCUPIED sign is located close to lavatories on the cabin visible wall.
- Special galley work lights form part of the fixed BFE galley equipment. The illumination is provided at the attendant's seat.
- Passenger stairway lights are integrated in the stairway.

4-Cargo and service area

- A separate lighting system is installed in cargo hold. The lights are controlled by each cargo door.
- Loading area light is sufficient to permit reading of labels on the ground in front of the cargo door.
- Service lights and electrical outlets are provided in all service bays.

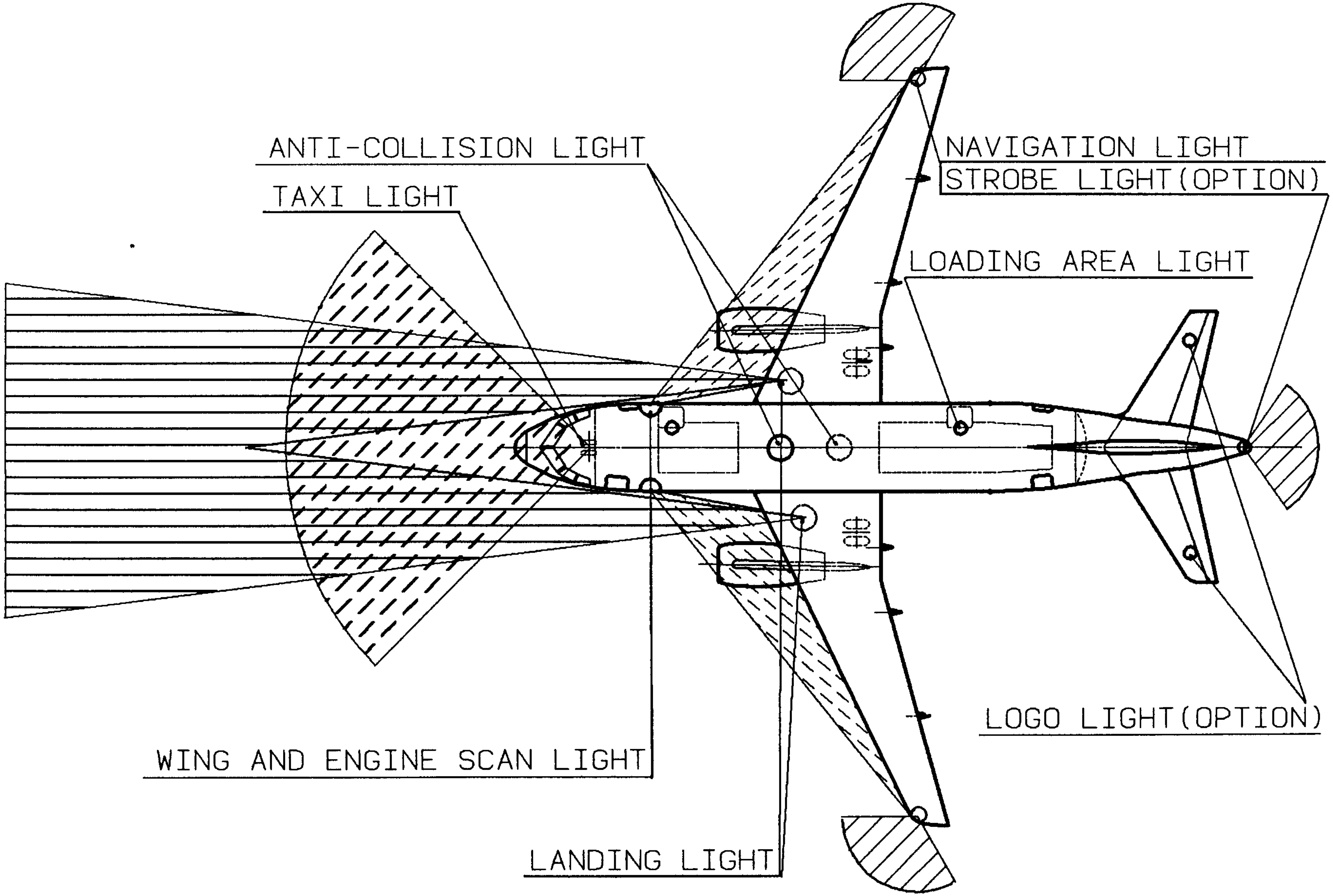

CABIN GENERAL FLUORESCENT LIGHTING
AISLE EMERGENCY LIGHTING
PASSENGER READING LIGHTS
PASSENGER READING LIGHTS

5-Exterior

- Two forward facing navigation lights are installed on both wing tips and a rearward facing navigation light is installed in the tail cone.
- Two retractable landing lights are installed on the fixed underwing panel.
- Two fixed taxi lights are installed on the nose landing gear to provide wide beam illumination for taxiing.
- Two anti-collision/strobe lights are installed on top and bottom of the fuselage along the centre line.
- Two wing and engine scan lights on each side of the fuselage are provided to illuminate the wing leading edge and the engine intake.
- Logo lights are provided on both sides of the horizontal tail as an option to illuminate the airline's logo on both sides of the vertical tail whenever the landing gear is extended.
- Strobe lights at wing tips and tail cone as an option are used as a duplicated navigation lighting system.

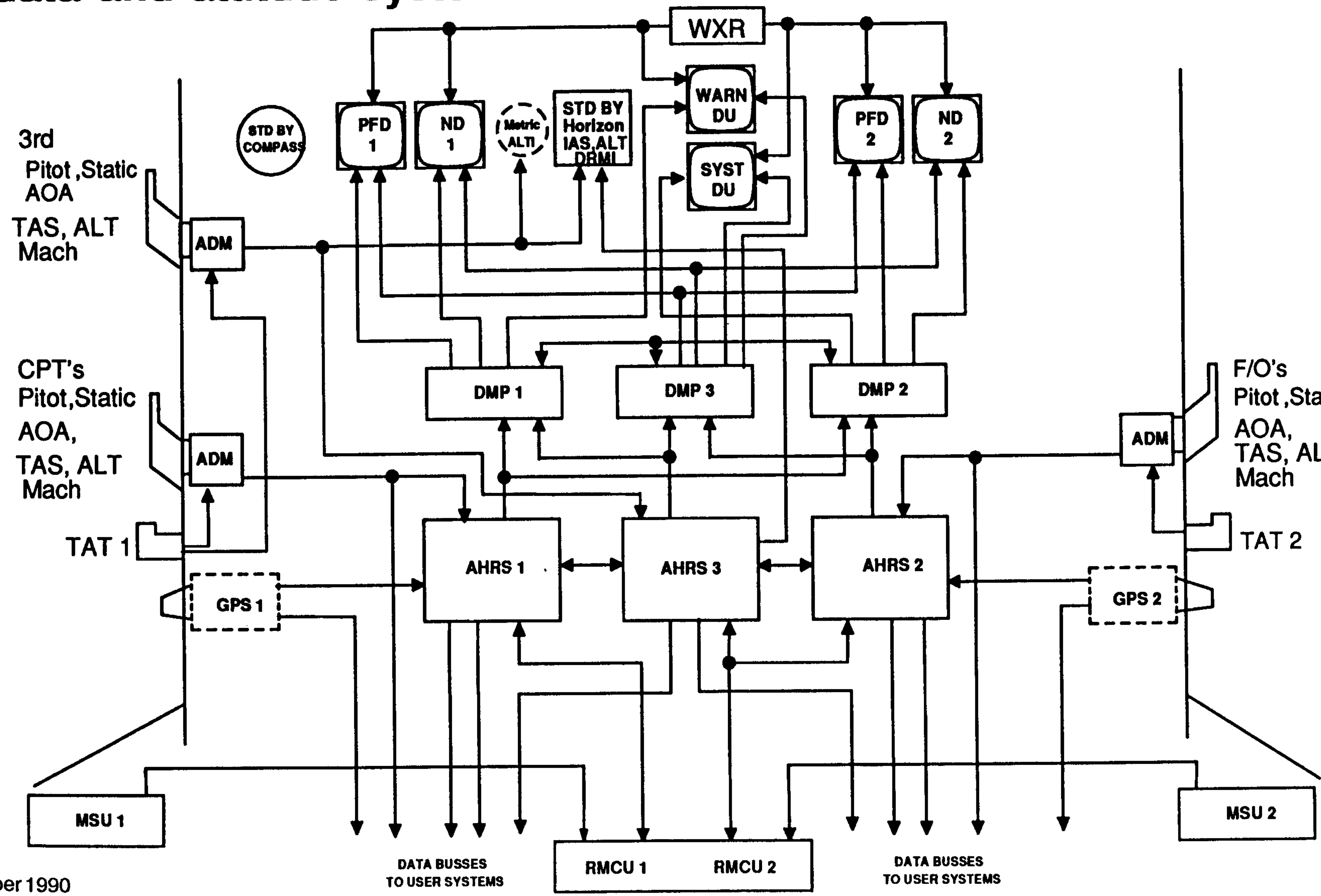
6-Emergency lighting

- Some of the cockpit lights are used for emergency lighting powered by essential busbars.
- Cabin emergency lights are provided to illuminate the aisle area.
- A dome light is provided in each lavatory powered from essential busbar.
- Evacuation path lights are installed in the stairway and slides.
- Floor proximity escape path marking consists of pathway lights and EXIT signs above floor.
- The Emergency Power Supply Units equipped with internal Ni/Cd batteries will provide sufficient power to all emergency lights and signs for at least 12 minutes.


ANTI-COLLISION LIGHT
TAXI LIGHT
NAVIGATION LIGHT
STROBE LIGHT(OPTION)
LOADING AREA LIGHT
LOGO LIGHT(OPTION)
WING AND ENGINE SCAN LIGHT
LANDING LIGHT

Contents

Air data and attitude system



2 - Radio Navigation Aids

The aircraft is equipped with conventional navigation aids. They are automatic tuned through the Flight Management System (FMS), for DME, VOR and ADF, or manual via the Radio Management Panels (RMP).

ILS and MLS will be integrated in one LRU if ever MLS becomes operational.
Global Positioning System(GPS) is a standard option, and will be integrated in the AHRS or IRS.
The Traffic Collision Alert and Avoidance System (TCAS) is an optional installation (for US operator mandantory 1993)

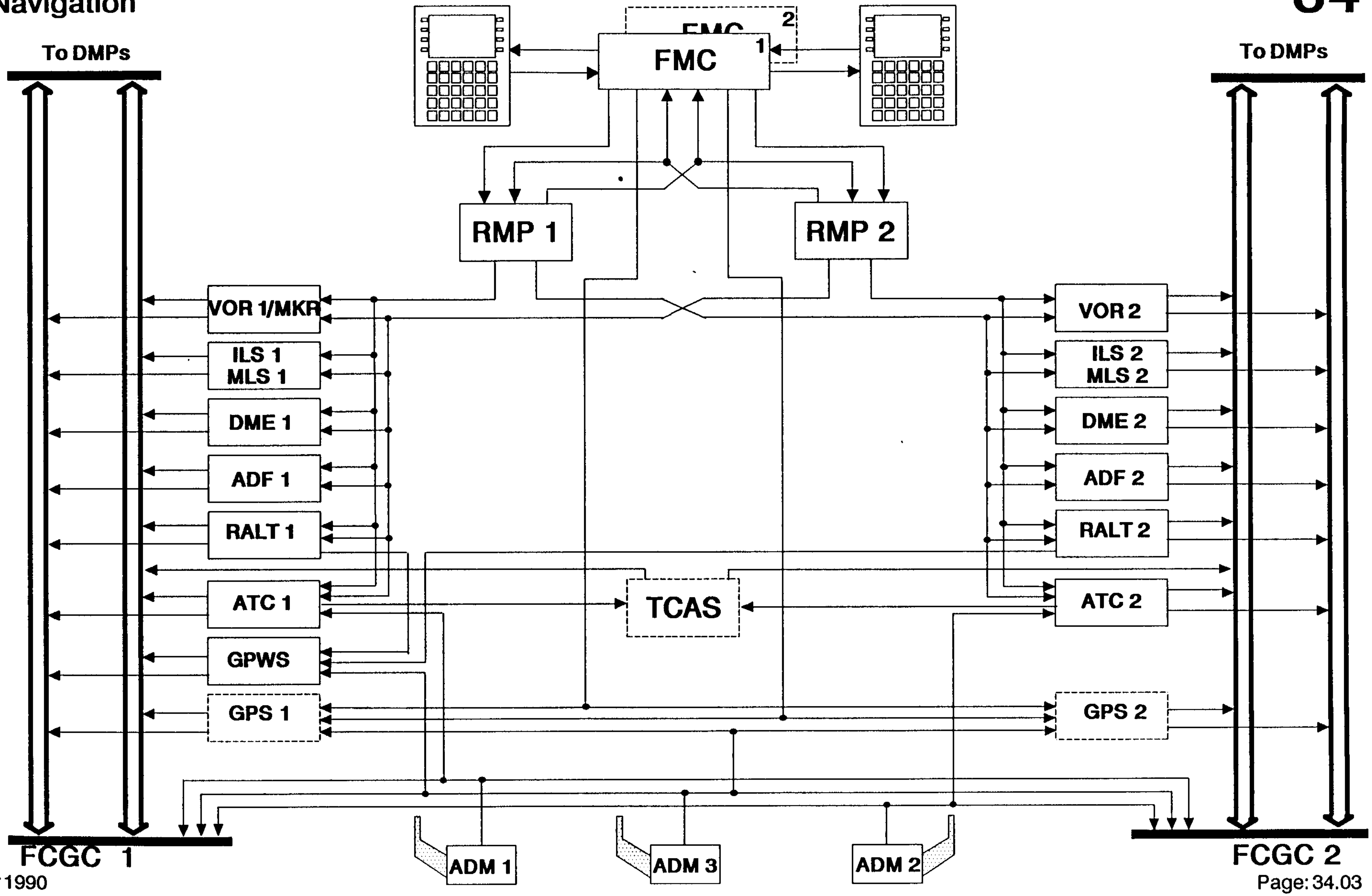
3 - Air Data and Attitude System

The aircraft offers a triple installation of air data systems and Attitude and Heading Reference System (AHRS).
All installed air data probes are smart probes, which are aerodynamically compensated. They supply the system with pitot, static and alpha air data. The data are converted to ARINC 429 format in the Air Data Modules (ADM) that are mounted directly to the probes. With an input of Total Air Temperature (TAT) the ADMs calculate the miscellaneous air data TAS, ALT and Mach.

Basically the aircraft is equipped with conventional strapdown AHRS updated by two manetic sense units.
The installation of an optical gyro Inertial Reference System (IRS) is provided as a standard option.
Both sytems are of the same size (4 MCU) an can be upgraded by an optional GPS integration.

Navigation

Radio Navigation



Contents

1 - General Description

Flight Crew Oxygen

The crew gaseous oxygen system is schematically shown in figure 35-1. Each crew station has a quick-donning mask with a demand regulator installed. The oxygen is supplied from a high pressure oxygen cylinder to masks through a pressure regulator / transmitter assembly and distribution circuit.

The crew oxygen system is capable of supplying oxygen whenever the cabin pressurization fails at any altitude

The high-pressure portable oxygen cylinder assembly is used by crew members in case of emergency when fighting a fire , against the emission of smoke and noxious gas with full mobility if there is a failure of the fixed crew oxygen system.

Passenger Oxygen Unit

The solid state chemical oxygen dispensing units are mounted above the passenger seats and in lavatories (fig.35-2). Each mask is provided with continuous flow of oxygen lasting at least 12 minutes after flow initiation.

Attendant Oxygen System

Above the attendants station a two-mask chemical oxygen unit is installed to supply emergency oxygen in case of cabin decompression.
Each attendant is equipped with a portable oxygen unit which can be used to provide emergency oxygen and first-aid treatment for passengers.

2 - Schematic

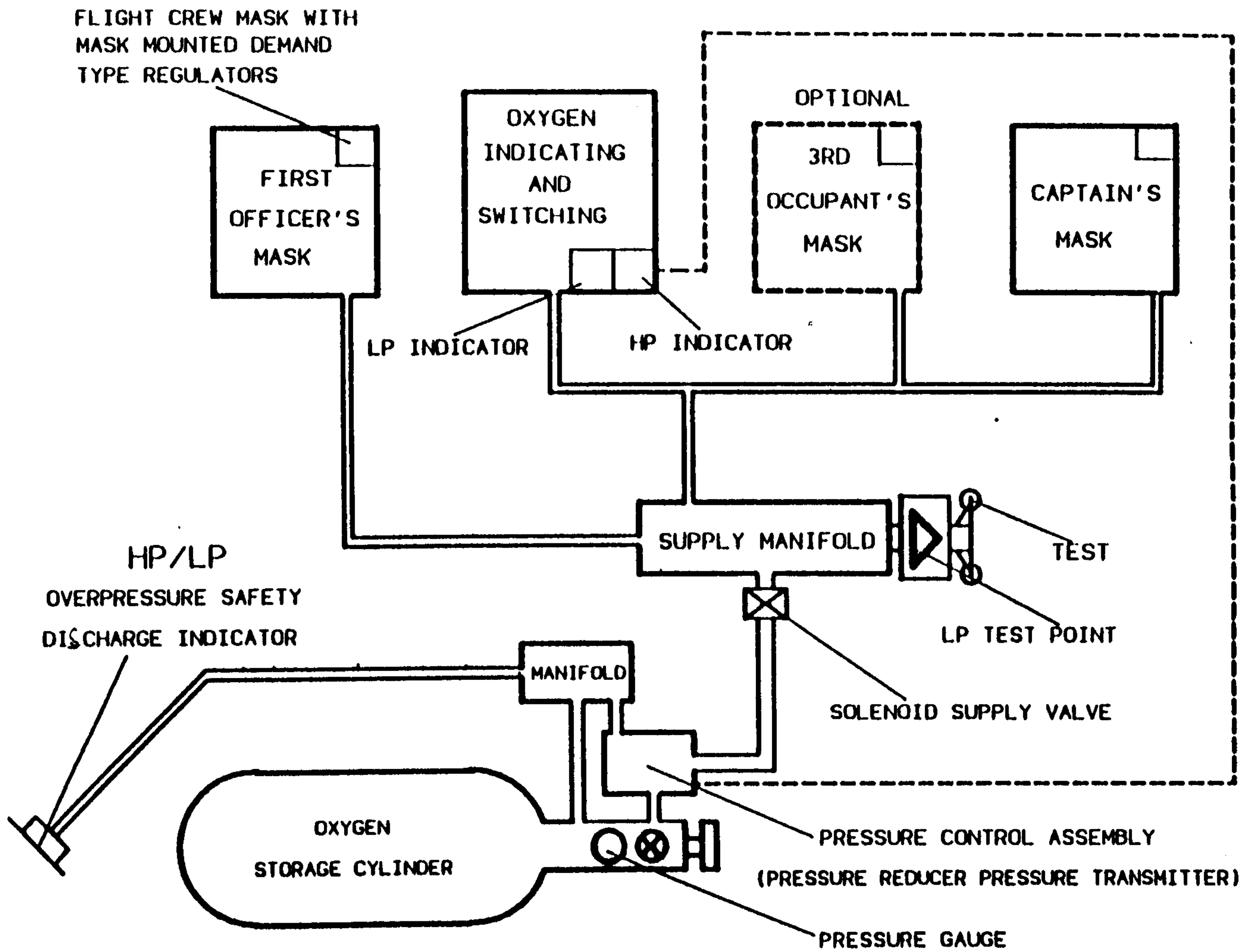
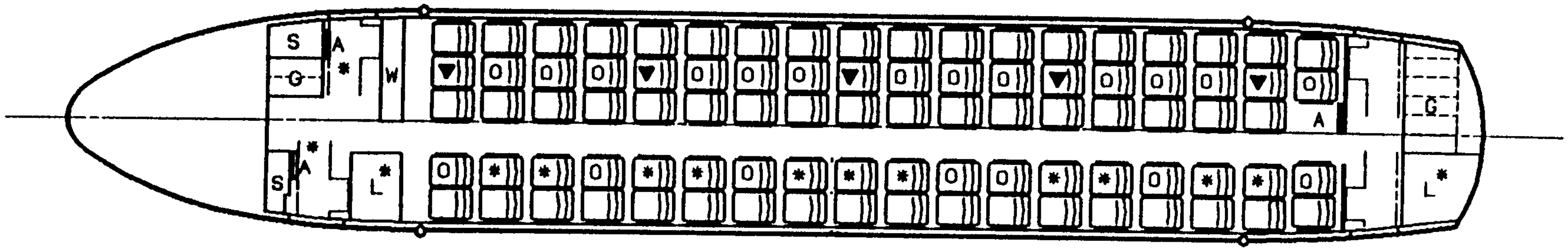


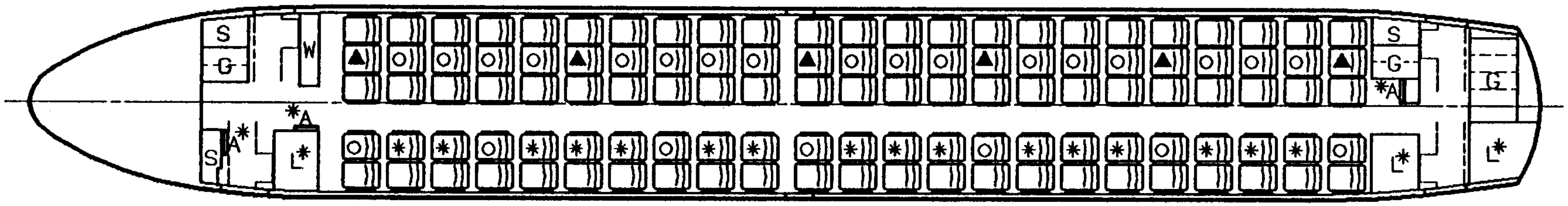
Figure 35-1 Crew Gaseous Oxygen System Schematic



— key—

= 2mask units(15)
= 3mask units(20)
= 4mask units(5)

Figure35-2/1. Passenger Oxygen System Distribution



- KEY -

* = 2MASK UNITS(22)

O = 3MASK UNITS(24)

▲ = 4MASK UNITS(6)

Figure35-2/2 Crew Gaseous Oxygen System Schematic

Contents

- General
- Bleed air system
- Engine bleed air supply
- Additional sources of bleed air

General description

Bleed air system

The pneumatic (bleed air) system provides hot compressed air for the following systems / functions :

- Air conditioning
- De-icing
- Engine starting
- Hydraulic and water systems pressurisation

Engine bleed air supply (see figure 36.10)

Each engine has its own bleed air supply control system, normally isolated from each other by the crossfeed valve.
Bleed air is drawn from either an intermediate pressure (IP) stage or a high pressure (HP) stage of the engine compressor, depending on flight mode (power setting). In the climb and cruise modes, IP bleed air pressure is high enough to satisfy system requirements and the HP control valve remains closed.

In descent mode (low engine power setting) the IP bleed air pressure is inadequate for system requirements. The drop in pressure allows the HP control valve to open. HP stage bleed air then supplies the bleed system, while isolating the IP stage by closing the IP stage check valve.

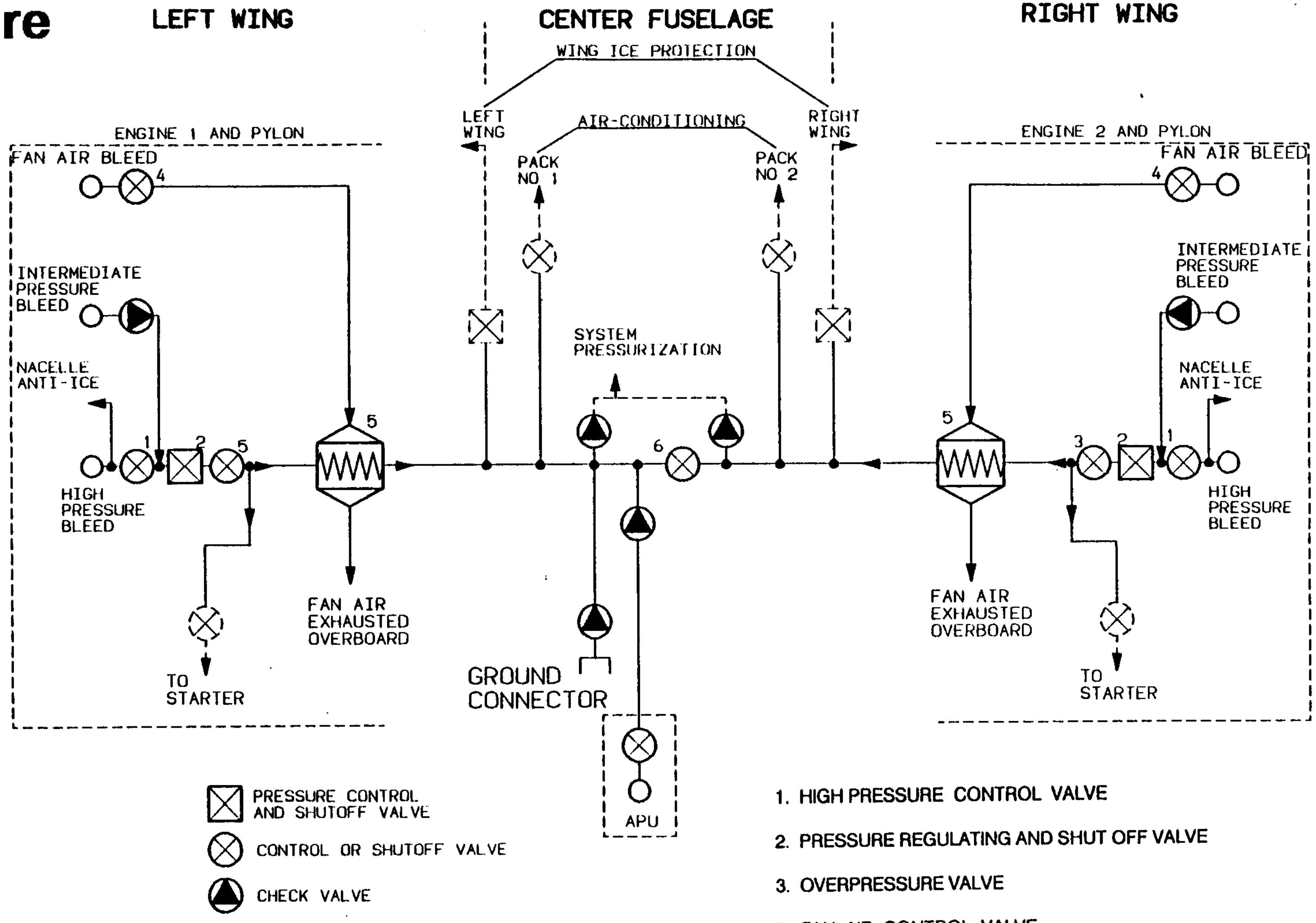
IP or HP bleed air is consequently passed through the pressure regulator, overpressure valve and finally the precooler heat exchanger to provide user systems with pressure and temperature controlled bleed air.

Additional sources of bleed air are :

- Ground supply unit - via HP ground connector
- The APU

Under normal flight conditions the bleed air system functions fully automatically. A dedicated bleed air monitoring computer (BMC) monitors each engine bleed system, and provides indication for crew action when system faults occur.

Architecture



1. HIGH PRESSURE CONTROL VALVE
2. PRESSURE REGULATING AND SHUT OFF VALVE
3. OVERPRESSURE VALVE
4. FAN AIR CONTROL VALVE
5. HEAT EXCHANGER (PRECOOLER)
6. CROSSFEED VALVE

FIGURE 36.10: BLEED AIR SUPPLY-SCHEMATIC

Contents

1. General

The aircraft is equipped with water and waste facilities. The system supplies potable water for the galleys and lavatories, and the waste disposal service allows waste water from the galley and toilet wash basins to drain from the aircraft, via drainmasts fitted at the underside of the fuselage.
The toilet waste contents are collected in tanks directly connected to the toilet flush system.

2 . Potable Water

The potable water is stored in a 60 liter (15.5 USgal) reservoir which is installed in the pressurized underfloor area forward of the centre wing box.
The tank is manufactured from glass fibre composite and pressurized from the bleed air system.

3 . Waste Water

Waste water from the basins in the lavatories and galleys is drained out of the aircraft via two electrical heated drain masts in the forward and aft fuselage. Additional provisions are provided for an optional lavatory and galley.

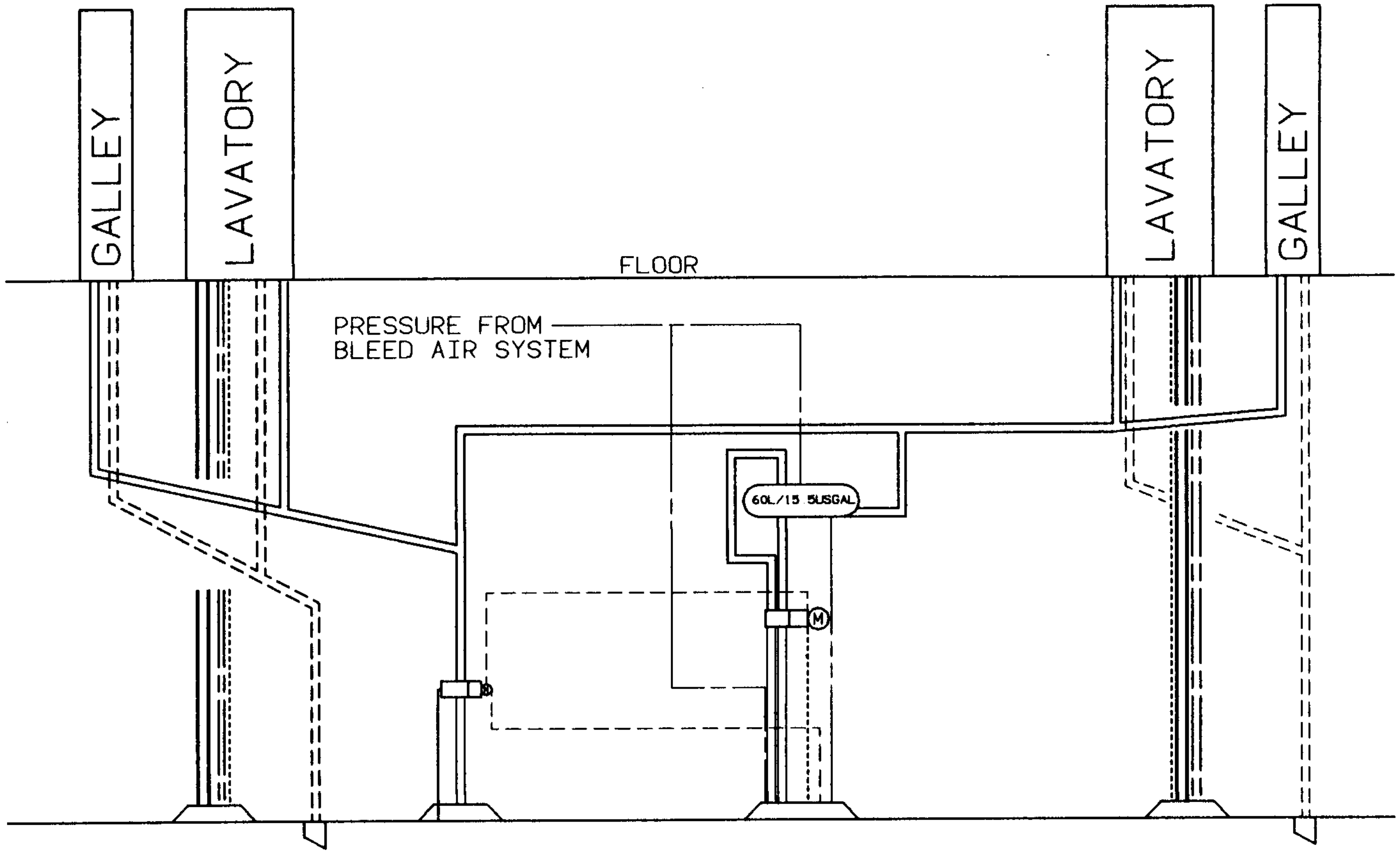
4 . Waste Disposal

The toilet system collects the waste disposal in the waste tanks of the toilet units. The waste tanks are manufactured from glass fibre compound and are equipped with a filter/pump and a drain valve assembly. During ground service the tanks are emptied, cleaned and filled with a prescribed quantity of flush-fluid.
A ventilation system for the toilet units prevents odours from coming out of the units.

5 . Air Supply

The potable water supply tank is pressurized with pressure regulated and temperature controlled air from the bleed air system. The air supply lines are equipped with non-return valves to protect against reverse fluid or air flow induction.

Fig. 38-01



POTABLE WATER
WASTE WATER
LAVATORY WASTE
LAVATORY FILLING AND FLUSHING
CABLE CONTROL
ELECTRICAL SIGNAL
AIR PRESSURE
DRAIN MAST ELCTR. HEATED

Contents

General

The on-line maintenance of the electronic systems is based on the use of the CMS (Centralized Maintenance System), comprising of one CMC (Centralized Maintenance Computer) and an optional printer.

The OMS provides for line- and shop-maintenance a central means to :

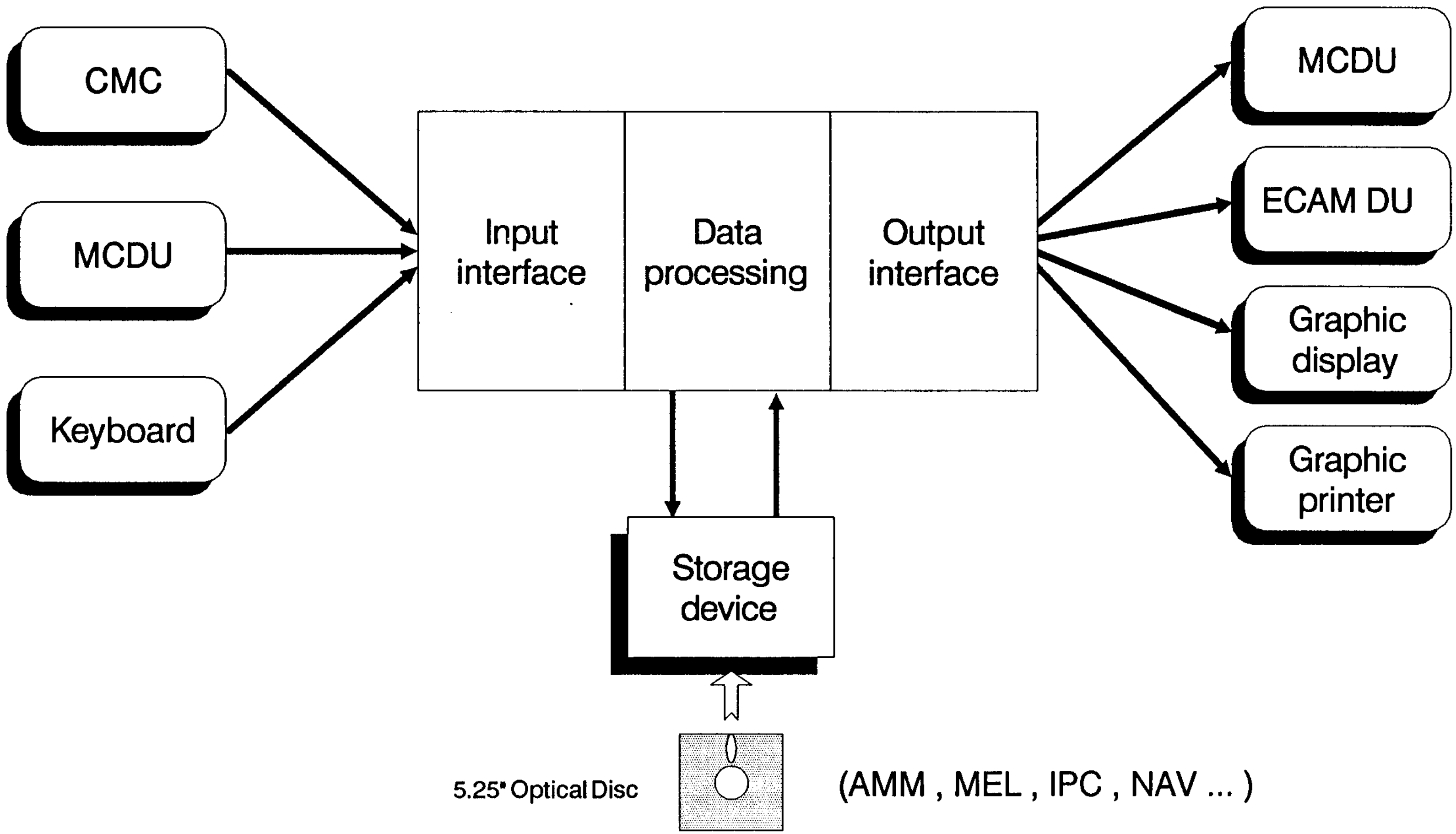
Display and interrogate	the BITEs of the various systems
and	
Initiate	tests from the MCDUs (Multipurpose Control Display Units) located on the centre pedestal (cockpit).

The intelligence required for :

detecting	the failures
processing	the corresponding maintenance data
formatting	messages to be displayed on the MCDUs

is included in each BITE of the avionics systems.

Electronic Library System (ELS)



Contents

1 General

The Auxiliary Power Unit (APU) installed on the MPC 75 is designed to provide bleed air to the aircraft pneumatic system and to drive an oil spray cooled AC generator during ground and in flight operation, thus increasing aircraft operational flexibility.

Independence of the MPC 75 from external sources on ground (up to 8000 ft) is assured by power available from the APU to drive a 60 kVA generator and additionally to supply bleed air for main engine start or the air conditioning system. During flight operation the APU is capable of providing electrical power within the whole flight envelope.

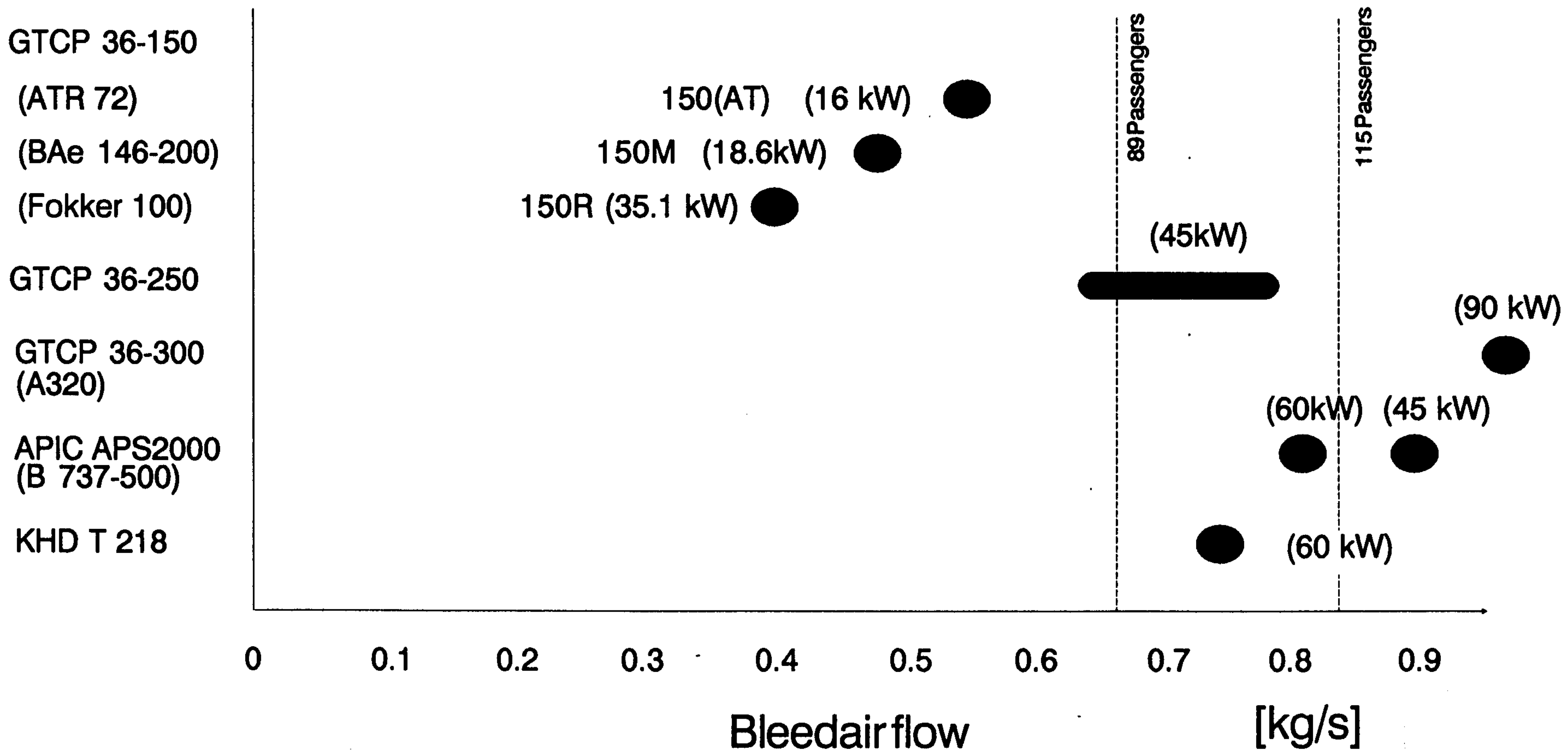
This permits dispatch of the aircraft under certain MEL conditions, where together with the in flight restart capability (up to TBD ft) a considerable increase in redundancy of electrical power is obtained.

Maximum operation limit of the APU is aircraft ceiling altitude.

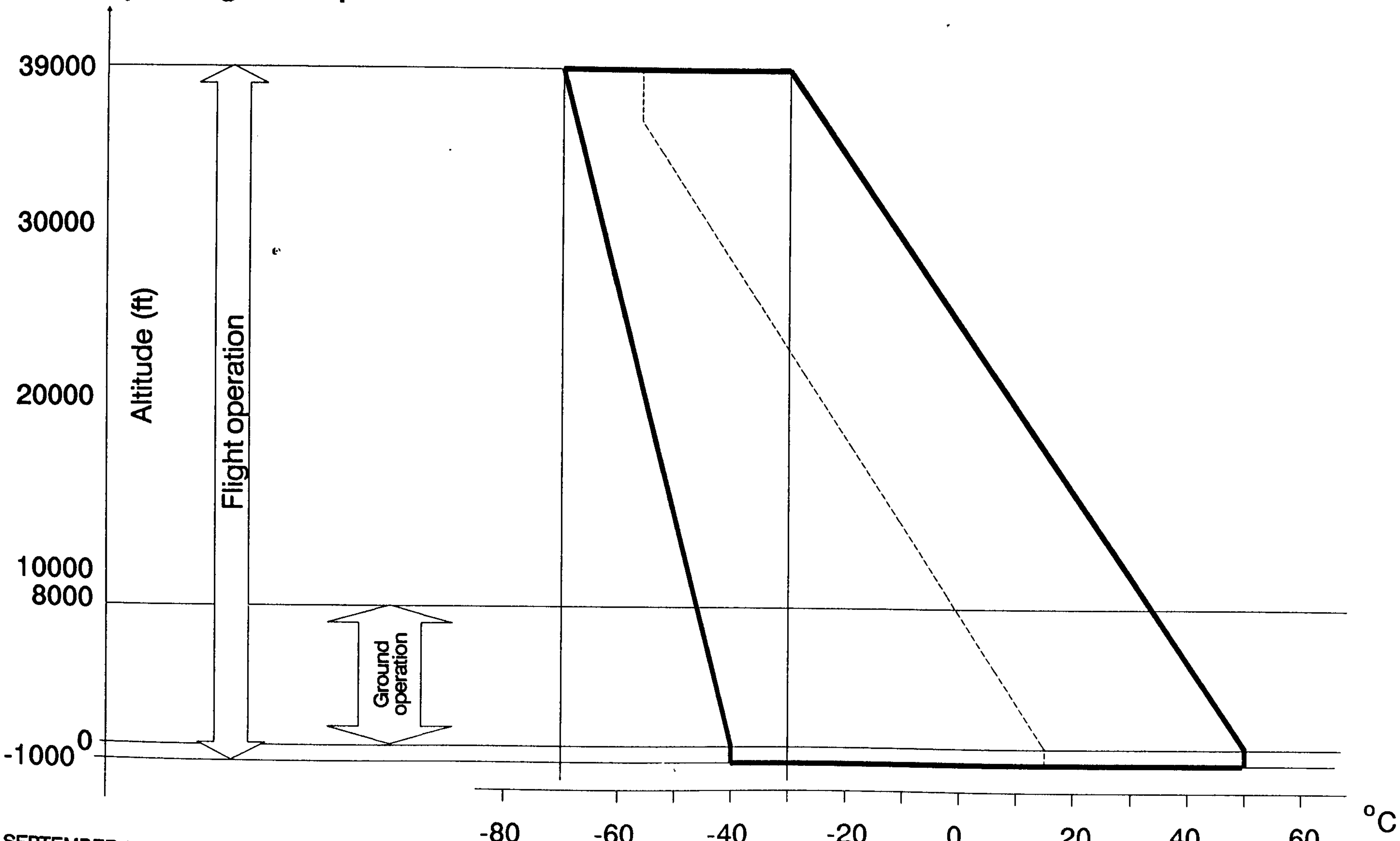
APU Performance Comparison for MPC 75 (Sea Level Standard Day)

MPC 75 electrical requirement 60 kVA

MPC 75 Bleed Air Requirements



2 APU Operating envelope



3 APU installation

The APU is located in the aft fuselage in the tail cone.
The housing is arranged principally as a support and aerodynamic fairing for the APU, air intake system and exhaust system.

In accordance with the construction regulations, the APU compartment is arranged as a fireproof box and is rigidly attached to the fairing structure. The firewalls and the access doors are manufactured from titanium sheet.

There is a pressure relief door to limit the pressure in the APU compartment to a value acceptable for the structure.

The installation of the APU is designed for a rapid change, the time for 'quick engine change unit' removal and installation, ready to start, will not exceed 1h 15 min.

The APU support is designed according to fail safe principles covering the event of fire.

4 APU subsystems

Fuel supply and control

The APU is supplied with fuel through a separate fuel line, drawing fuel from the LH main engine fuel system. A dedicated APU pump is installed in that line to permit fuel supply to the APU when the engine fuel system is not operating. Opening of the cross feed valve permits fuel supply from the RH tank to the APU.

An LP valve installed on the tank boundary permits to isolate the APU fuel line when the APU is cut off, thus avoiding pressure on the fuel line across the pressurised zone.

The LP valve is controlled by the APU master switch and closes automatically in case of emergency shut down of the APU.

The fuel control system operates fully automatically controlled and monitored by the APU Control Unit (ACU).

The system provides metered fuel to the APU combustor according to the inputs received from the ACU for timed acceleration and constant speed control ($\pm$ 0.5 per cent N).

Bleed air system

The bleed air flow is controlled according to aircraft system demand.

Sufficient APU bleed air power is available, while providing electrical power for equipment required for ground operation, to meet the specified ground air conditioning requirement.

The system is protected against reverse bleed air flow.

A compressor surge control system prevents compressor surge for all operating modes. The surge air is conducted into the APU exhaust.

Lubrication and generator cooling

The integral lubrication system for engine, generator and gear box includes an internal gear box oil reservoir, an oil pump assembly and an oil cooler.

By design the oil cooler capacity is sufficient to permit cooling of the oil spray cooled generator with the same circuit.

The APU operates with the same oil types as approved for the main engines and their accessories.

5 APU compartment cooling/ventilation and drain system

The APU cooling air and ventilation system provides air for cooling of the APU, equipment on the APU and ventilation of the APU compartment. Cooling air supply is the APU plenum chamber. Cooling air is delivered to the oil cooler and the APU compartment. Air out of the oil cooler is led to the outside of the aircraft.

After APU shut down ventilation of the APU compartment is achieved by a louvre in the upper side of the APU compartment. Free convection provides efficient ventilation of the APU compartment.

Drainage and leaks from various places are collected in a drain tank and discharged outboard via a drain mast.

6 Air intake

The common air intake for power section, bleed air generation and cooling is designed as a silencer providing high intake pressure recovery.

The air intake is located considering

- noise restrictions
- icing conditions
- dust ingestion
- re-ingestion of APU exhaust gases
- high installation pressure ratio in flight

7 Exhaust

The exhaust system is installed in a fire proof compartment separated from the APU compartment. The exhaust system functions as a silencer. It conducts the hot APU exhaust gases to the outside of the aircraft at a location providing high installation pressure recovery in flight.

8 Control and monitoring

The central component of the control and monitoring system is the APU Control Unit (ACU). This unit is installed in the rear fuselage and is easily accessible.

It uses microprocessor/digital techniques to realise the following functions :

- control the start sequence
- regulate the APU speed
- regulate the bleed air flow
- monitor all important operation parameters
- monitor the sensor units on the APU to detect the development of a serious fault
- drive indications and annunciation to the cockpit and provide adequate signals to the ECAM, FWS, OMS
- initiate APU shut down in case of a fault
- control the APU surge system

An RS 232 interface is provided on the ACU. This allows check out of the ACU circuits in the shop, as well as adjustment of the performance outputs.

The controls to switch on or off the APU and to activate the APU starting sequence are located in the cockpit. The APU operation is fully automatically controlled by the ACU.

APU monitoring for the flight crew is provided by indications on ECAM.

Control and monitoring cont'd

For maintenance purposes APU parameters are provided to the Onboard Maintenance System (OMS).
A test button on the cockpit fire panel allows testing of the fire extinguisher circuit as well as functional integrity of the fire detection system

Besides the controls in the flight deck emergency shut down of the APU is possible :

- by pushing the APU fire handle
- from the nose landing gear APU emergency shut down push-button
- automatically on ground after an APU fire is detected

Contents

FULL AUTHORITY DIGITAL ENGINE CONTROL (FADEC)

General Description

The MPC 75 engines are electronically controlled by the Full Authority Digital Engine Control (FADEC). Each engine is equipped with a fully redundant (dual) FADEC system which provides better engine protection and permanent engine health monitoring.

The application of a FADEC provides advantages to the MPC 75 aircraft. It saves weight, reduces pilot workload and maintenance cost, saves fuel by dimension free control of the gas generator and allows the optimum adaptation of thrust schedules to the aircraft needs.

FADEC is an electronic system which consists of a fully redundant (dual) Engine Control Unit (ECU) and an (simplex) Engine Interface Vibration Monitoring Unit (EIVMU)) with built in failure detection. In case of a FADEC, malfunction, the system switches to the other channel or an alternate control mode, the best working channel always being in charge of engine controls. This ensures engine performance and safety.

FADEC cont.

Each engine is equipped with a FADEC which provides:

- gas generator control
- engine limit protection
- engine automatic starting
- fly-by-wire system compatibility
- power management
- failure identification and indication
- condition monitoring

Engine Control Unit (ECU)

One ECU is located on the engine with dual redundant channels (active and standby) each having separate aircraft power sources to ensure engine starting on the ground and in flight. In addition dedicated ECU alternators assure independent power supply.

Dual redundancy for electrical input devices (Throttle Lever Angle (TLAs), engine sensor signals, Air Data System (ADS 1+2)).

Dual redundancy for electrical part of control actuator.

The simplex hydromechanical unit includes:

- the metering valve and servo valves to control the variable stator position
- the variable bleed valve control system
- the HP turbine active clearance control system actuators
- the fuel system
- the ignition system
- the thrust reverser system

Fault tolerance and fail operational capability.

High level of protection against electromagnetic disturbance.

Engine Interface Vibration Monitoring Unit (EIVMU)

The interface between the FADEC system and the other aircraft systems is mainly performed by the EIVMU through digital data buses.

One EIVMU per engine is located in the avionics bay.

Care is taken to preserve systems segregation for safety and integrity.

The EIVMU includes the necessary data processing provision to make engine parameters available for a condition monitoring system.

The compatibility with the aircraft fly-by-wire system and incorporation of power management function allows significant aircraft weight saving and fuel burn reduction.

ENGINE CONTROLS

MPC AIRCRAFT