Agreement on Trade in Civil Aircraft

TECHNICAL SUB-COMMITTEE

Additional Information on Selected Products

EEC

The following communication has been received from the EEC on 17 March 1982. It contains seven separate sheets ("fiches") of additional information on some of the proposals made by the EEC.

Additional information on other proposals made by the EEC will be forthcoming.

The attached sheets are subject to modifications, inter alia, of tariff classification.

__________

1English translation provisional. One page in 3/82, 4/82, 5/82, 6/82 and 7/82 French only.
1 - **Description of product** -

Assemblies, subassemblies, parts and parts of parts, i.e. spares used specifically for civil aircraft, identifiable by an ATA 100 code number assigned by the manufacturer and repeated in the illustrated catalogue (I.P.C. or I.P.L. (1) for aircraft, engines or equipment and airborne systems.

Such components and spares are elements of aircraft, engines or equipment and aircraft systems. They are necessary for the construction, periodical maintenance and repair of such aircraft.

Not included under this heading are parts and spares without specific destination, usable for general purposes.

**NOTA**: As stipulated by contract, operators must, primarily for safety reasons, provision these spares for the duration of the life of the product. Any substitution of parts must first be approved by the manufacturer.

To waive customs rights on engines, equipment and the airborne systems of civil aircraft, while enforcing them for components, parts and spares/specific replacements would be contrary to the aims of the Agreement concerning civil aircraft. It is discriminatory, dissuasive and penalizing on medium and long term basis and hence contrary to the concept of fair competition between products of the same type.

2 - **Price coding** -

Request for waiving of present barrier.

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<tr>
<th>NCCD</th>
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<td>84-59</td>
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</table>

(1) **I.P.C.**: Illustrated Parts Catalogue of aircraft.

**I.P.L.**: Illustrated Parts List of equipment.
Ensembles, subassemblies parts and parts of parts excluded from the Agreement under items:

3 - **Type of application** -

The building, maintenance and repair of civil aircraft in the manner described under Article I. of the Agreement covering the sale of civil aircraft.

See appended sheets illustrating identification of spares.

4 - **Technical description** -

Not applicable, see sheets listed above.

4 - **Importance of need** -

Essential for the duration of aircraft life, involves high costs.

5 - **Prevention against other than intended use** -

- Specific technical features
  - Specific, readily identifiable items complying with special requirements, national and/or international specifications and to conformity tests which govern aircraft certification
- Specialized sources
- Custom built features
- High price

Price considerations
1 - Description of product -

"Valves" for aircraft, or more specifically, equipment for the distribution, and regulation for fluid lines, assemblies, subassemblies, parts and identifiable parts of parts.

2 - Price coding - Request for new item quotation

<table>
<thead>
<tr>
<th>&quot;Valves&quot;</th>
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<td>84-61</td>
<td>90-24</td>
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3/4 - Example of application - Technical description -

When a fluid is circulated between an energy source and airborne systems, various more or less complex distribution components are involved: cock, valve, distributor, flow limiter, flow restrictor, flow distributor, selector, pressure release valve, clappers, etc.

The control organ of the above, whether included in the equipment or not, may be mechanical, electric, hydraulic or pneumatic, operating either on feedback or non feedback basis.

This type of equipment is employed in airborne systems of carriers:

- fuel lines (top-up of tanks and engine supply)
- hydraulic lines (flight controls, landing gear, airbrakes, wheel brakes, door control and other airborne ancillaries),
- pneumatic lines: (pressurization and air conditioning: cockpit, cabin, bays and miscellaneous compartments, oxygen distribution, deicing, etc.)

Such equipment is covered by aeronautical standards which differentiate it from similar equipment. Consequently, they are specifically and uncontestably aeronautical and are recognized to be conform with certification or qualification issued by official aeronautical authorities (FAA, DGAC, CAB, etc.)

5 - Importance of the need -

As described above, this equipment is employed in the fuel, hydraulic and pneumatic lines of aircraft, and their function is vital to safety.

Much equipment of this type is employed aboard civil carriers and the minimum value of same aboard a wide body carrier may be estimated at 1 million French Francs.
6 - **Preventions against other than intended use** -

+ Specific technical features
  - Specific, readily identifiable items
  - complying with special requirements,
  - national and/or international
  - specifications and to conformity tests
  - which govern aircraft certification.
+ Specialized sources
+ Custom built features
+ High price
  - Price considerations.

**ISSUE:** 29.XII.81
1 - Description of product -

- Equipment for pressurization and air conditioning, assemblies, subassemblies, parts thereof and identifiable spares.

2 - Price coding - request for new items - (1)

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>Rigid steel pipes, ready for use</td>
<td>73-18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couplings and clamps</td>
<td>73-20</td>
<td>76-07</td>
<td></td>
</tr>
<tr>
<td>Rigid aluminium pipes ready to use</td>
<td>76-06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigid titanium pipes, ready to use, titanium couplings and clamps</td>
<td>81-04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat exchangers</td>
<td>84-17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water injectors and separators/humidifiers, dehumidifiers</td>
<td>84-59</td>
<td></td>
<td></td>
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<tr>
<td>Valves, regulators, cocks</td>
<td>84-61</td>
<td></td>
<td></td>
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3 - Type of application -

To maintain a normal climatic environment on the ground and in flight for the benefit of crew, passengers, equipment and storage bays of the aircraft.

This function is provided by:

- the pressurization system supplying cockpits, cabins and cargo holds,
- the air conditioning system supplying cockpits, cabins, equipment (radio compartments, electronic bays, etc.) and cargo holds.

The system comprises equipment for temperature and humidity regulation.

4 - Technical description -

These systems involve much equipment, including:

- Compressors which are driven: 84-11 (covered except for parts)
  
  + Mechanically, by motors
  + or by air bled from turbojets (turbo compressors)
  + or by auxiliary power unit (APU)

(1) NOTA: See sheets: - assemblies, subassemblies, parts and spares
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<td>Turbo cooler units (expansion turbines)</td>
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<td>except parts)</td>
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<tr>
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<td>(not covered)</td>
<td></td>
</tr>
<tr>
<td>- Water aspirators or humidifiers</td>
<td>84-59</td>
<td>(not covered)</td>
<td></td>
</tr>
<tr>
<td>- Water separators or dehumidifiers</td>
<td>84-59</td>
<td>(not covered)</td>
<td></td>
</tr>
<tr>
<td>- Special hoses</td>
<td>39-07</td>
<td>(covered)</td>
<td></td>
</tr>
<tr>
<td>- Special rigid lines</td>
<td>40-09</td>
<td>(covered)</td>
<td></td>
</tr>
<tr>
<td>- Special couplings and clamps</td>
<td>40-16</td>
<td>(covered)</td>
<td></td>
</tr>
<tr>
<td>- Pneumatic or electronic valves and regulators for pressure control</td>
<td>83-08</td>
<td>(covered)</td>
<td></td>
</tr>
<tr>
<td>- Valves for air conditioning, output control or cut-off</td>
<td>73-18</td>
<td>(not covered)</td>
<td></td>
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<tr>
<td>- Temperature probes, amplifiers, temperature regulation valves</td>
<td>76-06</td>
<td>(not covered)</td>
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<tr>
<td>- Blowers for exhaust of conditioned air</td>
<td>84-04</td>
<td>(not covered)</td>
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<td>84-61</td>
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<td></td>
<td>90-24</td>
<td>(covered except parts 90-09)</td>
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<td>90-28</td>
<td>(covered)</td>
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</table>

Etc.

See appended documents containing examples.
5 - An essential need

This equipment is extremely important, and vital not only for aircraft operation, but also for safety of crew and passengers and for proper operation of airborne instruments and systems.

Pressurization and air conditioning systems represent approximately 11% of the cost of aircraft systems (not including airframe, engines and APU).

6 - Preventions against other than intended use -

+ Specific technical features
  (Specific, readily identifiable items complying with special requirements, national and/or international specifications, and to conformity tests which govern aircraft certification.

+ Specialized sources

+ Custom built features

+ High price
  (Price considerations.

7 - Remarks -

On the subject of "Pressurization and Air Conditioning", to date, the GATT Aeronautical Agreement covers only: units for air conditioning, joined together in a single body and including a motor driven blower and the devices needed to modify temperature and humidity, not including parts and spares thereof. This is far from complying with exchanges between signatory countries. For example, no equipment of this type "joined together in a single body" equips carrier aircraft bigger than 15 tons.

The requirements covered by & 2. illustrate components employed with pressurization and air conditioning equipment selected as an example. To be sure, the request for extension for all rigid ready to use pipes in steel, aluminium and titanium, has been repeated under 73-18, 76-06 and 84-01. The same applies to the heat exchangers listed under 84-17 and valves listed under 84-61, which are found in various systems carried by civil aircraft.

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### NORMALISATION DE LA DOCUMENTATION TECHNIQUE DES CONSTRUCTEURS

<table>
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<tr>
<th>SYST/CHAP.</th>
<th>SOUS-SYS/SECTION</th>
<th>TITRE</th>
<th>DEFINITION</th>
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<td>21</td>
<td></td>
<td>CONDITIONNEMENT D'AIR</td>
<td>Equipements et composants assurant la pressurisation, le réchauffage, le refroidissement, la régulation de l'humidité, le filtrage et la purification de l'air utilisé pour ventiler les zones pressurisées du fuselage. Comprend le compresseur de cabine, le refroidissement des équipements, le réchauffeur, le circuit carburant du réchauffeur, la turbine de détente, les vannes, manches à air, canalisations, etc.</td>
</tr>
<tr>
<td>00</td>
<td></td>
<td>Généralités</td>
<td>Partie du système et de ses commandes qui fournit l'air comprimé à la cabine. Comprend, par exemple, les commandes et contrôles des compresseurs, le câblage, etc. Ne comprend pas les commandes et contrôles du circuit de pressurisation cabine.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Compression</td>
<td>Partie du système servant à l'admission et à la distribution de l'air. Comprend les circuits de refroidissement des armoires d'équipements et, par exemple, les ventilateurs, manches à air, canalisations, prises d'air, clapets d'arrêt, câblage, etc. Ne comprend pas les vannes servant à la régulation de pression et de température.</td>
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<td>20</td>
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<td>Distribution</td>
<td>Partie du système servant à la régulation de la pression à l'intérieur du fuselage. Comprend, par exemple, les vannes de régulation, soupapes de décharge, dispositifs de signalisation/contrôle, commutateurs, amplificateurs, câblage, etc.</td>
</tr>
<tr>
<td>30</td>
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<td>Régulation de la pression</td>
<td>Partie du système et de ses commandes qui fournit l'air réchauffé à la cabine. Comprend, par exemple, les réchauffeurs, circuit carburant et commandes, circuits d'allumage et de signalisation/contrôle, liés au fonctionnement des réchauffeurs, le câblage, etc. Ne comprend pas les circuits de régulation et de signalisation/contrôle de la température.</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>Réchauffage</td>
<td>Partie du système et de ses commandes qui fournit l'air frais à la cabine. Comprend, par exemple, le groupe de réfrigération, les circuits de signalisation/contrôle liés au fonctionnement du radiateur, le câblage, etc. Ne comprend pas les circuits de régulation et de signalisation/contrôle de la température.</td>
</tr>
<tr>
<td>50</td>
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<td>Refroidissement</td>
<td>Partie du système servant à la régulation de la température. Comprend, par exemple, les vannes de régulation, sondes de température, commutateurs, dispositifs de signalisation/contrôle, amplificateurs, câblage, etc.</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Régulation de la tempéra-</td>
<td>Partie du système servant à la régulation de la température de l'air à l'intérieur de la cabine. Comprend, par exemple, les vannes de régulation, sondes de température, commutateurs, dispositifs de signalisation/contrôle, amplificateurs, câblage, etc.</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>ture</td>
<td>Régulation de l'humidité et de la contamination de l'air</td>
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<tr>
<td></td>
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<td>Partie du système servant à la régulation de l'humidité de l'air, à contrôler le degré de concentration d'ozone, à filtrer les déchets radioactifs présents dans l'air conditionné et à purifier l'air à l'aide de désodorisants, insecticides, etc.</td>
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</tbody>
</table>
The A310 system philosophy and major components are similar to those of the A300. The air supply is taken from the engine bleed and alternatively, from the APU. Two high pressure supply points are also provided. Conditioned air can also be supplied direct to the cabin air distribution by a low pressure ground connection. A ram air inlet is also provided for fresh air ventilation in flight when the packs are not operating.

The fresh air quantity required for air conditioning is defined to supply 12 cubic feet per minute per occupant (standard seat layout) and also to meet the heating and cooling requirements.

The system may be subdivided into two identical air conditioning groups and a temperature control subsystem.

Each air conditioning pack incorporates a three wheel "Bootstrap" air cycle machine with an air-to-air heat exchanger. This pack is identical to that of the A300. It is known to be reliable and needs little maintenance.

The packs and all associated equipment are installed (as on A300) under the central wing box. They are accessible via the main landing gear wheel well.

The air intakes to the heat exchangers are equipped with flaps to protect the heat exchangers against dirt injection during take-off and landing.

Upstream of each pack, a pack valve is fitted which can operate in two modes: normal mode which provides the specified performance of the air conditioning system, and economic mode which enables the crew, for fuel economy, to reduce the bleed air demand whenever the loading conditions of the aircraft permit.

The conditioned air (temperature, humidity) from the two packs is fed into a common cold air manifold. Hot air is supplied directly from tapping downstream of the bleed air flow control valves via a pneumatic pressure regulating valve into a hot air manifold.

The temperature may be automatically or manually regulated in four zones (flight deck, forward, mid and aft cabin) by varying the pack outlet temperature and adding trim (hot) air.

In automatic operation, the temperature at the pack outlets (cold air) is regulated as follows:

- one pack only operating: the pack discharge temperature is controlled by the zone requiring the lowest inlet temperature.

- two packs operating: if the flight deck requires the lowest inlet temperature, pack 1 is controlled by the flight deck and pack 2 by the cabin zone requiring the lowest inlet temperature. If one of the three cabin zones requires the lowest inlet
temperature, packs 1 and 2 are controlled by this zone.

If there is a failure in the automatic control, the outlet temperature of either pack can be varied manually on the pack temperature panel.

The air temperature in each zone is normally adjusted to the selected valve by automatic control of the trim air valves. These may also be positioned by manual selection on the overhead panel if the automatic control system fails.

An APU and pack temperature demand controller, in automatic mode, acts as an interface between the zone temperature controller and the pack temperature controllers. It also acts as an interface between total system demand and the APU electronic control when the APU is the air supply source.
Fig. 21-1 Air Generation and Temperature Control
2 AIR DISTRIBUTION IN FLIGHT DECK

(See Fig. 21-2)

The flight deck air distribution system is similar to that of the A300. Air is supplied along the left hand side of the aircraft to the following outlets:

- from the ceiling at the rear of the flight deck,
- below the front windscreen windows,
- at floor level on the left hand side of the flight deck.

At these three points, the airflow is manually adjustable in quantity.

- on the left hand side of the Captain's station,
- on the right hand side of the First Officer's station,
- near the ceiling at 3rd occupant station, 2 outlets.

For these four latter points, the airflow is adjustable in quantity and direction.

Extracted air is passed out of the flight deck into the electronic compartments.
3 AIR DISTRIBUTION IN PASSENGER CABIN

Cold air supplied from the packs is split into three riser ducts, one per temperature zone. (See Fig. 21-3).

Hot air is added in the required proportion in the riser ducts, which pass up between the cabin frames and furnishing panels to the cabin ceiling.

The ducted fresh air is then mixed with the recirculated air in the cabin ceiling main supply ducts, before it is distributed in the cabin by ducts above the lateral hatracks. (See Fig. 21-4).

The fresh air to recirculated air proportion is 60% to 40% in normal mode.

Recirculated air is supplied to the main air supply ducts by three electric fans, one in each temperature zone. Extracted air is passed out of the cabin through vents in the walls near the floor.

Tappings from the main supply ducts are taken to supply air for the individual ventilation of the toilets and galleys. Restrictors are installed in the supply ducts downstream of the tapping points to raise the pressure level for correct functioning of the individual air outlets.

Individual ventilation for the passenger compartment is provided as an option. (See Fig. 21-5)

The air for the individual ventilation is taken from the main cabin fresh air supply via separate distribution ducts in the cabin ceiling through the hatracks to the individual air outlets provided in the passenger service units. The airflow from the individual air outlets is adjustable in quantity and direction.

Fig. 21-3 Cabin Air Distribution (general Layout)
Fig. 21-4 Air Circulation

Fig. 21-5 Cabin Air Distribution
(Optional Individual Air Outlets)
The galley and toilet ventilation system is an entirely new design for the A310.

Air is supplied to the toilets and galleys from an individual ventilation system. In addition, air from the cabin can enter the toilets through inlet grills.

Air is extracted from the toilet boxes, toilet bowls and galleys via a pipe in the cabin roof. This pipe has many adaptors provision for installation of galleys and toilets in various positions in the cabin. Cabin pressure differential provides extraction during flight, while a fan is used when the aircraft is on the ground. All extracted air is passed directly overboard at a point located on the bottom of the aircraft, aft of the bulk cargo compartment.

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**Fig. 21-6 Galley and Toilet Ventilation**
5 ELECTRIC AND ELECTRONIC EQUIPMENT VENTILATION
(See Fig. 21.7)

Ventilation is provided for the main equipment racks complying with ARINC 600 (or ARINC 404A in some cases). Some other equipments in the main racks, as well as the pedestal and the flight deck panels are ventilated by air blown over the equipments and ambient air is extracted from around the equipment.

The air is drawn through a dust separator and filter by one of two identical blowing fans. The other fan is available as a standby. One of these fans is normally running whenever electrical power is available on board the aircraft. Automatic switch over to the other fan occurs after each flight or in case of failure (the latter case being indicated in the flight deck).

Additional ventilation is provided from a tapping in the flight deck fresh air duct when the air conditioning system is running. This air is not filtered.

The air through and over the equipment is normally sucked out by an extractor fan and, via two valves, passed overboard or into the forward cargo underfloor area to provide floor heating. The position of these two valves is controlled automatically depending on the situation (ground/flight, cold/hot day). The overboard valve can also be controlled manually. Battery ventilation is provided by a separate small fan, and the ducting is separated from the main electrical and electronic ventilation system.

A number of smoke detectors are placed in the system. Smoke detection is assisted by a flight deck "sniffer" for the smoke emergency shelf.

An optional refrigeration unit, complete with an additional cooling fan, is available for main equipment cooling on the ground. It is intended that this unit can be used when the APU is not running.
A310 Air conditioning system

Extraction fan

Equipment

Flow detector

Aircraft skin

Optional refrigeration unit

Flow detector

Overboard

Forward cargo underfloor area

Flow detector

Flow detector

Flow detector

Flow detector

Flow detector

Aircraft skin

Fig. 21-7 Electronic Bay Ventilation
6 CABIN PRESSURE CONTROL SYSTEM

(See Fig. 21-8)

The A310 Pressure Control System consists of two identical, independent, automatic systems, one being active, the other in stand-by. Switch-over from one to the other is automatic after each flight and in case of failure of the active system. Failure of a system is indicated in the flight deck, as well as an indication of which system is active. Manual selection is possible.

In each system, the pressure is controlled by two electro-pneumatic outlet valves, one situated forward of the air conditioning bay, the other aft of the bulk cargo compartment. The system function is dependent on pre-programmed cabin pressure altitude and rate of change of cabin pressure, aircraft altitude and pre-selected landing airfield elevation. It is possible to close the electro-pneumatic valves manually by switches on the flight deck. It is also possible to manually control the cabin pressure by means of the ground depressurisation valve, adjustable by a switch on the overhead panel in the event of failure of both normal systems. Alternatively, a mechanically controlled valve may be used in this situation. This valve is situated below the flight deck, with control by means of a wheel on the first officer's lateral console. Ground depressurisation is achieved automatically by electrically opening the pneumatic valves and the ground depressurisation valve.

Cabin excess altitude, excess pressure and negative excess pressure are prevented by additional automatic functions of the electro-pneumatic valves.

Automatic prepressurisation of the cabin before take-off is provided to prevent a noticeable pressure fluctuation in the cabin during rotation on take off. To achieve this prepressurisation, outlet valves and the depressurisation valve are closed for approximately 1 minute. Prepressurisation is maintained for 15 seconds after take off, when the cabin pressure control is automatically switched to its normal inflight mode.
The bulk cargo compartment of the A310 standard aircraft is heated and ventilated. A similar system can be fitted in the forward cargo compartment as an option.

The air is supplied to the heated cargo compartment through a distribution duct along the left hand side of the compartment. The air is extracted from the cabin, reheated by additional hot air bled from the hot air manifold. The hot air supply is controlled by a trim valve, which regulates the cargo compartments temperature. Temperature control of the cargo compartment is achieved in a similar manner to that of the cabin, using inputs from the flight deck preselector, the cargo compartment air temperature sensor, and the air supply duct sensor to control the trim air valve. The air is extracted from the cargo compartment through vents near the ceiling on the right hand side by an electrical fan. The extracted air from the bulk cargo compartment is passed under the compartment floor to provide floor heating. The extracted air from the forward cargo compartment is passed directly aft to the forward outlet valves. Underfloor heating of the forward cargo compartment is provided by extracted air from the electrical and electronic racks.
1 - **Description of product**

Equipment for the generation and distribution of aircraft electric power, assemblies, subassemblies, their parts and identifiable spares.

2 - **Price coding - request for new items**

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</table>

3 - **Example of application**

See appended document:

Excerpt from ATA 100, chapter 24.

4 - **Technical description**

Both on the ground and in flight, the supply of electric energy to the aircraft systems operating on electricity, is provided by:

- **electric generation systems**

- **electric distribution systems**

These installations employ many components which are specifically used in aeronautics, such as:

- **generators**:
  
  - Alternators with or without speed variator, with or without frequency change for 400 cps network ...... 85-01 (covered)
  
  - Dc generators of the turbo-machine starting and non-starting types .. 85-01 (covered)
  
  - Electro-chemical lead or nickel-cadmium batteries .............. 85-04 (not covered)
Fig. 21-8 Cabin Pressure Control System
- Devices for regulation measuring, protection, detection and control:
  - voltmeters, ammeters, frequency meters, etc.
  - generator regulation boxes,
  - generator control and protection boxes,
  - electric distribution monitoring systems (distribution, control, protection)
    90-28 (covered)
  - systems for surveillance of electric installations, as required for flight safety (automatic load relief emergency circuits), sub-voltage detectors, over-voltage, sub-frequency, over-frequency, etc.

- Switching and/or commutation devices
  - contactors
  - circuit breakers contactors
  - circuit make/break contactors
    85-19 (not covered)
  - commutators, switches
  - circuit breakers
  - initiators

- Conversion devices
  - transformers
    (partially covered) 682-08
  - converters
    (covered)
  - transformer rectifiers
    85-01 (not covered dans le NCCD) 682-61
  - rectifiers
  - battery chargers
    (covered in TSUS)
- Connection devices
  - connectors
    85-19 (not covered)
  - cabling (bundles & harness)
    85-23 (partially covered in NCCD)
    688-14 in TSUS

5 - Importance of need -

Electric power is essential for the operation of practically all the equipment carried by aircraft, and hence for flying under permissible safety conditions.

6 - Preventions against other than intended use -

These items have a specific function in the execution of flights (see for example, the enclosed document describing technical specifications for an aircraft electric system. They are completely identifiable, comply with special requirements, satisfy national and/or international specifications and are subjected to stringent controls.

Price considerations.

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<table>
<thead>
<tr>
<th>SYST. CHAP.</th>
<th>SOUS-SYST./ SECTION</th>
<th>TITRE</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>GENERATION ELECTRIQUE</td>
<td></td>
<td>Equipements et composants électriques qui produisent, commandent et distribuent du courant alternatif et/ou continu à d'autres circuits, y compris génératrices, relais, convertisseurs, batteries, etc., par l'intermédiaire des barres secondaires. Comprend aussi des éléments électriques courants tels que câblage, commutateurs, prises, etc.</td>
</tr>
<tr>
<td>-00</td>
<td>Généralités</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td>Entraînement génératrices</td>
<td></td>
<td>Mécanismes entraînant les génératrices à un régime prévu. Comprend, par exemple, le circuit de graissage, les dispositifs de connexion, les circuits de signalisation/contrôle et d'alarme de l'entraînement, etc.</td>
</tr>
<tr>
<td>-20</td>
<td>Génération alternative</td>
<td></td>
<td>Partie des systèmes qui assure la génération, la régulation, la commande et la signalisation/contrôle de la génération alternative. Comprend, par exemple, les convertisseurs, alternateurs, éléments de commande et de régulation, circuits de signalisation/contrôle, etc., tous les câblages jusqu'aux barres principales non comprises.</td>
</tr>
<tr>
<td>-30</td>
<td>Génération continue</td>
<td></td>
<td>Partie des systèmes qui assure la génération, la régulation, la commande et la signalisation/contrôle de la génération continue. Comprend, par exemple, les génératrices et alternateurs, transformateurs, redresseurs, batteries, éléments de commande et de régulation, circuits de signalisation/contrôle, etc., tous les câblages jusqu'aux barres principales non comprises.</td>
</tr>
<tr>
<td>-40</td>
<td>Alimentation extérieure</td>
<td></td>
<td>Partie du système à l'intérieur de l'aéronef reliant l'alimentation électrique extérieure au circuit électrique de l'aéronef. Comprend, par exemple, les prises, relais, commutateurs, câblages, alarmes lumineuses, etc.</td>
</tr>
<tr>
<td>-50</td>
<td>Distribution</td>
<td></td>
<td>Partie des systèmes permettant le branchement des sources de courant alternatif ou continu aux circuits d'utilisation. Comprend, par exemple, les barres principales et secondaires alternatives et continues, disjoncteurs des circuits principaux, dispositifs du circuit d'alimentation, etc.</td>
</tr>
</tbody>
</table>
1 GENERAL

The power generation of the A310 is similar in principle to that of A300 B2/B4.

However, better overall performances will be achieved by use of new technology components. For example, the air cooled generators coupled to Constant Speed Drive (A300 definition) are replaced by compact, light weight Integrated Drive Generators (IDG).

In normal flight condition, the electrical power supply of the A310 is provided by two IDG's, one per engine (see fig. 24-1).

The IDG's are integral spray-oil cooled; this oil then being cooled in turn by both an air/oil and fuel/oil heat exchangers; the air and fuel being engine supplied.
A third auxiliary generator driven by the APU can replace one of the main generators. This generator is built with the same electromagnetic components as the IDG but without the constant speed drive. A new housing connects the generator to the constant speed output of 12,000 RPM on the APU gearbox. (See Fig. 24.2 and 24.3) APU oil is used for cooling.

Three transformer rectifier units provide the direct current network supply.

In the event of main generator loss, three batteries and a static inverter provide emergency power for systems required to control the aircraft.

The overall block diagram of the generation and distribution is given in Fig. 24-4.

2 NORMAL FLIGHT CONFIGURATION

In normal flight configuration, each IDG, which is capable of providing 90 KVA in steady state conditions, supplies a so-called normal 115 V/400 Hz a.c. distribution network via its generator line contactor (GLC). These two networks are not paralleled.

- N° 1 distribution network comprises:
  - N° 1 normal a.c. busbar (AC BUS 1)
  - The essential a.c. busbar (AC ESS BUS) which is supplied by N° 1 normal busbar via a contactor (ETC 1).
  - The emergency a.c. busbar (AC EMERG BUS), which is supplied by the essential busbar.

- N° 2 distribution network corresponds to N° 2 normal a.c. busbar (AC BUS 2).

Two so-called normal 150 A (nominal) transformer-rectifiers (TR 1 and TR 2) each supplied by a normal a.c. busbar, supply, in parallel, the normal 28 V d.c. busbar (DC NORM BUS) via their respective split contactors.

A third so-called essential transformer rectifier (ESS TR), identical to the other two and supplied in parallel with the essential a.c. busbar, supplies the essential d.c. busbar (DC ESS BUS) via its split contactor.

The normal and essential d.c. busbars are connected by a bus tie breaker.
Three 25 Ah batteries are connected to the essential d.c busbar. During most of the flight, they are disconnected from the network (charge control) and in standby condition, awaiting an automatic reconnection signal (additional battery charge, autoland, busbar recovery).

### 3 ABNORMAL FLIGHT CONFIGURATION

Any one of the three generators is capable to power all the A.C. bus bars up to 90 KVA if the other two are failed (partial load shedding of galleys loads).

In case of loss of A.C. power generation from the generators (emergency condition) the 1 000 VA static inverter is supplied by the essential d.c. bus-bar (powered by the batteries) in order to supply the A.C. emergency bus-bar.

The batteries and the Static Inverter are capable of supplying emergency power for a minimum of 30 minutes, including two attempts to start the APU, in order to allow a safe landing with a minimum of radio and navigation equipments.
4 AIRCRAFT GROUND SUPPLY

On the ground, the entire aircraft network can be supplied via the two bus transfer contactors (BTC 1 and BTC 2):

- either from the auxiliary generator (APU GEN) via its line contactor (GLC 3);
- or from the ground power unit (EXT PWR) via the ground power contactor (EPC).

When both these sources are available simultaneously, the ground power unit has priority for supplying the aircraft.

It should be noted that:

- for ground servicing operations, it is possible to supply only part of the normal a.c. and d.c. networks.
- it is also possible to perform refuelling operations without a ground power unit by using one of the aircraft batteries and the static inverter as a source of electrical power.

5 ELECTRICAL POWER GENERATION CONTROLS

a) Main Panel (See Fig. 24-6)

This panel represents the general layout of the system and groups together the main controls and indications and shows each of its components in detail.

The electrical power generation and distribution control, indication and monitoring equipment is located on the flight deck overhead panel: (See fig. 24-5).

Fig. 24-5 Electrical Power Generation and Distribution Control
- Smoke detection warning in the cooling system of corresponding racks
- Effective load shedding indication
- Guarded control for setting into "Minimum Equipment" configuration in "Smoke emergency" procedure
- Control for setting into "Nav Land" configuration in "Smoke emergency" procedure
- Control for setting into operation of battery/charge monitoring unit and indication of battery contactor position
- Thermal runaway warning for any of the three batteries
- Control for connecting the three batteries (charge monitoring unit overriding)
- Smoke detection warning in battery ventilation system
- Warning for D.C. essential bus bar powered by battery only
- Warning for D.C. normal bus bar loss
- Indication of A.C emergency bus bar powered by static inverter
- Warning for A.C essential bus bar loss
- Guarded control for essential bus bar and TR power transfer and indication of contactor position
- Warning for A.C normal bus bar loss
- Indication of external power availability
- Control and indication of external power utilization
- A.C generator failure warning
- Control for exciting and connecting A.C generator
- Overload warning for any of the three A.C generators
- Control and indication of galley load shedding
- Guarded control for EDG disconnection
- IDG overheat warning
- IDG oil pressure drop warning

Fig. 24-6 Electrical Power Panel
b) Monitoring Panel

(See fig. 24-7)

An adjacent panel accommodates the monitoring instruments:

- A.C.: voltmeter, frequencymeter and load indicator associated with a rotary switch for selecting the source of the information presented (generation, distribution busbars).

NB: A rotary switch is provided on the maintenance panel for selecting the voltage phase to be indicated.

- D.C.: voltmeter and ammeter associated with a rotary switch for selecting the source of information to be displayed (generation or distribution busbar).
1 - Description of product

Fire protection equipment carried by civil carriers, assemblies, subassemblies, parts, specific parts of parts.

2 - Price code—new item pricing requested

<table>
<thead>
<tr>
<th>Product Description</th>
<th>N C C D</th>
<th>TSUS</th>
<th>T.Cn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartridges for extinguishers</td>
<td>84-21</td>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Discharge valves</td>
<td></td>
<td>84-61</td>
<td>(2)</td>
</tr>
<tr>
<td>Non-return valves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extinguisher cylinder selector</td>
<td>85-19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extinguisher handles</td>
<td>85-19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 - Type of utilization

All civil carriers must carry fire detection and extinguishing systems. These are completed by smoke detection systems (cabin, bay).

4 - Technical description

The fire detection and extinguishing systems are completely independent of each other. Extinguishing is controlled by the flight personnel, which eliminates untimely release of the extinguishers.

a) Detection systems:

- spot or linear detectors 85-17 (covered)
- detection and test boxes 90-28 (covered)
- visual and/or audio warnings (heat, smoke detectors) 85-17 (covered)

b) Extinguishing systems (areas: engine, APU and bays)

control handles 85-19 (not covered)

(1) See sheet No. 1/82
(2) See sheet No. 2/82
- Extinguisher cylinder 85-19 (not selector covered) 662-52 (not covered)
- Extinguishers 84-21 (covered)
- Extinguisher cartridges 38-17 (not covered)
- Discharge valves 84-61 (not covered)

c) Portable extinguisher systems (cabin area) or automatic (lavatories)
- extinguishers 84-21 (covered) 662-52 (covered)
- oxygen cylinders 90-18 (covered) 709-46 (covered)

5 - **Important Essential need**

These systems are indispensable for flight safety

6 - **Prevention of diversion to other uses**

. Specific technical features
. Specialized sources
. High price

The products employed (including the extinguishers) are specific in nature: special environment, type of fluids employed, light weight, specifications, etc.

7 - **Remarks**

Except for the extinguishers, the equipment making up these systems is not covered by the Agreement. They constitute a non-negligible portion of costs for installation aboard the aircraft of fire protection systems and their maintenance.

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<table>
<thead>
<tr>
<th>SYST/ SOUS-SYST/ CHAP. SECTION</th>
<th>TITRE</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>PROTECTION CONTRE L'INCENDIE</td>
<td>Equipements et composants fixes et portatifs qui détectent et signalent la présence d'un incendie ou de fumée, et emmagasinent ou distribuent le produit d'extinction dans toutes les zones protégées de l'aéronef. Comprend les bouteilles, clapets, canalisations, etc.</td>
</tr>
<tr>
<td>(16)</td>
<td>-00 Généralités</td>
<td>Partie du système servant à détecter et à signaler la présence d'une surchauffe, de fumée ou d'un incendie.</td>
</tr>
<tr>
<td></td>
<td>-10 Détection</td>
<td>Parties fixes ou portatives du système servant à éteindre l'incendie.</td>
</tr>
<tr>
<td></td>
<td>-20 Extinction</td>
<td>Partie du système servant à détecter, à signaler et à éteindre les flammes qui se propagent dans la mise à l'air libre ou les bouches de ventilation du circuit carburant, afin de prévenir l'explosion de ce circuit.</td>
</tr>
</tbody>
</table>
26-00.00.00 FIRE PROTECTION

26-10.00.00 FIRE DETECTION - MAIN ENGINES

.01.00 A continuous element dual loop type fire detection system will be provided for each engine.

.02.00 The systems will be independent with maximum emphasis on reliability and freedom from false alarms due to a short or open circuit, to allow dispatchability with one circuit inoperative.

.03.00 The system will allow a crew member to check the elements for continuity and identify an inoperative circuit in flight.

.04.00 Fire detector elements and connectors will be secured and routed so that:

.04.01 The element has positive protection from damage during maintenance including cowling operation and engine component replacement;

.04.02 Elements with different alarm set points will be at least 6 inches different in length. Elements with the same alarm set point will be either the same length or at least 6 inches different in length;

.04.03 Clearance between the element and adjacent structure will be maintained;

.04.04 Fire detection elements will be easily replaceable;

.04.05 Element connections will be moisture proof.

.05.00 When operated normally as a dual system, a short to ground or open in one loop circuit will not initiate a false fire alarm.

.06.00 An engine fire warning will be indicated by:

.06.01 illumination of a red light on the central warning panel

.06.02 illumination of a red light in the respective fire control and fire extinguisher lever

.06.03 a fire bell

.07.00 Activation of the fire control lever will turn off and reset the fire bell.

.07.01 A fire bell audio cancel push button will be provided behind the fire control lever.

A.300 B/ATLAS
26-11.00.00  FIRE DETECTION - APU

.01.00 A dual continuous fire detection system will be installed for the protection of the APU and its equipment.

.02.00 The number of components in the detection systems will be kept to a minimum and it will be possible to replace them without removing the APU.

.03.00 The fire detection systems will be of the same type as that used for the main engines and will be installed in the APU compartment.

.04.00 A fire warning will be indicated by:

.04.01 A light on the flight deck APU panel

.04.02 A warning bell

.04.03 An electric horn which will operate when the aircraft is on the ground, to provide a warning to the ground crew.

26-12.00.00  SMOKE DETECTION

.01.00 A smoke detection system will be provided for the following compartments:

.01.01 Front equipment compartment

.01.02 Front freight compartment

.01.03 Centre freight compartment

.01.04 Rear freight compartment

.01.05 Outlet of the batteries ventilation duct

.02.00 Red warning lights indicating the source of smoke will be provided in the flight deck.

.02.01 A smoke warning in the central warning panel will repeat all smoke warnings.

.02.02 Automatic shut down of the SMOKE red lights when the smoke disappears will be provided.

26-20.00.00  FIRE EXTINGUISHING - MAIN ENGINES

.01.00 Fire extinguishing will be provided for the accessory zone in the fan cowling and the forward zone around the gas generator, in the form of a two-shot system, each shot being supplied by a single-head bottle.

.01.01 There will be two bottles for each pod connected to a single distribution system.
26-20.02.00 Connections in the fire extinguishing system, subject to relative motion between components, will be made of flexible and fire-resistant materials.

.03.00 Magnetic indicators will be provided on the flight deck to give indication of extinguisher bottle discharge.

26-21.00.00 FIRE EXTINGUISHING - APU

.01.00 The fire extinguishing system will comprise a Freon bottle and necessary plumbing to discharge into the APU compartment.

.02.00 In the event of a fire warning an automatic system will shut down the APU and, after a delay of 5-10 seconds, will operate the fire extinguisher.

.02.01 This automatic system will operate on the ground only, manual operation being required under normal flight conditions.

26-22.00.00 FIRE EXTINGUISHING - FRONT FREIGHT COMPARTMENT

.01.00 A one shot fire extinguishing system for the front or centre freight compartment will be provided.
## INTRODUCTION

Aircraft fire protection systems are provided for:

- engines and APU comprising fire detection and extinguishing system;
- electronic bay with a smoke detection system;
- cargo compartments comprising a smoke detection and fire extinguishing system.

### 2 FIRE PROTECTION FOR ENGINES AND APU

The fire detection systems for the engines and the APU are from SYSTRON-DONNER. The detection loops are of pneumatic type. (See fig. 26-1). Basically, they consist of a stainless steel tube (1.6 mm diameter) filled with helium. The helium is prepressurized (2-3 bar). One end of the tube is equipped with two pressure switches, one of them detecting continuously the prepressure (fault switch), the other one providing an alarm signal as soon as the helium pressure rises above a preset value due to overheat. In order to achieve a sufficient increase of gas pressure even with a discrete fire, a metal hybrid core element is provided inside the tube. This metal hybride releases a significant amount of hydrogen when being heated, thus

![Fig. 26-1 Engine or A.P.U. Fire Detection (principle)](image-url)
Fig. 26-2 Engine Fire Protection System
operating the alarm switch in case of a local fire.

All the detector loops are duplicated (loop A and B). In a control box (one per engine and APU), the alarm signals of the two loops are AND-gated in order to avoid false warnings. On the respective fire protection panel (one for each engine and for the APU, located on the overhead panel), the fire alarm signal illuminates the indicator in the fire handle, both Loop-lamps, and activates the flight warning system (See fig. 26-2).

The fault signal and the alarm signal of each loop are OR-gated in order to indicate a loop failure by the respective LOOP light.

In each nacelle, one duplicated detector loop is located in the lower part of the pylon and a second one on the engine core (GE engines having a third one on the fan). The APU compartment is equipped with one duplicated loop. The alarm temperatures are different for the various locations; they are preset via the prepressure in the detectors.

The fire extinguishing system for each nacelle consists of two extinguisher bottles (APU: one bottle), installed in the rear part of the pylon and filled with Halon 1301. The two bottles are connected via a tube to the spray nozzles, the locations of which depending on the type of engine. Each bottle can be discharged by means of a double wired cartridge. The continuity of the doubled wiring can be tested by pushing the Squib test button on the fire protection panel. The light SQUIB comes on when both wires are intact (while one of them being sufficient to fire the cartridge).

In case of engine fire, the extinguishing procedure is as follows:
- throttle to idle
- shut high pressure fuel cock (which is lighted due to the fire alarm)
- pull fire handle (which shuts hydraulic suction lines, fuel LP valve, appropriate bleed air valve, and which opens the generator field circuit)
- wait 10 seconds (slow down of engine)
- push the button AGENT 1 to discharge one of the extinguisher bottles (only possible after the fire handle has been pulled)
- if alarm persists, push the button AGENT 2.

In case of APU fire, the APU will be shut down automatically or will have to be shut down manually depending where the fire is detected.

The extinguishing procedure is then similar to the procedure used for engine (only one AGENT).

3 FIRE PROTECTION FOR ELECTRONIC BAY

Smoke in the electronic bay is detected by four smoke detectors which are of the ionisation type. They detect smoke in the cooling air extraction ducts of the different groups of equipment, as shown in fig. 26-3.

The signals are elaborated in the detector box (the same as used for cargo compartments) and the respective smoke warning light on the overhead panel comes on.

The presence of smoke in the smoke emergency shelf and in two of the three inertial reference systems can be confirmed by a sniffer which is provided with a small fan.
If FLT COMPT. or MAIN BAY smoke warning light has been triggered, the procedure consists of shedding all busbar loads except for some essential equipment (which are concentrated in the smoke emergency shelf).

The push button MIN EQPT for this procedure is located adjacent to the warning lights. By use of the push button SMOKE DRILL NAV. LAND, a part of the previously cut-off supplies can be restored to allow an instrument approach after a smoke drill has been performed.

In case of smoke warning (and confirmation by the sniffer) in the minimum equipment bay, all equipment in this bay can be shed using the circuit breakers grouped on the specially marked part of the overhead circuit break panel. In case of battery smoke, the three batteries can be switched off individually.

A fault in one of the four detector circuits is indicated on the front panel of the detector box and on the maintenance panel (BITE DISPLAY). The circuits can be tested by use of the selector and the test push button on the maintenance panel. In the electronic bay, a 1 kg portable fire extinguisher is installed.
4 FIRE PROTECTION FOR CARGO COMPARTMENTS

(See fig. 26-4)

Smoke in the cargo compartments is detected by two detectors per compartment (six total). They are of the ionisation type and installed in the ceiling of the compartments.

The signals of the two detectors of the fwd compartment are OR-gated. Since the aft and bulk cargo compartment are divided only by a net with a non-sealed curtain and thus these two compartments are considered (for the fire protection) as being one, the signals from all four detectors are OR-gated.

The signals of the six detectors are elaborated in the same detector box as used for the electronic bay.

In case of smoke, the respective SMOKE light on the overhead panel is illuminated (plus FWS) and the valves of the respective cargo compartment heating and ventilation system are closed automatically.

For fire extinguishing, two identical extinguisher bottles are installed at the right hand side of the fwd cargo compartment. They are filled with Halon 1301.

Each bottle is equipped with two independent discharge cartridges and ducted to the spray nozzles in the cargo compartments such that both bottles can be used for either application (fwd or aft/bulk).

The discharge cartridges are electrically ignited by use of two guarded switches which are located on the overhead panel.

In case of smoke warning, bottle no. 1 will be discharged (feed back signal DISCH. 1 illuminates). After one hour, the indicator DISCH. AGENT 2 will illuminate automatically. This reminds the crew to discharge bottle no. 2 in order to compensate the leakages of extinguisher agent out of the compartments. (See illustration next page).
Fig. 26-4 Fire Protection for Cargo Compartments
1 - Description of product-

Equipment for loading and unloading (automatic and otherwise) aircraft cargo, the relative subassemblies, parts and identifiable parts of parts.

2 - Price code - new item pricing requested -

<table>
<thead>
<tr>
<th>Item</th>
<th>NCCD</th>
<th>TSUS</th>
<th>Ch.T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball bearing</td>
<td>84-22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorized ball bearings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction gear drive motor less than 1 hp</td>
<td>85-01</td>
<td>682-42</td>
<td></td>
</tr>
<tr>
<td>Blocking devices</td>
<td>84-22</td>
<td>664-12</td>
<td></td>
</tr>
<tr>
<td>Luminous detection devices controlling motion and lock</td>
<td>85-21/90-28</td>
<td>712-06</td>
<td></td>
</tr>
<tr>
<td>Control boxes</td>
<td>85-19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 - Type of utilization -

The system here described is the standard version employed by such mass carriers as: B-747, DC 10 - Lockheed 1011 - Airbus A-300 and A-310, etc.

4 - Technical description -

Large carrier aircraft have spacious bays for accommodating merchandise.

Some civil aircraft are designed for exclusively or partially carrying cargo: freighters, convertible (quick change) aircraft, combination types.

To facilitate rapid handling, freight is placed in containers or standard pallets.

Owing to their limited volume, aircraft bays must be equipped with devices for:

a) Moving loads:

- ball bearing platform 88-03 (covered)
- ball bearings with case 84-22 (covered)
- platform with roller bearings 88-03 (covered)
- ball bearings 84-22 (not covered)
b) Mooring loads:
- Lock jacks 84-22 (covered) 664-12 (covered)
- Blocking devices 84-22 664-12

Because there is very little time for loading and unloading operations during layovers, these operations must be made automatic. Consequently, in addition to the foregoing, the following equipment must be used:

a) a centralized control system 90-28 (covered)

b) a container moving system: 90-28 (covered) 664-12 (covered)
- loading jacks 84-22 (not covered)
- motorized rollers 84-22 (not covered) (partly)
- reduction gear drive motor 85-01 (not covered) 682-42 (not covered less 1 HP)

6) a control system:
- luminous detection device (transmitters, receivers) 85-21 (not covered)
- control boxes (for starting-up the needed motorized rollers and release of locks, gradually, as the container arrives at its designated spot. This system locks the container in its final location) 85-19 (not covered)

5 - Essential need -
With worldwide development of air freight, this kind of system is becoming general practice aboard medium and mass carriers.

The value of the equipment involved in such systems is not negligible, and depends upon the size of the bays and the extent to which they have been made automatic for handling.

6 - Prevention of diversion to other uses -
Specific technical features:

This equipment differs from other cargo handling equipment by its ultra-light design made necessary because the loading device remains within the aircraft. It complies with stringent aeronautical safety rulings.
Specialized vendors

Owing to these highly specialized features, there are very few vendors in the world that make such equipment (three or four)

High price

7 - REMARKS -

The GATT Aeronautical Agreements exonerate "machines and devices for loading and unloading (84-22 - 664-12)" but not their parts and spares. It is necessary to establish exactly what equipment is included under these specifications, so that exact reciprocal procedure may be adopted.
Cargo compatibility.

The extra wide body of the Airbus A300 and A310 enables interline LD3 containers to be carried side by side.

Full width pallets, common to the long range wide body aircraft, can be flown directly onto regional routes.

When you operate an Airbus fleet, short haul air cargo becomes a profitable proposition.

More good reasons why the Airbus A300 and A310 are called the number one twin-aisle twins.
3 CARGO COMPARTMENTS

a) General

Two large underfloor cargo compartments can accommodate up to 21,860 kg (48,200 lbs) of cargo in containers or on pallets of the same standard as those used on present modern wide-bodied aircraft. In addition, a bulk hold can accommodate up to 2,770 kg (6,100 lbs) of cargo.

All compartments are designed as category C compartments. They are equipped with a smoke warning and fire extinguishing system (refer to chapter 26).

b) F’W’D and AFT Cargo Compartments

The fwd and aft compartments are designed to be compatible with the requirements for certified and non-certified unit load devices (ULD). A selection out of the possible loading combinations is shown in Fig. 25-14.

The loading of the following ULD’s is possible in the standard aircraft:

- LD1 certified containers type NAS 3610-2K2C (IATA A2) limited to a maximum gross weight of 1587 kg (3,500 lbs) each

Fig. 25-14 Cargo Flexibility
- LD3 certified containers type NAS 3610-2K2C (IATA Al) limited to a maximum gross weight of 1587 kg (3500 lbs) each.

- LD6 certified full size containers type NAS 3610-2L2C limited to a maximum gross weight of 3175 kg (7000 lbs) each.

- LD7 pallets (88" x 125") type NAS 3610 2A1P, 2A2P, 2A3P, 2A4P, and 2A6P limited to a maximum gross weight of 4627 kg (10 200 lbs).

Provided that the requirements of the Weight and Balance Manual are met, all non-certified half and full size containers as defined above can be loaded to the maximum gross weight equivalent to 2K1C/2L1C (2830/5660 lbs).

The volumetric dimensions and the maximum load values (limited by structure) for the three compartments are given in Fig. 25-15. As an additional information, the cargo load is indicated for an average loading density of the LD3 containers.

c) Bulk Cargo Compartment

This compartment is designed for bulk cargo and the transportation of livestock (for heating and ventilation refer to chapter 21).

A net separates the aft cargo from the bulk cargo compartment. This net is equipped with adequate tensioners to prevent sagging in service, and is covered with a screen, which can be removed without the use of special tools, on the bulk cargo compartment side.

This screen is adequately attached to the net and to the compartment at its edges to act as a seal between the aft and bulk cargo compartments for air conditioning purposes. There is no special opening for access purposes.

The bulk compartment is divided by nets into three parts, the forward part (11,5 cu. m), the middle part (4,0 cu. m.), and the crew baggage partment (1,7 cu. m.).

<table>
<thead>
<tr>
<th>Cargo hold</th>
<th>Use for</th>
<th>Overall volume</th>
<th>Palletized</th>
<th>Volume in LD-3 containers</th>
<th>Max. load (structural limit)</th>
<th>Average load (180 kg/m³ = 11.25 lb/cu.ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward</td>
<td>Freight on pallets or in containers</td>
<td>60.3 m³ (1 780 cu.ft)</td>
<td>31.4 m³ (1 110 cu.ft)</td>
<td>35.8 m³ (1 248 cu.ft)</td>
<td>12 340 kg (27 200 lb)</td>
<td>6 440 kg (14 200 lb)</td>
</tr>
<tr>
<td>Aft</td>
<td>Cargo or pass. baggage in containers</td>
<td>34.5 m³ (1 218 cu.ft)</td>
<td>—</td>
<td>26.5 m³ (936 cu.ft)</td>
<td>9 520 kg (21 000 lb)</td>
<td>4 820 kg (10 630 lb)</td>
</tr>
<tr>
<td>Bulk</td>
<td>Bulk cargo</td>
<td>17.3 m³ (611 cu.ft)</td>
<td>—</td>
<td>—</td>
<td>2 770 kg (6 100 lb)</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>102.1 m³ (3 609 cu.ft)</td>
<td>31.4 m³ (1 110 cu.ft)</td>
<td>62.3 m³ (2 184 cu.ft)</td>
<td>24 630 kg (54 300 lb)</td>
<td>11 260 kg (24 830 lb)</td>
</tr>
</tbody>
</table>

Fig. 25-15 Volumetric and Weights Figures
d) Cargo Loading System

Both the forward and aft cargo compartments are provided with a semi-automatic electrically powered cargo loading system.

The cargo loading system is controlled by an operator using a control panel equipped with a joystick, which returns to the neutral position once released (See Fig. 25-16).

The control panels for the forward and aft compartments are located behind service doors in the outer skin on the right hand side of each doorway.

It is possible to load and unload containers singly or in pairs and to load and unload the forward and aft compartments simultaneously.

The cargo loading system permits manual loading/unloading of the ULD's if the power drives are inoperative for any reason.

Both cargo compartments are equipped with one way overrideable door sill latches, a safety device to prevent ULD rollout. These door sill latches can be used for ULD alignment purposes. A handle to lower them manually is provided in the cargo loading system control panel.

Locking and unlocking of containers and pallets in the cargo compartments is carried out manually.

In the forward and aft underfloor cargo compartments, tie down points are installed.
1 - **Description of product** -

Aircraft intercom equipment, assemblies, subassemblies, parts and parts of parts.

2 - **Price code - new item pricing requested**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>COCN</th>
<th>TSUS</th>
<th>T.Can</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft interphones, telephone handsets</td>
<td>85-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reception switches, headsets</td>
<td>85-22</td>
<td>684-72 (covered)</td>
<td></td>
</tr>
<tr>
<td>Control boxes, junction boxes, racks</td>
<td>85-19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cockpit voice recorder</td>
<td>92-11</td>
<td>685-41</td>
<td></td>
</tr>
<tr>
<td>Antenna coaxial feeders</td>
<td>85-23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic audio system, music play-back</td>
<td>92-11</td>
<td>685-41</td>
<td></td>
</tr>
<tr>
<td>Antennas, antenna couplers, HF energizers, radio subassemblies</td>
<td>85-15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF power amplifiers</td>
<td>85-22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Under reserve that the above are not included in assemblies and subassemblies of these instruments.

3 - **Type of utilization**

Radio-electric airborne intercom system, interphone, cabin audio system, safety recorder.

4 - **Technical description** -

All aircraft must carry communication systems for their own safety, for the safety of other aircraft, for contact with ground control services and for receiving instructions while in flight. It is also necessary to provide contact between flight personnel.
Such a system may be broken-down into:

a) Communication systems with the outside (ground service and other aircraft)
   - HF, VHF, Selcall stations 85-15 (covered)
   - Radio-telephone sets

Remarks
The transmitter-receivers (transceivers) are covered by the agreement, but such are additional subassemblies, such as:

- power amplifiers,
- antenna lead-ins,
- Selcall (selective call boxes),
- Control boxes
- Shockmounts, racks
- Decoders

are not covered inasmuch as the parts and parts of parts of 85-15 are not covered by the Agreement. Similarly, assemblies and subassemblies other than those used by radio-guide, radio-detection, radio-probe and radio-telecontrol are not included.

b) Aircraft intercom systems, flight personnel/audio system

- Interphones, telephone handsets 65-13 (not covered)
- Telephone switches 85-13 (not covered)
- Junction boxes 85-19 (not covered)
- Microphones 85-14 (covered) 684-72 (covered)
- Headsets 85-22 (not covered) 684-72 (covered)

c) Safety systems
   - Cockpit voice recorder 92-11 (not covered) 685-41 (covered)

d) Systems for communication with passengers
   - Public address 85-14 (not covered)

e) Cabin audio systems
   - Music playback, automatic announcements 92-11 (not covered) 685-41 (covered)
5 - **Essential need** -

Except for the cabin public address system, all other equipment is vital to the aircraft. As the aircraft communications system employs almost exclusively electronic items having a high unit price ($5,000 to $30,000 each = approximately $30,000 to 180,000 Francs), the total cost in the case of a medium-size or heavy carrier comes to around $100,000 (600,000 Francs). Of this amount, it may be estimated that only one half is covered by the GATT agreements.

6 - **Prevention of diversion to other uses** -

- **Specific technical features**: (the airborne radio equipment is absolutely specific in nature (Avion)

- **Specialized sources**: (Few of the world's manufacturers have the competence needed to develop such equipment.

- **High price**: (See §5, high price owing to the specified operating conditions and rulings.

7 - **Remarks** -

As stated in paragraph 5, the GATT Aeronautical Agreement covers only a portion (in value) of the equipment making up the communications system. There is also doubt with regard to certain subassemblies and with regard to reciprocity between TSUS, NCCD and Canadian price lists.
## AIR TRANSPORT ASSOCIATION OF AMERICA
### SPECIFICATION DE LA DOCUMENTATION TECHNIQUE DES FABRICANTS

<table>
<thead>
<tr>
<th>SYST/CHAP.</th>
<th>SOUS-SYS/SECTION</th>
<th>TITRE</th>
<th>Définition</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td></td>
<td>COMMUNICATIONS</td>
<td>Equipements et composants permettant de communiquer entre deux parties de l'aéronef, entre l'aéronef et un autre aéronef ou les stations au sol. Comprend les équipements de communications en phonie et en graphie, la sonorisation de la cabine des passagers, l'interphone et le magnétophone ou tourne-disques.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-00 Généralités</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-10 Haute Fréquence (HF)</td>
<td>Partie du système servant aux communications entre l'aéronef et le sol par ondes porteuses à haute fréquence. Comprend, par exemple, les émetteurs, récepteurs, alimentation, panneau de commande, antenne, coupleur d'antenne, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-20 Très Haute Fréquence et Ultra-Haute Fréquence (VHF/UHF)</td>
<td>Partie du système servant aux communications entre l'aéronef et le sol par ondes porteuses à très haute ou ultra-haute fréquence. Comprend par exemple, les émetteurs, récepteurs, panneau de commande, décodeur selcal, antenne, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-30 Sonorisation de la cabine, information et distraction des passagers</td>
<td>Partie du système permettant de s'adresser aux passagers et de les distraire. Comprend, par exemple, les amplificateurs, haut-parleurs, combinés, magnétophones, panneaux de commande, etc. Comprend également des équipements radio, vidéo et cinématographiques.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-40 Interphone</td>
<td>Partie du système servant au personnel navigant et au personnel au sol à communiquer entre différentes parties de l'aéronef. Comprend, par exemple, amplificateur, combiné, etc. Ne comprend pas le circuit d'interphone du poste d'équipage qui fait partie du circuit radiotéléphonique.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-50 Radio communication</td>
<td>Partie du système commandant la sortie des récepteurs de communication et de navigation appliquée aux écouteurs et haut-parleurs de l'équipage et la sortie des microphones de l'équipage appliquée aux émetteurs de communications. Comprend, par exemple, panneau de commande de commutateur téléphonique, microphone, casques, haut-parleurs du poste d'équipage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-60 Déperditeur de potentiel</td>
<td>Partie du système qui est utilisée pour dissiper l'électricité statique.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-70 Surveillance auditive et télévisée</td>
<td>Installations qui enregistrent, ou surveillent, les conversations ou les mouvements de l'équipage ou des passagers en vue du maintien de l'ordre et de la sécurité. Comprend enregistreurs de conversations, télévision, avertisseurs, etc.</td>
</tr>
</tbody>
</table>
Position des antennes
Location of aerials
Figure 23.00
Designed for superior performance, the Fairchild Cockpit Voice Recorder (CVR) system provides a continuous 30-minute record of all voice communications originating in the cockpit, the individual-crew stations and the Public Address system.

In operation with many carriers and in many countries, the Fairchild CVR meets and exceeds all requirements of FAA Technical Standard Order TSO-C64 and Aeronautical Radio (ARINC) Characteristic 557.

RLINE ACCEPTANCE

Fairchild CVR's are approved for installation by all major airframe manufacturers. Over 3000 systems have been delivered for the fleets of Aer Lingus, Air Canada, Air India, All Nippon, American, BOAC, Braniff, CP Air, Delta, Eastern, EL Al, Iran Air, Northwest, Olympic, PSA, Pan Am, Piedmont, Qantas, TWA, Universal, Western, World and many other users in all parts of the world.

Many unique features insure operational quality of the highest order. Positive test meter indication for sequentially checking the 4 recording channels — High quality internal playback system incorporated for qualitative evaluation — Four track in-line heads record signals free from time base error and cross talk — Low intermodulation distortion and high signal-to-noise ratio far exceeding TSO requirement assures maximum range of information — Fast automatic gain control assures optimum performance of microphone and preamplifier under all cockpit conditions — AC erase is employed in both erase modes ensuring always "clean" tape for recording. Bulk erase circuit contains electrical interlocks to provide fail-safe protection against accidental erasure.
SURVIVABILITY

FAA survivability requirements are exceeded. Qualified per TSO C-84 the CVR has also been successfully tested to more stringent requirements for Flight Data Recorders (TSO-C51a). Excellent survivability is assured by high strength steel casing designed for impact, crush and shear protection, and a unique thermal barrier.

Successfully tested at: Impact of 1000 g applied to 3 orthogonal planes with 5 ms duration—Impact shear - a 500 pound steel bar dropped from 10 feet on each side of enclosure in most critical plane with contact point of 3/4" diameter—Static crush of 10 tons applied to 3 axes (4 times the 5000 pound TSO C51a)—Fire test for one hour at 1100°C (double the requirements of TSO C-84, C-51a).

The recording tape is exceedingly well protected by a multi-stage protection system consisting of an inner aluminum case, thermal barrier, outer stainless steel case and exterior dust cover. The unique thermal barrier is encapsulated to protect it from scuffing and damage in normal operation. When submitted to high heat the thermal barrier maintains the enclosed tape transport at safe temperature.

SERVICEABILITY

Simplified design and ready accessibility facilitates rapid inspection and overhaul.

The self-contained playback and internal design permits complete incoming or maintenance tests without disturbing inspection seals.

Mechanical and electrical assemblies may be tested as individual entities. Detailed system checks, electrical and mechanical, require removing only the dust and crash pack covers to expose all subassemblies. Test points and controls on individual electronic modules are readily accessible. All transistors are socket mounted.

GENERAL SPECIFICATIONS

MODEL A100 RECORDER (Standard)

- Size: 1/2 short ATR
  4-7/8" W x 12-9/16” L x 7-5/8” H
- Color: International Orange
- Weight: 21.5 pounds
- Power: 115 volt, 400 Hz, 50 watts max, bulk erase: 20 watts max, normal op.: 28 VDC, 21 watts max.
- Connector: DPX-B - 57-34P-0101
- Connections: ARINC Characteristic 557
- Tape: 1/4" preconditioned magnetic recording (Endless Loop) tape, mylar base
- Transport drive: Direct — no clutches
- Tape Speed: Standard NARIB; 1-7/8 i.p.s.
- Channels: 4 in line — coincident recording
- Recording duration: 30 minutes minimum
- Head assembly: Pre-aligned — 3 heads

MODEL A152 CONTROL UNIT (Standard)

- Size: ATA panel
  5-1/2" W x 2-1/2" H x 2-1/2" D
- Color: Grey
- Weight: 1.2 pounds
- Connector: MS 3112-20-41P
- Connections: ARINC Characteristic 557
- Internal components: Microphone preamplifier — microphone — meter — test switches (2) — headset jack
- AGC: Fast reacting 30 db range — low distortion, true AC attenuation

RELIABILITY

Rugged construction results in a CVR that requires little maintenance during normal operational life. Reliability features include: All Fairchild transistor circuitry — Fail-safe, double relay bulk erase — Simple single stage drive assembly — High temperature lube sealed bearings — fully captured tape path — Preconditioned polyester recording tape.

MODEL A55 MICROPHONE MODULE

- Size: 2" W x 2" H x 3-1/2" L
- Color: Black
- Weight: 0.5 pounds

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A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

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Fairchild Industrial Products — Rieistrasse 12, Effretikon, Zurich
CH 8307, Switzerland (052) 3254-66; Cable: FAIRICON

FAIRCHILD INDUSTRIAL PRODUCTS

Rear Office: Fairchild Industrial Products

Front Office: Fairchild Industrial Products

INTER Shuttle: Fairchild Industrial Products
D. Group Assembly Parts List

Cockpit Voice Recorder System (Model A100 Shown)
Figure 20

October 15, 1972
Main Recorder Assembly A100, All3
Figure 21

January 1, 1967
1 GENERAL

In accordance with the fail safe principle adopted for the complete aircraft, a dual radio and navigation system is provided in the A310. Both pilot and co-pilot have an integrated instrument system combining heading, attitude, flight director and radio information.

All radio systems are designed such that a failure is indicated or immediately recognizable by comparison.

The location of the avionic equipment (see fig. 23-1) has been carefully studied and the coaxial length requirement has been taken into account.

- The HF antenna coupler is close to the HF antenna
- The radio altimeters are close to the antennas.

Plugs and sockets and wire terminations are of the crimped type. Radio wiring is separated from other wiring and routed clear of hot air ducts. Protection is provided to ensure that electronic units, components, connectors and cables will not be contaminated by water, hydraulic and other fluids. If not otherwise stated; the equipment mounting and wiring is in accordance with ARINC standardization.

Adequate space is provided to allow for system growth and development during the operational life of the aircraft.

Static Dischargers

Static dischargers are installed on the wing and tail unit trailing edges to minimize corona discharge interference resulting from precipitation, static or engine charging.
2 ANTENNAE
(see fig. 23-2 for location)

The following antennas are installed:

- VHF-COMM. omnidirectional ....................... 2
- VHF-NAV. omnidirectional ........................ Dual
- LOCALIZER ........................................... Dual
- GLIDE SLOPE ........................................ Dual
- MARKER ................................................... 1
- ADF ...................................................... 1 (2nd optional)
- DME omnidirectional ................................ 2
- Weather radar scanner (+90° azimuth, +15° pitch, X band, 30 inches) .......... 1
- Radio altimeter (low range) ......................... 2 sets
- HF ......................................................... 1

Provisions are made for the following antennas:

- Third VHF-COMM. omnidirectional ........ 1 space provision
- OMEGA ................................................... 1 space provision

Maximum practical decoupling is provided between each VHF antenna and between VHF antenna and VOR antenna.

The dual omnidirectional VHF/NAV antenna is connected by two separate coaxial cables to the receivers. The same principle is adopted for the GLIDE SLOPE and LOCALIZER antennas.

DME antennas are located to avoid mutual interference between each other and the ATC transponder antennas.

Radio altimeter antennas are located to avoid mutual interference between each other and the DME antennas. The weather radar radome is designed so as to be capable of being opened or closed by one man.

All antennas are removable from outside the aircraft, requiring no disassembly of cabin or cargo compartment linings.
Fig. 23-2 Antenna Location

- Weather radar (30° reflector)
- VHF 1
- VHF 3 (struct. prov.)
- ADF 2 (provs.)
- VOR
- ATC 1 ATC 2 (prov. DABS)
- ADF 1
- HF
- Localiser
- Glide slope
- DME 2 Marker
- VHF 2
- OMEGA (provs.)
- Radio altimeters
3 EQUIPMENT INSTALLATION

The radio avionics are located below the cabin floor in the forward section of the pressurized compartment. It gives access space for several maintenance personnel.

Quick access is provided from the flight deck through a hatch, and from outside either through the cargo compartment or through an access door in front of the nose landing gear; a folding ladder is stowed near the door. This allows simultaneous cargo loading and avionics maintenance (fig. 23.3).

Two large compartments are located on each side of the centreline just forward of the cargo compartment. This disposition gives a very good access to the black boxes and the routing of the harness. Wiring is easily accessible and capable of replacement without removal of plugs and sockets.

Equipment rack is marked so that equipment is easily identified with the units installed.

The racking length is designed to accommodate MCU according to ARINC 600 and long or short ATR units according to ARINC 404A. Electronic units mounted on racks in this compartment are cooled by forced air.
**4 SYSTEMS DESCRIPTION**

The communication system includes all transceivers necessary for transmitting and receiving messages from other airplanes and from ground stations. (See Fig. 23.4)

Following installations are provided for the communication system:

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>ARINC</th>
<th>NUMBER PER AIRCRAFT</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF (option)</td>
<td>719</td>
<td>0</td>
<td>Full provision for No. 1</td>
</tr>
<tr>
<td>VHF</td>
<td>716</td>
<td>2</td>
<td>Space provision for VHF No. 3</td>
</tr>
<tr>
<td>Selcal</td>
<td>714</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Passenger address system</td>
<td>715</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tape reproducer (option)</td>
<td>539 A</td>
<td>0</td>
<td>Full provision for one music and prerecorded announcement system</td>
</tr>
<tr>
<td>Audio-Interphone system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cockpit voice recorder</td>
<td></td>
<td>1</td>
<td>(B.F.E)</td>
</tr>
</tbody>
</table>
A310 Communication

Fig. 23-4 Communications Block Diagram
a) HF System (Full provision)

A single system allows two way long range communications with ground stations and other aircraft on the frequency range of 2 to 29.999 MHz providing a selection capability of 28.000 channels spaced 1 KHz apart (See Fig. 23.5)

Description

The HF system comprises:
- a control panel (see Fig. 23.6) located on the overhead panel
- a transceiver located in the main compartment bay (See Fig. 23.1)
- an antenna coupler and one antenna, both located in the leading edge of the vertical stabilizer (See Fig. 23.1 and 23.2)

A space provision is provided for a second HF.

Connection with other systems

The HF system is connected with:
- the flight interphone which provides microphone and push-to-talk signals
- the flight recorder which receives a ground signal during HF transmission
- the radio master supply panel.
b) VHF System (Fig. 23-7)

The very high frequency (VHF) system is one of the means of communication between ground stations and the crew and between different aircraft.

The aircraft is equipped with two identical VHF installations which are independent of each other.

Space provision has been provided for installation of a third VHF system.

The VHF transceivers operate in the range of 118 to 139.95 MHz frequency with 25 kHz spacing.

The VHF system comprises:

- two control panels (see Fig. 23.8) located on the pedestal
- two transceivers located in the main equipment bay (see Fig. 23.1)
- two antennas VHF 1 and VHF 2 (see Fig. 23.2)

The VHF system is connected with:

- the flight interphone which provides microphone and push-to-talk signals
- the flight recorder (flight data acquisition unit)
- the selcal system
c) Selective Calling System

The SELCAL system allows the ground operator to call a single aircraft among a group of aircraft in flight without requiring the crew to listen constantly on the ground station frequency. The calling code is identified by a combination of four letters selected from among the twelve available letters 'A to M'.

The SELCAL system comprises:
- a control panel (see fig. 23.9)
- a SELCAL decoder equipped with two channels.

The decoder accepts inputs from VHF1 and 2 and VHF3 or HF1 and 2 if installed. SELCAL indication and reset functions are included in the control panel.

---

**Fig. 23-9 SELCAL Control Panel**

**Fig. 23-10 SELCAL Block Diagram**
d) Audio Interphone System

The audio interphone system provides means of telephone communication between the crew members and integrates the selection possibilities of reception and transmission through the radio communication and radio navigation systems (HF, VHF, VOR, etc.). See Fig. 23-11 and 23-12.)
Flight Interphone System

Description

The flight interphone installation comprises (See Fig. 23-13 and 23-14)
- 3 audio selector panels (as per Fig. 23-15)
- 4 jack boxes
- 2 loudspeakers
- 2 interphone radio push-to-talk switches on handwheels
- 1 4th occupant push-to-talk switch
- 1 ground connection on the nose gear
- 4 oxygen mask microphones
- 3 hand microphones
- 3 boomsets
- 1 headset

Fig. 23-13 Flight Interphone Location
Fig. 23-15 Audio Selector Panel

Fig. 23-14 Flight Interphone Location

For 3rd Crew Member

- Maintenance panel
- Hand mike
- Audio selector panel
- Jack box panel
- Observer seat
- Hand mike
The cockpit voice recorder is designed to record on an endless magnetic tape, crew communications and conversations during flight and to preserve such record in the event of an aircraft accident. In operation the system records four separate channels of information simultaneously on a half hour magnetic tape.

Playback is not possible unless the recorder is removed from the aircraft.

The recorded conversations and communications can be completely and instantly erased as soon as the aircraft has landed.

Description (See fig. 23-16)

The cockpit voice recorder installation consists of:

- a microphone control panel
- a cockpit voice recorder located in front of the rear pressure bulkhead.

- Cockpit Voice Recorder
- Service Interphone
(See Fig. 23-17)

The service interphone allows:

- in flight, service telephone communications between crew members and cabin attendants.

- on the ground, telephone communications between crew members, cabin attendants, and the parts of the aircraft fitted with ground connections in order to facilitate maintenance.

The service interphone installation comprises:

5 attendant telephone stations comprising:

- 1 telephone handset switch
- 1 telephone jack box
- 1 telephone handset
- 17 jack boxes for ground service jack audio system (See Fig. 23-18)
- a service interphone amplifier
1. Radome
2. Electrical ground power receptacle
3. Forward cargo compartment
4. Forward air conditioning bay
5. Main landing gear forward well
6. Air conditioning bay under wing box
7. LH engine
8. Tip of LH wing
9. Rear fuselage section
10. Aft equipment bay
11. Aft cargo compartment
12. Main LH gear well
13. Main RH gear well
14. Tip of RH wing
15. RH engine
16. Electrical compartment
17. Nose landing gear
   (flight interphone)

Fig. 23-18 Service Interphone - Location of Jacks
- Passenger Address
(See Fig. 23-19)

The passenger address system includes:

(a) The passenger address system, which provides:
   - aural announcements to the passengers
   - chime tones to alert the cabin attendants of a call from passenger's seats or lavatories
   - changes in cabin signs.
   - calls from flight deck.

Announcements over the system to passengers are initiated through Handsets which are located at the cabin attendant's station and the flight deck.

(b) Music and prerecorded announcements (BFE).

The reproducer, which is remote controlled from the forward attendant station, broadcasts either music or recorded announcements.

The emergency oxygen announcement is automatically activated by a pressure switch, in case of rapid decompression.

Description:

The passenger address system comprises:

- a passenger address amplifier
- sufficient number of loudspeakers fitted within the cabin with or without central hatrack and the lavatories.

- 3 cabin attendant stations with PA announcement (L/H side only)
- Full provision for:
  - a music and prerecorded announcement reproducer
  - a music reproducer control box.

Fig. 23-19 Passenger Address System - Block Diagram
- Call System

A - Between flight deck and ground crew

The system permits:

(a) The flight crew to alert the ground crew,

(b) The ground crew to alert the flight crew.

The installation consists of:

- Mechanic call (MECH CALL) indicator light and button, and a reset button located on the pilot's overhead panel. (See Fig. 23.20)

- A warning horn located in the nose landing gear well.

- A call from the flight compartment is initiated by pushing the 'MECH CALL' push-button on the overhead panel. The 'COCKPIT CALL' light illuminates and the warning horn sounds.

A call from the ground to the flight compartment is initiated by pushing the 'COCKPIT CALL' push-button. The 'MECH CALL' light appears in the flight compartment with an associated one second buzzer audio warning.

B - Between flight deck and cabin

Call from flight compartment to attendants

All ATTND call Button: Action on this button results in a pink light and a CAPT call light appearing at all the attendant stations, and aural Hi-lo tone through the passenger compartment and the attendant loudspeakers.

PURSER call Button: Action on this results in a CAPT call light appearing at the purser's station, and aural Hi-lo tone through the passenger compartment and attendant loudspeakers.

MID ATTND call, and AFT ATTND call buttons: Action on these buttons result in the CAPT call light appearing at the corresponding attendant station and a Hi-lo tone through all attendant loudspeakers.

Call from attendant to flight deck (See Fig. 23-21 and 23-22)

Action on the CAPT call button results in the respective CALL lights (PURS, MID or AFT) appearing on the flight deck and a one second buzzer aural signal. The CAPT call buttons on all attendant stations will be illuminated.
Call from attendant to attendant

Action on either of PURS or 2L/R, 3L/R or ALL ATTN buttons results in the respective PURS or ATTN light appearing on the called attendant station or on all attendant stations and a Hi-Lo tone through all attendant station loudspeakers. The call button on all attendant stations will be illuminated.

Note:
All call lights are of the reset type. Reset is achieved at flight deck and attendant stations through hook up of handset.

For long routes several entertainment systems may be installed:
- Passenger individual entertainment system (music, hard wired)
- Multiplex passenger entertainment and service system (music, steward call and reading light command in arm rests)
- Super 8 movie system with or without central hatrack together with an entertainment system (2 different languages are possible)
- ARINC 723 Video projection system with or without central hatrack together with an entertainment system (two different languages are possible).

Fig. 23-21 Attendant station
Fig. 23-22 Attendant Communication Controls

NOTE: Purs button blanked off at purs station