

ELECTRONIC INSTRUMENT SYSTEM PRESENTATION



ELECTRONIC INSTRUMENT

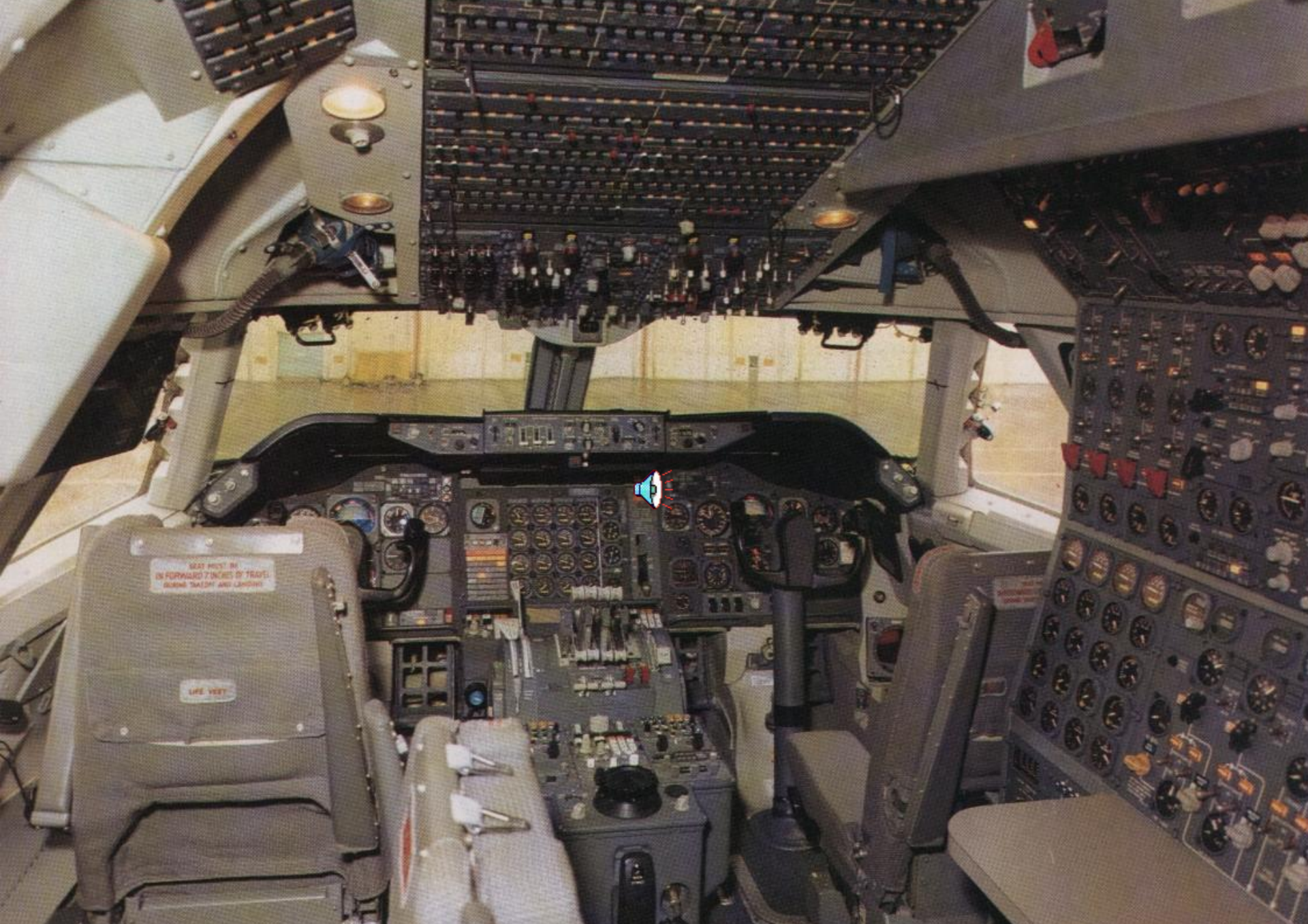


MENU

System presentation

1/32







In comparison to old technology aircraft, the flight deck on the A320 is designed to be a comfortable uncluttered environment in which to work. By utilizing modern electronic display units, the presentation of information to the pilots has been improved.



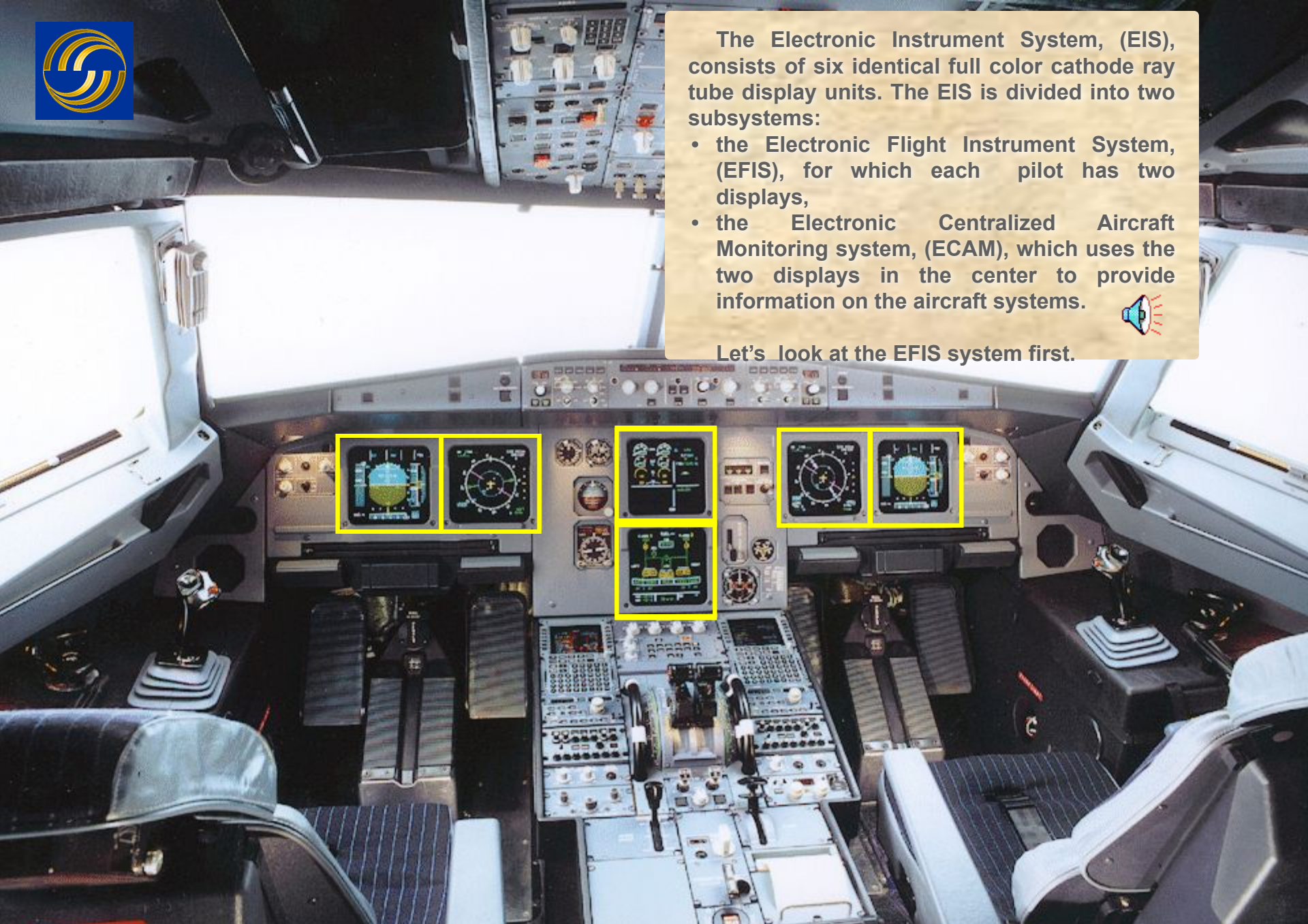


The Electronic Instrument System, (EIS), consists of six identical full color cathode ray tube display units. The EIS is divided into two subsystems:

- the Electronic Flight Instrument System, (EFIS), for which each pilot has two displays,
- the Electronic Centralized Aircraft Monitoring system, (ECAM), which uses the two displays in the center to provide information on the aircraft systems.



Let's look at the EFIS system first.





Flight parameters are displayed on Primary Flight Displays (PFD) while Navigation data is displayed on Navigation Displays (ND).

ELECTRONIC FLIGHT INSTRUMENT SYSTEM



PFD1

ND1

ND2

PFD2



ELECTRONIC INSTRUMENT

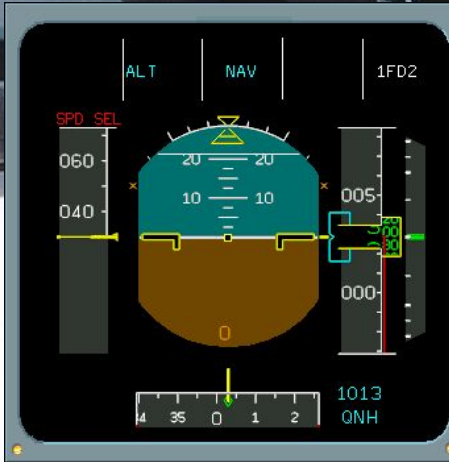


MENU

System presentation


5/32





<p>PFD</p> <p>OFF BRT</p>	<p>PFD/ND XFR</p>	<p>ND</p> <p>OFF BRT</p>
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Outboard of the PFD, there are control knobs to adjust the brightness of the associated PFD and ND, or to turn the display off.



<p>ND</p> <p>OFF BRT</p>	<p>PFD/ND XFR</p>	<p>PFD</p> <p>OFF BRT</p>
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A switch is provided to allow the information on the PFD and ND displays to be transferred.

The use of this switch will be explained in the EIS reconfiguration module.





The two displays in the center are dedicated to the Electronic Centralized Aircraft Monitoring system (ECAM). At this stage we will simply introduce the ECAM displays and associated controls. In later modules, the ECAM system will be studied in detail.



ELECTRONIC CENTRALIZED AIRCRAFT MONITORING





The upper ECAM display is known as the Engine Warning Display (E/WD).
The lower ECAM display is known as the System Display (SD). It is on this screen that various aircraft system parameters can be viewed by the pilots.
As an example, we will cycle through the system pages for you.



ELECTRONIC CENTRALIZED AIRCRAFT MONITORING



Engine/Warning Display

System Display





The presentation of system information is based on a “Need to Know” philosophy. This means that only the system information relevant to the particular phase of flight is presented to the pilots. You will see this demonstrated in the Normal and Abnormal operation modules.



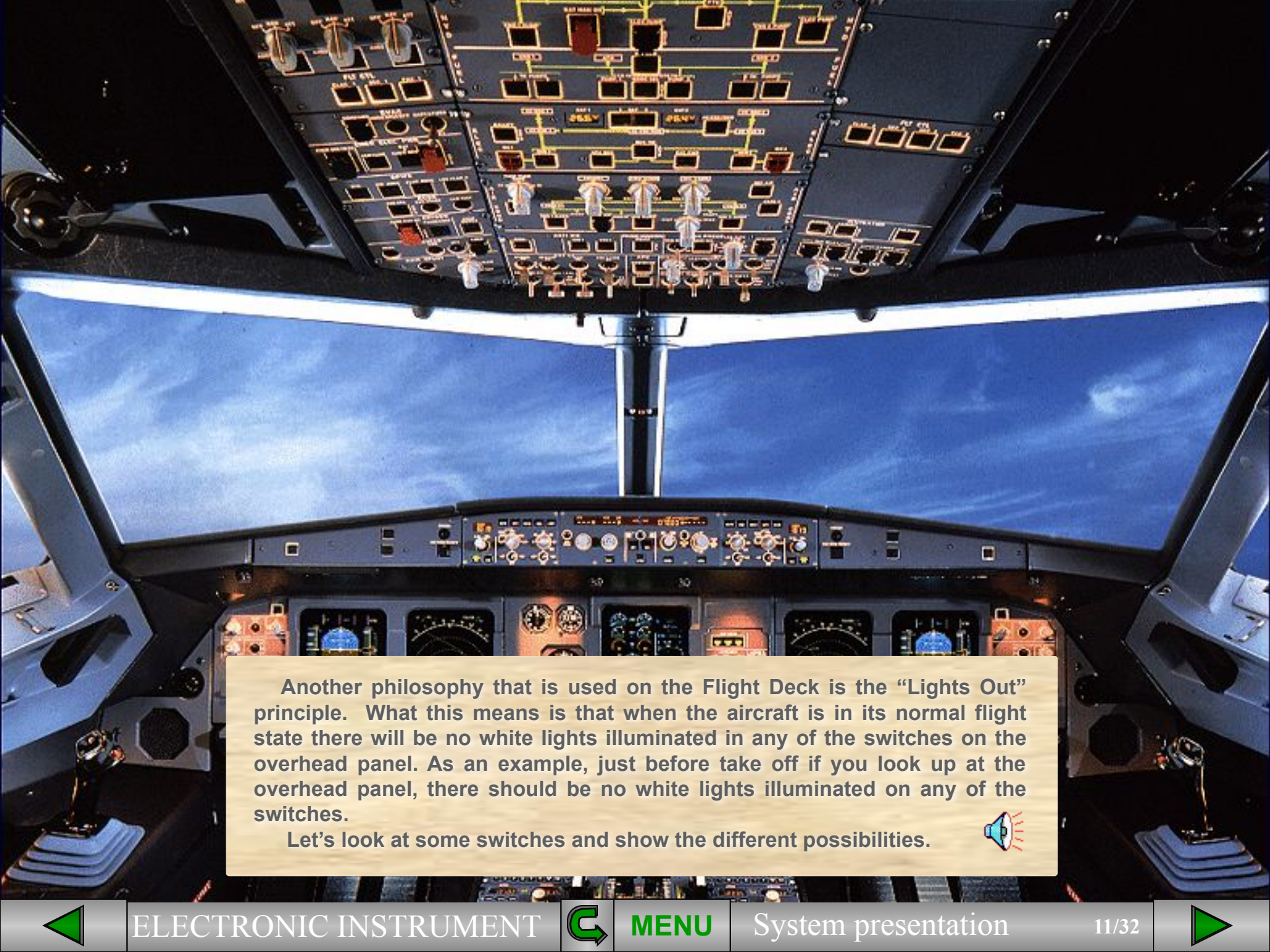
ELECTRONIC CENTRALIZED AIRCRAFT MONITORING



Engine/Warning Display

System Display





Another philosophy that is used on the Flight Deck is the “Lights Out” principle. What this means is that when the aircraft is in its normal flight state there will be no white lights illuminated in any of the switches on the overhead panel. As an example, just before take off if you look up at the overhead panel, there should be no white lights illuminated on any of the switches.

Let's look at some switches and show the different possibilities.





Normal operation configuration - light out position



ABNORMAL Fault indication



System deactivated



System activated

For the majority of the switches on the overhead panel, the push button switch logic is;

- Normal operation configuration - No light showing, (the LIGHTS OUT philosophy).
- Abnormal condition - Amber FAULT light (this assists identification of the switch associated with an abnormal condition).
- Non lights out switch position - White light. If normally the system should be operating and is deactivated a white OFF light is illuminated. If normally the system should not be operating and is activated a white ON light is illuminated.





Temporarily selected switch



Applicable system status


There are some switches on the overhead panel which are used on a temporary basis or may have an indication of their state. The logic is;

- Temporary selection for operational reasons - Blue ON light e.g. anti-ice
- Applicable system status - Green light - e.g. APU available.

You will see this philosophy demonstrated throughout the course.



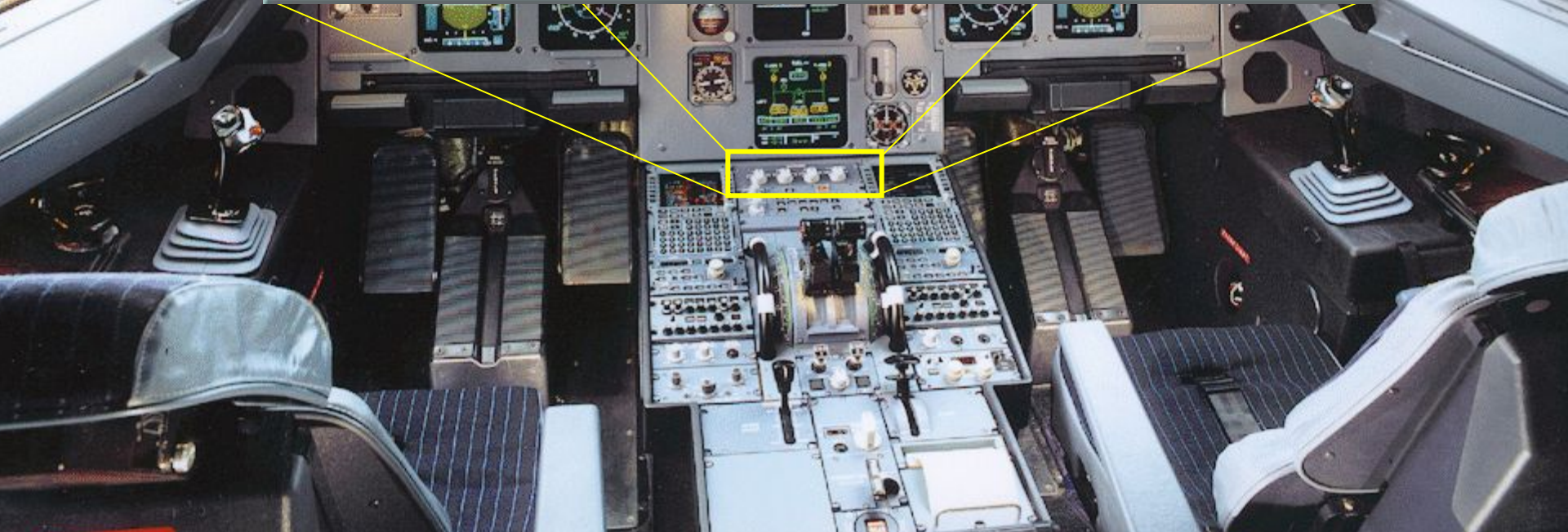


Below the ECAM displays, on the center pedestal, is the ECAM control panel. The two controls on the left hand side are to adjust the brightness of the two ECAM screens or to turn them off. We will look at the rest of the controls on this panel in more detail later. 





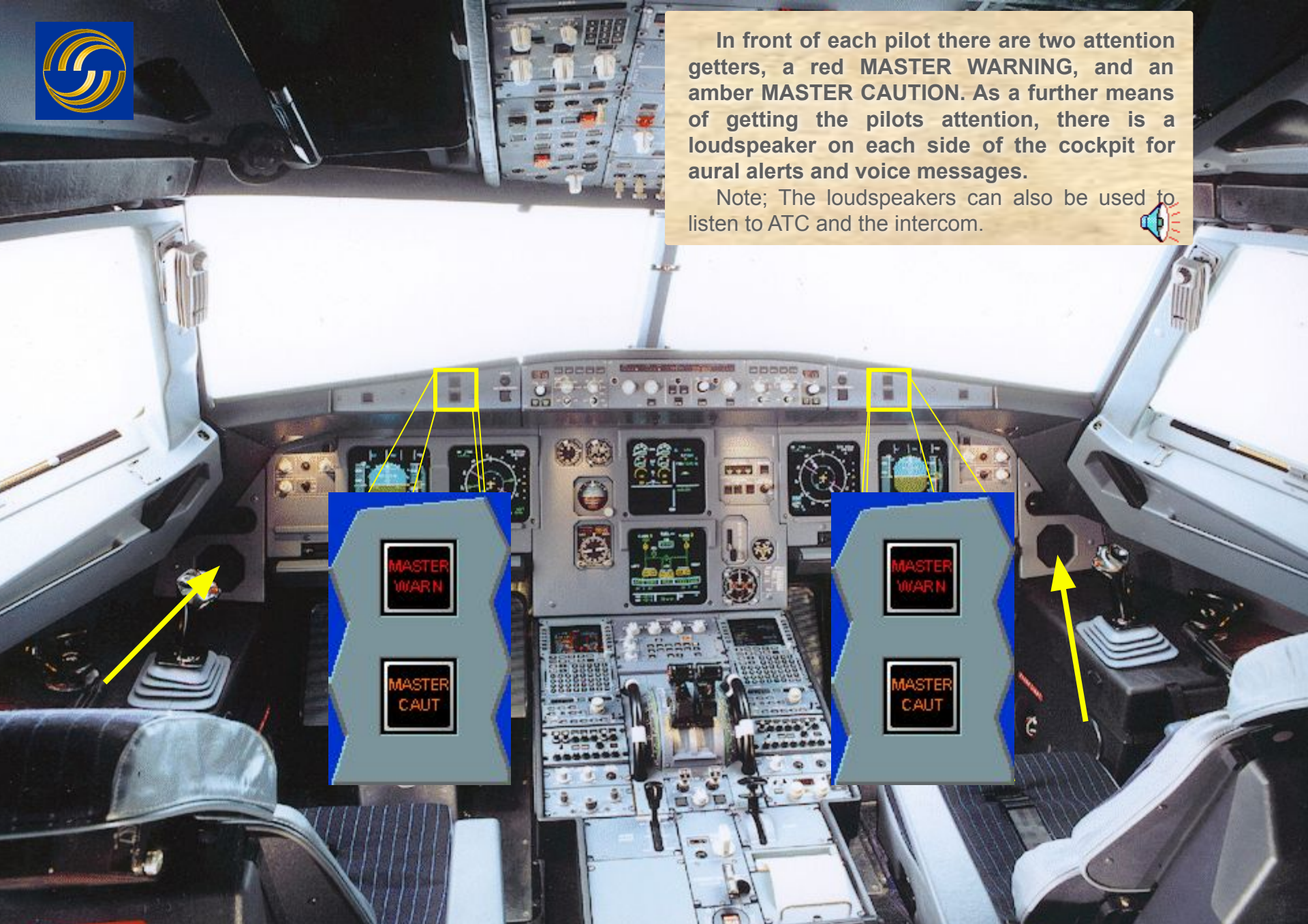
Just below the ECAM screens, on the pedestal, is a switching panel for use in abnormal situations to restore data to the EFIS and ECAM displays. You will use this panel in the EIS Reconfiguration module.





In front of each pilot there are two attention getters, a red MASTER WARNING, and an amber MASTER CAUTION. As a further means of getting the pilots attention, there is a loudspeaker on each side of the cockpit for aural alerts and voice messages.

Note; The loudspeakers can also be used to listen to ATC and the intercom.





Now, let's go back to the EFIS system. For the EFIS displays, data from the Air Data and Inertial Reference System (ADIRS) plus Navigation data from the Flight Management and Guidance System (FMGS) is fed directly to three Display Management Computers (DMC).



DMC1

DMC3

DMC2



ADIRS DATA

NAV DATA



The three identical DMC process the data and generate the images to be displayed.

Under Normal circumstances:

- DMC1 supplies EFIS information to the Captains' PFD and ND
- DMC2 supplies the First Officers' PFD and ND.
- DMC3 is available as a backup.

You will see the use of DMC3 in the abnormal operation module.



DMC1

DMC3

DMC2

ADIRS DATA

NAV DATA

BACKUP

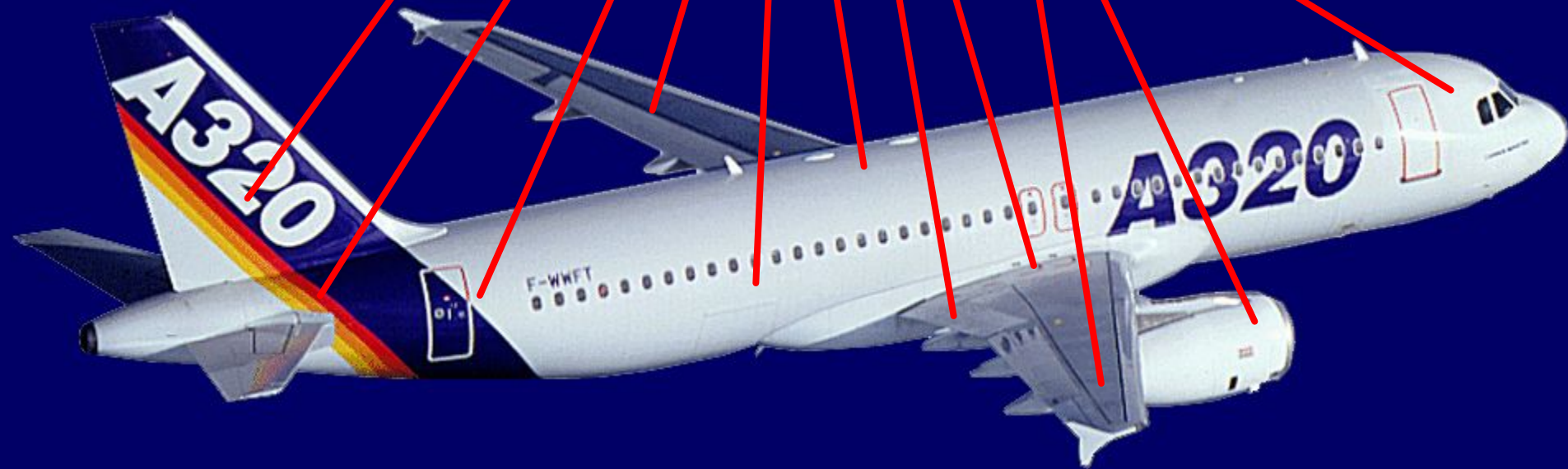


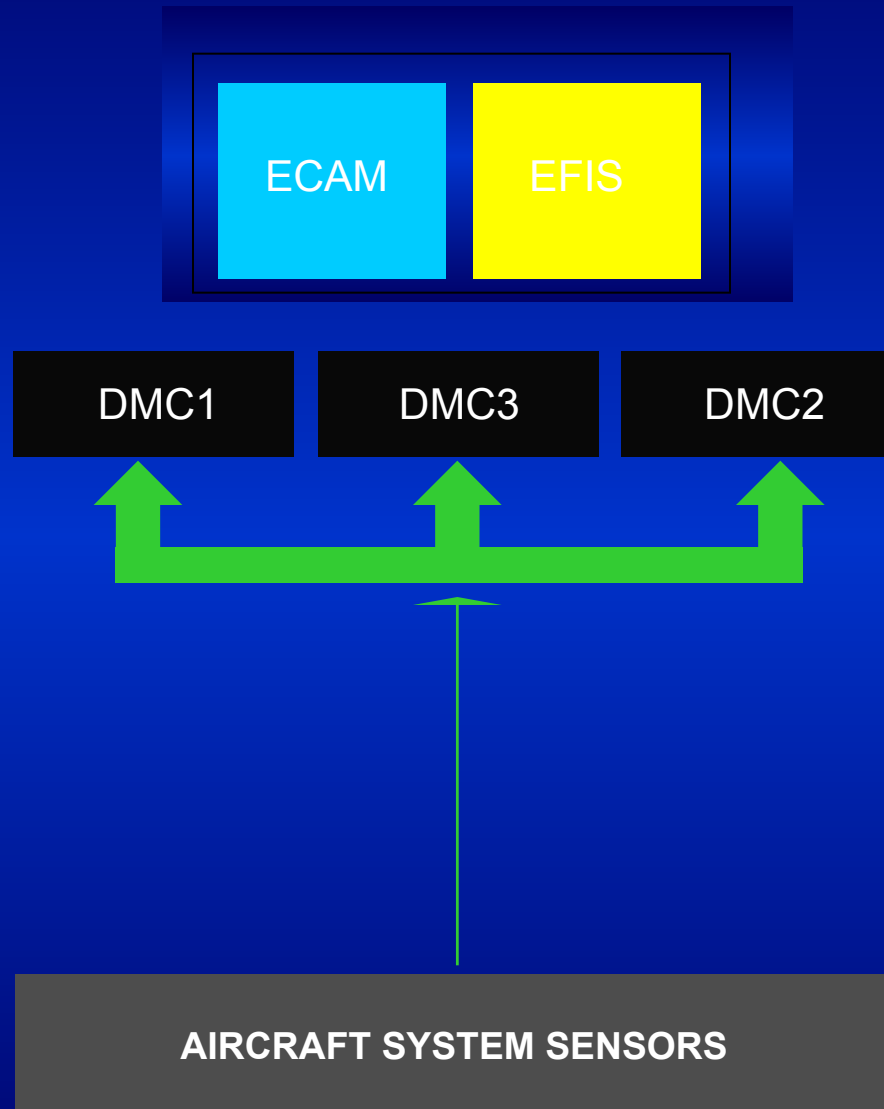
Now, let's look at the other EIS sub-system, ECAM, and how the ECAM displays get their data.

Sensors are fitted throughout the aircraft to monitor the various systems, including system controls operated in the flight deck.



AIRCRAFT SYSTEM SENSORS





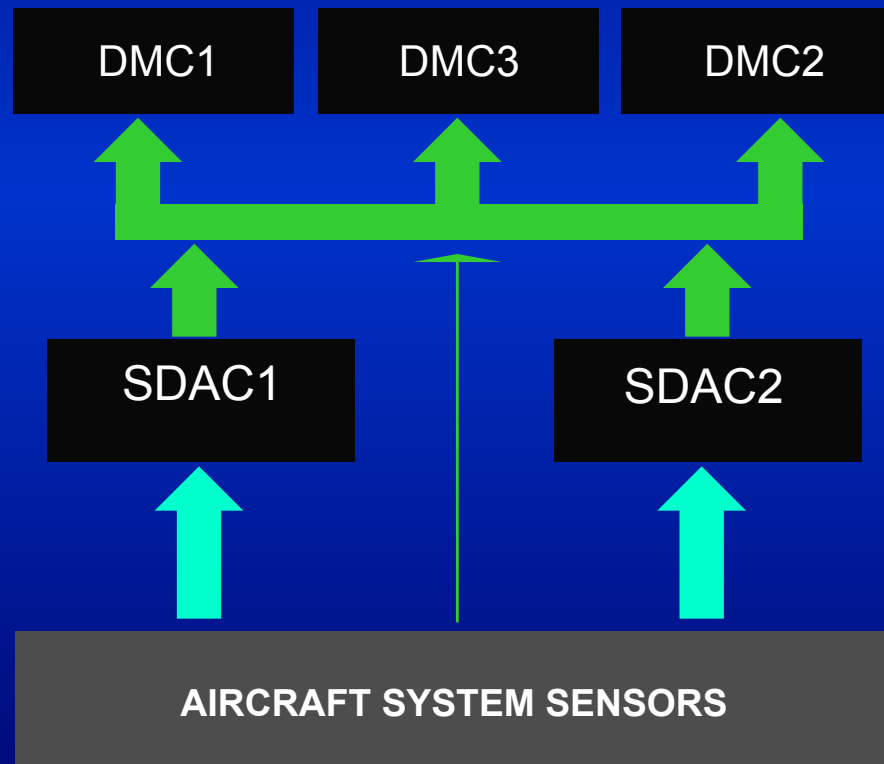
Data for certain parameters, for example Fuel Quantity and Primary Engine Indications, is routed directly from the system sensors to the three DMC.

Note that there are separate channels within each DMC for ECAM and EFIS.





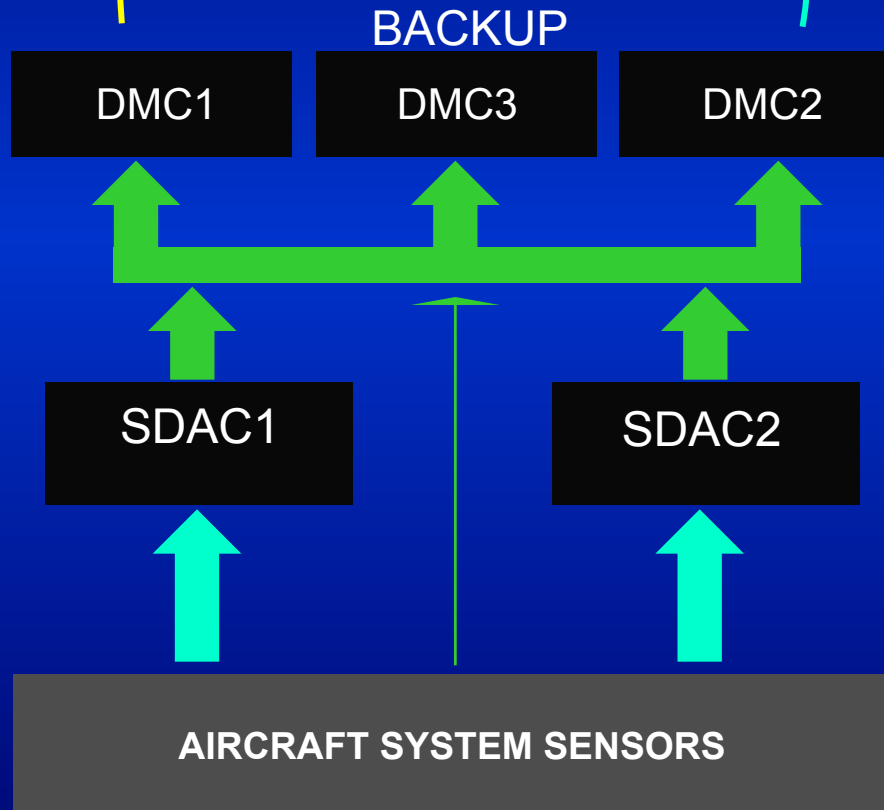

For the majority of the systems the sensors supply data to 2 System Data Acquisition Concentrators (SDAC). The SDAC acquire system data, process it, and send System page data to the 3 DMC.





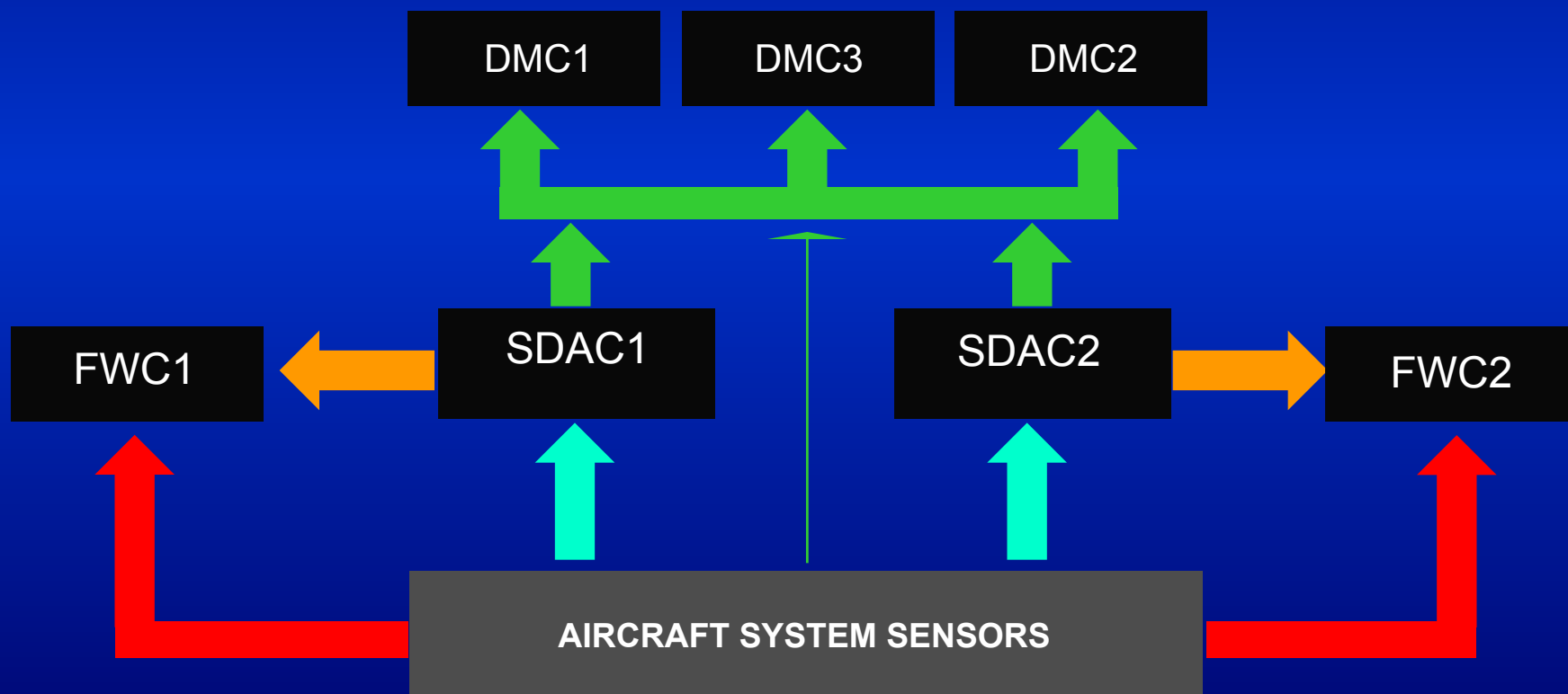
Normally:

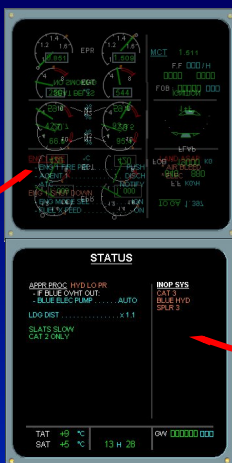
- DMC 1 supplies the E/WD,
- DMC2 supplies the SD,
- DMC 3 is available as a backup.





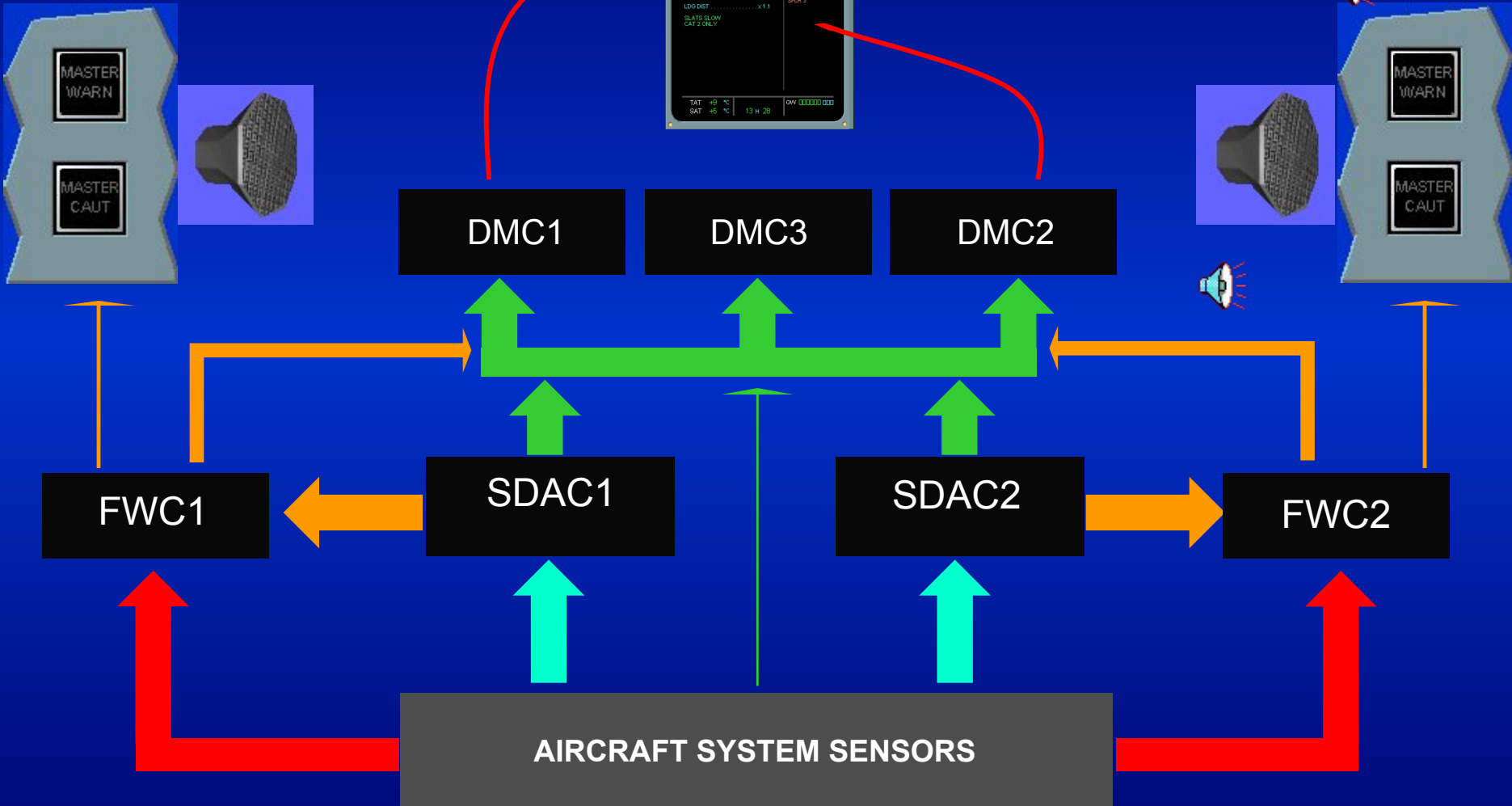
- Two identical Flight Warning Computers (FWC) receive data from:
- the aircraft system sensors to generate red Warnings,
 - the SDAC to generate amber Cautions.

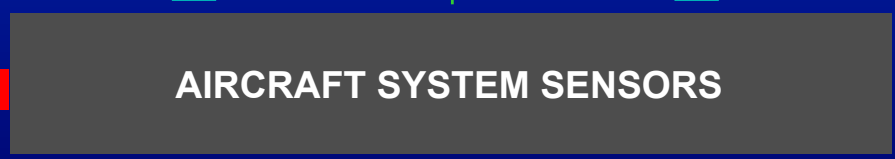
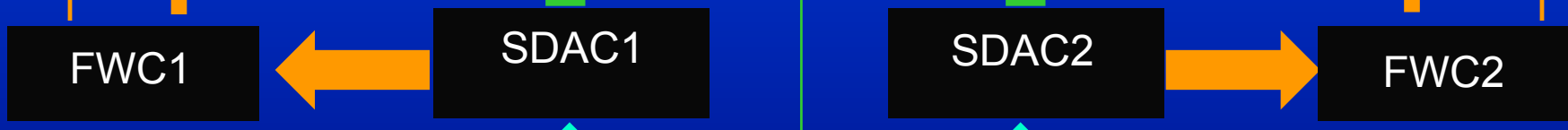
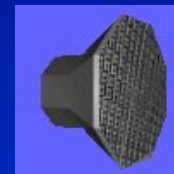
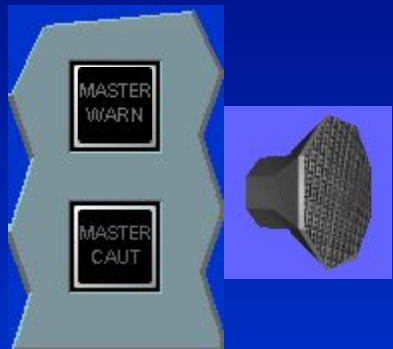
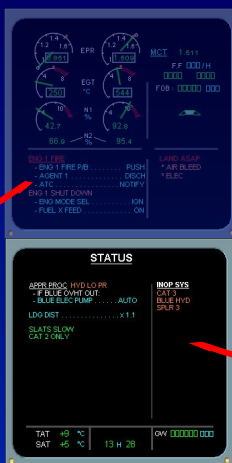




The FWC then supply;

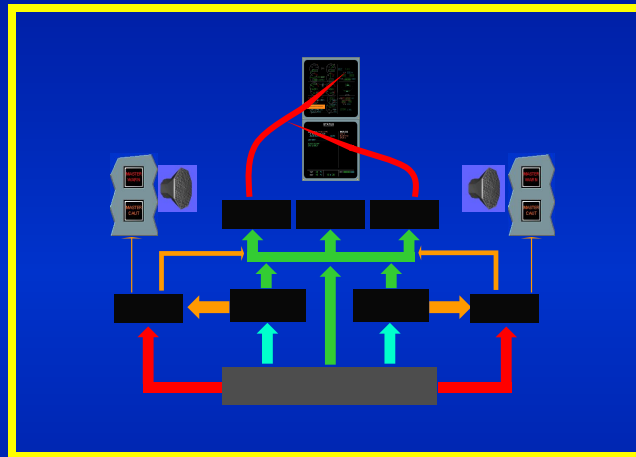
- the DMC for the display of alert messages,
- the attention getters,
- the loudspeakers for aural alerts and synthetic voice messages.







The ECAM System



All the components shown can be collectively called the ECAM system.

We will study the use of the ECAM system in a separate module.





In addition to EFIS and ECAM, time measurement devices are provided.

The master time reference for all aircraft systems is provided by a clock, located on the right lower side of the main panel.

In this example the time is 1328.



LIFE VEST





ENGINE

1550 FUSED LBS 1540

17.2 OIL QT 17.2

VIB (N1)
0.2 T 0.2

VIB (N2)
0.2 T 0.2

AIR

LDG ELEV AUTO 200 FT
ΔP 1.5 PSI

CKPT	FWD °F	AFT
72	74	73
	68	68

CAB V/S FT/MIN
0
CAB ALT FT
5000

TAT +15 °C
SAT +15 °C

13 H 28

GW 112000 LBS

The time is also displayed at the bottom of the System Display.



LIFE VEST





Adjustment of the time is achieved by using the UTC selector and the SET knob. You will have the opportunity to do this in the simulator.

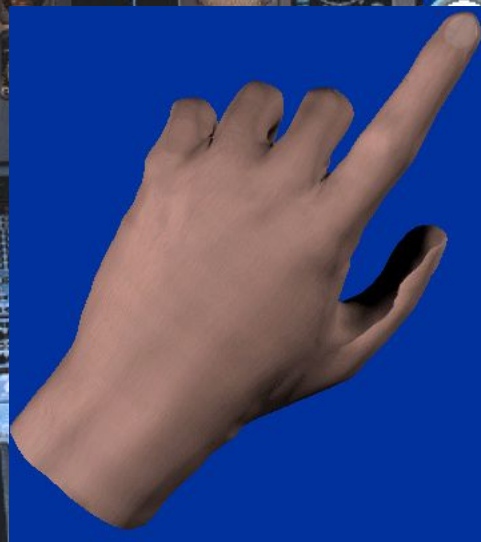


LIFE VEST



The SET knob can also be pressed to display date information, in the order month then day.

In this example the date is July 4th.





There are chronograph and elapsed time facilities on the clock. These functions will be covered later.



LIFE VEST



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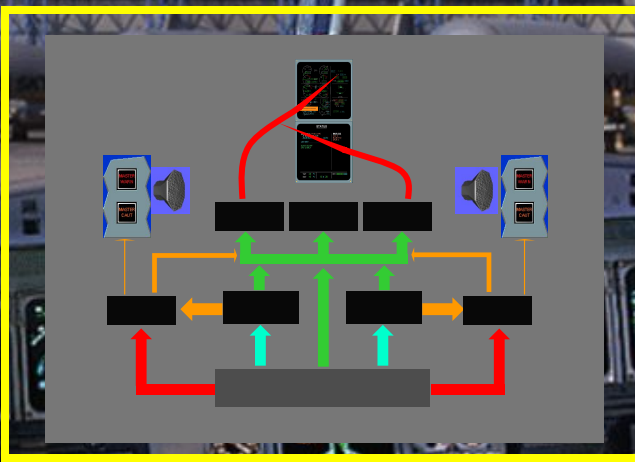


MENU

System presentation

31/32





In this module we have introduced you to the Electronic Instrument System, (with its two sub sections EFIS and ECAM), and the clock. In the next modules we will concentrate mainly on the ECAM system and then later in the course return to look at the EFIS displays in greater detail.



Module Complete



MENU

LIST OF SUBJECTS

- EFIS DISPLAYS
- ECAM DISPLAYS
- SYSTEM ARCHITECTURE
- CLOCK

AUDIO

GLOSSARY

FCOM

RETURN

EXIT



ELECTRONIC INSTRUMENT



MENU

System presentation

