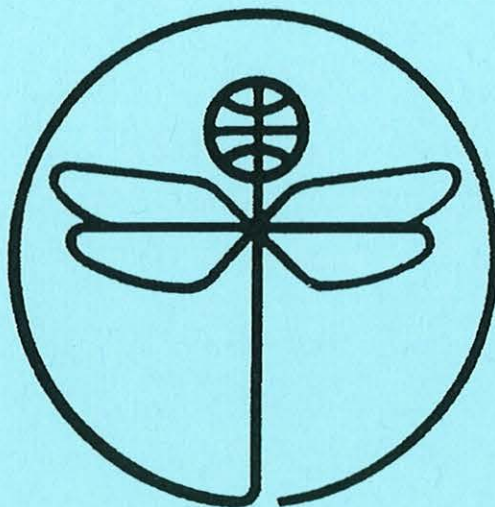


## Twenty-first European Rotorcraft Forum



Paper N° V.2

# Avionique Nouvelle

The Eurocopter avionics concept  
for its new light and medium helicopters

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Avionique Nouvelle. The Eurocopter avionics concept for its new  
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## Avionique Nouvelle The Eurocopter avionics concept for its new light and medium helicopters

### 1- Abstract

This conference presents the Eurocopter approach to the systems installed on our new civil helicopters. We all recognize that helicopter effectiveness depends not only on the effectiveness of the helicopter itself but also of the system/subsystem it is equipped with to achieve the requested mission. In fact, the systems we presently install on our helicopters do not really suit our needs, as they have been defined for the needs of airplanes.

To really define the requirements of a helicopter system, Eurocopter launched a large market analysis. This market analysis has enabled these requirements to be defined with regard to functionalities, costs, reliability... and to set priority on these requirements. On this basis, we have launched the Avionique Nouvelle program in a partnership with major equipment manufacturers.

### 2- Present systems installed on helicopters

The systems presently installed on our 2 to 6 ton helicopters are either

- a so-called conventional system based on electromechanical ADI and HSI , sometimes coupled with a simple AFCS
- or a so-called modern system based on CRT piloting instruments (EADI-EHSI) coupled with a 3 or 4 axis AFCS

Both systems are derived from products that have been developed for the IFR airplane civil market.

In fact, IFR passenger transport is only one of the many helicopter applications.

The helicopter is suited mainly to low altitude VFR flight with visual references, hover and logging.

None of the IFR based systems are suited to such missions. At the best, they provide only little help, and are sometimes dangerous as the large surface of piloting panels necessary for such systems strongly limits the visibility of the outside world.

### 3- Market survey

In order to determine precisely what the real market demand is, Eurocopter conducted a large market survey based on questionnaires and complemented by interview with almost 70 civil operators in Europe, USA and Canada. These customers had operated more than 1000 helicopters and performed above 500,000 flying hours per year. The consultations were focussed on the requirements for helicopters on the 1.5 to 6 ton range and took into consideration all the basic fields of avionics:

- basic instrumentation and piloting displays
- autopilot
- navigation system
- radiocommunication management
- safety and maintainability aspects

The mission covered by the investigation were:

- aerial work and logging (cargo sling, air photography)
- passenger transport
- Corporate transport
- offshore (passengers and freight)
- emergency medical service
- police
- surveillance, search and rescue

According to the answers from all the operators, we have defined the requirements for a new system optimized for civil helicopter missions. These requirements were given priorities as follows :

- 1- Reduce the direct maintenance costs
- 2- Increase failure detection and localization without external tooling
- 3- OK for glass cockpit but simplify its use
- 4- Use GPS for navigation
- 5- Simplify helicopter piloting
- 6- Reduce the acquisition cost
- 7- Improve outside visibility
- 8- Reduce the weight



#### 4- The AN approach

The market analysis provided us with confirmation that the existing systems did not cover the real requirements of the customer . As a consequence, our approach is to develop a system that

- satisfies the customer requirements
- is applicable to all our light and medium helicopters for the next 15 years
- is scalable from simple VFR systems installed on light helicopters to large IFR suites or SAR configurations on medium helicopters
- makes extensive use of the new technologies
- is open to customer specifics needs
- is developed in partnership with major equipment manufacturers (presently SFIM and Sextant)

Commercially, this approach allows better amortization on our whole range of helicopter in the future, and as a secondary market provides the equipment manufacturers with some airplane applications.

Technically, to meet the cost challenge and the scalability criteria, we have opted for new technologies currently available as follows :

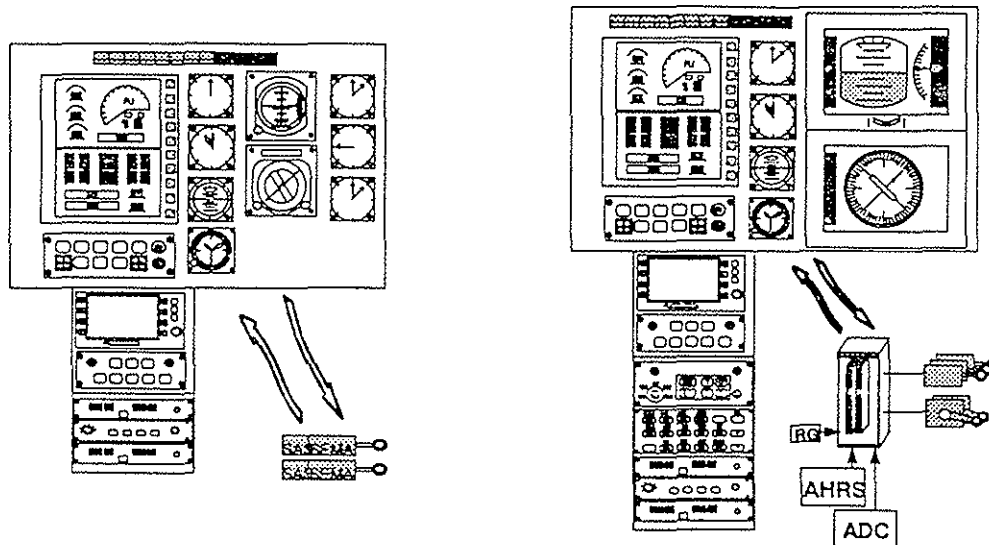
- smart sensors, actuators and displays
- digital links between modules
- displays using the up-to-date Active Matrix LCD technology
- environment levels compatible with new requirements, including EMI, HIRF and lightning
- integrated maintenance system

#### 5- AN solutions

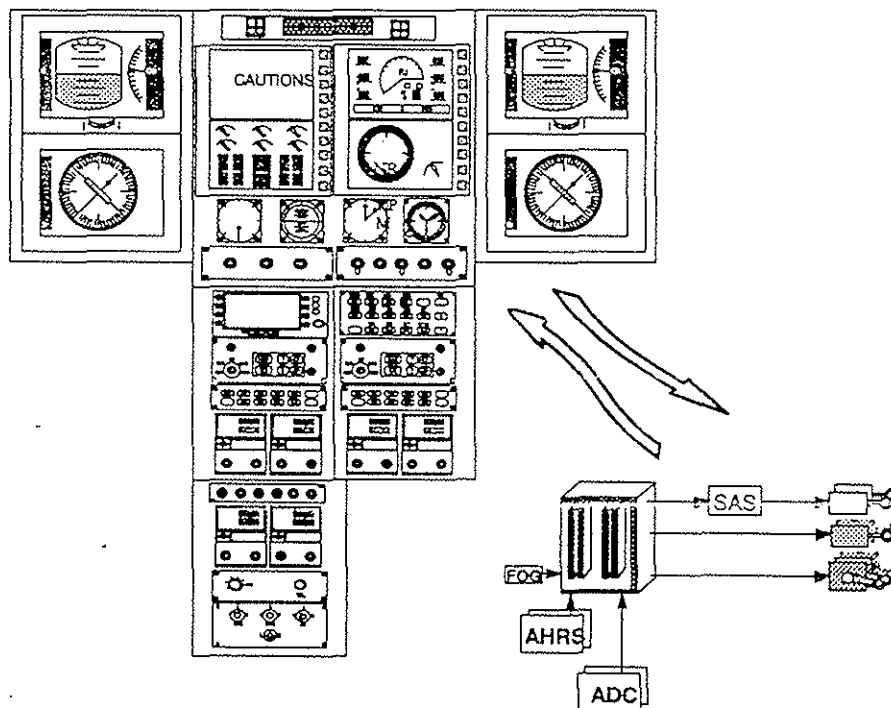
The AN system is designed to perform the following functions

- vehicle and engine monitoring
- AFCS
- piloting displays
- navigation
- HUMS
- integrated maintenance

Here are some typical AN configurations:



VFR SINGLE ENGINE HELICOPTER



IFR DUAL ENGINE HELICOPTER

## 6- Meeting the customer criteria

1- Reduce the direct maintenance cost (DMC) :The direct maintenance cost has a large impact on helicopter efficiency. As a consequence, we have designed our system in order to lower the DMC. :

- By using new technology, the MTBF is drastically increased.
- The amount of part numbers is also reduced ( as an example, 38 items are replaced by only 15 items of equipments with 9 different part numbers) This enables the stock of equipment and as a consequence, the direct maintenance costs to be lowered.
- A better failure detection and localization (see next §)

2- Better failure detection and localization without external tooling : The AN system contains an integrated maintenance system. All intelligent components are linked by a maintenance bus (Helilink) which allows the recording of failure information and abnormal behaviour occurring in flight together with information on the context of the failure. Data can be displayed on the VEMD or recorded on a magnetic card. These features permit a 95% rate of successful failure localization.

3- OK for glass cockpit but simplify its use : The Primary Flight Displays and Navigation Displays have been discussed and approved by helicopter pilots. The display has been tested in flight and its high quality demonstrated. In particular, contrary to CRT displays, the display is perfectly readable in any light, including bright sun.

4- Use GPS for navigation : OK

5-Simplify helicopter piloting: The First Limit Indicator is displayed on the VEMD. FLI is a synthetic display allowing the helicopter to be piloted while keeping a check on engines by observing only one indicator. The AN FLI is a simplified and integrated version of the one installed on the SuperPuma helicopter.

6- Reduce the acquisition cost : The use of new technologies and the broad amortization basis provides instant competitiveness and will increase competitiveness in the future.

7- Improve outside visibility: As some instruments are deleted, the piloting panel height is reduced by 10 cm, its width by 20cm compared with other systems.

8- Reduce the weight: Weight reduction of up to 15 Kg is possible compared with other systems.

## 7- Conclusion

On the basis of a large market survey, Eurocopter has launched the development of the Avionique Nouvelle system. This system meets all the requirements identified for civil helicopters in the range 1.5 to 6 tons.

This development is being carried out in partnership with major equipments manufacturers.

Our target is that AN will make our helicopters even more attractive to our customers.

## Abbreviations

ADI : Attitude Display Indicator  
AFCS : Automatic Flight Control System  
AN : Avionique Nouvelle  
CRT : Cathode Ray Tube  
EADI : Electronic Attitude Display Indicator  
EHSI : Electronic Horizontal Situation Indicator  
EMI : ElectroMagnetic Interference  
GPS : Global Positioning System  
HIRF : High Intensity Radiated Field  
HSI : Horizontal Situation Indicator  
HUMS: Health and Usage Management System  
IFR : Instrument Flight Rules  
LCD : Liquid Crystal Display  
SAR : Search And Rescue  
VEMD: Vehicule and Engine Management Display  
VFR : Visual Flight Rules