

ENAV numbers

Flights handled in one year	roughly 2 million
Peak of flights managed in one day	6,064
Control Towers (TWRs)	39
Area Control Centres (ACCs)	4
Total sq km of airspace for which ENAV is responsible	752,832
Air/ground contacts per year	31 million
Employees (two thirds of whom with operational tasks)	3,251
Hours of training imparted in 2010	248,000
Investments 2003-2010	1,500 million Euros

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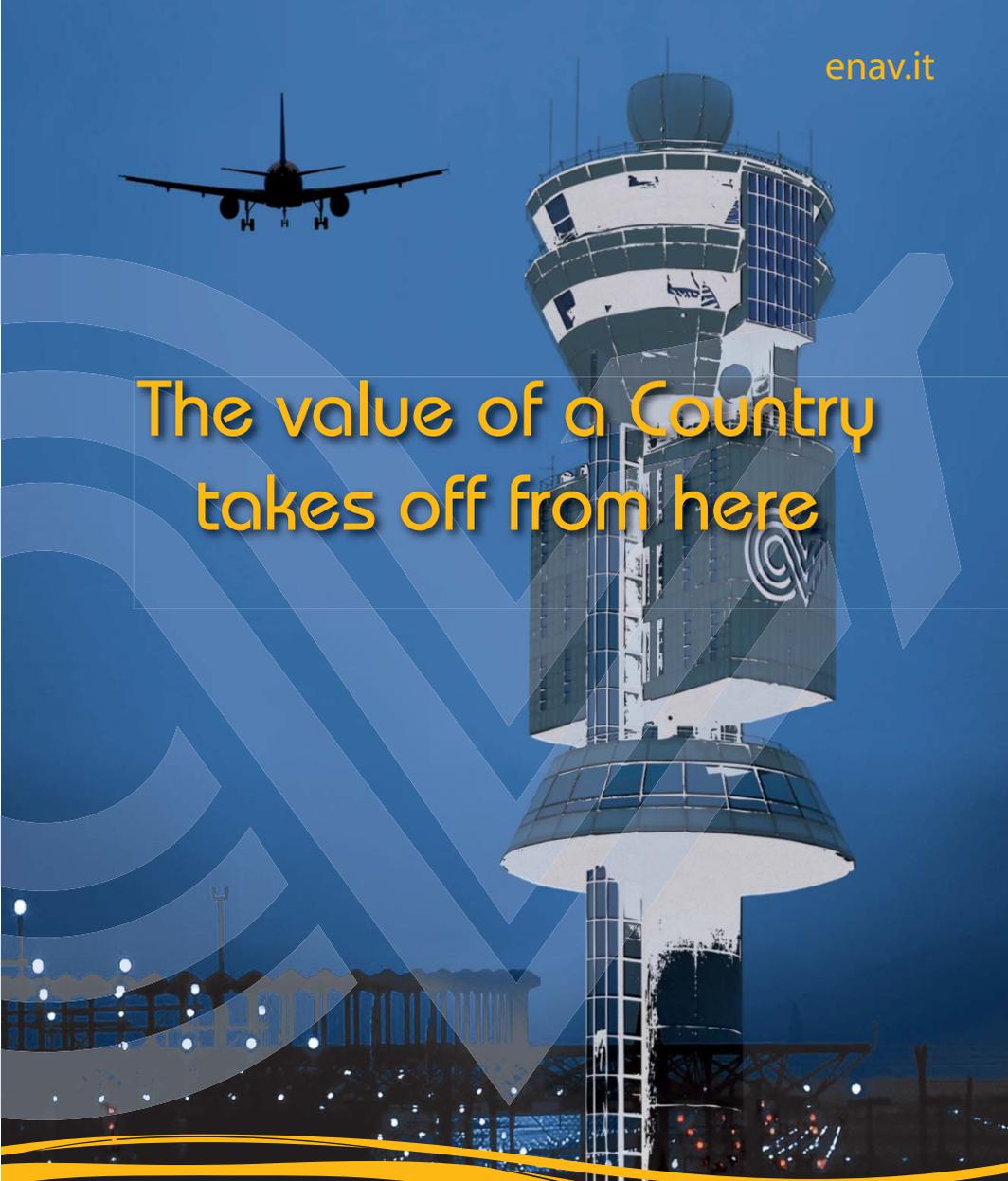
business.department@enav.it



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The value of a Country takes off from here



Engineering





Engineering

ATIS AUTOMATIC TERMINAL INFORMATION SERVICE

The Automatic Terminal Information Service (ATIS) provides a critical information service for the air traffic control.

According to ICAO ANNEX 3, Techno Sky has realized a new generation ATIS acknowledging the overall updates according to the 73rd Amendment.

The ATIS System receives airport weather bulletins (Metar, Met Report, Special, Spec) and other meteorological data provided by the local meteo system, it validates and processes them and creates an "ATIS bulletin" that can be extended by additional information or emergency messages. Eventually, the ATIS bulletin is broadcasted over a VHF radio channel as an audio stream towards the landing/taking off aircraft in the terminal area. The provided service is fully automated but the ATCOs can manually perform operations to manage conditions of unavailability of upstream systems or sensors.

Innovation

To face the continuous innovation of ICAO regulation, the new generation ATIS System has been designed to be easily expanded, allowing to support any future needs with no infrastructure or architectural modification.

Techno Sky also has paid a great attention to the usability to be intended as the efficiency of ATCO activities and the ease and pleasantness perceived using the product. For this reason a Human Machine Interface has been provided completely based on the modern Web 2.0 paradigm.

To facilitate even more the maintenance, configuration and monitoring operations, the ATIS System also provides a web oriented Administration Console, remotely accessible by a simple browser.

ARCHITECTURE Design

The ATIS System is based on last generation enterprise technologies, ensuring significant software quality factors such as reliability, scalability and availability. The ATIS architecture is structured on different layers, each of them based on an high modularity. The "Acquisition" module is in charge of receiving the local weather bulletins provided by the data collector. The delivered bulletins are managed by the "Process" module, responsible of the main business operations, that are validation and creation of "ATIS bulletins". The "Voice Manager" module receives the processed data, performs a text-to-speech (TTS) conversion and prepares an audio stream to be transmitted – synchronized with the push-totalk signal – to the Communication Service and to the telephone network. Finally the "Presentation" module provides real time information to ATCOs by means of a web interface.

Reliability and Availability

Reliability and availability are ensured by a clustered architecture based on two or more servers. The most healthy node in the cluster is elected as the master node, while the others serve as hot standby nodes. An high fault tolerance is achieved by means of failover detection and hardware and software replication. The downtime is limited to few seconds, due to the hot standby characteristics.

If a general fault occurs, a procedure automatically starts to manage the re-organization of servers and a new healthy master node is elected. The web status console informs

promptly ATCOs about the status of servers while the ATIS System performs transparently the failover procedure. This operation can be manually executed by the ATCO for maintenance purposes. The ATIS System also supports online software operational changes, in particular cutover or hot swapping.

SERVICES AND FEATURES

Automated Services

The ATIS System autonomously manages the whole workflow of data acquisition, data processing and radio transmission of airport information. All the airport weather bulletins are supported (Metar, Met Report, Transition Level, etc.): they are semantically and syntactically validated according to the ICAO rules, identifying in this way possible errors of creation or transmission of messages. The ATCO is notified of any wrong messages and the System assists him/her during the operations of modification and correction. During the elaboration of a new "ATIS bulletin", all valid data are retrieved and grouped according to the appropriate syntax, fully reconfigurable according to local needs. Finally the created bulletin is converted, through an automated TTS, into an audio stream ready to be broadcasted.

User Console

The ATIS System provides to the ATCO an AJAX based web interface, recreating the typical desktop applications mode of use. The console provides several features:

- Monitoring of the ATIS and Emergency bulletins currently broadcasted per runway, displayed in both full text format and broken down with details. Furthermore, a synoptic status console informs ATCOs about the status of the servers, the TTS subsystem, the presence of wrong messages and more other significant information
- Autonomous management of weather data, aimed to guarantee the service availability in case of unavailability of external data sources. ATCO can manually insert the Metar or Met Report data and process them in order to generate the "ATIS bulletin". The

System also accurately alerts the user if errors occur during the data

compilation, guiding him to the correct data entry

- Emergency management, simple and effective, with the possibility to create new "Emergency bulletins" or recall the previous ones from a repository, broadcasting the result through a single command
- Airport and runway data management, with automatic generation of "Runway state message" to synchronize the upstream weather systems
- Voice configuration, in terms of volume, speed and pitch in order to improve the voice quality

Administration Services

Techno Sky has developed a web based application for the remote management and maintenance of ATIS System.

An innovative user friendly interface makes easy the configuration, management and maintenance operations through several features, including:

- remote system configuration and management
- remote start, stop and restart
- previous configurations restore
- real time monitoring of system and sub-systems
- download, backup and storage of data base on optical media
- system logs analysis



AMIS ADVANCED METEOROLOGICAL INFORMATION SYSTEM

Techno Sky, according to ICAO Annex 3 - 73rd Amendment, has designed and developed an advanced system for the acquisition and presentation of airport weather data, integrating any meteorological data collector to obtain measurements from all the airport sensors. The received data are validated, elaborated, stored and ready to be presented to the User, according to the specific ICAO requirements.

Innovation

The AMIS System has been designed and realized with the last generation technologies. Its high modular Web 2.0 architecture increases the usability and maintainability and facilitate any future extensions.

The provided features allow an easy and secure remote management of the whole System, without the need of any additional software on the clients.

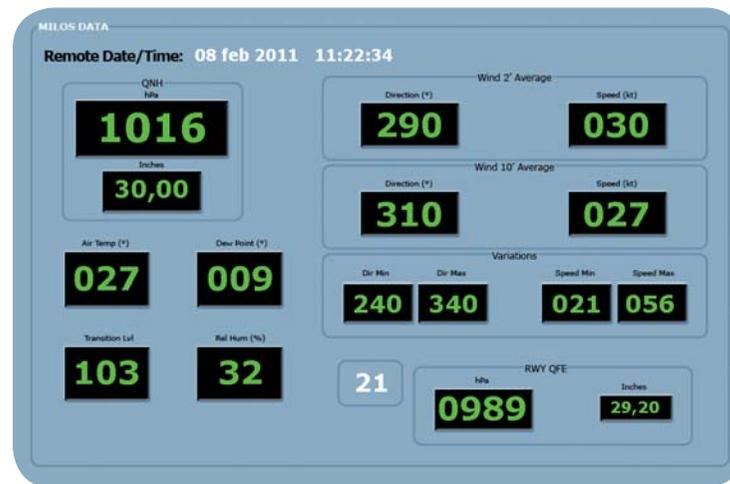
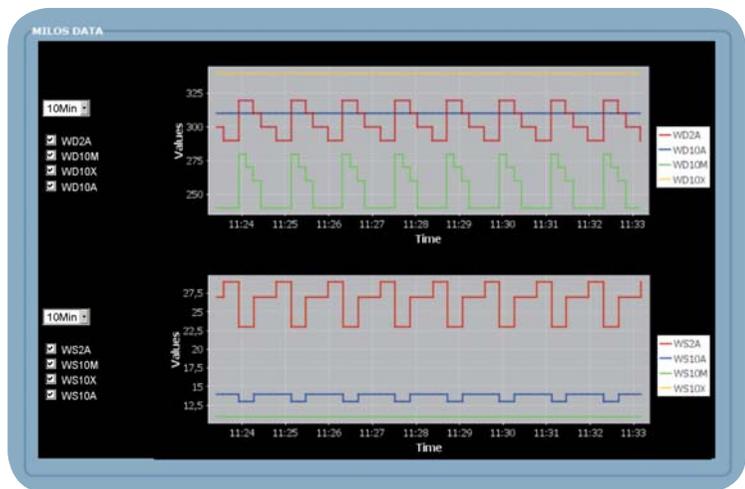
To support and make more efficient the maintenance activities, a remotable web administration dashboard has been developed.

ARCHITECTURE

A two tiers architecture is the basis of the AMIS System. The first tier, based on application server, involves the acquisition and computing layers, while the second tier includes all the presentation layer, both User and Administration. The "Computing" layer performs the following activities:

- data acquisition
- data validation and elaboration according to the 73rd Amendment
- data storage

The presentation layer, modular and easily expandable, provides an innovative and extremely user-friendly *Human-Machine Interface*. The System is also integrated with the national Weather Data Bank (BDM), that receives the AMIS data, and with the National Telemanagement System (STN), responsible of the equipments real-time monitoring.



SERVICES AND FEATURES

User Console. The AMIS System, through the web user console, provides several functionalities:

- real-time presentation of weather data (QNH, QFE, temperature, dew point, transition level, 1 and 10 minutes average wind speed and direction)
- graphs of the data on time intervals of 10 min, 1h and 24h
- hazards management, e.g. data lack with noninvasive alert
- Change of the used runway (command receiving or sending) where there is no possibility to perform it on the primary weather system (eg. AWOS)

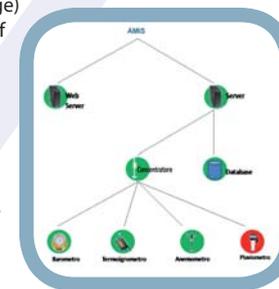
To access the presentation interface the User needs just a common browser, with no additional software on client. The interface is adaptable to the screen and fully configurable in terms of style, size and font color.

Administration Services

AMIS provides a web based application for the remote management. An innovative user friendly interface eases the maintenance, configuration and monitoring operations through several functionalities, including:

- remote system configuration and maintenance
- previous configurations restoring
- system and sub-systems real time monitoring
- data analysis and statistical reports
- data export in different formats (excel, xml, image) allowing the selection of different time periods of observation
- DB remote download and back-up on optical media
- log management on file system and database
- remote start, stop and restart

The administration services are reachable through a common web browser. As well as the User Console, the graphical interface is adaptable to the screen and fully configurable in terms of style, size and font color.



ARAS AERODROME REMOTE ALARM SYSTEM

Scenario

To receive real-time "information and communication" of an aircraft in an emergency situation is a vital requirement to save lives.

In the case of an emergency several Rescue Agencies are alerted:

- Airport Management
- Fire Brigade
- ATS
- Military Air Force
- Civil Protection
- First Aid
- Police Forces
- Hospitals
- Customs

Solution

Techno Sky has developed an "Aerodrome Remote Alarm System" (ARAS) with functions compliant with ICAO Doc 9137 and Enac APT 18A requirements.

ARAS has been developed with the aim of providing system reliability and easy understanding for all Rescue Agency staff on duty. System reliability is guaranteed by a secure feedback of emergency signals transmitted to Rescue Agencies.

The events storage system feature allows to replay, at any given moment, the time sequence of emergency situations transmitted by the control tower and received by the agencies.

System Architecture

System architecture is of a client-server type, developed on an embedded hardware and software platform.

The selected hardware equipment is fanless and can work in unfavourable environmental conditions.

Transmitting console

This is the tower operating console enabled to transmit alarm, emergency and accident signals.

Synoptic monitor display

This is the tower touch screen monitor which:

- displays in a simply manner the activation of light and sound alarms of each Rescue Agency
- displays in a simply manner the feedback from each Rescue Agency
- ends the emergency status informing all Rescue Agencies

Maintenance Display

This is a touch screen monitor which:

- monitors technical performance
- interrogates all system components with the use of diagnostic tools
- displays any faulty components



Core System

This is a supervision system which:

- acts as a monitoring and maintenance server for clients
- interprets transmitted signals
- manages remote feedback
- manages communication data links
- alerts maintenance client of faulty conditions
- stores on database relevant emergency signal data and feedback from Rescue Agencies

Receiving Units

This is the equipment installed in the Rescue Agencies' sites, consisting of:

- three state of emergency light and sound alarms
- off-alarm and feedback pushbuttons
- status light indicators of the stop emergency event
- light and sound indicators of any technical faults

Features and Performance

- can integrate with several transmitting consoles
- can integrate with several monitoring consoles
- can integrate with several maintenance consoles
- provides data exchange in real time
- can be implemented with the most frequently used communication protocols
- can be interfaced with wireless equipment and GSM remote control
- can be connected to an unlimited number of Receiving Units
- can be expanded with real time video graphic functions to provide Rescue Agencies with an indication of the intervention area on a grid map
- can be expanded with web-based functions for LAN and WAN control
- can be customized for installation in different environments



MAPIRO

MAINTENANCE ADVANCED PROCEDURES INNOVATIVE REAL TIME OPERATIONS

Scenario

During the past few years the role of maintenance has been greatly influenced by the growth of surrounding technological systems.

Maintenance needs to be considered as a set of management philosophies, operational techniques and Information & Communication Technology (ICT) tools able to support the technological choices which the evolution of the international ATM scenario imposes. This requires a clear understanding of the main aspects of maintenance:

- Strategy
- Choice of maintenance operation policy
- Full maintenance process control

Needs

The complexity of the ATM environment requires continuous improvement in the following areas:

- Asset configuration
- Workflow planning
- HMI friendly
- Storage of maintenance activities
- Real time monitoring of systems
- Infrastructure remote control
- Automation of warehouse activities

Solution

In this wide and complex scenario, the purpose of our research is to analyse, integrate and test all kinds of advanced technologies in an innovative way.

Our final objective is to optimize existing maintenance and logistic processes in order to increase ATM's infrastructure availability and reduce management costs.

MAPIRO is an integrated and advanced solution that combines different enabling technologies including Mobile Computing, Telecommunications networks, GPS and RFID. MAPIRO has been designed by Techno Sky using a high level of modularity, flexibility and usability.

Human Machine Interface (HMI) concepts have been completely integrated into MAPIRO. Furthermore, this solution has been tested in different simulation scenarios.

Why MAPIRO?

Maintenance - Maintenance activities

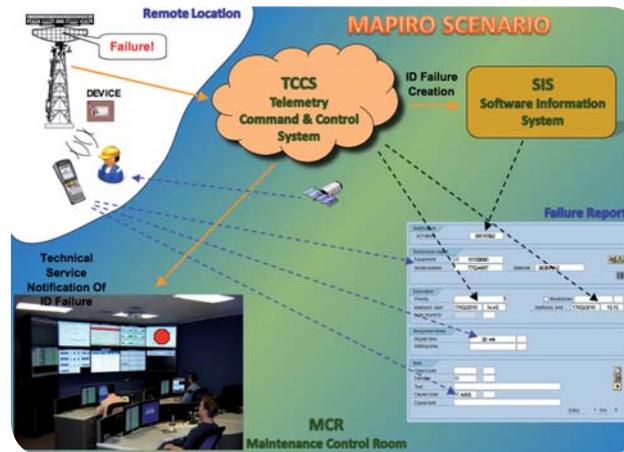
Advanced - Advanced telecommunications system

Procedures - Procedure management

Innovative - Innovative concepts on mobile technology

Real Time - Real time data storage

Operations - Operations in several environments



Concepts

Advanced Prototype

MAPIRO can be used with the main Mobile Computing devices:

- Pocket PC
- Smartphone
- Ultra Mobile PC
- Tablet PC

The interface with the Telemetry Command & Control system (TCC) and the compatibility with all Software Information Systems (SIS) are key aspects of this advanced prototype.

Human Machine Interface

MAPIRO HMI has been developed bearing in mind the different needs of its end-users. Its user friendly interface permits the quick execution of a variety of different operations.

Activities

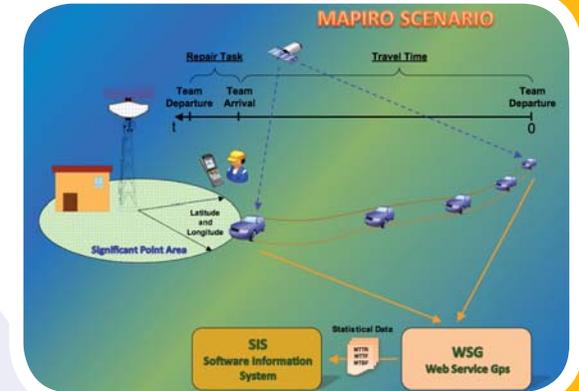
MAPIRO works in the following main areas of activities:

- Items identification
- Storage of logistic operations
- Warehouse inventory
- Report maintenance automation
- Failure storage
- Configuration management
- Statistical data
- Spare parts management
- Planning

Features & Performance

Some features and performance data of MAPIRO:

- Over 100 types of workflows and scenarios
- Over 1000 test cases executed
- Data security management
- Over 5000 data inserted
- Use of COTS products
- Modular system
- Suitable in various operational environments
- Quick data load
- Auxiliary acoustic system during operation of data selection
- Optimized system during internal memory management



RVR RUNWAY VISUAL RANGE

The Runway Visual Range (RVR) provides a critical information service for the air traffic control. According to ICAO ANNEX 3, Techno Sky has realized a new generation RVR acknowledging the overall updates according to the 73rd Amendment.

The RVR System integrates and utilizes new generation data collector, which gathers, validates and processes data generated by a variety of meteorological sensors, including transmissometers and background luminance sensors, installed near the runways. Particularly, the data collector is in charge of computing the RVR value based on a complex mathematical algorithm, taking into account both the meteorological conditions and the levels of lights detected on each runway and on the external environment.

The RVR System receives data from the data collector and re-validates, stores and provides automatically RVR information to the presentation sub-system.

Innovation

Design and implementation of the RVR System leverages recent and advanced technologies.

From the point of view of usability and maintainability, the system architecture has been designed with high modularity, on the basis of Web 2.0 paradigm.

According to these features, ATCOs can manage the entire system without needing to install any software on client locations. In order to make maintenance, configuration and operations monitoring easier, the RVR System provides a web oriented console accessible from anywhere on the operative network.

Architecture

The RVR system is based on a two-tier architecture. A modular design approach makes the system versatile for any required customization.

The processing layer performs the following tasks:

- Acquisition from the data collector
- Data validation and processing in accordance with the 73rd Amendment of ICAO
- Data storage

The presentation layer, modular and easily extensible, provides an innovative user friendly HMI for data visualisation to the ATCOs.

The RVR System is also able to manage the following aspects:

- One to four transmissometers installed nearby the runways, used for the detection of Meteorological Optical Range (MOR)
- One or more background luminance sensors
- One or more interfaces for automatic monitoring of the runway lights intensity (optional)
- Several client web console

The RVR System is designed to be used on different typologies of runway categories (from 1st category to 3rd C one).

Furthermore, the RVR System is able to export information about the statuses of subsystems and sensors towards an external telemanagement system responsible for the remote monitoring.



SERVICES AND FEATURES

User Console

The RVR System provides different web consoles for each user typology (ARO and TWR), all of them based on Ajax technology. User consoles allow to perform several operations:

- Update of real-time data received from the data collector (average 1 minute of RVR according to the current brilliance, average 10 minutes of RVR according to full brilliance, maximum and minimum values of RVR at 100 % of brilliance, tendency, background luminance, runway lights)
- RVR data provided through two different consoles, the first for TWR, the latter for ARO
- Charts of the RVR values computed for TDZ, MID, and END zones on different time intervals
- Management of critical situations, such as the lack of data, with non-invasive alert
- Change of the used runway (command receiving or sending) where there is no possibility to perform it on the primary weather system

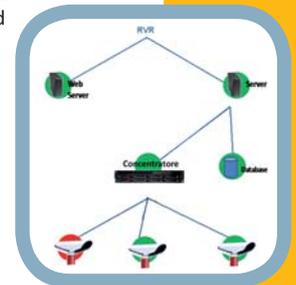
In order to access to the ATCO console a simple web browser is required and there is no need to install additional software on client machines. Furthermore the GUI is adaptable to the screen and fully configurable in terms of style, size and font color.

Administration Services

Techno Sky has also developed a web based application to manage and maintain remotely the RVR System.

- An innovative user friendly interface facilitates administration operations providing to the system administrator several features including:
- Remote configuration and management of the RVR System
 - Restore of previous configurations
 - Real-time monitoring of RVR System and subsystems
 - Data analysis and reporting for statistical purposes
 - Data exporting in various formats (excel, xml, image) selecting an appropriate time period of observation
 - Backup of database on optical media device and/or filesystem
 - Management of logs in filesystem and data base
 - Start, stop and restart operations to be performed remotely

The administration services can be accessible by means of a web browser. As for the user console, the GUI is fully configurable and adaptable to the screen in terms of style, size and font color.



ENAV Business
Solutions:
a global offer
of high
value-added
services

V²ILMA VEHICLE FOR VOR AND ILS MAINTENANCE

Techno Sky, according to the standards set out in ICAO DOC 8071 VOL I ch. 4, has designed and implemented a new motor vehicle for ILS Cat. III (Instrumental Landing System) and VOR (VHF Omni-directional Radio Range) maintenance.

Thanks to the integration of latest generation hardware and software instrumentation, the "Vehicle for Vor and ILS MAintenance" is able to analyse the electromagnetic field generated by ILS and VOR systems through both static and "in movement" inspections.

Techno Sky carries out ILS/VOR maintenance and operations in the Italian airports of Rome Fiumicino, Milan Linate and Malpensa, Turin, Bologna and Venice.

The experience acquired throughout the years has made it possible to conceive and design the new mobile station "V²ILMA", hence bringing technological innovation to ILS/VOR maintenance.

The System

V²ILMA is a mobile station for field analysis developed through the integration of specialized instrumentation and mechanical components, according to the airport security rules. The equipment includes:

- receiver/analyser of the ILS/VOR field data;
- central data processing and data storage unit, with touch screen interface
- telescopic "antenna-holder" pole, adjustable by compressed air generator up to twenty-one meters in height
- measurement laser for the pole altitude
- mechanical stabilization system with flatness indicator
- auxiliary system for distance and speed measurement (odometer)
- avio and ground transceivers
- dual band antenna
- energy generation and distribution system, including power generator and power supply unit
- barrier and position light equipment
- auxiliary internal air conditioner

The central processing unit acquires real time data from the remote laser, ILS receiver and odometer, analysing and integrating the data on the basis of current measurements. All the initial start-up operations of the devices are performed through the same central processing unit.

Workability and measurements

The cockpit, in a single work-station, offers full information on the measurements under way and on the state of the work of the vehicle itself.

Thanks to the coordinated work of two technicians, one driver and one performer, the following graphic and numerical field analysis is achieved:

- dynamic analysis of Localizer, carried out across the runway axis at a constant speed, allows to analyse the magnitudes of Difference in Depth of Modulation (DDM), Sum of Modulation Depths (SDM), Measurement of electric field strength (RF) and 90/150 Hz Modulations (MOD 90/150)

- static analysis of the Localizer, carried out acquiring data in specific positions of the runway, allows to analyse the temporal stability of the magnitudes of interest
- dynamic analysis of the Glide Path, carried out extending the telescopic mast to the maximum height, allows to analyse the DDM at several quotas of the runway perpendicular
- static analysis of the Glide Path, executed at a set quota of the runway perpendicular, allows to analyse the temporal stability of the DDM
- static analysis of the VOR, executed in the sites of interest, allows to analyse the temporal stability of radial reference, characterized by magnitudes of field strength, azimuth and 30/9960 Hz modulations

V²ILMA-Software

Based on the LabView technology, the central processing software achieves the graphic-numerical analysis of the received data in real time, through a usable and intuitive graphic interface.

The V²ILMA-Software is parametric with respect to the ILS/VOR specification of the sites of interest: through an internal data base, the system compares the acquired data with the acceptance limits of the current site. Thanks to the high level of internal modularization, the software is easily adaptable to the different hardware configurations of the motor vehicle. During the measurements, the data acquired from the laser, odometer and ILS receiver are integrated and processed showing the operator the relative graphic trend; upon termination, it is possible to punctually analyse the numeric values of the registered magnitudes, through the data storage subsystem.

Hardware – Software configuration

- V²ILMA-Software version 1.0
- ILS/VOR receiver Rohde & Schwarz EVS 300
- Measurement laser FAE LS 111 FA
- Odometer: Nudam ND6080, ND6058 modules
- PC BOX EBC 3100/ACE627
- Monitor touch screen AFL 15M/T-R
- Pneumatic telescopic mast FIRECO
- UHF Radio ICOM F2810
- VHF Radio ICOM A110
- Generator MASE VOYAGER 5010 DM
- APC SMART UPS XL 3000
- Stabilization system
- Flatness indicator

