LEONARDO ELECTRONICS

LEADINSKY
NEW GENERATION AIR TRAFFIC CONTROL SYSTEM

LeadInSky is the complete and modular Leonardo solution to Air Traffic Control in Oceanic, Continental, En-Route, Terminal Approach and Airport Surface environment.

LeadInSky is designed for managing a higher amount of aircrafts in a safe and efficient way optimizing ANSP business and competitiveness. This is achieved through five main pillars:

- Assuring aircrafts separation (BE SAFE)
- Minimising Delays in En-Route, Approach, Tower and Surface environment (BE IN TIME)
- Maximizing Traffic Capacity (BE EFFICIENT)
- Reducing ATCO's workload and stress related (BE EASY)
- Maintain the highest percentage of availability of the system (BE RELIABLE)

LeadInSky complies with ICAO's Aviation System Block Upgrades (ASBU), Eurocontrol Standards, and FAA, incorporating leading technology while ensuring state of the art constraints regarding Safety, Security, and Human Factors.
LeadInSky evolution roadmap consists of planned up-to-dates which are regularly reviewed against international standards, technological improvements, and customer specific needs.

LeadInSky is the latest significant milestone of Leonardo long-standing experience in the air traffic control and management market. Leonardo company has been operating in this sector for several decades and is present in 150 countries worldwide with ATM sensors and systems.

LeadInSky architecture is modular and flexible such to allow specific design for any scenarios: from small Airports or Approach Control Units to very large nationwide ATM systems with multiple connected remote towers.

LeadInSky Operative Functionalities includes:

- New innovative and flexible Controller Working Position designed by Human Factor specialists
- Integration of heterogeneous data sources into a single traffic picture
- Integration of surveillance data in both legacy and Asterix formats (PSR, SSR, SMR, ADS-B, MLAT, WAM, ADS-C)
- Virtual Tracks (FPT) and virtual position report to fill surveillance gaps
- Seamless integration with ARTAS to ensure the highest level of accuracy and reliability
- Ultimate radar fallback with direct access to radar front-end on the CWP
- Accurate, continuous and consistent update of trajectory data (after Controller input) thanks to sophisticated prediction algorithms
- Silent coordination inter and intra sectors supporting AIDC and OLDI Standards
- Civil-military coordination within a continuum airspace and two-ways interoperability for civil and military missions
- Airspace Volume and FDP parameters online adaptation
- Multiple geography management with automatic switch-on runway change or manual order
- Support of PBN procedures and precision SID and STAR
- Parallel independent runway management and optimal runway management
- Free Route enabler such to provide ANSP with tools capable to reduce environmental impact
- Advanced ATC tools including Tactical Tool, Monitoring Aids, Conflict Detection and Resolution, Arrival Manager, Airborne Separation Assistance Systems, Distance Based Separation granted by RECAT, I4D, Holding Stack
- Safety Nets applications including STCA, MSAW, APW, APAM, NTZ with available online adaption
- Fully integrated datalink applications regulated by international standards capable to support air ground communication (AFN, CM, CPDLC, ADS-C, DCL, D-ATIS) and data exchange
- A-SMGCS and CDM interoperability including DMAN, Terminal Data Link Services, Surface Conflict Alert and Airport Performance Monitoring
- Dependable voice and digital communication systems
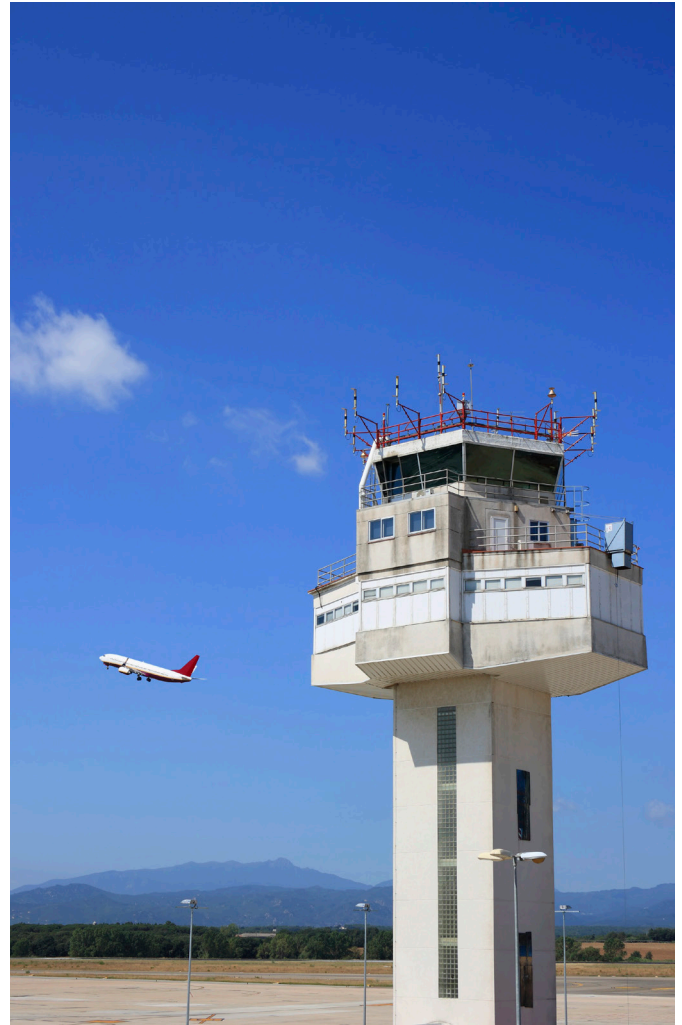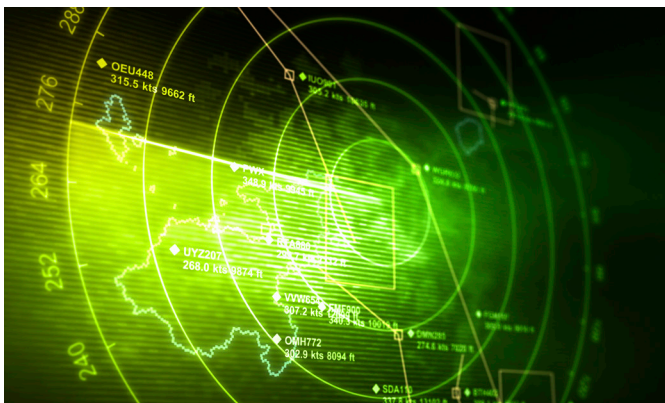
LeadInSky Support functionalities includes:

- Air Traffic Flow Management Tools witch allow for Strategic, Pre-Tactical and Tactical planning
- Control and Monitoring System based on SNMP protocols
- Recording and Playback of metadata and video recording
- Statistic and Billing tool adaptable to specific environment needs
- Surveillance Performance Analysis
- Air Traffic Controller Training Platform

LeadInSky Architectural Design guarantees:

- Virtualized and Cloud Architectures adapatable to customer needs and constraints
- Fully redundant systems from basic hardware components to sophisticated software implementation logics capable of reducing risk and increasing system availability
- Easy maintenance such to reduce life cycle costs
- High performance and capacity figures
- Contingency and back up options
- Future expansion and capability of integrating remote approaches

THE CONTEXT

The progressive growth of air traffic in recent years, with a trend of about 3% of increased air traffic per year joined with new challenges of aviation decarbonisation, such to achieve the climate goal of reducing CO_2 emissions, call for more efficient operations and improved technology.

This can be achieved through a new generation of ATM Systems.

This is why currently Air Traffic Control is moving towards strategic Air Traffic Management, while Air Navigation Service Providers need to be supported in improving their services in terms of efficiency, safety and environmental impact.

In order to face this increasing complex scenario, Leonardo has developed LeadInSky, LeadInSky architecture provides seamless support to ATM achieved by integrating the most advanced solutions for Ground and En-Route. Those are based on the new operational concepts derived from international R&D programmes, such as the ambitious Single European Sky ATM Research (SESAR) programme. In this respect, LeadInSky has been designed as a distributed architecture providing:

- High Availability, achieved by fault tolerance mechanisms implemented through HW and SW redundancy. Fault Detection functions permit standby roles capable to take over any application switch-over. Several degraded mode solutions are also applied to minimize the impact of service unavailability on ATC operations.
- High Performance, achieved through a balanced distribution of the computational load on HW resources. The availability on each system node of the up to-date set of ATC information (replicated database) is also an enabler of higher performances.
- Usability and modifiability, achieved separating ATC business applications from the technical layer (e.g. middleware). Moreover every user interface is separated from the other applications and supplied with a comprehensive set of customisation tools which allow for a perfect adaptation to the operational environment.
- Interoperability, achieved through SWIM Technical Infrastructure which enables for handling Flight, Aeronautical and Meteo information data from a generic source.

FALL BACK & DISASTER RECOVERY SOLUTIONS

Multilevel fallback logics are implemented providing high availability of data processing and consistency through different levels of redundancy. Local hardware or application switch over are managed through hot/stand-by configurations, available from any central processing unit.

Radar data are distributed for multi-radar processing and for direct access, providing reliable capabilities of maintaining track/flight plan correlations after any system state transition.

Most of flight data management, performed by centralised applications running during nominal operations, can be also executed in degraded mode at any controller working position, such to satisfy elementary requirements for safe air traffic navigation.

LeadInSky can also be configured in order to accomplish "Fall Back" or "Disaster Recovery" tasks. An Operational-to-Fall Back logic aligns together operational configuration, flight, and surveillance data.

Complete and immediate recovery of air traffic control capability is thus guaranteed in case of total failure of the operational system.In case of total shut down of one operational site, a "mirrored" one can immediately acquire control. In this way safe and seamless operations are granted.
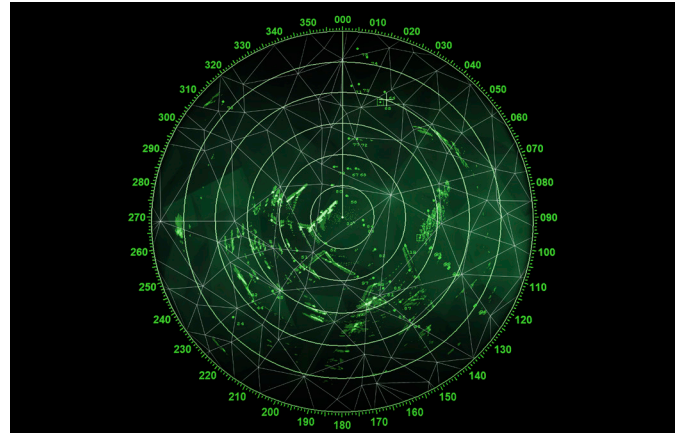

LEADINSKY:
THE RIGHT ANSWER TO ATM FUTURE QUESTIONS

LeadInSky is under continuous improvement such to grant significant progresses in different crucial sectors of Civil Aviation: environment, flight capacity, cost efficiency and safety.

Thanks to its native open architecture, LeadInSky can integrate innovative solutions coming from investments in Research and Development initiatives. Those include SESAR which allows evolved capabilities, standards, and technologies to be implemented complying with new standards requested by Customers, in line with ICAO-ASBU roadmap requirements. Main functional and technical enhancements include:

- Trajectory Prediction and Conflict Detection and Resolution enhanced using aircraft down-link data
- UTM-ATM interoperability which enables Advanced Air Mobility
- RPAS insertion in controlled airspace
- Civil-Military Interoperability
- Digital evolution of Airport integrated surface management
- Virtual Center and cloud-based ATM as a Service
- AI powered applications: Trajectory Prediction, Speech Recognition, CDR tools
- Cyber Security further enhancement
- SWIM-TI evolution supporting Air-ground Communication for ADS-C, UTM and Micro Weather Forecasts applications
- Integrated Communication, Navigation, and Surveillance system: LDACS, multi-link capabilities
- New CWP interaction modes at Tower and En-Route

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