TELERAD

Aeronautical and Maritime Radiocommunication Systems

COMMUNICATION

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Several partners

Complementarity at the service of safety

The 1970s saw the birth of geopositioning with the development of the American GPS (Global Positioning System), initially developed for military use. Since the early 2000s, this technology is now available for professional or private civil navigation and geolocation applications. GPS receivers are found today in many objects in daily use. When the applications become critical in terms of the safety of people and property such as in air transport, maritime transport or driverless vehicles, the signals delivered by satellite constellations (GPS, GLONASS, Galileo, etc.) does not always meet the level of requirements in terms of accuracy, integrity or service continuity. To meet these requirements, the differential GPS concept was developed in the 1990s. Its principle is based on augmenting the GPS signal by means of a correction coming from another source.

In the area of air navigation, the International Civil Aviation Organization (ICAO) has defined two types of augmentation, one based on an extended zone, the SBAS (Satellite Based Augmentation System), the other local, the GBAS (Ground Based Augmentation System) (cf. our Letter of December 2012). These supplementary augmentations will, in the future, address all phases of flight including all-weather landings. To enlighten us on this subject which is central to the field of flight safety, we are pleased to welcome Thierry Racaud, CEO of the European Satellite Service Provider (ESSP).

Patrice Mariotte
CEO of TELERAD

Three questions for...

Thierry Racaud

CEO of the European Satellite Service Provider (ESSP)

ESSP We certify you're there.

Could you tell us about ESSP and its missions?

European Satellite Services Provider (ESSP) is a simplified joint-stock company established in 2008, whose shareholders are the main European Civil Aviation organizations:

- DSNA (Direction des Services de la Navigation Aérienne, France).
- AENA (Aeropuertos Españoles y Navegación Aérea, Spain).
- DFS (Deutsche Flugsicherung, Germany).
- ENAV (L'Ente Nazionale Assistenza al Volo, Italy).
- NATS (National Air Traffic Services, United Kingdom).
- NAV (Navegação Aérea de Portugal, Portugal).
- Skyguide (Schweizerische Aktiengesellschaft für zivile und militärische Flugsicherung, Switzerland).

ESSP is an air navigation services operator certified as such by the European Aviation Safety Agency (EASA). The main mission of the company is to operate and deliver the EGNOS service (European Geostationary Navigation Overlay Service) which is the European Union's own satellite system, managed by the GNSS (Global Navigation Satellite System) European Agency (GSA) based in Prague.

What services does ESSP offer?

EGNOS allows the GPS to be "augmented", bringing integrity to it (i.e. reliability) and accuracy (on the order of one meter in the 3 dimensions versus 5 to 10 meters for standard GPS). As of 2023, EGNOS will "augment" the positioning signal from the Galileo satellites. The accuracy and reliability offered by Galileo means that the signal can be used for critical applications (those putting human life at risk) such as air navigation for precision landings; other activity sectors are interested in having access to precise and reliable positioning: maritime transport for guiding ships into ports for example, railways, the car industry for driverless vehicles and even farming. In the area of aviation, more than 300 airports in Europe now offer the precision "EGNOS" satellite approach. The majority of business aircraft carry avionics on-board which allow them to use EGNOS in addition to certain models of helicopters - the latest generation of commercial aircraft including ATRs and the A350 are also equipped and Airbus intends to market "EGNOS equipped" A318/319/320/321/330 aircraft as of next year. ESSP is also involved in international programs in South Korea and in Africa with the ASECNA. On the other hand, ESSP is positioning itself as a provider of other satellite services for aviation, in particular in the IRIS telecommunications program in collaboration with Inmarsat (cf. interview with Magali Vaissiere, Director of telecommunications and integrated applications for the European Space Agency in the December 2018 issue of TELERAD).

On what infrastructures are you relying on for offering these services?

EGNOS is based on about 40 ground stations mainly distributed throughout Europe and North Africa, on 2 mission centers in Italy and Spain which operate 24 hours per day and 6 satellite transmission stations. ESSP groups together 120 partners of 10 nationalities on its sites of Toulouse and Madrid.

With products and systems in more than sixty countries, TELERAD is specialized in the study, the development and the manufacture of radio systems used for the control of aerial and maritime navigation. A unique company in this area, it is a key player in the French and European defense, industrial and technological base.

NEWS

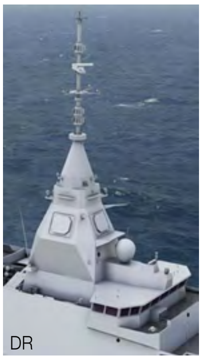
And PAF!

The PAF, otherwise known as the Patrouille de France, the French Military aerobatics team, was created in 1953 and is based in Salon de Provence. Made of twelve Alphajet aircraft and nine pilots, it is one of the oldest aerobatics team with the United States.
The Patrouille de France regularly performs displays in France and abroad from May to October. The first part of their presentation is called the “ribbon”. It involves eight Alphajets forming different formations and slow figures. The second part picks up the pace and is called “synchronization”. The team then divides up into two formations and performs figures involving two, four or six aircraft. The Alphajets are separated by two to three meters from each other with speeds varying from 300 to 800 km/h...
In this context, the coordination and securing of changes in the presentation volume, “the box” and surrounding airspace, has to meet the highest level of requirements in terms of reliability and availability.
Faced with these constraints, TELERAD mobile ground-to-air radio solutions have been able to guarantee the successful execution of the PAF presentations for many years.


DR

VoIP raises anchor

TELERAD, the pioneer and major player in the definition of the international standard Eurocae ED-137, has initiated new partnerships with naval and maritime big French integrators concerning VoIP (Voice over Internet Protocol) communications.
ED-137 standardizes the use of VoIP on interconnection networks for radio and VCS (Voice Communications Systems).
The goal of these collaborations is to meet the growing needs of communications and new constraints while limiting the complexity of on-board architectures on military ships. It is based on the new generation of software defined radio Series 9000-2G.


DR

VoIP in the Indian Ocean

As a long-time partner of the Civil Aviation Department (DCA) of Mauritius in the framework of multi-mode radios, TELERAD has just won a new contract with its partner INEO Energy. This concerns the installation and commissioning of a Series 9000-2G VoIP communications system and Very Small Aperture Terminal (VSAT) equipment. This is a partnership which fully meets the objectives of the Mauritius Civil Aviation Department: “To be recognized as the best regulator of civil aviation and the best provider of air navigation services in the region”.

FOCUS

Stay tuned, the wave arrives!

Knowledge of radio wave propagation is essential whether for studies of interference (cf. TELERAD Letter of December 2016) or for the calculation of radio coverage. The International Civil Aviation Organization (ICAO) requires its Air Navigation Service providers (ANSP) to supply a minimum field level (70 µV/m) throughout the zone where radio communication is required for air traffic control.

For VHF and UHF radio communications in particular, radio coverage will be determined by considering the propagation of the wave in free space and the establishment of a link budget. This budget will depend on transmitter power, the sensitivity of the receiver, the gain of the antennas, losses in coax cables linking the radios to the antennas, but also the frequency.

The carrier frequency created in the transmitter situated in the control center, transporting the air traffic controller’s voice, is transformed into an electromagnetic wave emitted by the antenna. This wave propagates at the speed of light and undergoes attenuation in free space before arriving, for example, at the receiver in the aircraft.

If the signal level received is sufficient, the receiver can after de-modulation, thus reconstitute the vocal signal of the controller to the pilot.

However, the curvature of the earth will limit this propagation to the radio horizon (see box). In the zone of 50 km situated behind this radio horizon, the propagation occurs by diffraction with very high attenuation. Beyond this zone, propagation occurs by scattering.

TELERAD offers beyond the radio horizon solutions by combining a high power 700 W Transmitter, a high sensitivity receiver and a system of directive antennas. These long-range radio systems are especially suited to arrivals and departures on transoceanic routes.

Moreover, since the earth is not perfectly spherical, the ground terrain must be taken into account for continental radio coverage.

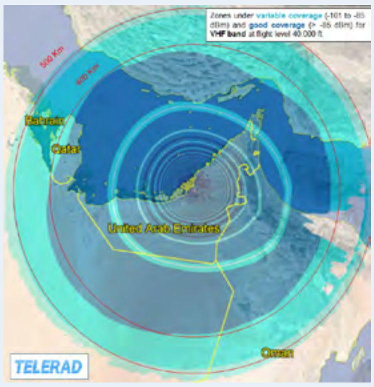
In certain cases, you want to extend the radio coverage beyond the horizon while keeping the same frequency and in this event, you can turn to “Climax”. “Climax” consists of re-using the same channel over an adjacent zone using tiling coverage. In the overlap zone, the aircraft receives information transmitted by two ground transmitters which are broadcasted with a slight frequency offset with respect to each other, thus allowing the audible reception of the signal.

In the framework of its radio experience, TELERAD offers its clients, detailed calculations of radio coverage which incorporate the performance of their radios, the characteristics of the antenna systems and the terrain database over the entire planet as a function of the flight levels (see box).

Radio horizon

It is calculated thus:

$D = 4.1\sqrt{H}$ with “D” the distance in km and H the height in meters. E.g. an aircraft at level FL300 (10,000 meters), will have a radio horizon of 410 km, i.e. 221 Nm, while it would be reduced to 130 km if it was at 1,000 meters of altitude.



These basics are developed in the framework of “Radio Cohabitation” training offered by TELERAD. To download the presentation sheet for this training, LINK

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Director of publications: Patrice Mariotte | Managing Editor: Philippe Ruas | Editor in chief: Bruno Grossières
Publishing committee: Bruno Grossières, Patrice Mariotte, Ramuntxo Oruezabala, Philippe Ruas.
TELERAD S.A. 2, avenue de la Butte aux Cailles F - BP 302 – 64603 Anglet Cedex – France