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## Several partners



## Mission: Resilience

If TELERAD has been known worldwide for more than fifty years for its expertise in the field of airborne and maritime control, a characteristic of these radio systems is often forgotten, being literally at their core: resilience.

Whether in the civil or military field, TELERAD equipment operates 24 hours a day, 365 days a year on all the continents, in the most extreme contexts, on the ground, at sea or in the air as well as of course being "combat proven".

In these contexts where the failure of radio communications is simply unthinkable, TELERAD is there to "fulfil the mission".

With this purely operational approach, according to the military term, we are delighted to welcome the Air Force General Laurent Lherbette from the French Air Force Command.

**Patrice Mariotte**  
CEO of TELERAD

## Three questions for:

## Air Force General Laurent Lherbette

Air Force Command  
(CFA-Commandant les forces aériennes)



### Could you tell us more about the Air Force Command?

The CFA is responsible for ensuring the combat readiness of the personnel and equipment of the Air and Space Forces (AAE) and includes some 23,000 aviators in all specialties. It provides capacity for the benefit of air operations. In other words, nothing happens in the AAE without the CFA.

My purpose is to prepare us for tomorrow's war. The actions of the CFA fall completely into the three "C's" of the Chief of the Defense Staff [chef d'état-major des armées (CEMA)]: "Competition, Contest, Confrontation": adapted by the Chief of the Air and Space Force Staff [chef d'état-major de l'armée de l'air et de l'espace (CEMAAE)] as: "discourage, defend and defeat". This also involves training for high-intensity conflicts.

### What is the role of Information and Communication Systems (ICS) in the framework of high-intensity combat?

CFA implements or repairs many ICS resources such as tactical data links, secure networks, telephony, etc. ICSs are comparable to a central nervous system ensuring the transmission of orders of engagement but also relaying vital information coming from fighter aircraft or ground-to-air defense [defense sol-air (DSA)] systems engaged in the aerial battle. They provide essential support for transiting all the information essential to the actions in progress (real-time) as well as that needed for planning (lead-time).

High intensity combat can be defined as massive, lightning-fast confrontation or war by attrition. In this context, the redundancy and resilience of ICSs enables the decision loop to be solidified and accelerated in a context of interference and denial of access. All these features are fundamental to the new doctrines of Multiple Environment/Multiple-Fields [Multi-Milieux/Multi-Champs (M2MC)]. As the US Air Force General Deptula has written: "Success in future conflicts will largely depend on the ability to use information, automation and machine learning."

### How do the new technologies ensure the interconnection of systems in the framework of air operations?

For military air operations, sharing of information on the field of battle is a key factor for success. Aviation and transmission have developed hand-in-hand. Installed in cockpits, the wireless telegraph then the radio as of 1917 for the first time, linked the sky and the earth in the heat of the battle. Yesterday the Wireless Telegraph, today the 8.33: the ICAO specifications adapted in our programs, guarantee our aircraft to be able to operate worldwide, ensuring liberty of action for our forces.

Big Data, the use of artificial intelligence, the developments in cybersecurity or the constitution of a "combat cloud", its security, the conditions of access to data, the governance of metadata within it, or the interoperability conditions of these data represent major challenges that we have to master.

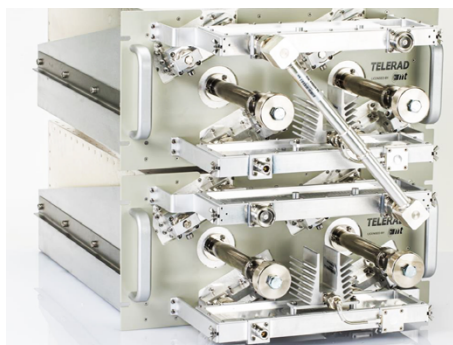
To just give one example, the services provided by the "Voice over IP" technology (CONTACT radio system) will revolutionize the architecture of our C2 Air structures as well as the use of DSA systems by designing a new approach to information transmission. CONTACT prefigures the integration of a "combat cloud" completely integrated between doers and deciders.

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.

## French civil aviation chooses TELERAD combiners

As a historic supplier for French civil aviation in the area of radio communication systems, TELERAD has won the contract for the supply of antenna multi-couplers. This shared filtering system allows up to 8 transmitters to operate together on a single antenna. This system simultaneously accepts several operational communications while protecting them from undesirable signals from the external environment (noise, parasitic noise, harmonics, etc.). After validation by the technical teams from the DGAC/DSNA/DTI (Civil Aviation General Directorate/Air Navigation Services Directorate/Technology and Innovation Directorate)

at the end of 2021, the first equipment items were delivered in the first quarter of 2022.



## En route for landing

Components of the GNSS (Global Navigation by Satellite System), the GBAS (Ground Based Augmentation System) provides GPS corrections to aircraft on approach to guide them during the landing phase. As mentioned amongst others in the "European ATM Masterplan", the GBAS is intended eventually to replace conventional ILS (Instrument Landing Systems).

GPS corrections are broadcasted by radio on a VHF frequency. TELERAD is the main designer and manufacturer of the transmission module called VDB (VHF Data Broadcast). TELERAD, in partnership with universities and international integrators, is participating in the deployment of GBAS on all continents.

## FOCUS

### The electromagnetic spectrum, a natural, rare and strategic resource

In 1887, the German physicist, Heinrich Hertz demonstrated the existence of electromagnetic waves, thus confirming the theory of electromagnetism of Maxwell, published several years before. In order to do this, Hertz invented the "exciter" (the oscillator) and the "resonator", ancestors of our radio transmitters and receivers.

In honor of Heinrich Hertz, the frequency of radio waves is measured in Hertz (1 Hz = one wave cycle per second). (They are referred to as "Hertzien" waves in France).

Since their discovery, radio waves have revolutionized communication, even if at the time, Hertz said "this does not have any application. It's just an experiment to prove that Maxwell, the master, was right". Nowadays, we cannot even imagine the number of applications and services that are based on radio waves! They are present everywhere daily: cell-phones, television, micro-waves, smart buildings, Internet of Things, etc.

The result is that this natural, rare and strategic resource, the electromagnetic spectrum, is very much coveted. It must therefore be used properly. To do this, regulations are established on the scale of countries and international coordination. So in France, the National Frequency Agency (ANFR - Agence Nationale des Fréquences) is in charge of the management of frequency bands, the assignment of frequencies and the management of sites. In addition, it ensures the monitoring of the spectrum. The ANFR also manages the coordination of frequencies with neighboring countries and conducts institutional cooperation actions with its part-

ners, in particular through the International Telecommunications Union (ITU) conferences.

The electromagnetic spectrum is divided into frequency bands according to an international standardization created by the ITU: radio waves from 3 Hz to 300 MHz and micro-waves from 300 MHz to 300 GHz.

The concept of "service class" is defined within these frequency bands: aeronautical, maritime, meteorological, amateur radio, radio broadcasting, radio navigation, satellite, scientific, etc. The band allocated to civil aviation communications extends from 117.975 MHz to 137 MHz (VHF), while aeronautical communication for the French Department of Defense falls into the bands 138-144 MHz (VHF) and 225- 400 MHz (UHF).

It is precisely for covering different services over these ranges of frequency that TELERAD develops radio equipment of the "Software Defined Radio" (SDR) design allowing all types of infrastructure for aerial navigation control or coastal maritime communication to be based on a common platform.

The latest model of radio, the TRX9020 transceiver, is the most highly developed version of the TELERAD product line since it covers the VHF and UHF bands and supports different waveforms. This model provides more features and allows several services to be addressed from a single platform.

### The TRX 9020-2G V/UHF transceiver

The TRX 9020-2G V/UHF transceiver is a multi-band and multi-mode software radio. It has been chosen by the French armed forces for equipping fixed and tactical infrastructures (see: [TELERAD Communication Newsletter, December 2021](#)).

Its main features are:

- Wide band 118-144 MHz (VHF), 225-400 MHz (UHF), extendible on option 108-174 MHz
- VHF: AM, FM (F3E, G3E), ACARS, extendible to mode VDL 2
- UHF: A3E, F3E
- RF output power programmable from 2 to 50 W
- Protocols: SNMP, VoIP as per the standard EUROCAE ED-137

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