European Global Navigation Satellite Systems Agency

HORIZON 2020


**G**eneral aviation **R**escue capacity **IM**provement for the worldwide **A**doption of a **S**afe **S**olution based on **E**uropean GNSS

# General aviation user's needs collection workshop

**Barcelona**
**January 31st 2018**

ThalesAlenia Space — a Thales / Leonardo company

ECA GROUP — ELTA

PildoLabs move smart

AOPA

ASCLNA

L'AEROCLUB

# Index

1. Context
2. GRICAS overview
3. GRIMASSE overview
4. Operational scenarios

# 1 - Context

**SAR Statistics**

- 99% -> Percentage of aeronautical accidents involve GA aircraft
- 83% -> GA accidents survival ratio
- 840 rescue operations in Europe per year for a cost of 30 M€

**GA SAR Equipment**

- <15% -> Percentage of GA aircrafts equipped with aeronautical SAR beacons (ELT)
- 50% -> Percentage of GA users equipped with PLBs (regulation in UE)
- 35% -> Percentage of GA users unequipped

**GA SAR Operation Management**

- GA generates the majority of RCC workload
- Connection between RCC and other operators are mainly manual, lowly supported by automatized procedures and common tools

**SAR Evolution**

- New uses of Galileo Return-Link intensively discussed for PLB, EPIRB and ELT(DT) (remote activation)
- Organization of exchanges in aviation around SWIM concepts well advanced, but hardly dealing with SAR and only for CA

# Project objective

To **propose and demonstrate** innovative and global solutions based on **MEOSAR system**, using **Galileo Return Link**, to improve the safety and security of air navigation.

- Independent Aircraft tracking Solution in abnormal conditions
- Autonomous Distress Tracking (ADT)

It is an answer to new ICAO specifications defined for **Global Aeronautical Distress and Safety System** (**GADSS**) to be applicable by 2021.

# 2 – GRICAS Overview

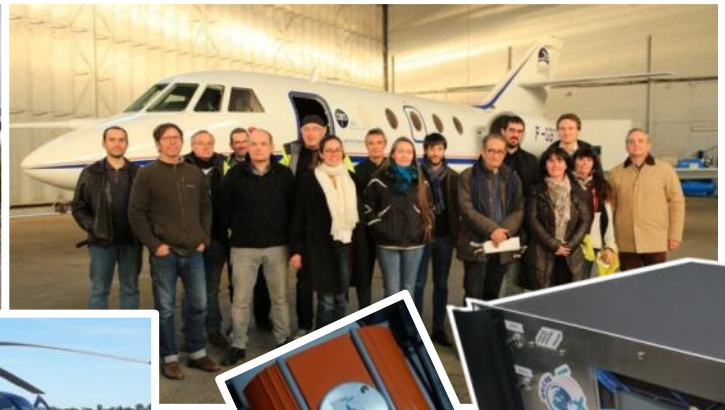
**ELT-DT Field Trial**
April 2017
Sabadell, Spain
Cessna 182 - ACBS

**In-flight RLS Field Trial**
November 2017
Sabadell, Spain
Cessna 182 - ACBS

**Commercial Aviation Field Trials**
December 2017
Toulouse, France
Falcon 20 - SAFIRE

February 2018
Dakar, Senegal
ATR 42 - ASECNA

1st ELT-DT Test → 1st in-flight RLM activation → 1st commercial aircraft test → Commercial aircraft test & dissemination



# 3 – GRIMASSE overview

## Project objective

To define, demonstrate and support standardization of solutions based on **MEOSAR system (Galileo)** to improve the **SAR operations** efficiency and safety for **General Aviation**.

**GRIMASSE** proposes an answer to the need expressed by RCCs, AOPA and ICAO to improve **General aviation safety** by extending the **GADSS** concept to any aircraft and rotorcraft.

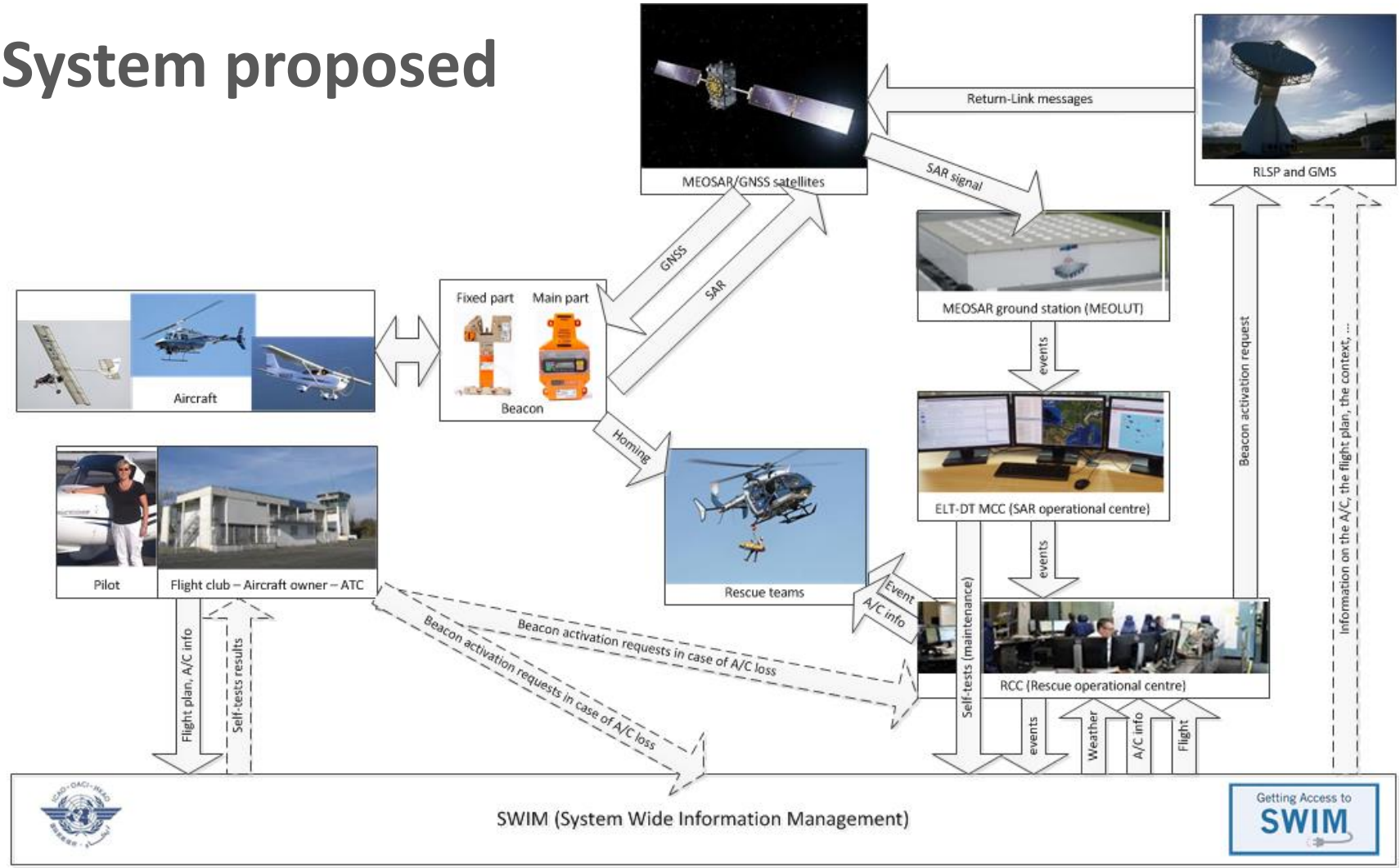
> ICAO: in GADSS official delivery end of 2016 "ADT.07 - Assess extending applicability to other aircraft operations".

## Main challenges

- **Beacon cost**, including integration into the aircraft, maintenance, minimal modification to the aircraft or rotorcraft structure and automatic triggering logic
- Organization of **the communication between elements of the SAR operational chain** through the development of SWIM-standard-based applications

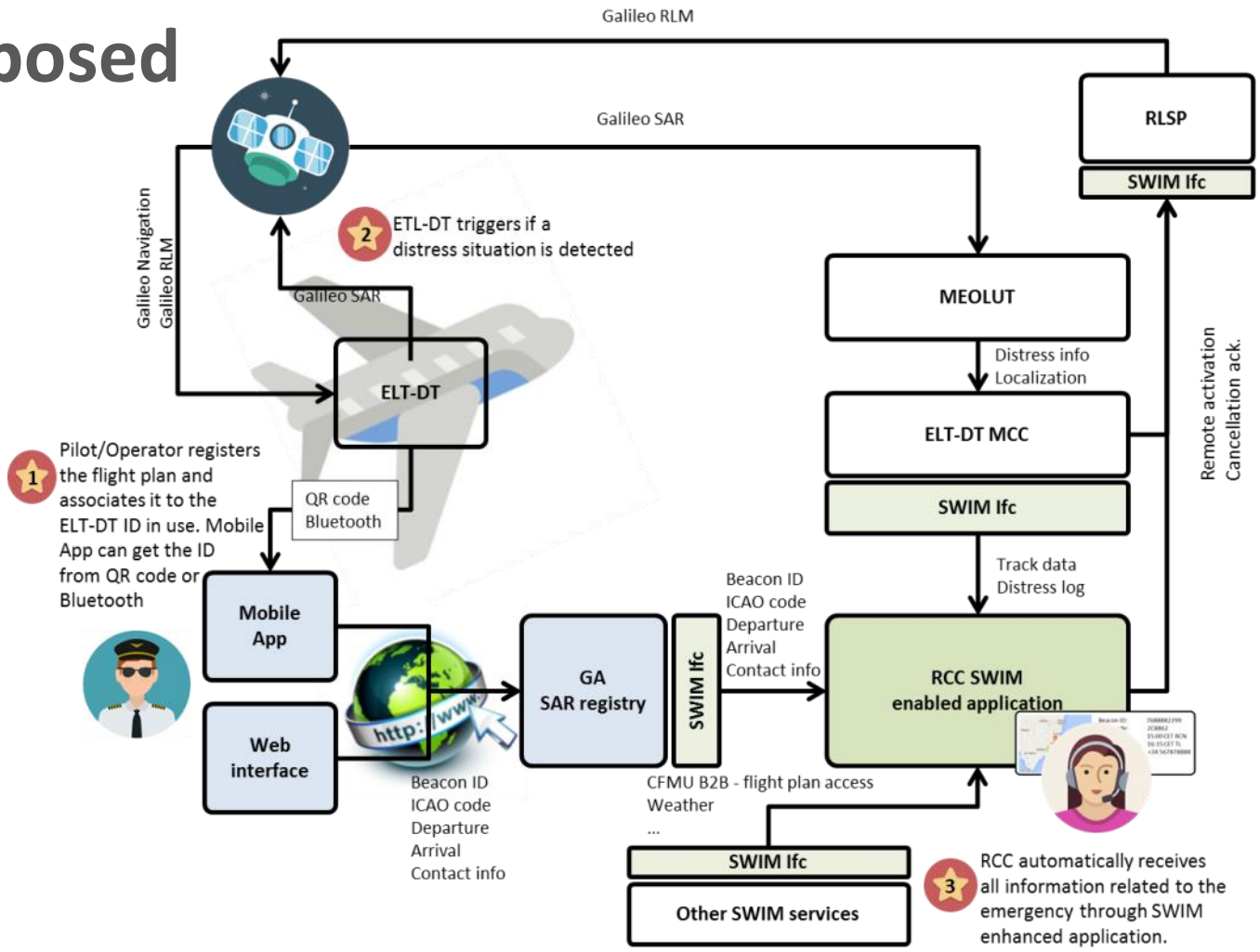
# 3 – GRIMASSE overview

## System proposed



# 3 – GRIMASSE overview

## System proposed



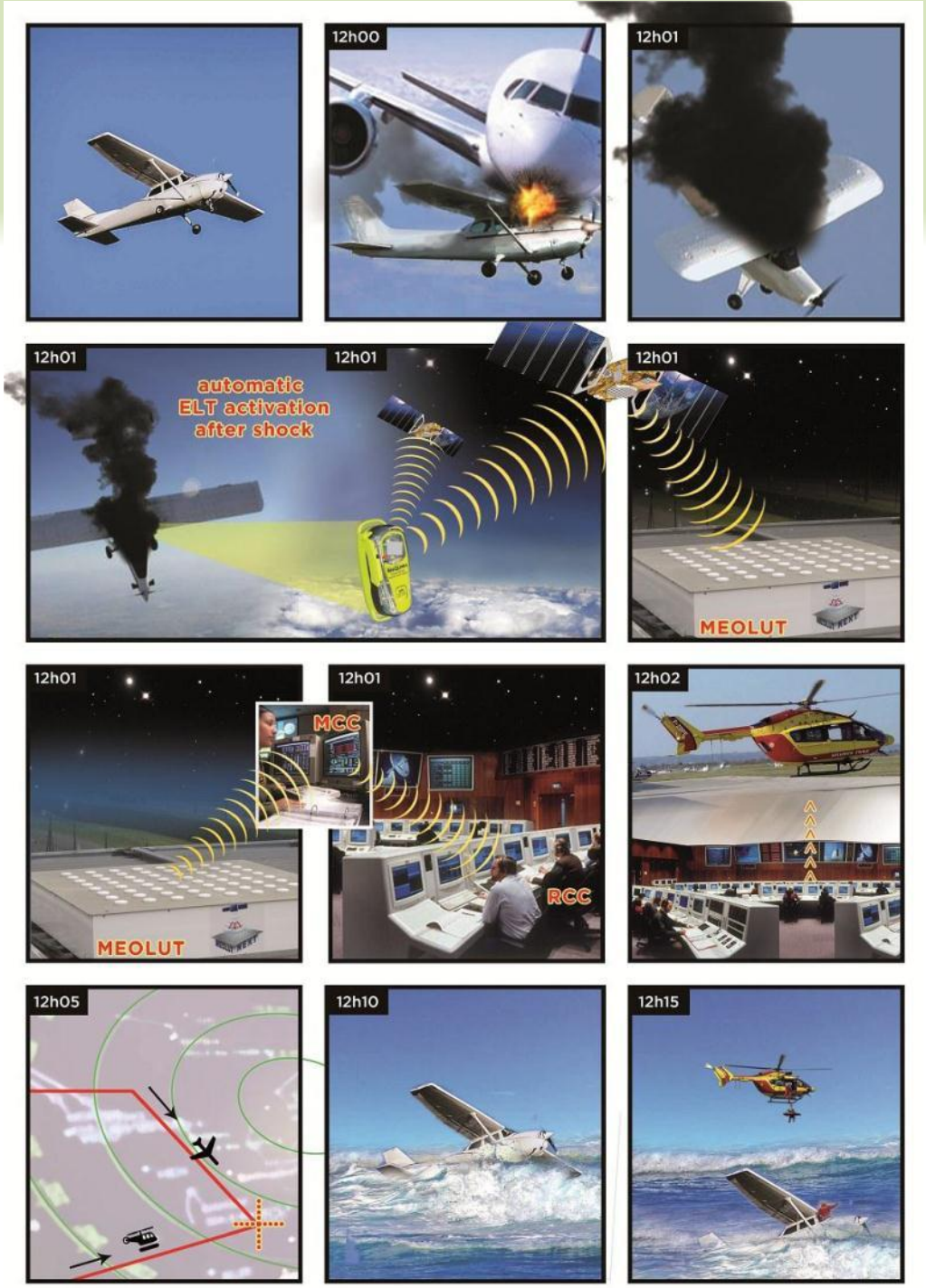
# 4 – Operational scenarios

## Scenario 1

**Automatic beacon triggering and anticipated rescue - Violent shock**

- An aircraft undergoes a violent shock in the air
- Automatically, the ELT is activated thanks to inertial sensors embedded
- Distress signal is transmitted **ELT** ➪ **Galileo Satellites** ➪ **MEOLUT**
- MEOLUT calculate ELT's position
- Alert and ELT's location are sent to relevant MCC and RCC
- MCC and RCC contact rescue services

**¡Pilot is quickly located and rescued!**


12h00
12h01
12h01
12h01
automatic
ELT activation
after shock
12h01
12h01
MEOLUT
12h01
MCC
12h01
RCC
12h02
MEOLUT
12h05
12h10
12h15

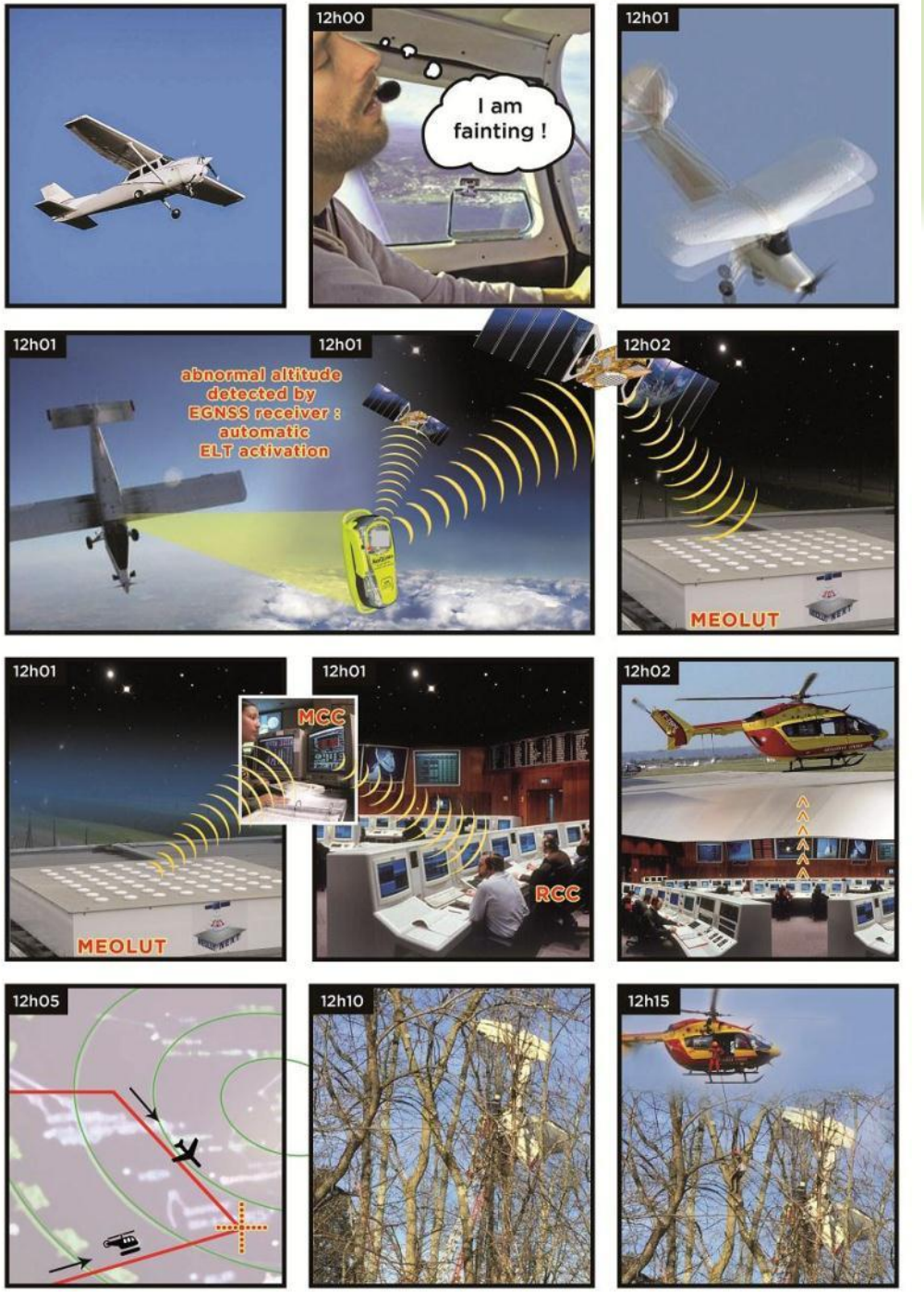
# 4 – Operational scenarios

## Scenario 2

**Automatic beacon triggering and anticipated rescue - Abnormal descent rate**

- A pilot faints while piloting ➪ aircraft starts spinning
- Automatically, the ELT is activated thanks to abnormal altitude detection by EGNSS embedded
- Distress signal is transmitted **ELT** ➪ **Galileo Satellites** ➪ **MEOLUT**
- MEOLUT calculate ELT's position
- Alert and ELT's location are sent to relevant MCC and RCC
- MCC and RCC contact rescue services

**¡Pilot is quickly located and rescued!**


12h00
I am fainting !
12h01
12h01
12h01
abnormal altitude detected by EGNSS receiver : automatic ELT activation
12h02
MEOLUT
12h01
MCC
MEOLUT
12h01
RCC
12h02
12h05
12h10
12h15

# 4 – Operational scenarios

## Scenario 3

**RLS use for remote activation**

- Pilot has to do a emergency landing in an area with no communication network ➪ Pilot cannot contact rescue services
- The flight club identifies a mismatch in the aircraft flight plan
- The flight club contacts the RCC and asks to active the aircraft's ELT

**RLSP** ➪ **Galileo Satellites** ➪ **ELT** ➪ **Galileo Satellites** ➪ **MEOLUT**

- MEOLUT calculate ELT's position
- ELT's location are sent to relevant MCC and RCC
- MCC and RCC contact rescue services

**¡Pilot is easily located and rescued shortly after the crash!**


12h00
12h01
I have to do an emergency landing
12h05
12h07
12h07
There is no network here, I cannot contact rescue services...
13h00
Aircraft, where are you ?
13h01
I have lost contact. Please, RCC, activate the beacon.
RLM
>>> RCC > RLSP >>>
13h02
RLM
Remote ELT activation
13h03
13h20

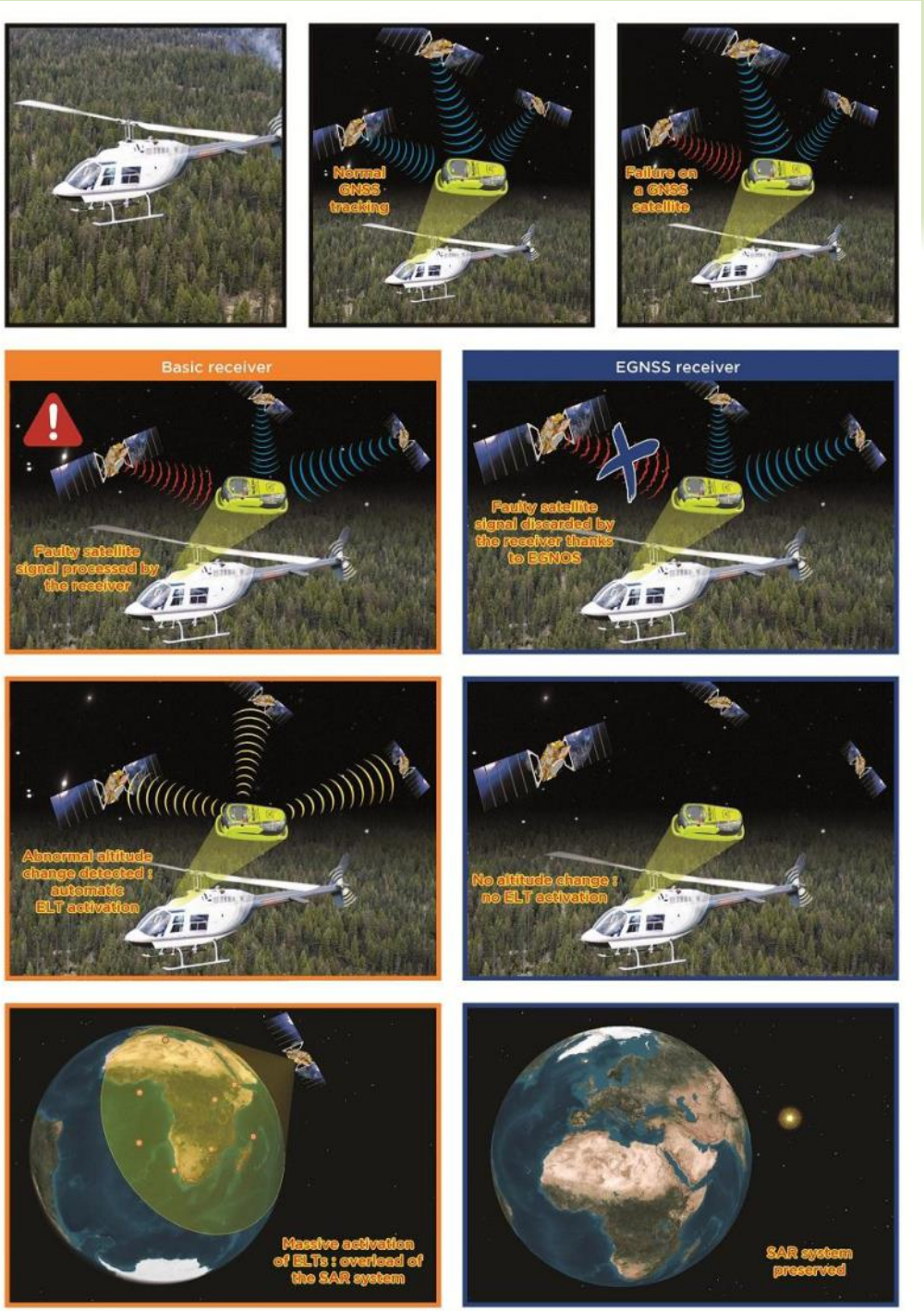
# 4 – Operational scenarios

## Scenario 4

**Comparison of basic/EGNSS receiver for ELT triggering**

- While an helicopter is flying a GNSS satellite starts emitting a corrupted signal
- If the ELT is equipped with standard GNSS receiver:
  - the faulty satellite is processed as a good one resulting in a sudden altitude change
  - ELT is automatically activated, and so for other aircrafts in field of the faulty satellite
  - SAR system becomes overloaded and real distress signals cannot be attended
- If the ELT is equipped with EGNSS receiver:
  - the faulty satellite is discarded by the receiver thanks to EGNOS messages
  - the helicopter's altitude remains stable and ELT is not automatically activated

**¡SAR system is preserved from congestions thanks to EGNSS!**


Normal GNSS tracking
Failure on a GNSS satellite
Basic receiver
EGNSS receiver
Faulty satellite signal processed by the receiver
Faulty satellite signal discarded by the receiver thanks to EGNOS
Abnormal altitude change detected : automatic ELT activation
No altitude change : no ELT activation
Massive activation of ELTs : overload of the SAR system
SAR system preserved