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# SAR Galileo Service

Europe's Contribution to  
Rescue Operations

ICAO EUR/APAC SAR workshop  
Baku 3 October 2024





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## AGENDA

- 1. SAR Galileo State of Play**
- 2. SAR Galileo new Services**





## SAR figures Worldwide in 2023

- SAR Events: 1,076
- People Rescued: 3,109 (8 every day)
- 70% Maritime, 20% Air, 10% Land
- More than 63,745 since 1982



**Legend:**

- In yellow: ELTs
- In red: EPIRBs
- In blue: PLBs (Land)
- In green: PLBs (Aviation)
- In purple: PLBs (Maritime)



## SAR Galileo

### Contribution to the worldwide SAR effort in Cospas-Sarsat

- 1 SAR payloads aboard Galileo satellites
- 2 Forward Link Ground Segment
- 3 Return Link Ground Segment

#### + Galileo Contribution

- the largest Space Segment (L-band) contributor
- the largest Ground Segment contributor (4 MEOLUTS)
- the only Return Link Service Provider



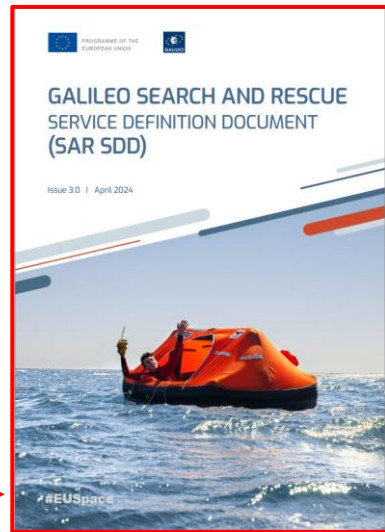
# SAR/Galileo From Design to Full Operational Capability



SAR Galileo was an EU Council decision in 2004

Galileo Services Portfolio

Open Service (OS)	Public Regulated Service (PRS) - Governmental Service	Search and Rescue Service (SAR)	High Accuracy Service (HAS)	Emergency Warning Service (EWS)	Commercial Authentication Service (CAS)
Ready to provide service for emergency and safety	Ready to provide service for emergency and safety	Ready to provide service for emergency and safety	Ready to provide service for emergency and safety	Ready to provide service for emergency and safety	Ready to provide service for emergency and safety
Under development	Under development	Under development	Under development	Under development	Under development



1

The SAR/Galileo Forward Link Service is a regional contribution to Cospas-Sarsat MEOSAR System providing fast and accurate detection and location data over the European and Indian Ocean Areas

In Service  
12/2016

2

The SAR/Galileo Return Link Service is a worldwide service enabling a communication link back to the originating emergency beacon through the Galileo Navigation Signal in Space (I/NAV E1), sending a confirmation message (RLM) to the user that the distress signal has been localized by the System.

In Service  
01/2020



# SAR/Galileo Space Segment

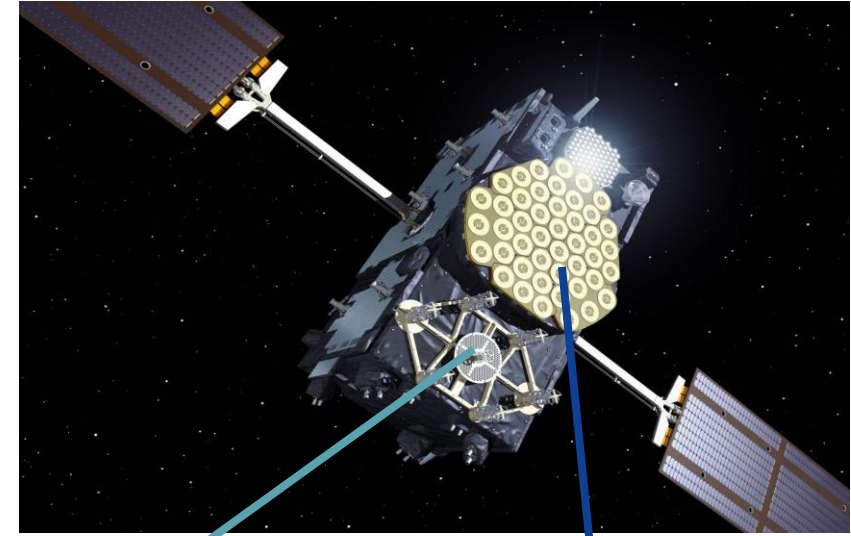


L1, first two Galileo Satellites with SAR payloads on 12/10/2012



credits: launchphotography.com

L13, Galileo Constellation Completed on 17/09/2024



- 1 406Mhz SAR Transponder (FLS)
- 2 L-Band Navigation Payload (RLS)





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# SAR/Galileo Ground Segment



- 2 Services (FLS, RLS)
- 26 Satellites (2 more under Commissioning)
- 4 SAR/Galileo MEOLUTs
- 1 Return Link Service Provider
- 8 Reference and 4 Calibration Beacons

# SAR/Galileo Ground Segment - MEOLUTS



**SPITSBERGEN  
MEOLUT**  
Norway



**MASPALOMAS  
MEOLUT**  
Spain



**LARNACA  
MEOLUT**  
Cyprus

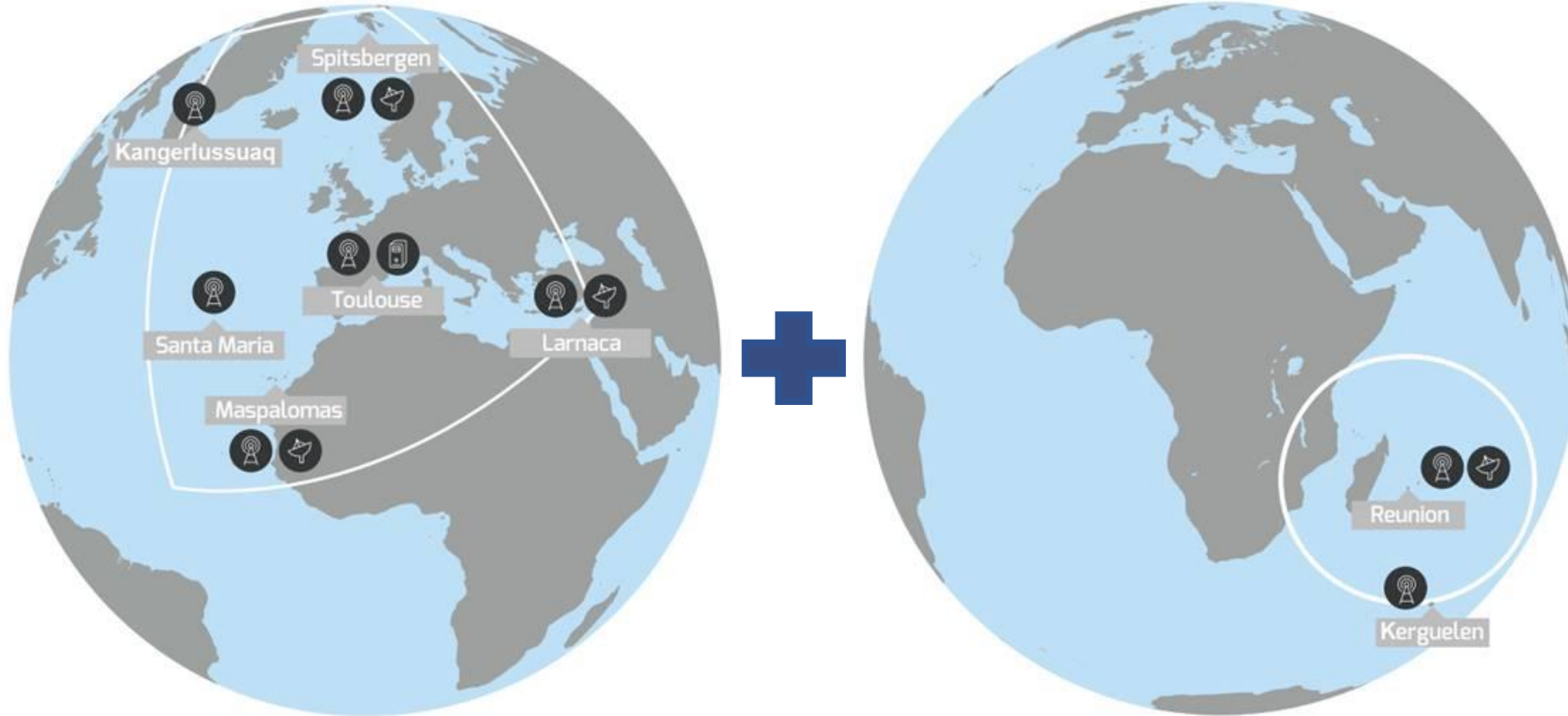


**REUNION  
MEOLUT**  
La Réunion (France)





# SAR/Galileo Forward Link Coverage Areas



**European Coverage Area**

**Indian Ocean Area**

7 continuously transmitting Reference Beacons are used for Service Monitoring

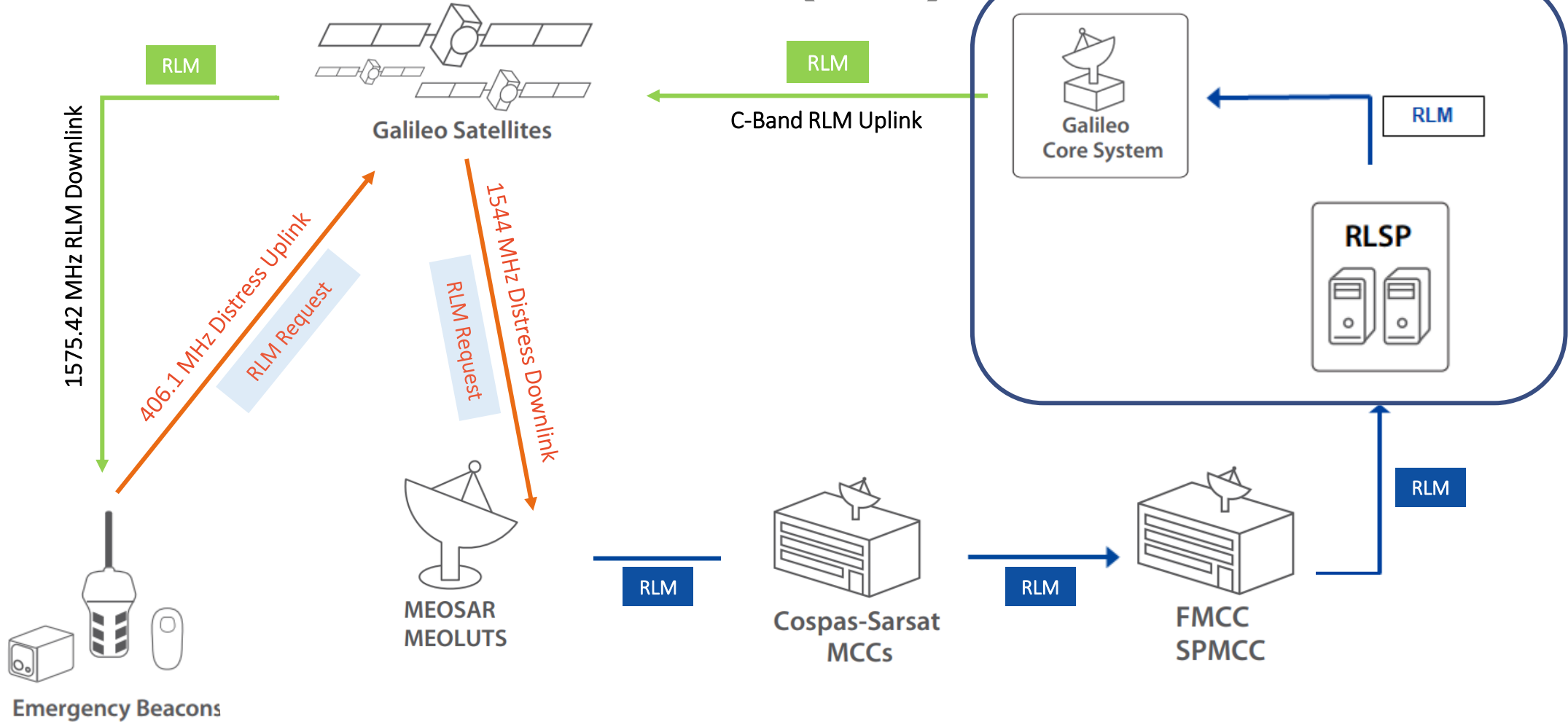


## **SAR/Galileo Return Link** **Galileo Answering to your SOS**

- A world-wide, USER CENTRIC, free of charge C/S and Galileo Service in operations since January 2020.
- The RLS uses the Galileo Navigation signal and broadcasting capabilities to deliver an automatic confirmation to the beacon that the distress call has been received and located by the SAR forces.
- RLS is a confidence boost to anyone in distress.
- RLS is the backbone for future Galileo and C/S Evolutions



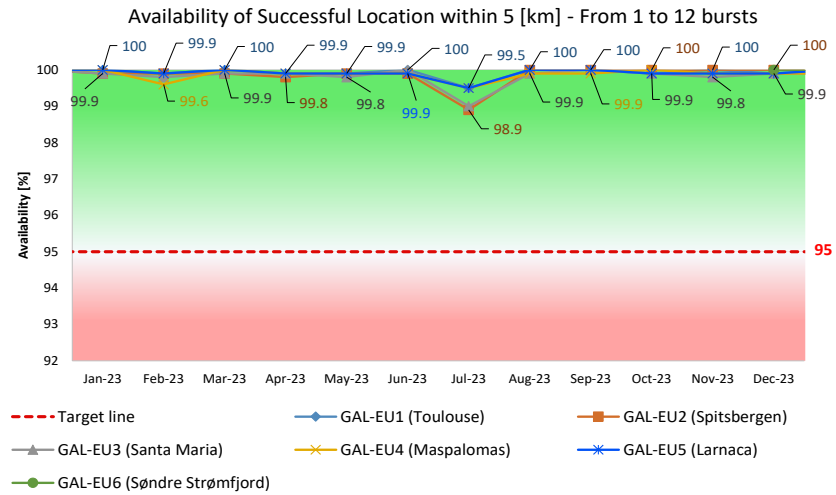
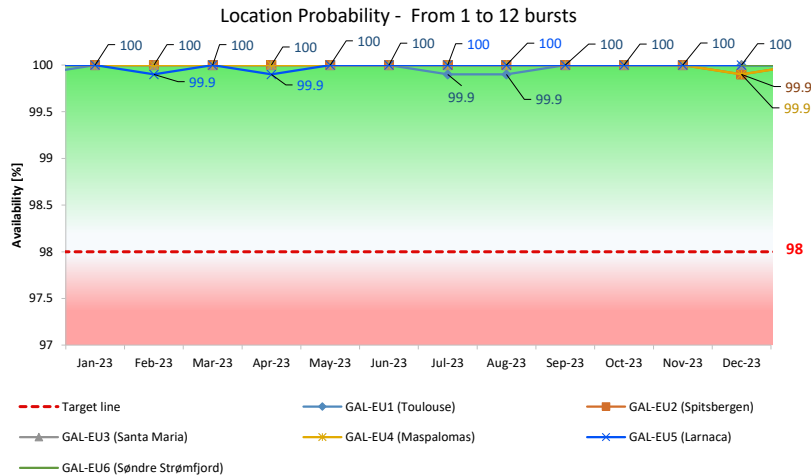
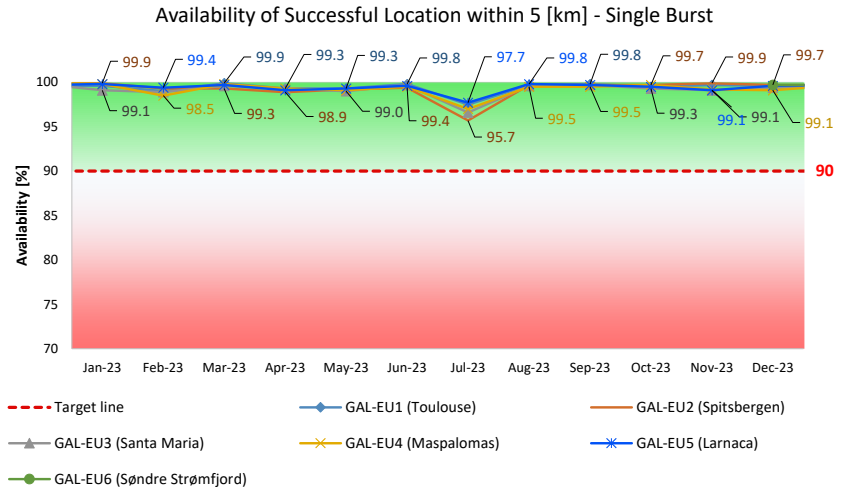
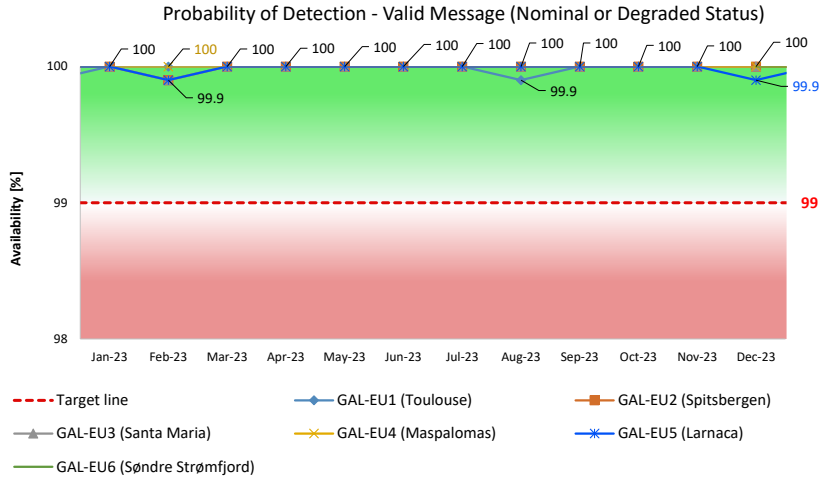
# SAR/Galileo Ground Segment: The Return Link Service Provider (RLSP)



**RLS is the backbone for future Galileo Services**



## SAR/Galileo Performance Minimum Performance Levels



# SAR/Galileo Service Performance: Summary

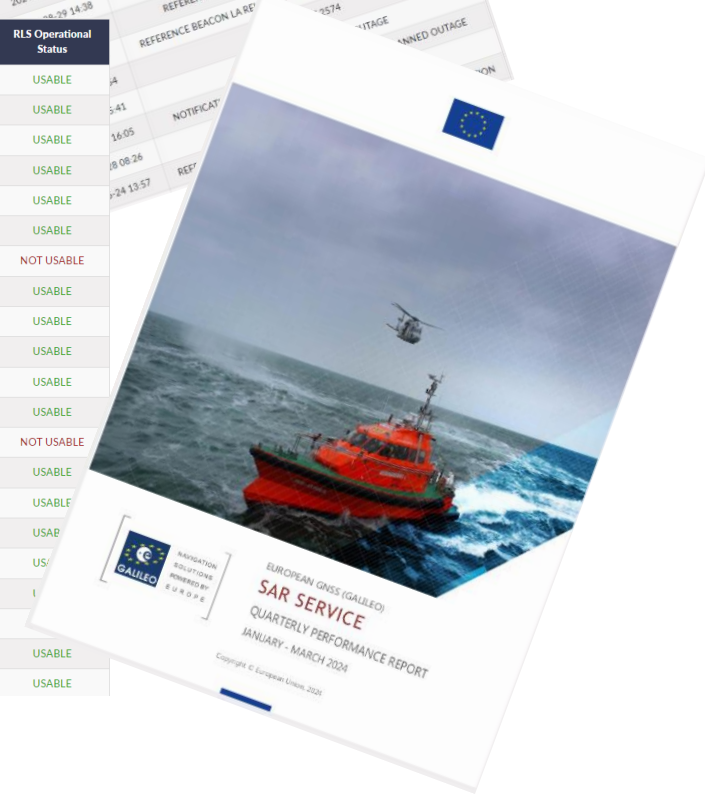
- The excellent Availability of the Service  $\geq 99.9\%$  contributed to the rescue of approx. 1,389 people within EU territories during 2023.

- Main Performance Metrics:

- Forward Link Detection Probability constantly at 100%;
- Location Accuracy within 5km  $\geq 99.8\%$
- Mean Location Accuracy 784m;
- Return Link Delivery Latency <1min

Satellite Name	SV ID (PRN)	Cospas-Sarsat ID	Operating Mode [kHz]	FLS Operational Status	RLS Operational Status
GSAT0101 <sup>1</sup>	E11	N/A	-	N/A	USABLE
GSAT0102 <sup>1</sup>	E12	N/A	-	N/A	USABLE
GSAT0103	E19	419	ALC90	F	USABLE
GSAT0201	E18	418	ALC90	F	USABLE
GSAT0202	E14	414	ALC90	F	USABLE
GSAT0203	E26	426	ALC90	F	USABLE
GSAT0204 <sup>2</sup>	E22	422	ALC90	OFF	NOT USABLE
GSAT0205	E24	424	ALC90	F	USABLE
GSAT0206	E30	430	ALC90	F	USABLE
GSAT0207	E07	407	ALC90	F	USABLE
GSAT0208	E08	408	ALC90	F	USABLE
GSAT0209	E09	409	ALC90	F	USABLE
GSAT0210 <sup>3</sup>	E01	401	ALC90	OFF	NOT USABLE
GSAT0211	E02	402	ALC90	F	USABLE
GSAT0212	E03	403	ALC90	F	USABLE
GSAT0213	E04	404	ALC90	F	USABLE
GSAT0214	E05	405	ALC90	F	USABLE
GSAT0215	E21	421	ALC90	F	USABLE
GSAT0216	E25	425	ALC90	F	USABLE
GSAT0217	E27	427	ALC90	F	USABLE
GSAT0218	E31	431	ALC90	F	USABLE

NASU Number	Date (UTC)	NASU Subject
20240332	2024-09-05 09:54	COSPAS-SARSAT MEOSAR-EQUIPPED SATELLITE COMMISSIONING
20240331	2024-09-05 09:50	NOTIFICATION OF GALILEO RETURN LINK SERVICE PLANNED
20240330	2024-08-30 12:45	REFERENCE BEACON LARINANA/EU FGB HEX MESSAGE MODIFICATION
20240329	2024-08-29 14:39	REFERENCE BEACON SONDBRESTROMFIORD/EU FGB HEX MESSAGE MODIFICATION
20240328	2024-08-29 14:38	REFERENCE BEACON SPITSBERGEN/EU FGB HEX MESSAGE MODIFICATION
20240327	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240326	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240325	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240324	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240323	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240322	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240321	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240320	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240319	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240318	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240317	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240316	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240315	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240314	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240313	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240312	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240311	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240310	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240309	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240308	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240307	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240306	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240305	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
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20240303	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240302	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION
20240301	2024-08-29 14:38	REFERENCE BEACON LA REUNION/EU FGB HEX MESSAGE MODIFICATION



- The European GNSS Service Center Web [[www.gsc-europa.eu](http://www.gsc-europa.eu)] is the main tool for SAR/Galileo users to get access to the latest performance reports, System Information as well as relevant Operational Notifications.





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## AGENDA

1. SAR Galileo State of Play
2. SAR Galileo new Services



# Galileo Future Services: Enhancing the Galileo Emergency Solutions Portfolio

1

**Galileo**  
SAR/Remote  
Beacon  
Activation

A diagram showing a satellite in space emitting a yellow signal cone towards a red and white airplane and a blue boat on the ocean surface. A yellow beacon icon is shown on the boat.

2


**Galileo**  
Two Way  
Communication

A diagram showing a satellite in space emitting a yellow signal cone towards a green speech bubble on the ocean surface containing the text '2W'.

The SAR/Galileo Return Link Service (RLS) enables a communication link back to compatible devices through the Galileo Signal in Space and is the the backbone of the "G1G" implementation of new the following Galileo Services

3

**Galileo**  
Distress  
Position  
Sharing

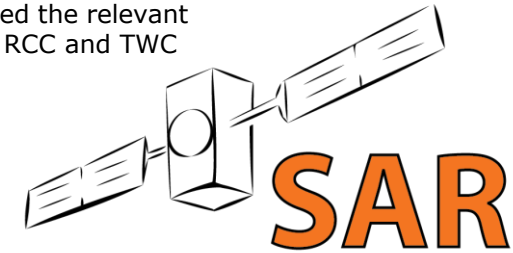
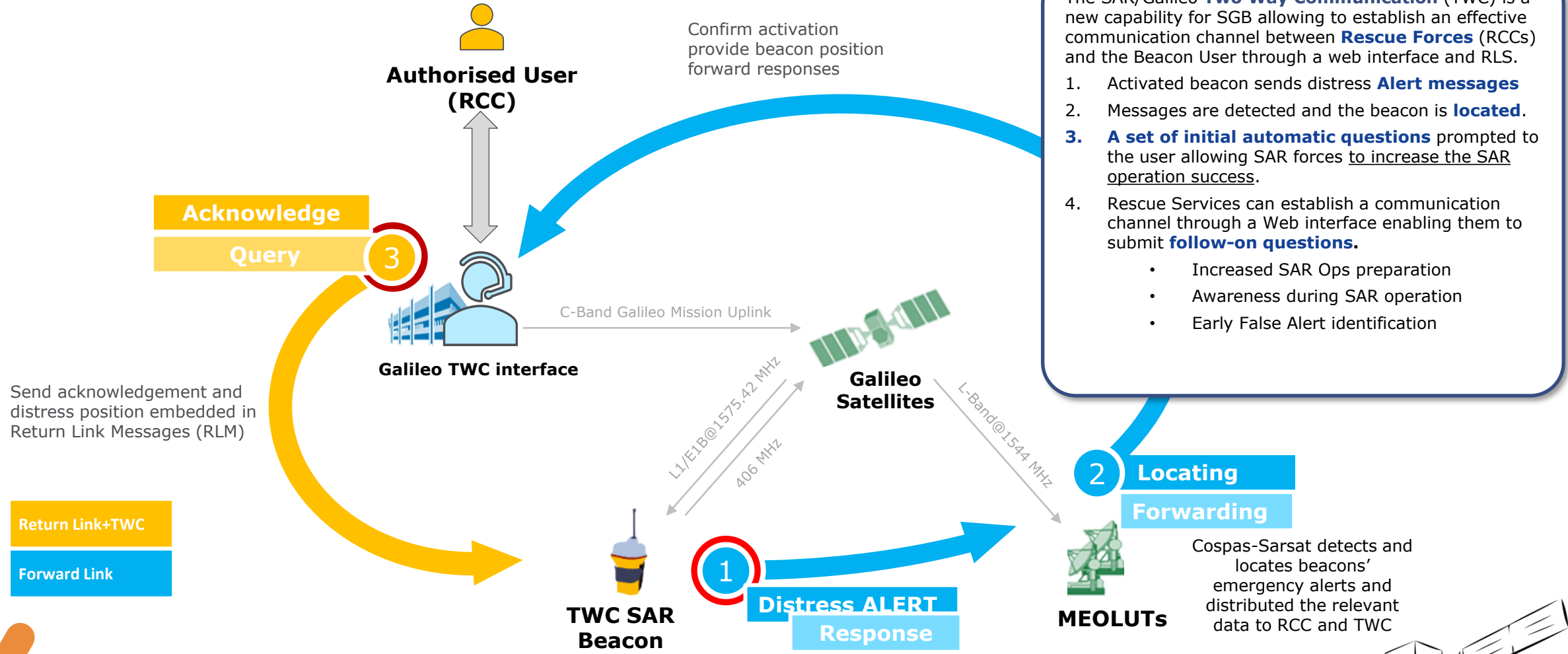
A diagram showing a satellite in space emitting a yellow signal cone towards a red location pin on the ocean surface, with concentric yellow circles around it representing signal propagation.

4

**Galileo**  
Emergency  
Warning  
Service

A diagram showing a satellite in space emitting a yellow signal cone towards a smartphone on the ocean surface displaying an 'Alert' message.

# Two Way Communications - Concept





## TWC – Question/Answer Dataset

- Communication is performed through codes defined in shared Libraries in both the Beacon and the TWC provider and RCCs (i.e. 101010= Fire on board). TWC Questions, Answers and Messages are exchanged as codes.
- Codes are predefined in « Dataset »

### Initial Questions

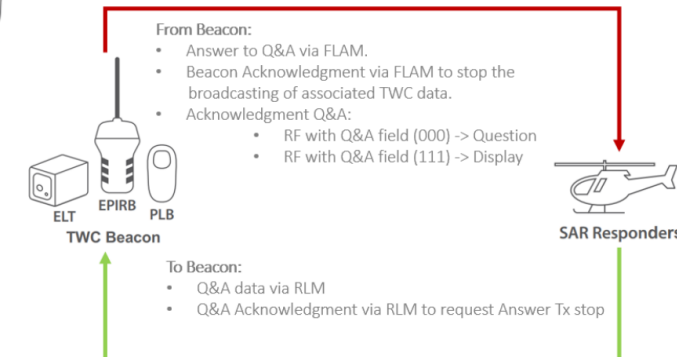
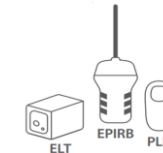
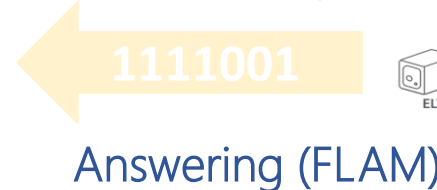
- Hard-coded in the beacon
- Immediate display upon beacon activation
- First information to enable the RCC to launch an adequate incident response

### Follow-on Questions

- Chosen by the RCC operator from a database.
- "Multilingual"
- Sent to the beacon
- Answers to be selected from the beacon by the user in distress

Code	Question
0101001	What is the nature of distress?
1111001	Fire on Board

Initial Questions and Answers	1- Nature of distress?	Man overboard Fire - Explosion Flooding - Sinking Grounding - Beaching Disabled - Adrift Lost people Other
	2- Need for medical assistance?	Yes No or don't know
	3- Number of persons involved?	1 2 3 4 05-oct >10
	4- Functional Survival gear available	Yes No or don't know
	5- Communication or signalisation available	Communication Signalisation Both None or don't know



## TWC – Question/Answer Dataset

**Initial Automatic Questions** (IAQs) have been defined in close cooperation with active SAR and RCC operators, resulting in a no-nonsense approach, like:

- « *how many people do need help?* » (1, 2-4, 5-8, etc ...)
- « *do you need medical assistance?* »
- « *What is the nature of distress?* » (Water/Maritime, Land, Air, Lost, etc ...)

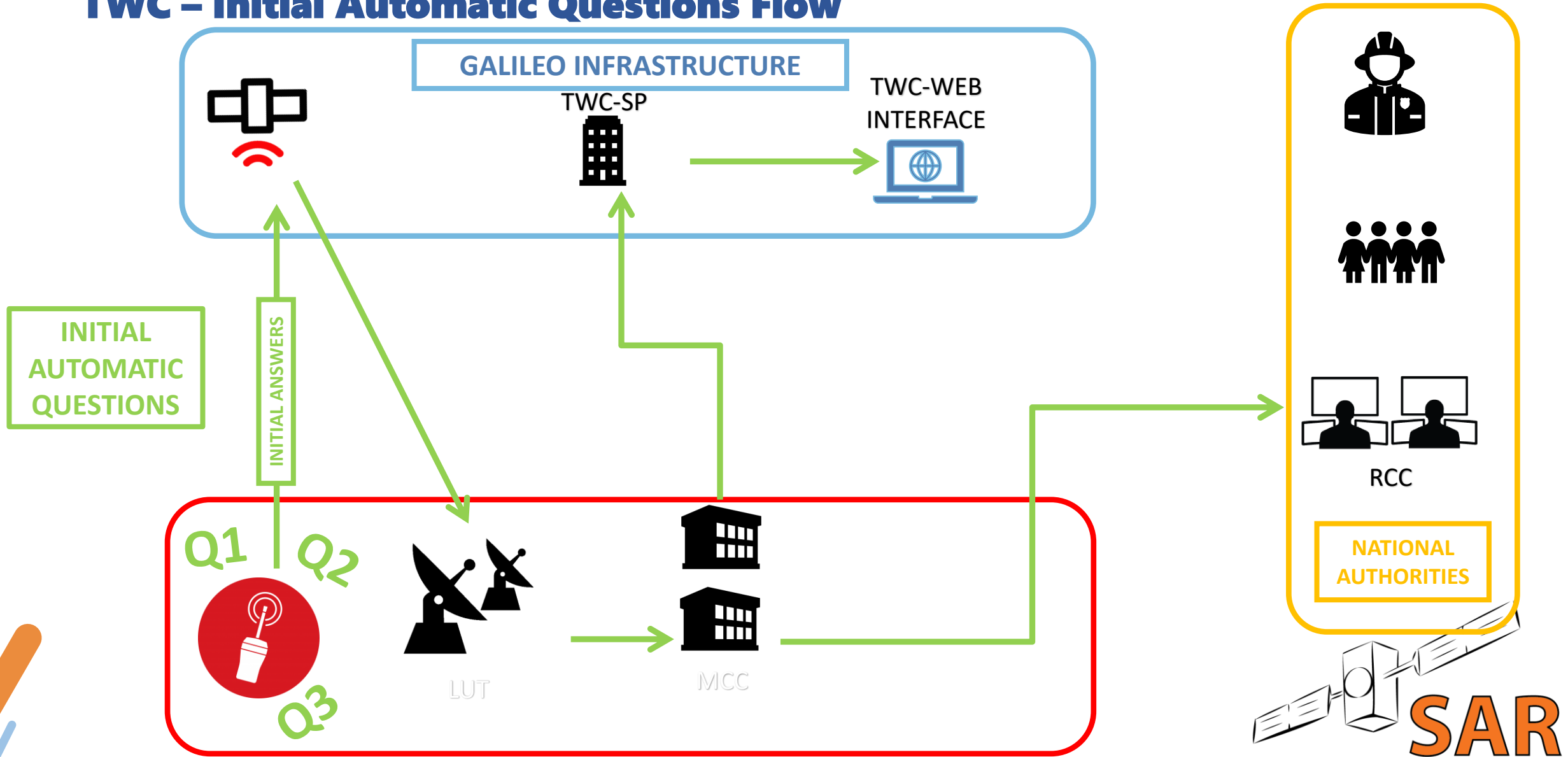
Responses trigger supplementary questions to further detail the distress scenario

**Follow-on Questions** are divided in two main categories:

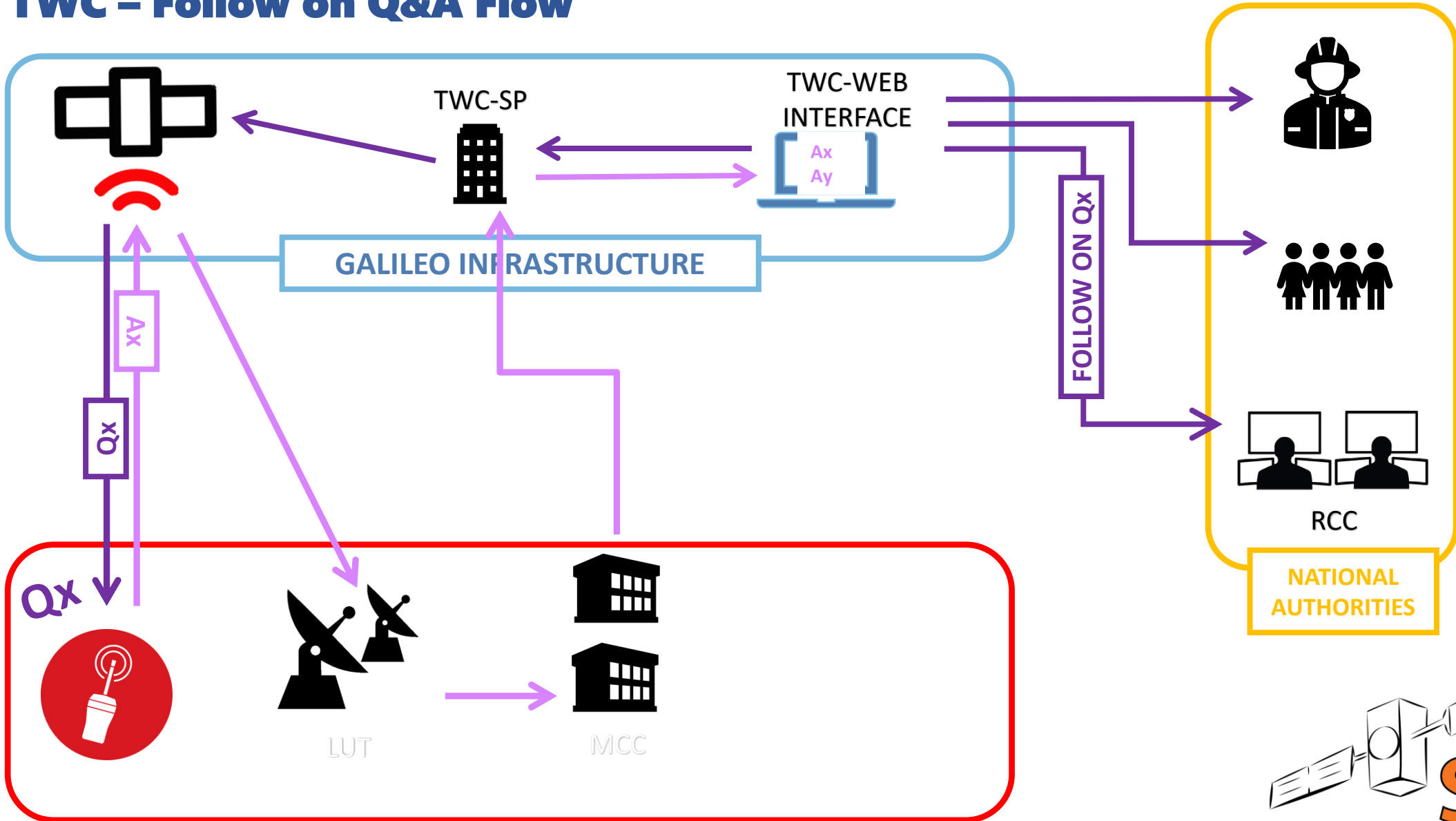
- Question common to all cases (medical condition, equipment & supplies available, etc..)
- *Ex: geographical surroundings (In water (river/sea/lake), Down a cliff/ravine, In a hole/rift, In a plain, In desert, In a tree, In forest/jungle, In snow, In mountain, In high mountains) , ...)*
- Questions specific to the nature of distress (Water/Maritime, Land, Air, Lost, etc ...),
  1. *Ex: « Are there Life Rafts available? » (Yes, Yes and donned, No or don't know)*



# TWC – Initial Automatic Questions Flow



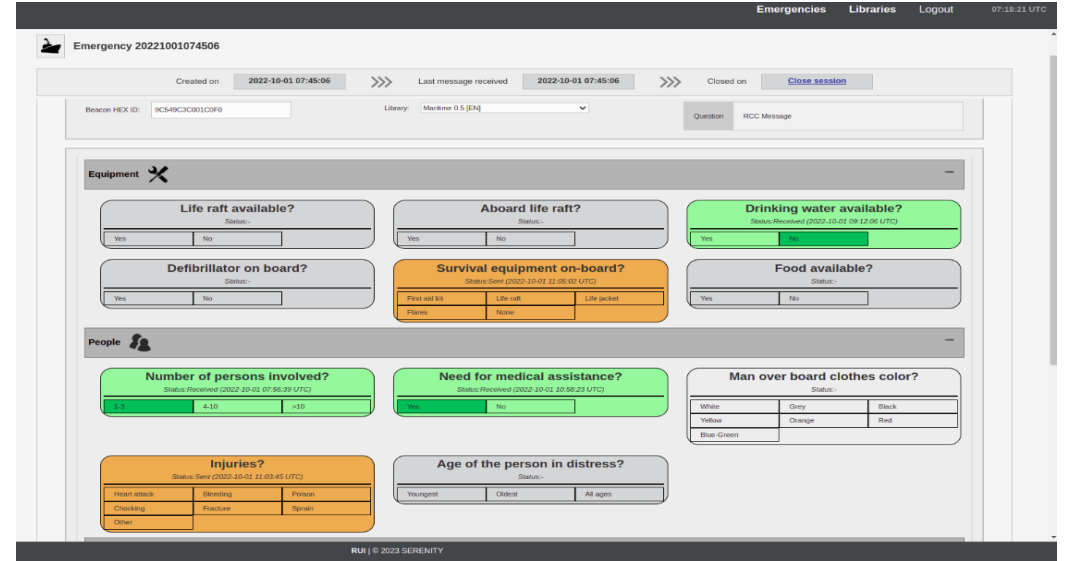
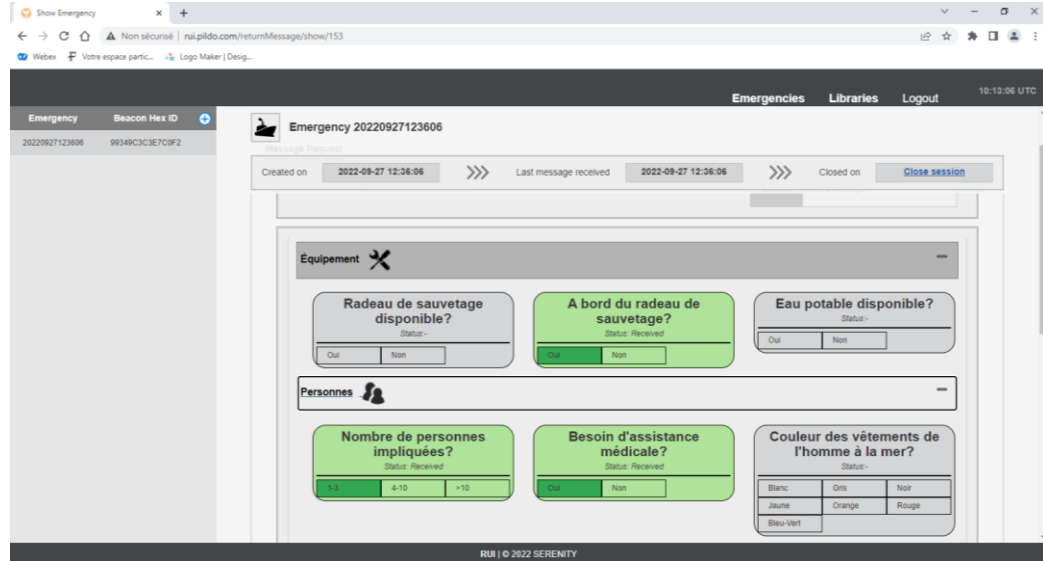
# TWC – Follow on Q&A Flow





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## Two Way Communications Past Demo Phase Results



## TWC – next steps

- Cospas-Sarsat is in the process of releasing
  - *C/S R.025 “COSPAS-SARSAT TWO-WAY COMMUNICATION OPERATIONAL CONCEPT AND HIGH-LEVEL REQUIREMENTS”*
  - *Question/Answer/Instruction dataset* beta release (English version). Translations in other languages may be submitted by countries to C/S for inclusion in the dataset
  - Additional work to be performed to consolidate R.025, and Q/A/I dataset
- The European Commission and EUSPA will launch the TWC Pilot Capability phase early 2025
  - RCC operator interface mock-up for testing and review → Seeking feedback for customization and improvements.
  - Availability of the End-to-End TWC functionality in ‘testing mode’
  - Testing access for beacon manufacturers and SAR operators
  - Mandatory enrolment to EUSPA for participation





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**THANK YOU  
FOR YOUR  
ATTENTION**

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