Advanced Research in Telecommunications Systems (ARTES)

ESA Thematic Information Day

June 25th 2012, BELSPO, Brussels

A. Ginati

European Space Agency (*ESA*)

European Space Agency

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→ TELECOMMUNICATIONS
& INTEGRATED APPLICATIONS
European Space Agency

The ARTES programme today

A balanced combination of Generic Envelope Programme Elements,

- ARTES 1: Preparatory
- ARTES 3-4: Products (HYLAS, AMERHIS) & Commercial Applications
- ARTES 5: Technology
- ARTES 20: Integrated Applications Promotion (IAP)

and Specific Mission/System orientated Programme Elements

- ARTES 8: Alphabus/Alphasat
- ARTES 11: Small GEO platform/mission
- ARTES 7: EDRS
- ARTES 10: Iris
- ARTES 21 SAT-AIS


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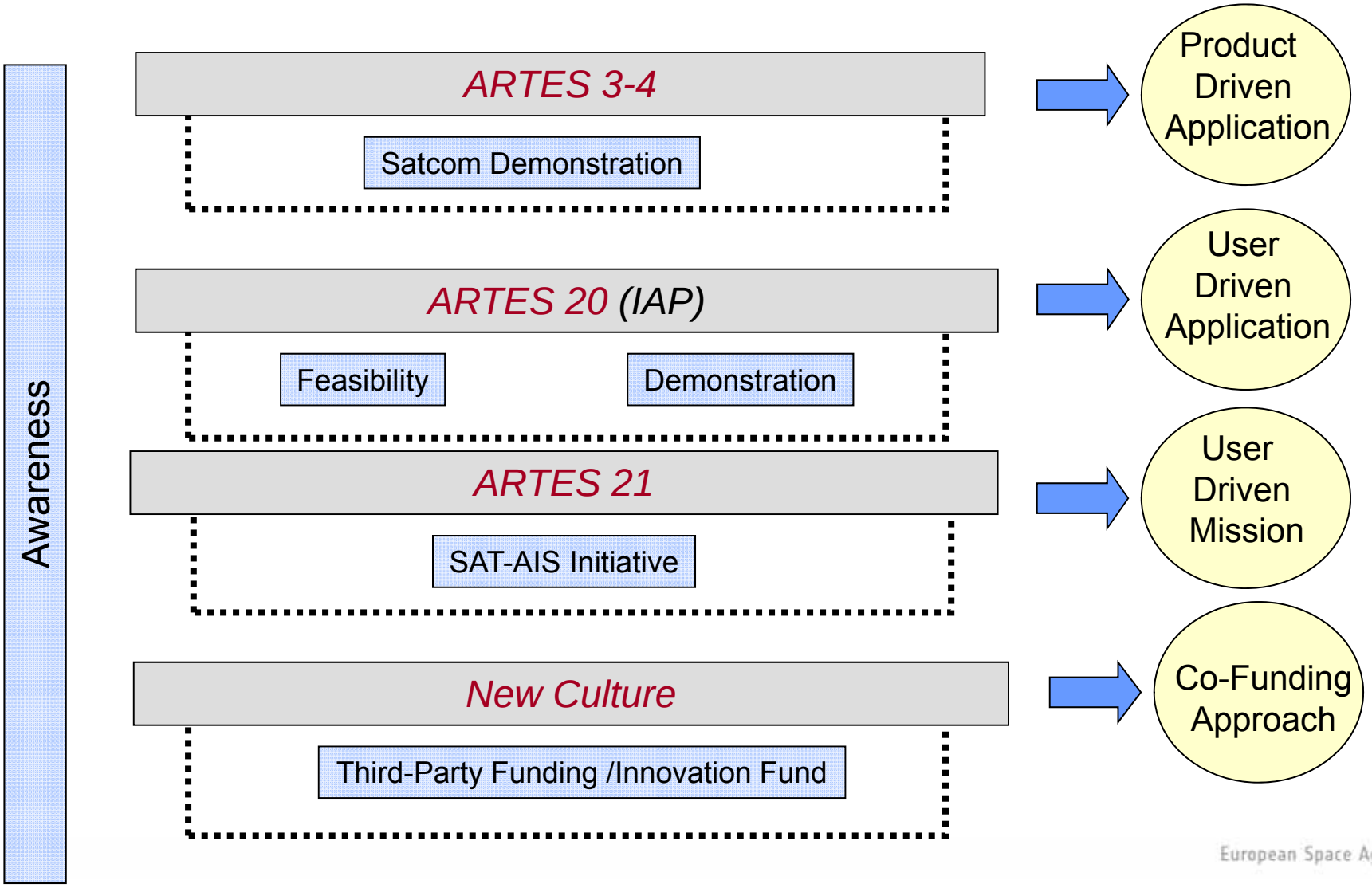
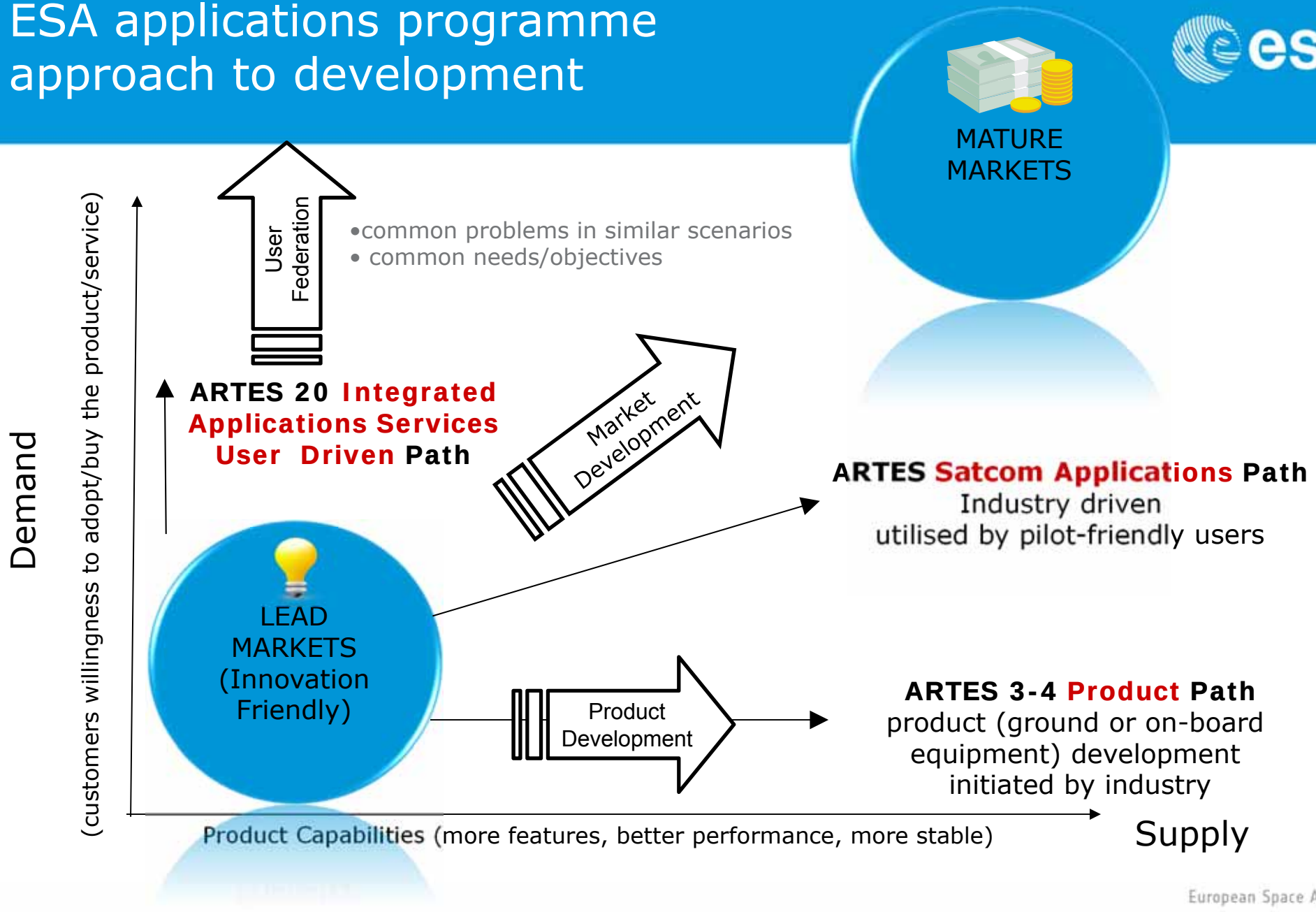
ARTES
Applications
European Space Agency

ARTES Applications & User Driven Missions



ESA applications programme approach to development



Thematic Areas addressed by ARTES Satcom Applications Projects

Telemedicine/ Medical Education

29 Projects
22.7 MEUR (ESA part)

Satcom Networks Systems & Services

37 Projects
31.2 MEUR (ESA part)

B2B / B2C

34 Projects
32.6 MEUR (ESA part)

Location Based Satcom Services

15 Projects
4.3 MEUR (ESA part)

Disaster Relief/ Emergency Management

11 Projects
3.6 MEUR (ESA part)

Community Information Services & Capacity Building

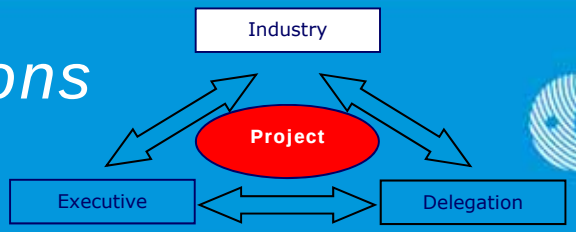
16 Projects
9.3 MEUR (ESA part)

Distance Learning

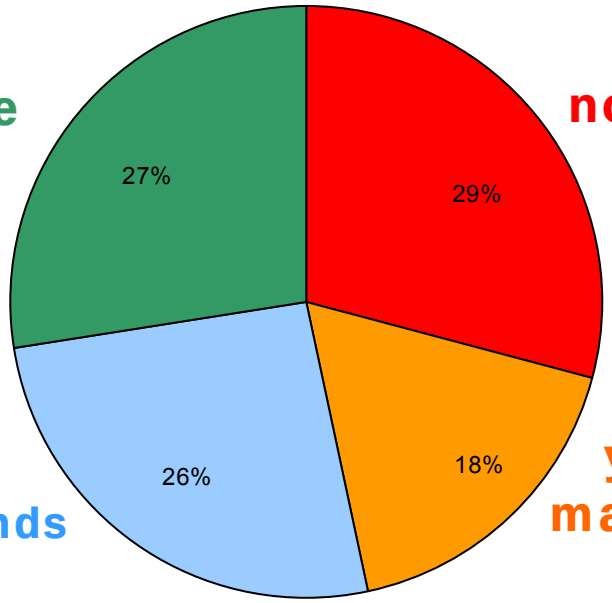
9 Projects
4.2 MEUR (ESA part)

eGovernment

2 Projects
1.9 MEUR (ESA part)



Did the product or service resulting from your project get into the market (i.e. with paying customers)?



yes, with total sales above the internal project fund

no

yes, with total sales not yet recovering project internal funds

yes, offered on the market but no sales yet

2nd Annual ARTES Applications WS, April 19&20th 2012 in Harwell, UK Stimulate and promote also new entrant into ESA

ARTES 3-4 Satcom Applications

In the period 1998-2011, 154 Satcom Applications Projects have been launched in the ARTES 3,4,5,3-4 Programme Elements for a total value of 112 MEUR (part funded by ESA), of which:

66% of the projects contracted to Small and Medium Enterprises

~50% of the projects contracted to new entrant into ESA Telecom

Industry/Users want a quick solution to business needs, which requires a faster process, based on LL and feedback the following elements are implemented:

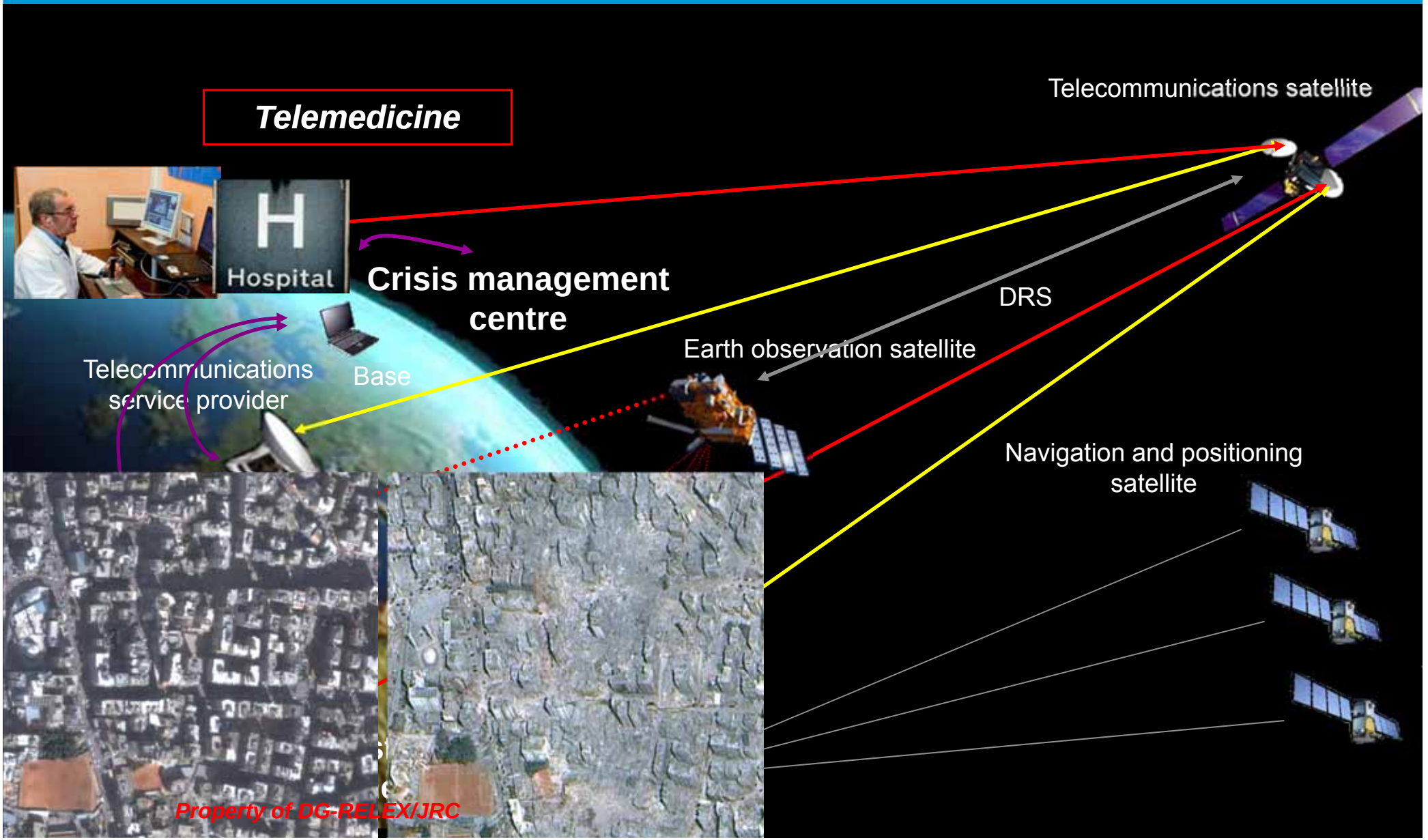
Artes 3-4: in March 2012 the "applications open call" was improved

The goal :

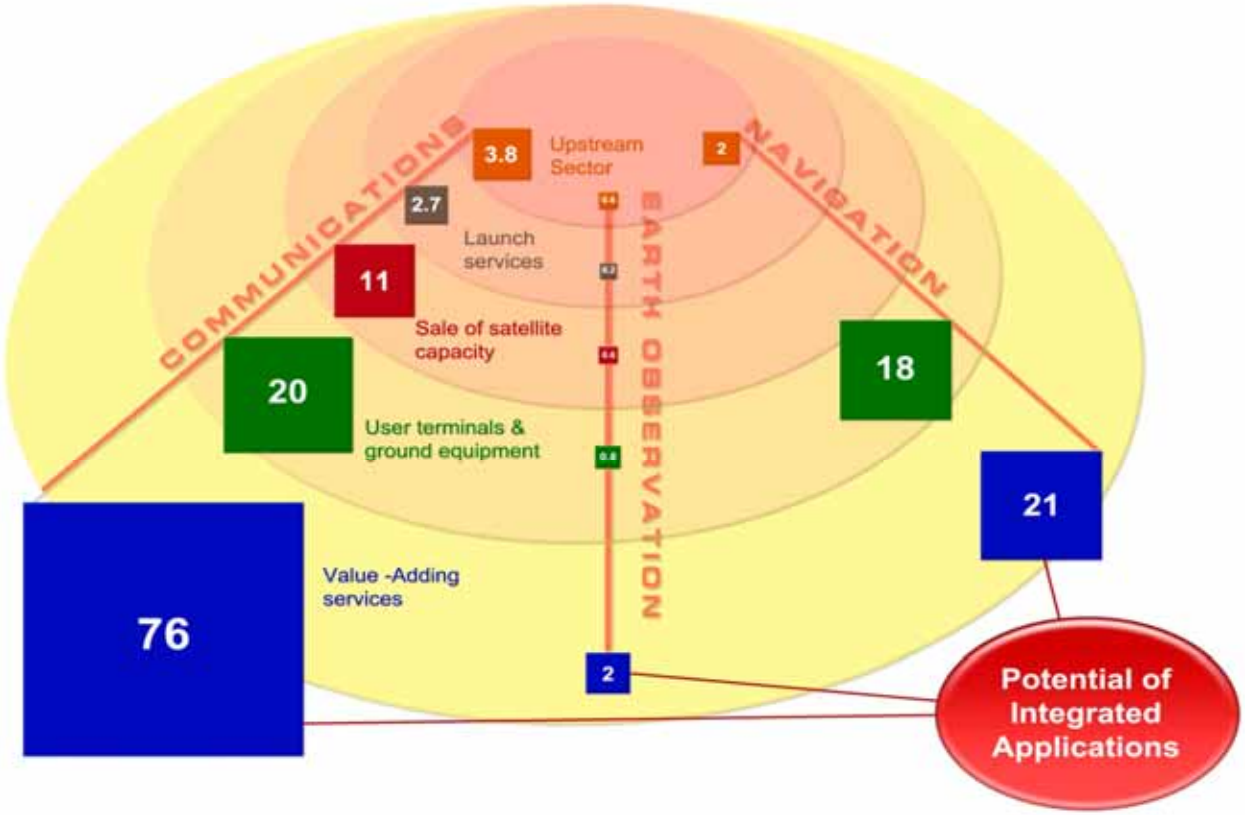
Foster new utilization of existing space capacity and capability, in close partnership with end-users, through the development of integrated (different space and non space technologies) applications projects which demonstrate a potential for sustainable services.

Incubator of Services

Integrated Applications
Example: ”Service-Buy” Model



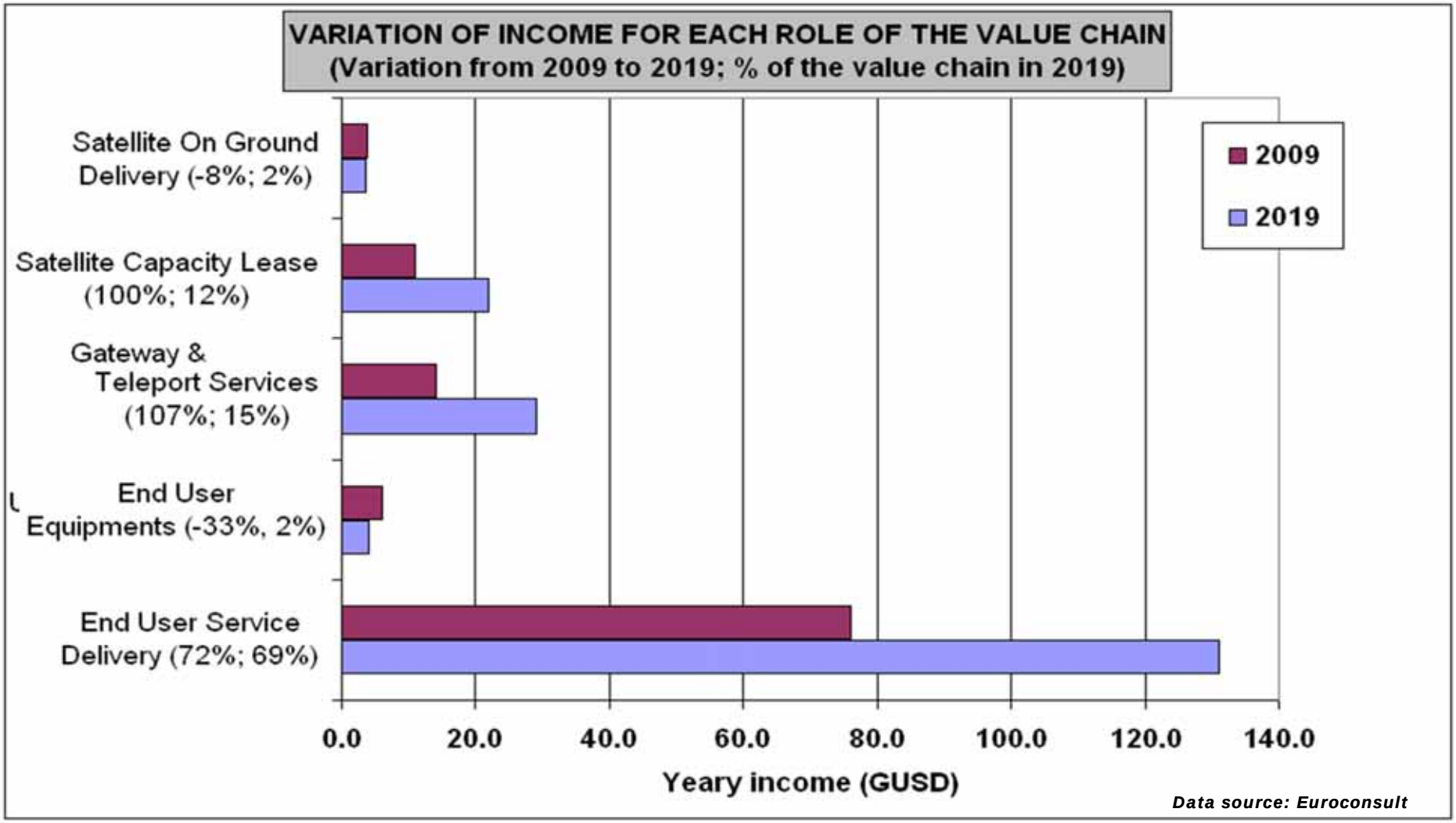
The Three Value Chains in Commercial Satellite Applications Global Space Market Revenue in US$Bn



- **Sat communications are dominant with >75% of the downstream services revenue**
- **Navigation is emerging 21%**
- **EO is currently 2%**

Source: Euroconsult & GSA, 2009/10

2009-2019: Revenues shifting downstream in the value chain



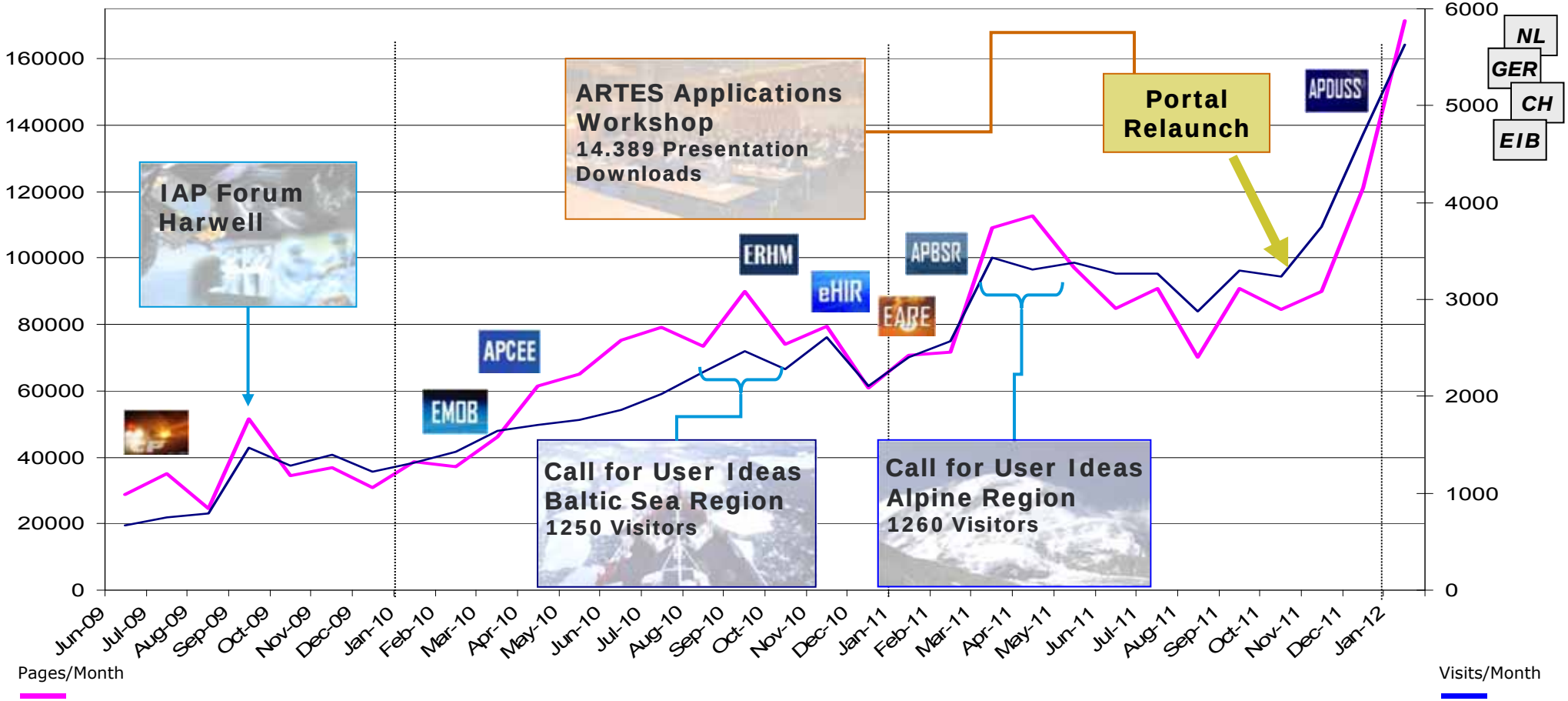
Answer: effective awareness actions are reflected in growth of the IAP Portal

Evolution

User-Interaction

Creating Awareness through Events and Opportunities

Ambassador Platforms & Community Portals



Space Application – ARTES 3-4 and 20
User Driven Missions – ARTES 21

The following activities emanating from:

- **IAP Preparation Phase**
- **IAP WorkPlans: 2009, 10, 11**
- **IAP Demo projects**
- **ARTES 3- 4 Open Call**
- **ARTES 21 SAT-AIS**
- **3rd Party Funding**

Cover wide thematic fields range: ***Space 4:***

- ***Africa, Arctic, Med***
- ***Civil Protection/Crisis Management***
- ***Development, Knowledge***
- ***Maritime, Fisheries***
- ***Health, Agriculture***
- ***Capacity building***
- ***Consumer***
- **Safety, Security**
- ***Transport***
- ***Energy***

Climate → Energy, Health …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Operational
Services
European Space Agency

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integrated & telecommunications applications

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Integrated Applications Portal

Dedicated to customized solutions

IAP Demonstration Projects (On-Going / Under Preparation)

Highlight

Successful user involvement / partnership

Users / stakeholders from different areas are actively involved and co-funding the demonstration project.

[-] News & Events

ENERGY

space grid

Value-added Services to improve grid management

Terna

HEALTH

T4MOD

Telemedicine for Medical Operations in Distant Areas

TRANSPORT / SAFETY

SBAS

Integrated Services supporting small and regional airports in air traffic management

slamair

ENAV

ENAC

HEALTH

VECMAP

Services supporting disease vector mapping

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[-] News & Events

SAFETY

NG-RMP (Recognised Maritime Picture for Irish Naval Service)

Integration of NG-RMP services into the Irish Naval infrastructure

SAFETY

FAAPS – Fully Automated Aqua Processing Service

NRT flood monitoring services

Das Land Steiermark

ENERGY

INTOGENER

Decision-support services for hydro-power management

endesa

endesa chile

TRANSPORT / SAFETY

SEMAFORS

Ship Efficiency Monitoring, Weather Forecasting and Optimise Routing Service

Port of Rotterdam

TRANSPORT / SAFETY

3InSat

Services improving train management systems

RFI RETE FERROVIARIA ITALIANA

GRUPPO FERROVIE DELLO STATO ITALIANE

SAFETY / SECURITY

Land Border Control

Border surveillance services supported by means of space technology

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SAT-AIS Demonstration Projects

Highlight

ESA – EMSA Partnership on European SAT-AIS initiative

This agreement led not only to create demonstration projects, it also allowed the creation of new *SAT-AIS / ARTES 21 Pogramme line*

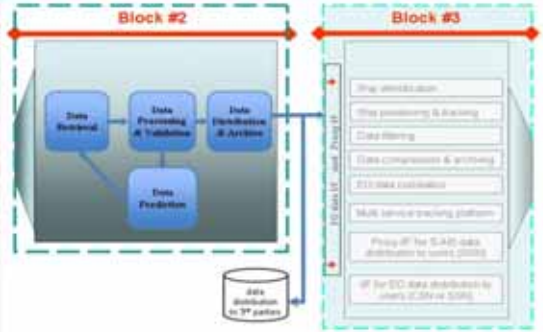
[-] News & Events

TRANSPORT / SAFETY

SAT-AIS Data Processing Centre Demonstrator

Development, integration, testing and validation of the SAT-AIS mission Data Processing Centre, providing services to the maritime user community

EMSA

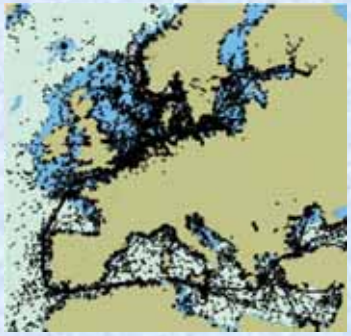


TRANSPORT / SAFETY

BLUE-BELT

Demonstration of the Satellite-based AIS service provision as a complement and back-up for the terrestrial AIS network. Part of the EMSA SSN Pilot Project

EMSA



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Pre-Operational Services

Highlight

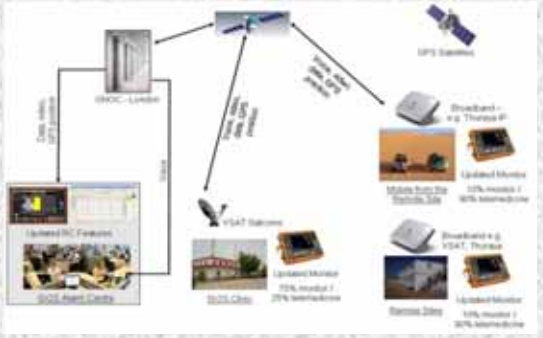
Pre-operational services correspond to projects that have achieved enough maturity with commercial partners

[-] News & Events

HEALTH / SAFETY

AMAZON

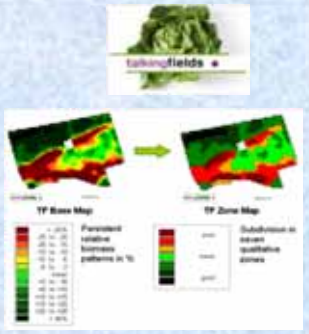
Real-Time satellite-based telemedicine service for professional clinical users in remote locations, particularly inside planes



TRANSPORT / SAFETY

TalkingFields

Comprehensive precision farming services supporting farmers, providing recommendations for planning, conducting and documenting farming measures.



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Highlight

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[-] News & Events

AGRICULTURE

GrapeLook

Support to Water Irrigation Management in South Africa by means of space assets

Water Watch

UNIVERSITY OF KWAZULU-NATAL

INYUVESI YAKWAZULU-NATALI

DEPARTMENT of AGRICULTURE

Provincial Government of the Western Cape

REFERENCE: Real-time web application

ENQUIRIES: A S Roux

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ATCOM APPS

SAT-AIS

IAP

Operational Services

Highlight

Success of ESA and IAP

These services are self-sustainable; continuation without further ESA involvement

[-] News & Events

SAFETY

IAEA Nuclear Safeguard Network

Definition of a pilot set of services connecting IAEA HQ with nuclear facilities in 3 countries for inspection purposes.

IAEA International Atomic Energy Agency

Network expansion

IAEA expands these services to cover additional 8 sites/countries

SAFETY

FlySafe

Services comprising space & terrestrial assets generating bird warning notifications to improve flight safety in North-West Europe

ARMÉE DE L'AIR

Bundeswehr

ESA established operational and sustainable services in NW Europe

ROBIN: successful Start up company established with large record of contacts

FlySafe-2, RLNAF, BAF announced in April 2011 follow-on to expand the coverage area.

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3rd Party Funded Activities

Highlight

IAP attracts the interest of a number of funding institutions

The potential of space-based technologies to provide applications and services bringing societal benefits to vast regions of the world is enormous.

[-] News & Events

HEALTH / SPACE FOR AFRICA

SAHEL – Satellite African eHEalth vaLidation

Services comprising space & terrestrial assets generating bird warning notifications to improve flight safety in North-West Europe

European Commission
Development and Cooperation

ESA is the implementing Agency

An example of recognition of ESA capability in establishing complex, interdisciplinary and international projects

HEALTH / SPACE FOR AFRICA

eHSA – Satellite-Enhnaced Telemedicine and eHealth Services for Sub-Saharan Africa

Development of a satellite-enhanced eHealth infrastructure for the benefit of sub-Saharan Africa

GRAND-DUCHY OF LUXEMBOURG
Ministry of Foreign Affairs
Development Cooperation Directorate

eHSA

Further Opportunities

Thanks to this cooperation, ESA and EIB are exploring the possibility to extend cooperation by means of the
"Space for Mediterranean"

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3rd Party Funded Activities

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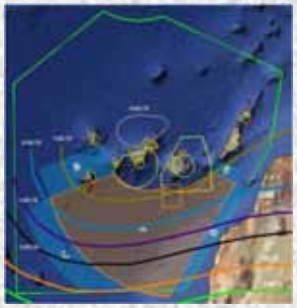
[-] News & Events

UAS Demonstration Project

SAFETY

Support to the operation of UAS in the provision of services in non-segregated space

EDA



NEW OPPORTUNITIES

MT INNOVATION FUND

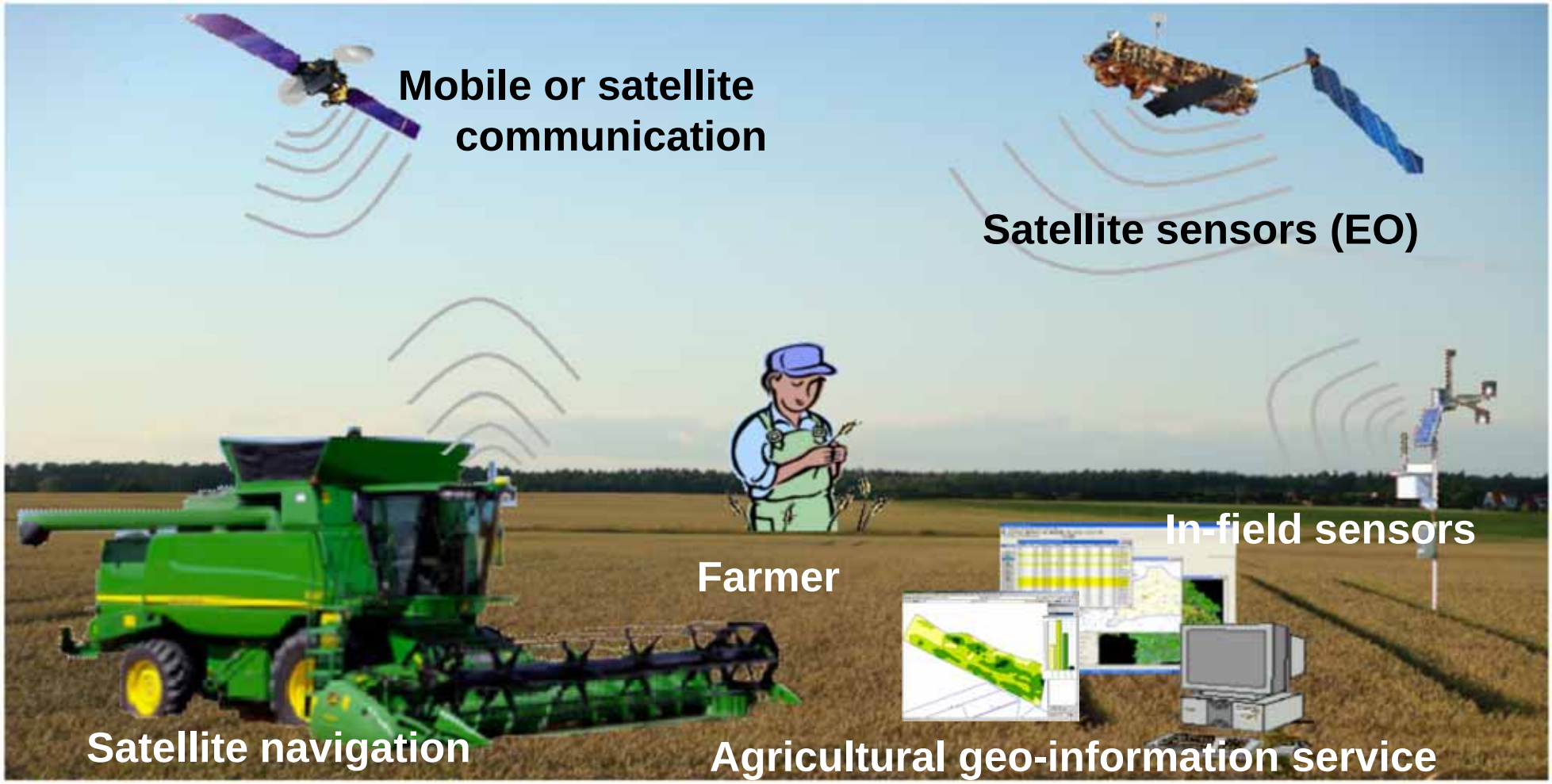
Support for candidate space and non-space industry players who might have an interest to extend their business with additional promising products and services, but they lack of financial capability

MT AEROSPACE An OHB Company | Bayerische Staatsregierung | DLR

Innovative Mechanisms

IAP is developing a new culture to support a wide spectrum of communities and thematic areas

Talkingfields main functional elements



TalkingFields services

Service name	Service description
1) Service for improved soil mapping	Information about soil heterogeneity for cost-beneficial GPS-based selective sampling for soil mapping
2) Service for economic evaluation	Evaluation whether site-specific fertilization is economic for the farmer's fields and provision of management zones
3) Service for plant protection measures	Information about biomass and density as an indicator for crop disease risk; decision support and application map for site-specific plant protection measures;
4) Service for yield estimation	Yield estimation 2-4 weeks before harvest

Current Status of Processing and Orders

Integrated Satellite-Based IAEA Safeguard Services

IAP- Multi-Satellite Network

Chernobyl

the issue

- Every year between 700-1000 people died during long duration flights (>6 h) due to medical reasons
- Each day 1- 1.5 planes are landing in emergency conditions for medical reasons the statistic data on these landings showed that 45% can be avoided if a single electrocardiogram could be transmitted from the plane to an emergency medical department in an hospital;
- The cost of such re-routings is about 80K€.
- Increase flights duration, A380, 15 hours non stop
- Increase number of passengers will increase with the new capacities of the planes

AMAZON, Management of Medical Emergency for commercial aviation (BMI, Lufthansa…)

Birds and Flight Safety

GAF (1997-2004): 360 collisions strikes/year
FAF (1998-2005): 320 collisions strikes/year
RAF(<2004): 110 documented serious accidents

Estimated conservative cost due to damage and delays of commercial aircraft worldwide 1.2 billion USD per year

Birds and Flight Safety

July 15 1996 a Belgian C-130 crashed at Eindhoven Air Base due to a bird strike. 34 people were killed and 7 people were seriously injured.

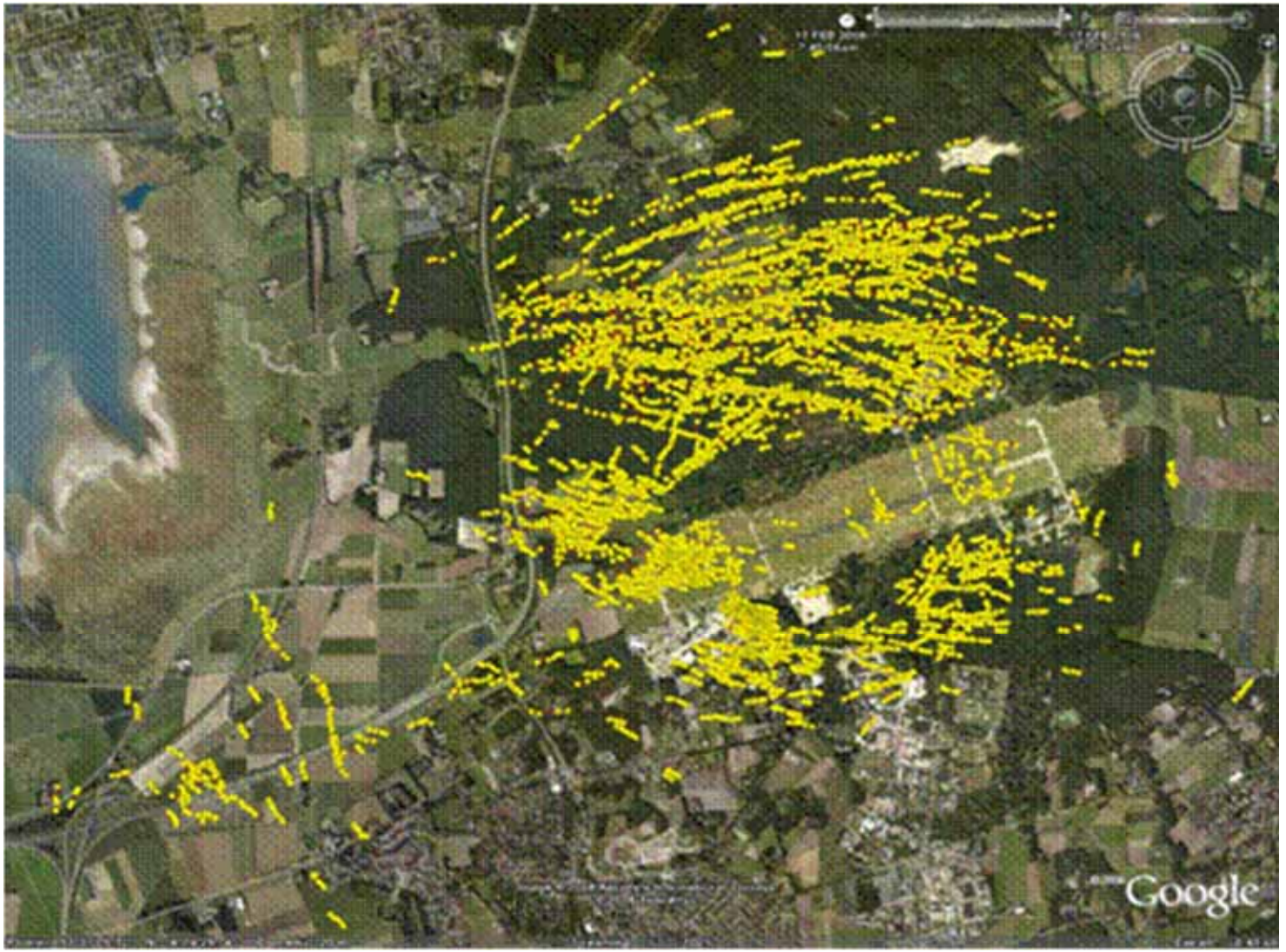
FlySafe Intermediate Results

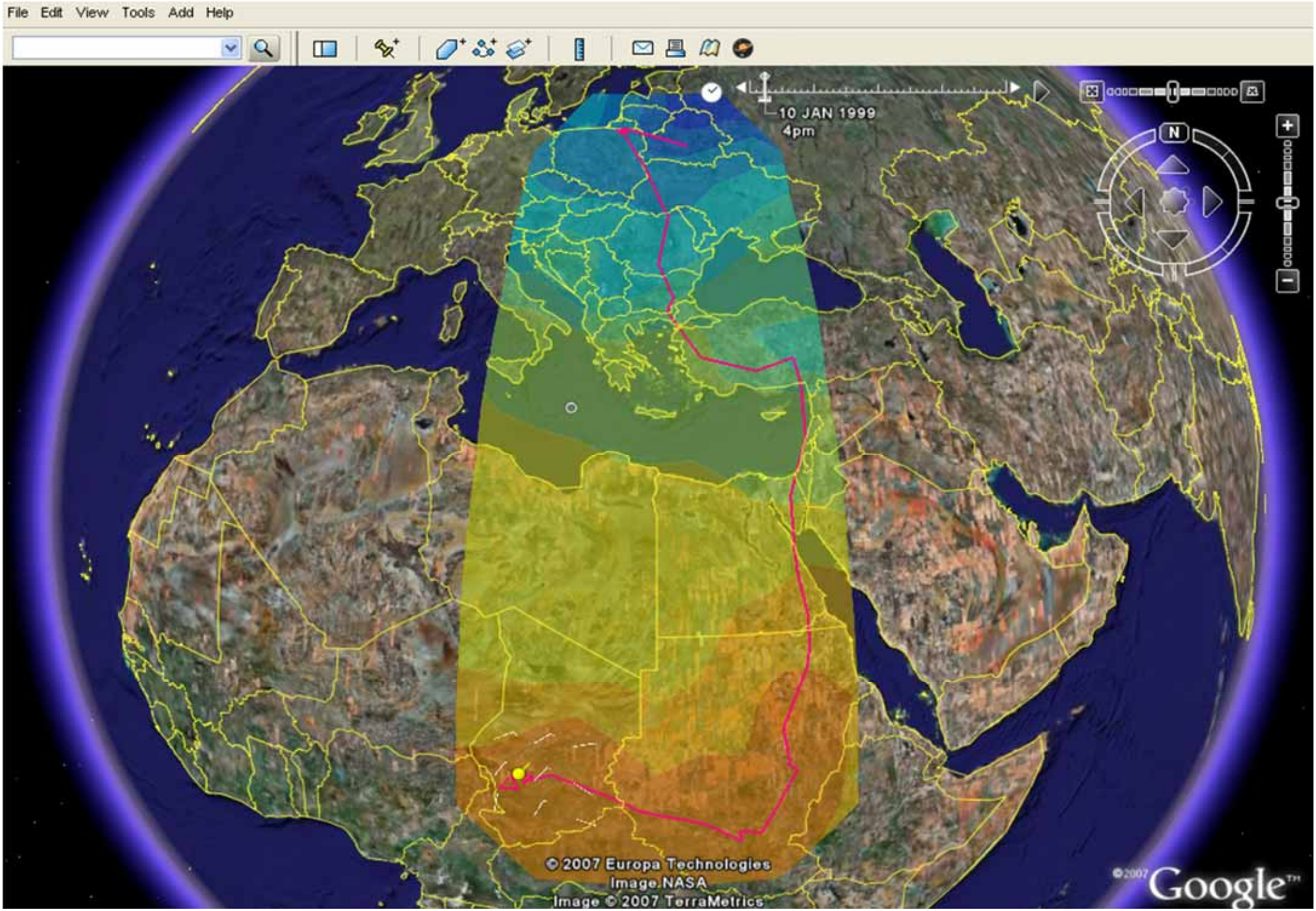
"It's just to let you all know that FlySafe is really able to do spectacular things"

Example: Gulls movement Woensdrecht Airbase, NL

Night of Feb.20th 2008

(photo RNLAF).

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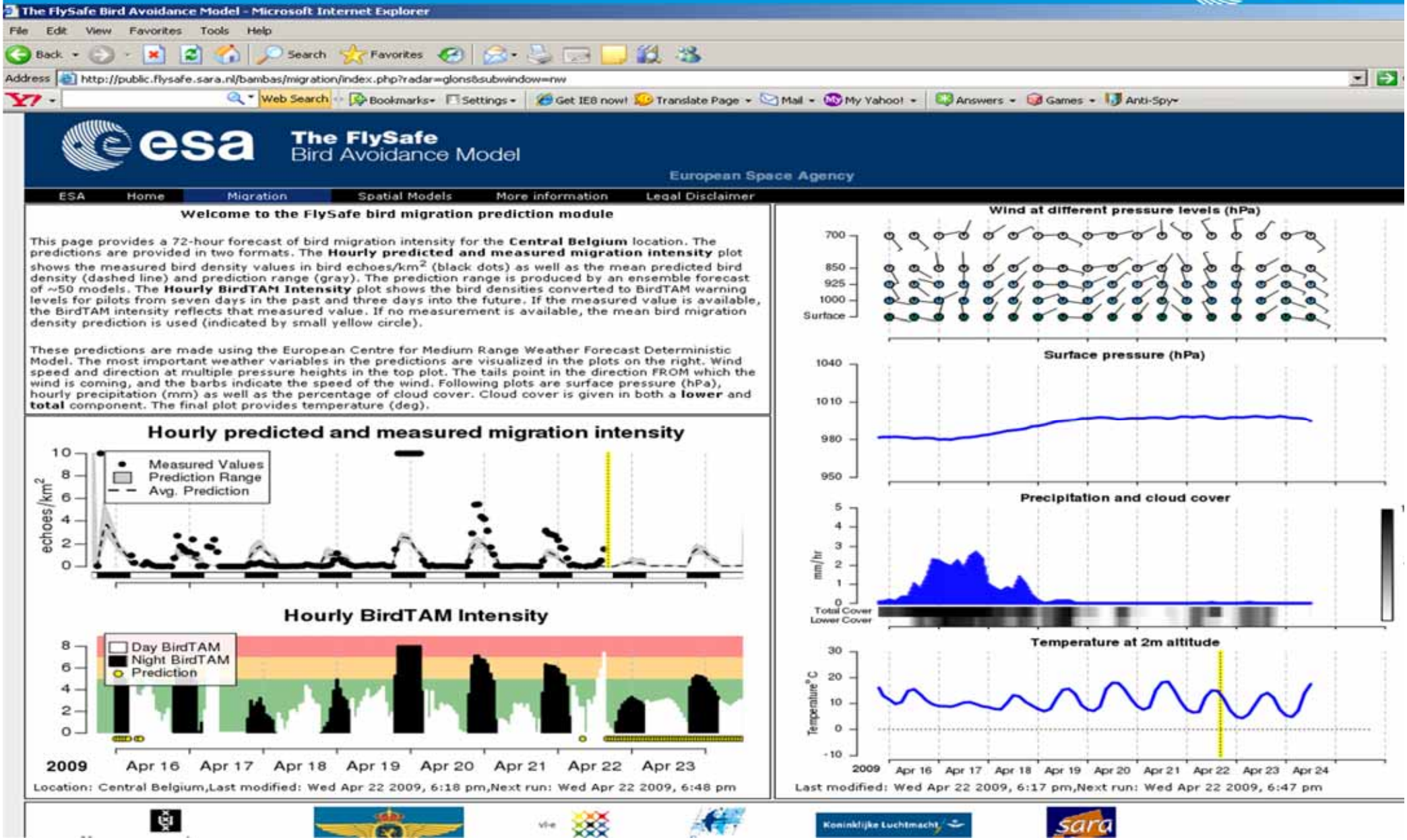


Hudson river (New York – 15/01/09)

Hudson River

Hudson river (New York – 15/01/09) (simulation)

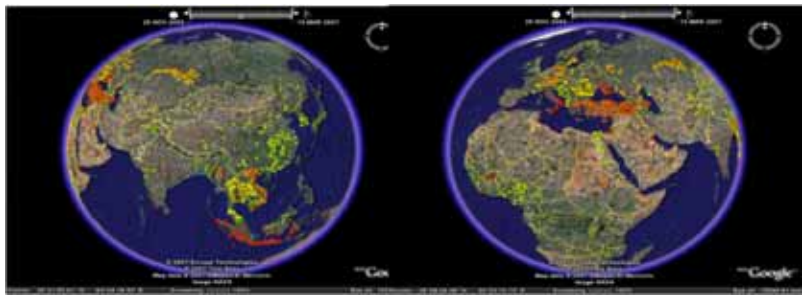
Improvements Needed for the Local Situation Anticipation of Birds Crossing the Airport

FlySafe, Spin-off Applications

Birds and Energy

Birds and Agriculture

- Birds and Health



Avian Influenza H5N1 outbreaks

Source: Declan Butler http://declanbutler.info/blog/?p=58

FlySafe project activities

Trial of on-airfield avian radar (ROBIN Lite)

- prevention of local bird strikes
- 2 D radar on 1 airbase

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LA DÉFENSE

VOORRANG AAN VREDE
PRIORITÉ À LA PAIX

FlySafe project use and operational impact for Belgian Air Force flying activity

Serge Sorbi (BAF)

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Belgian Air Force

Birdstrike prevention “en route”

- **Giving information to pilots so that they can avoid high bird density zone.**

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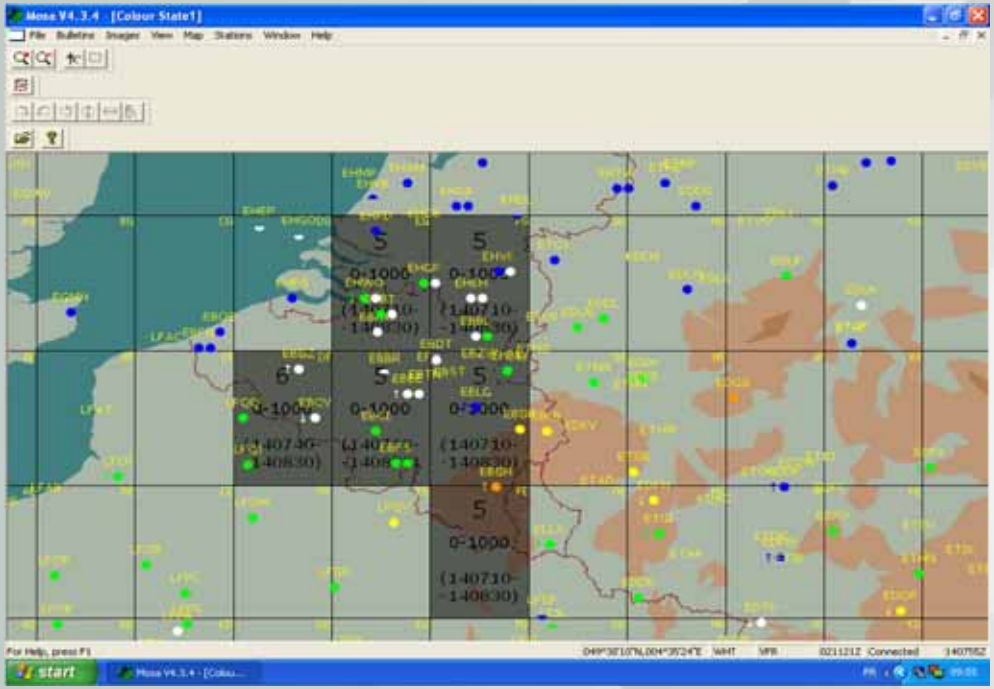
PRIORITÉ À LA PAIX

BIRDTAM

- **Information is transmitted by specific message : BIRDTAM**

- **BIRDTAM also broadcasted via the pilot's meteorological support software.**



- Georef square
- Bird Intensity
- Altitude
- Validity period

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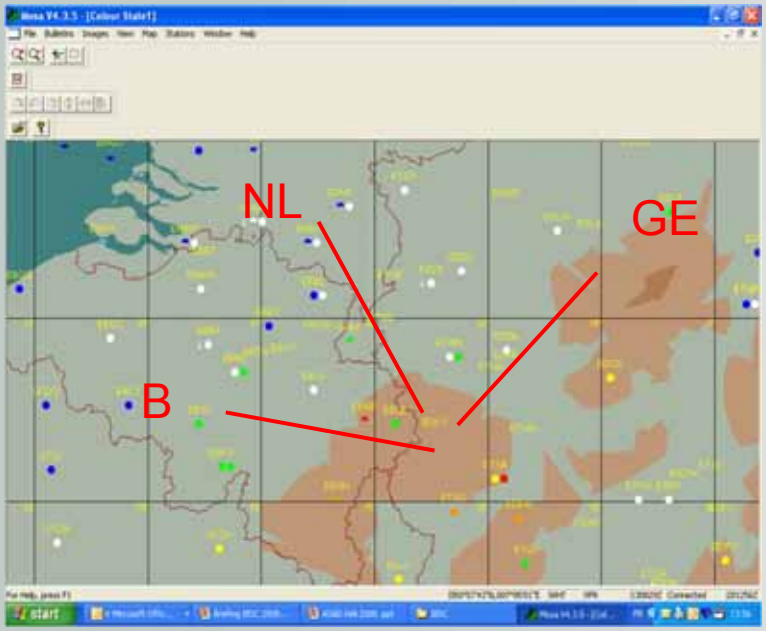
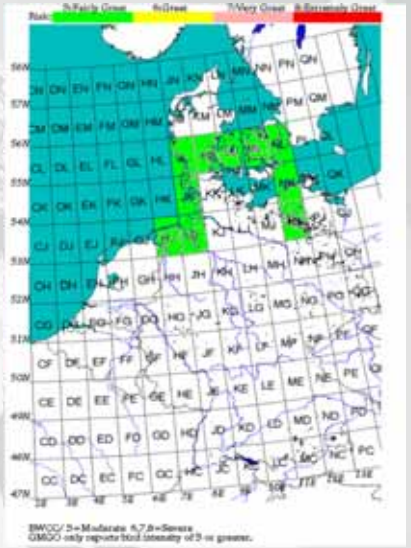
FlySafe project improvement

- **Necessity of harmonization of BIRDTAM broadcasted by different countries for a common georef square.**



International NOTAM
Database
Traben trarbach



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PRIORITÉ À LA PAIX

BIRDTAM impact on flying operations

- Due to BIRDTAM, the flying operations can be limited (BIRDTAM ≥ 5) or even totally cancelled (BIRDTAM = 8).

- It has a direct operational impact on the flying program and can have a financial impact for BAF

- during bird migration period.
- during night flight period.

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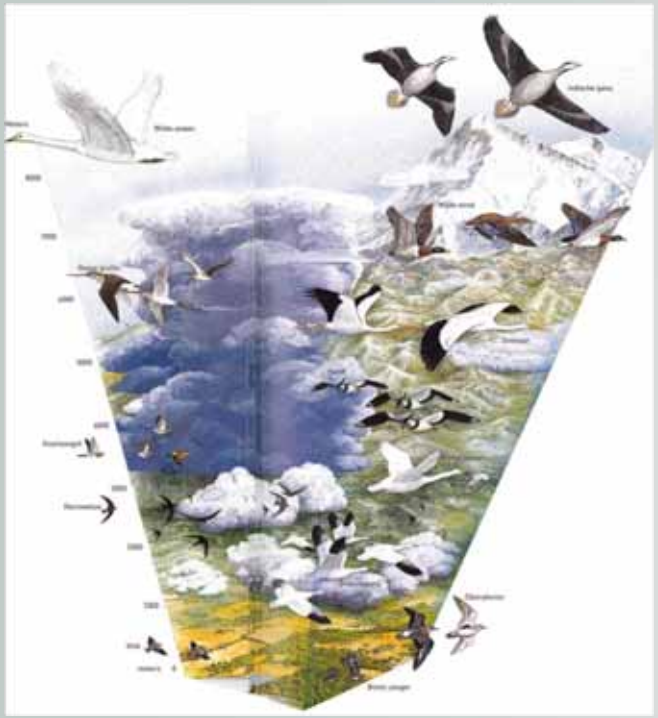
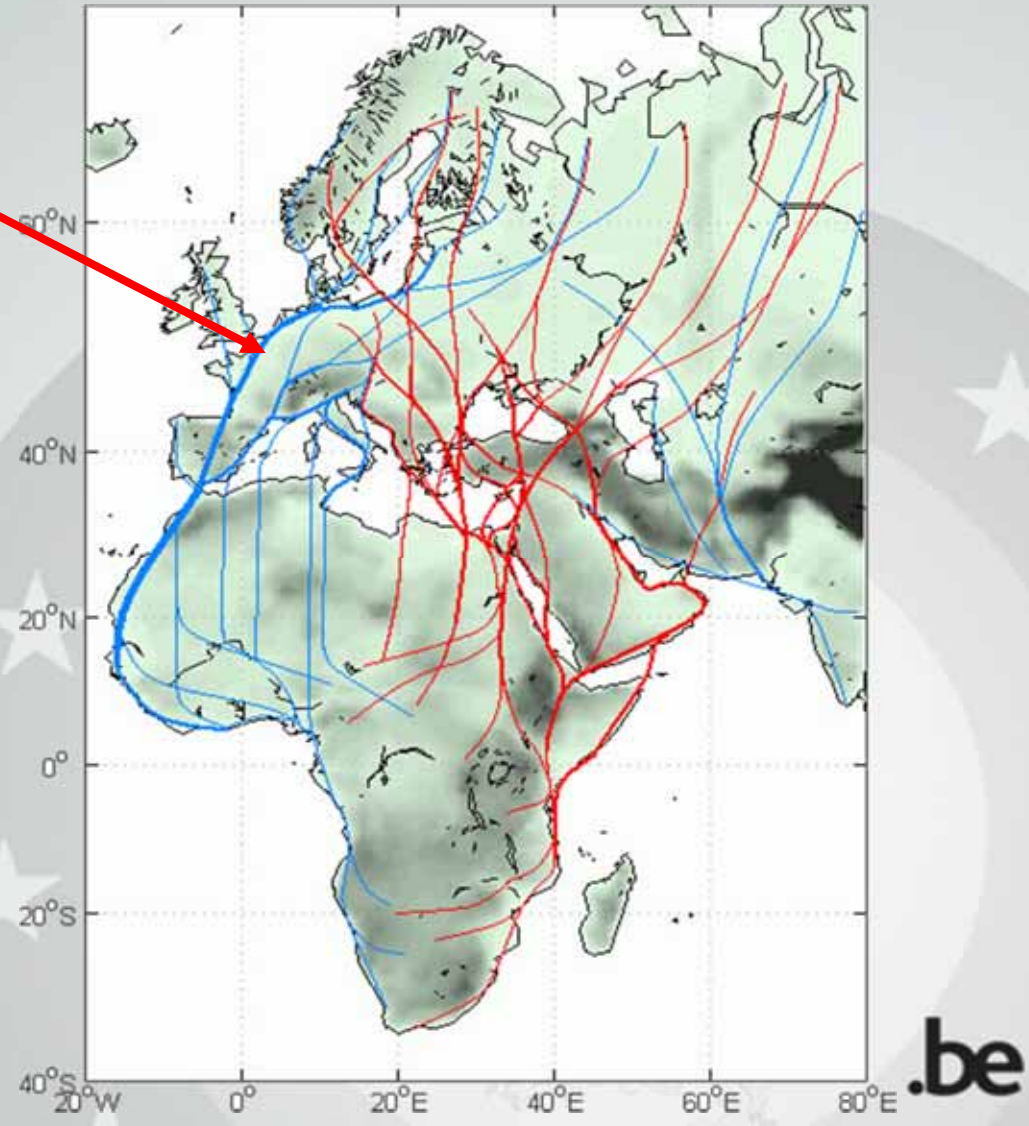
Bird migration above Belgium





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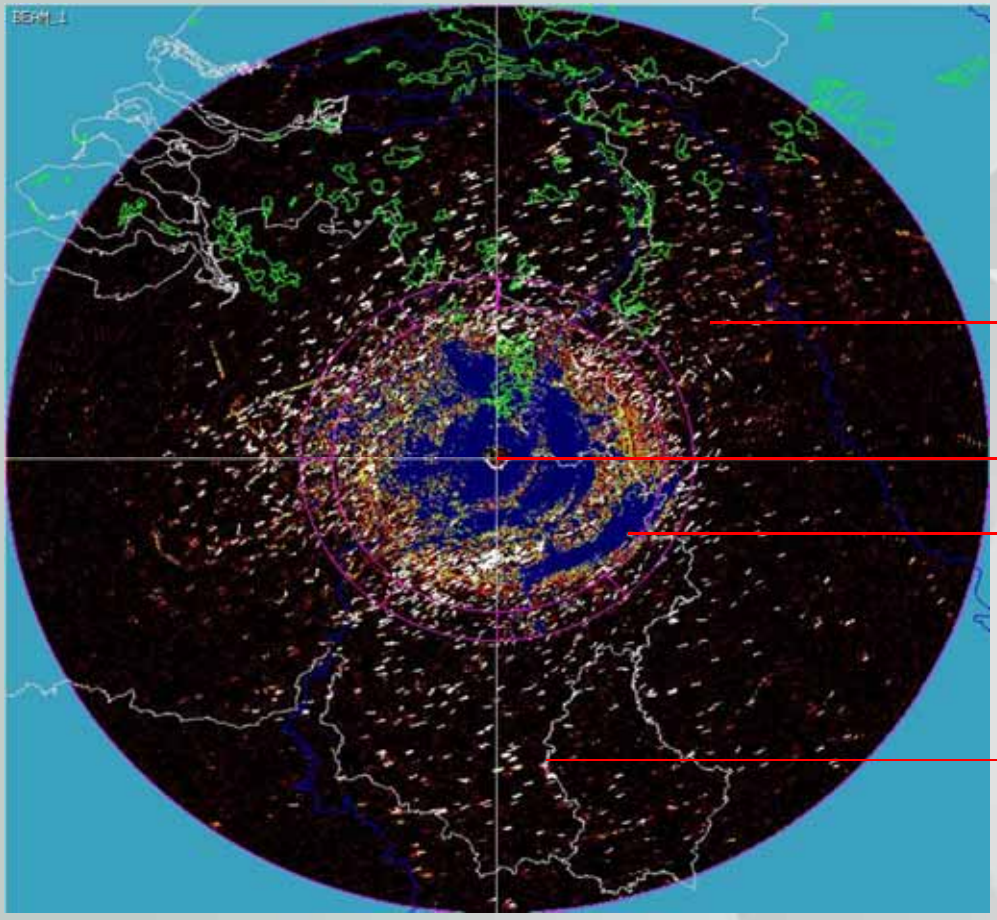
Bird migration above Belgium

MPR radar = Robin picture (100 sec)



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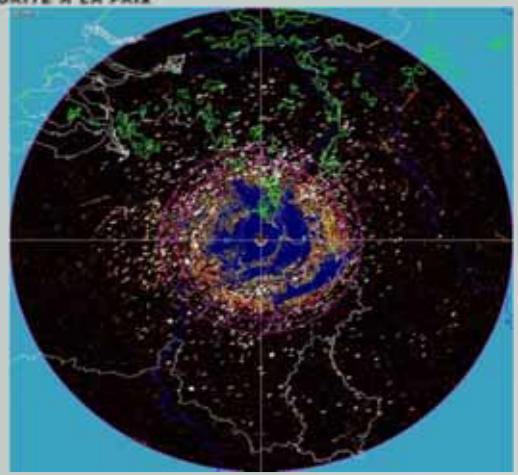
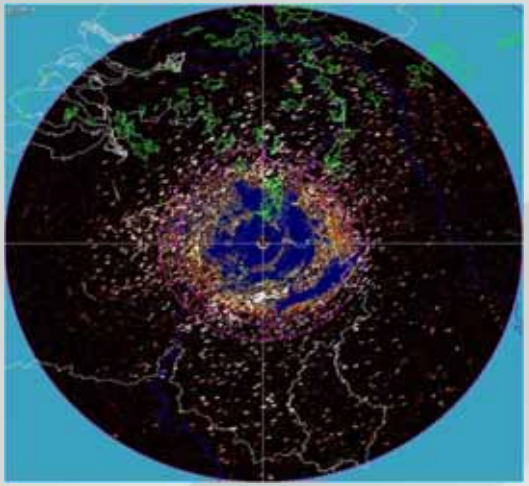
Bird migration above Belgium



08 march 2011 – 1625z



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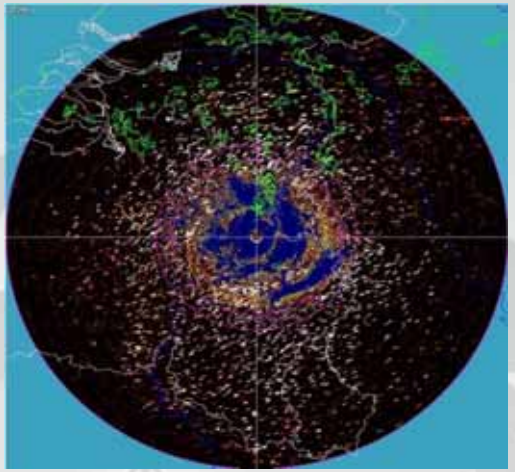

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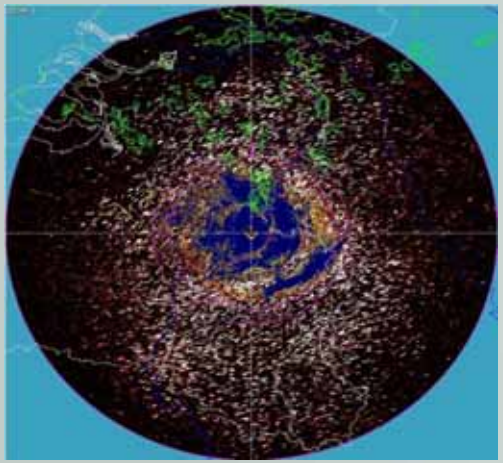

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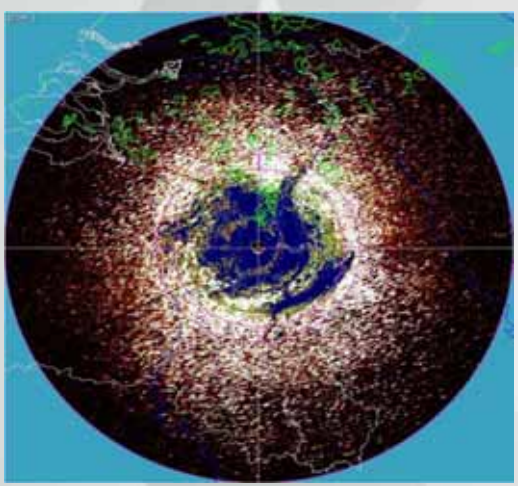
DUSK



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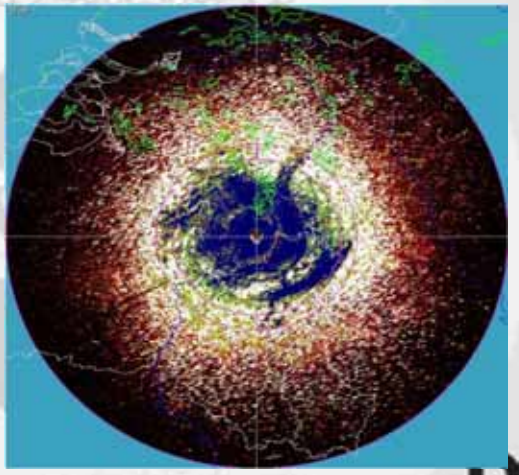


08 march 2011 – 1855z

DEFENSIE
LA DÉFENSE

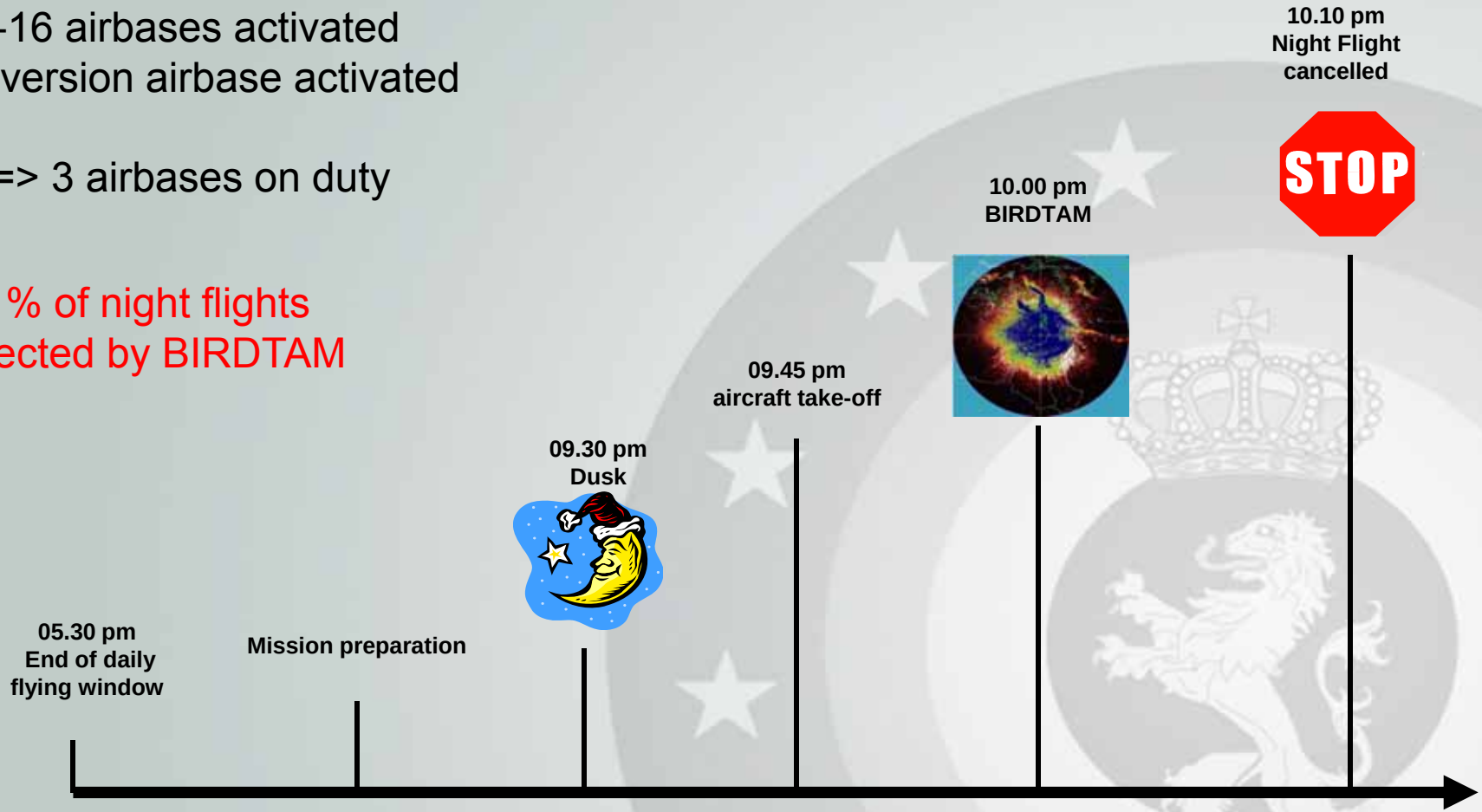
VOORRANG AAN VREDE
PRIORITÉ À LA PAIX

Impact of bird migration on F-16 night flight operation

2 F-16 airbases activated
1 diversion airbase activated

=> 3 airbases on duty

30 % of night flights affected by BIRDTAM



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DEFENSIE
LA DÉFENSE

VOORRANG AAN VREDE
PRIORITÉ À LA PAIX

Impact of lack of forecast in case of night flights cancellation.

Services on duty : Stand-by for nothing !

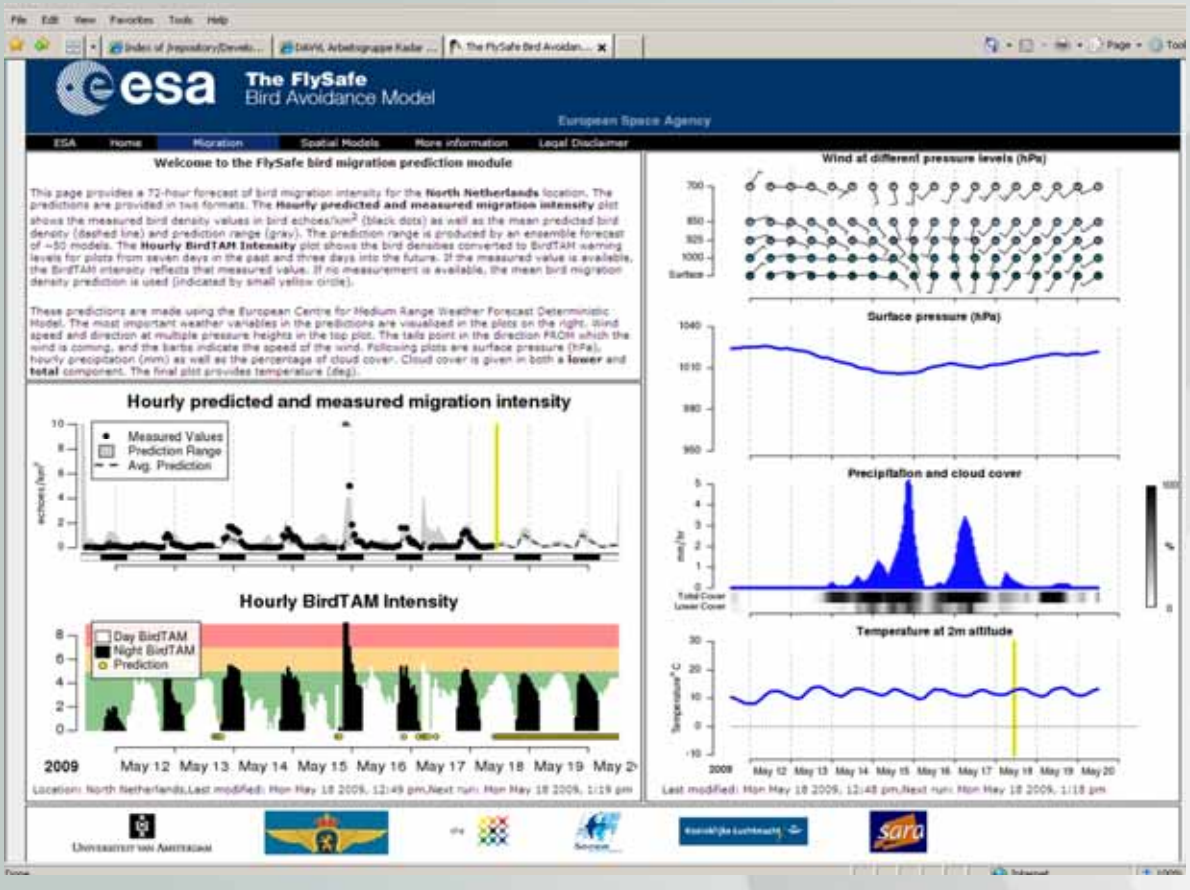
Flight planning disturbed, time & money lost

.be

DEFENSIE
LA DÉFENSE

VOORRANG AAN VREDE
PRIORITÉ À LA PAIX

BIRDTAM forecast
« For AF's, a way to save money »

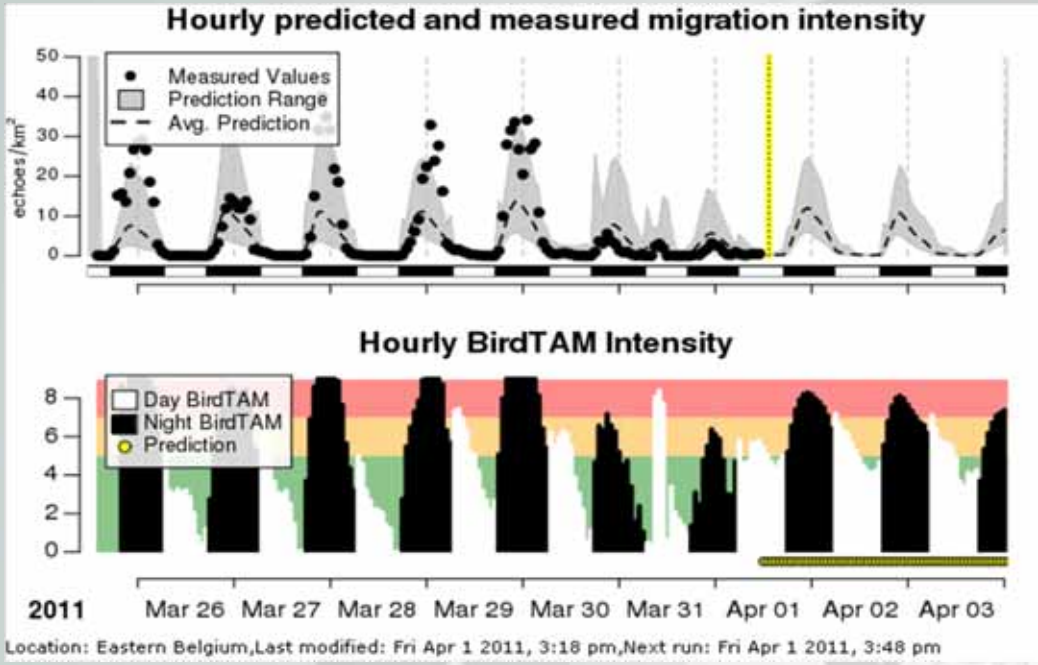


- **Better planning of flying activity.**
- **In case of BIRDTAM 8 forecast : cancellation of night flights**
- **48 hrs forward**

.be

BIRDTAM forecast
« For AF's, a way to save money »

- **Belgian BIRDTAM forecast developed in the framework of the FlySafe Project**



- **Better flight planning, better time and human resources management => money saved**

SAT-AIS

EUROPEAN INITIATIVE FOR SATELLITE BASED AIS

User Driven Mission

Joint EMSA / ESA Initiative

European Space Agency

AIS Introduction

What is the Automatic Identification System ?

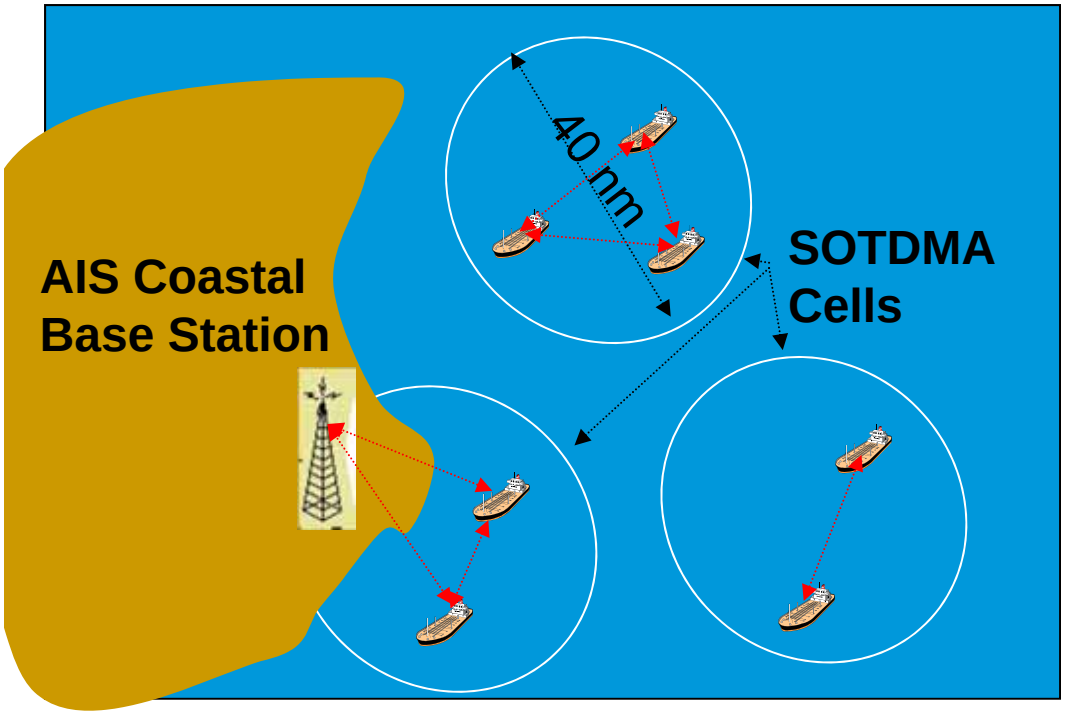
- is a short range coastal tracking system used on ships
- developed to provide identification and location information to vessels and shore stations with the aim of exchanging different types of data including position, identification, course, speed and others
- allows vessels to anticipate and thus avoid collisions at sea by means of continuous traffic monitoring
- additionally it offers important ship monitoring services to coastal guards as well as search and rescue organizations.

Sources: Law Offices of Countryman & McDaniel/CargoLaw.com, International Salvage Union, 2003

What is AIS?

- The Automatic Identification System (AIS) is communication system provides identification and location information to vessels and shore stations
- Aim of exchanging data (position, identification, course and speed).
- This allows vessels to anticipate and thus avoid collisions in the sea by means of a continuous traffic monitoring with several navigation aids
- AIS also offers important ship monitoring services to coastal guards or search and rescue organizations.

The system is based on the broadcasting of fixed length digital messages using the Time Division Multiple Access (TDMA)



AIS message fields

Start buffer	Training sequence	Star flag	Data	FCS	End flag	End-buffer

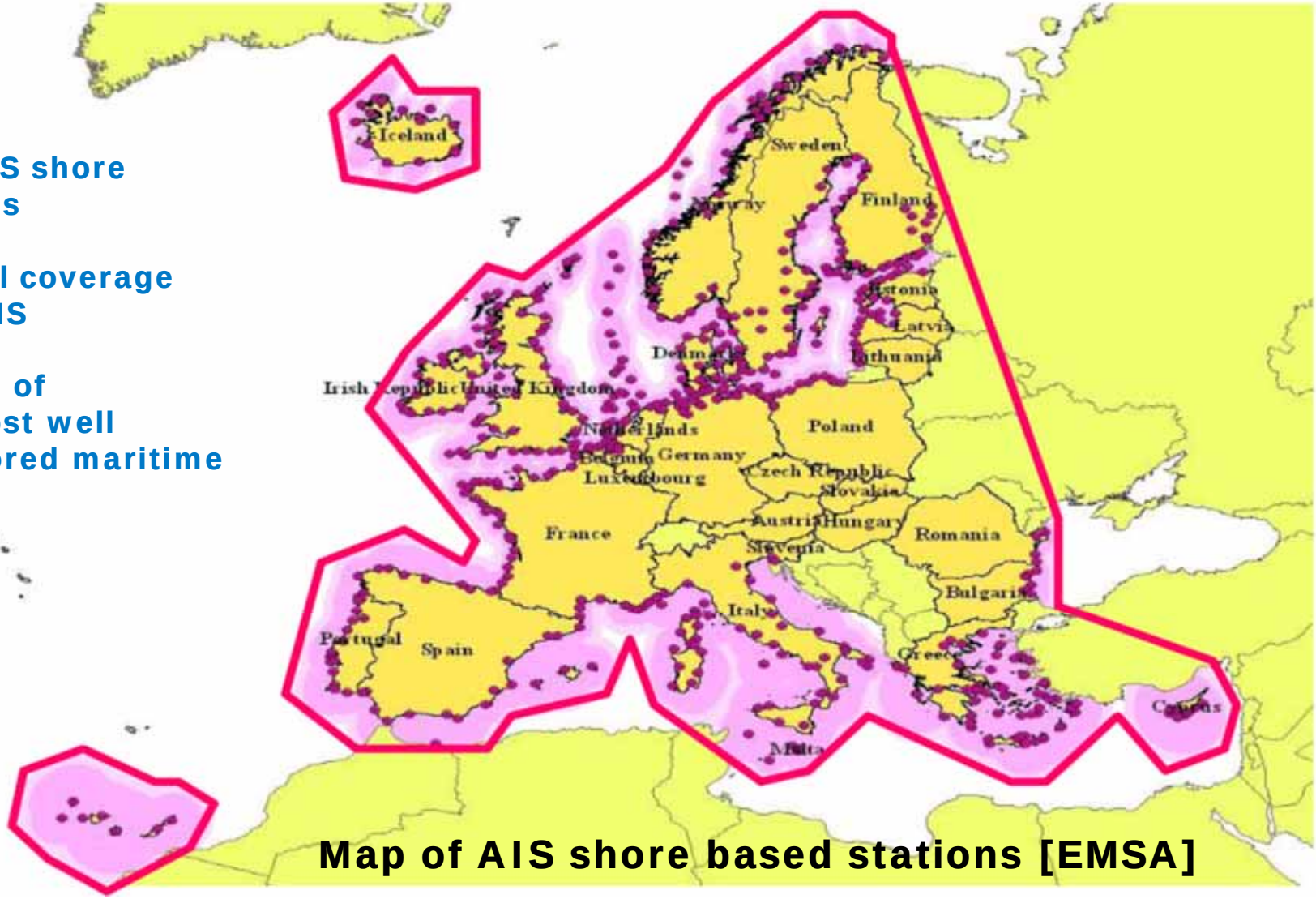
SAT-AIS Initiative

URD: Annex-2 Excluded Zones

727 AIS shore stations

Coastal coverage in all MS

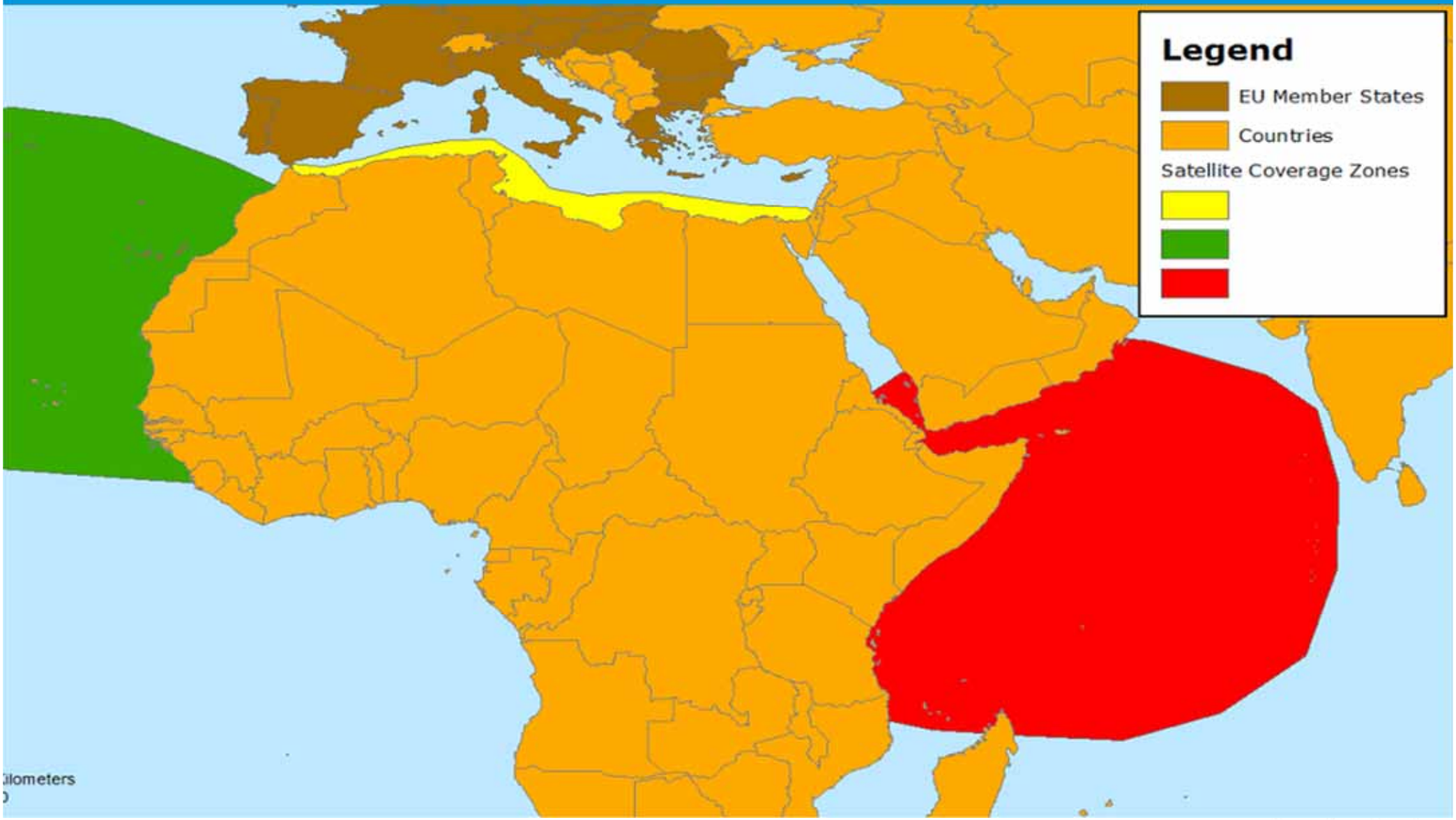
EU one of the most well monitored maritime region



Map of AIS shore based stations [EMSA]

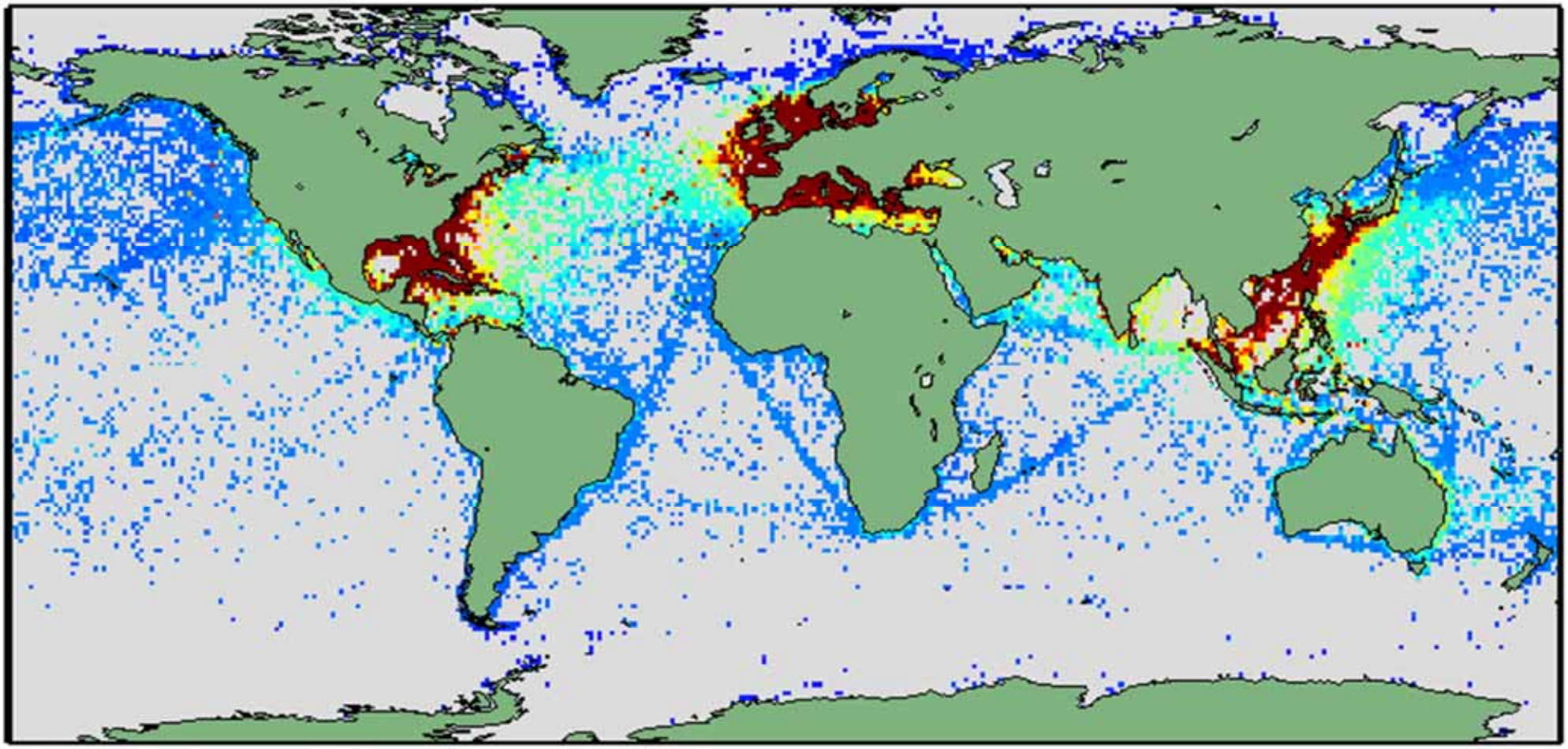
ace Agency

ODEM priority areas



SAT-AIS Initiative

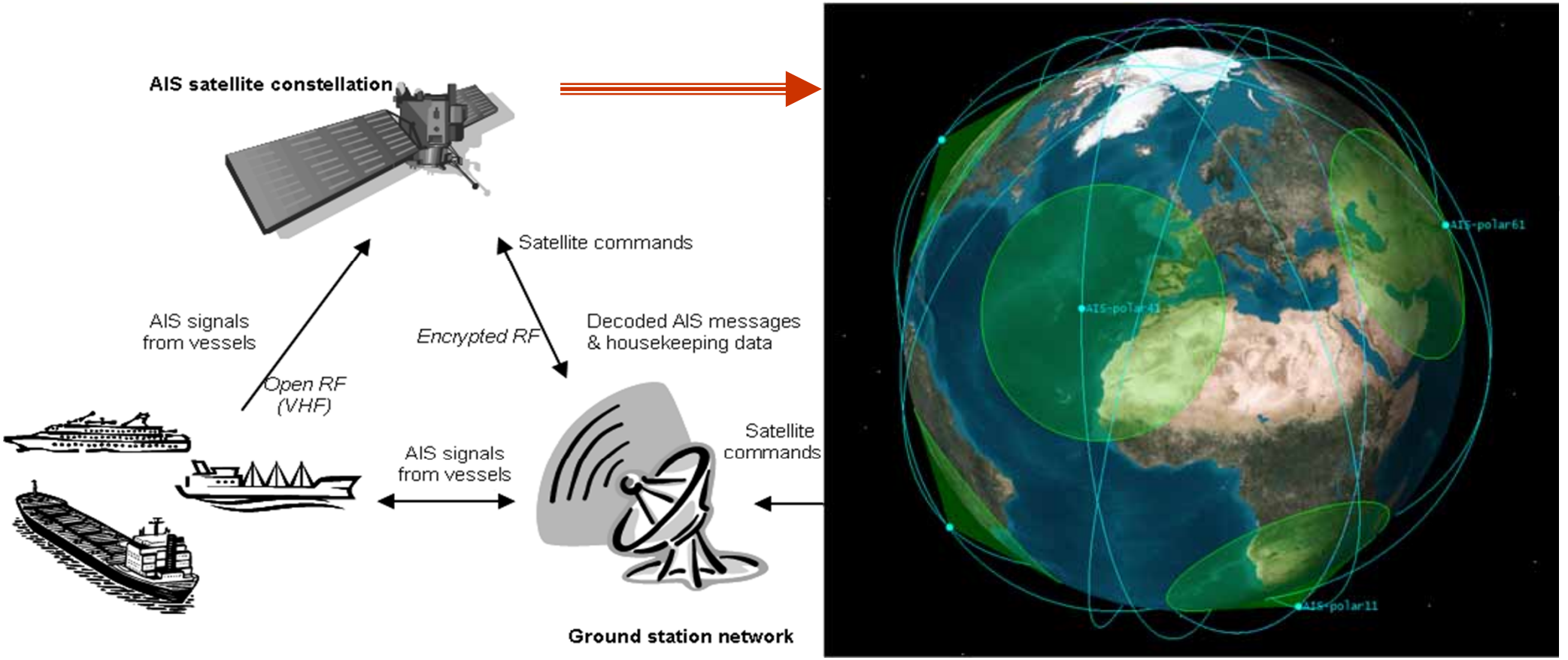
URD: Annex-3 High Traffic Zones



Results from Phase-A constellation (12 S/C, dipoles 2021, OHB / FFI)

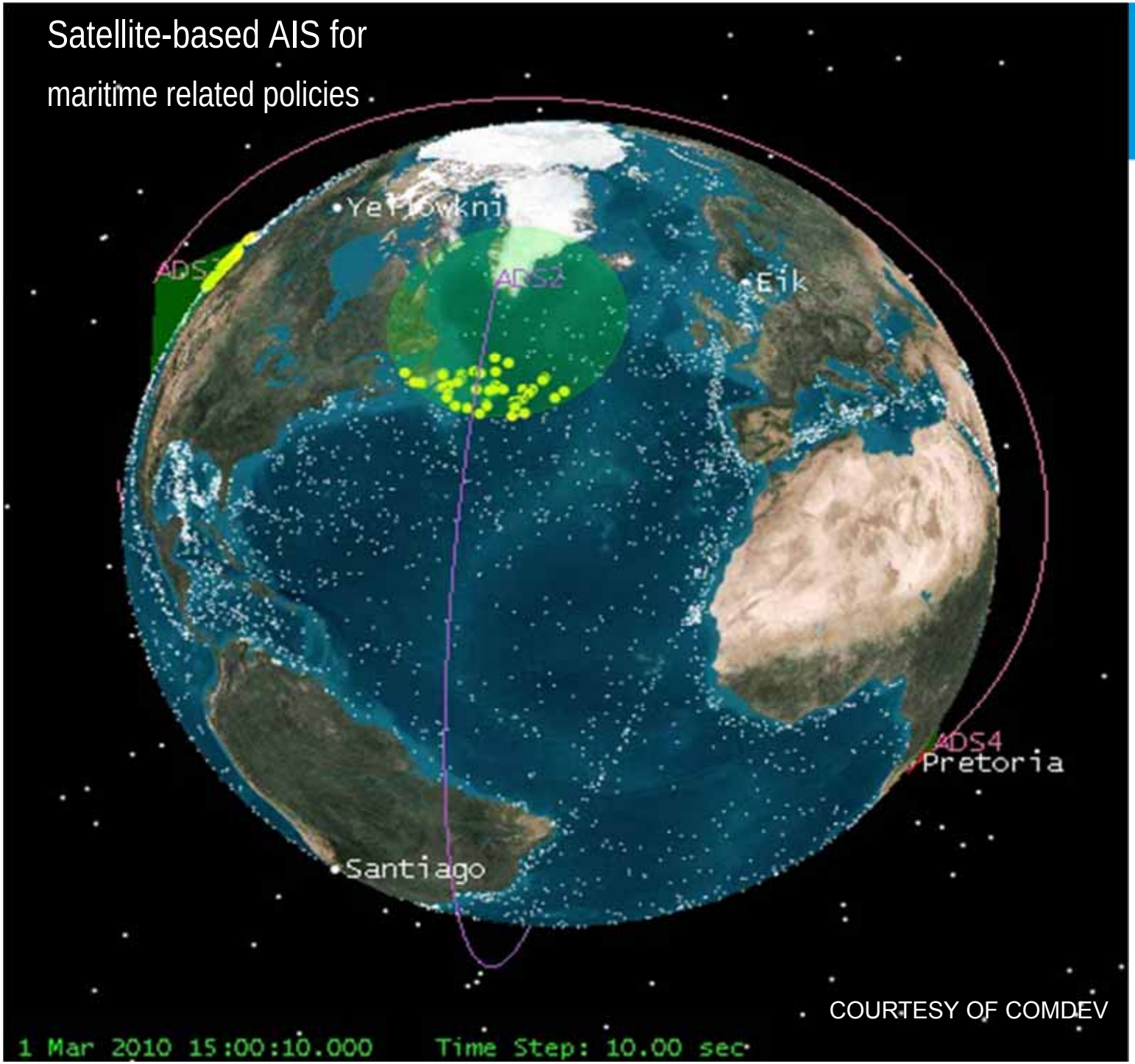
SAT-AIS Objectives

AIS signal detection from space



Satellite-based AIS for

maritime related policies



COURTESY OF COMDEV

DG-MARE / ESA

Joint

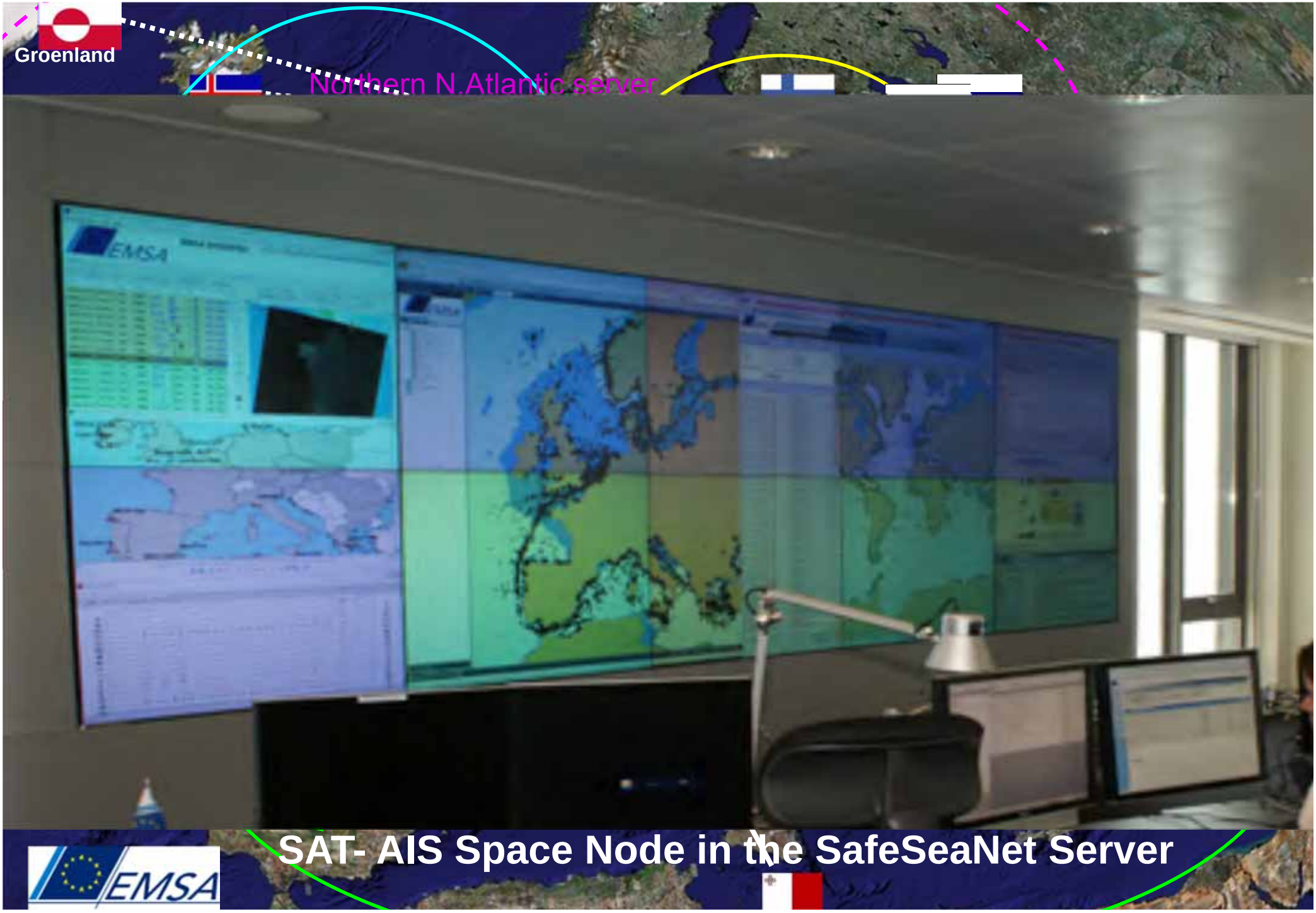
Action Team

&

European

Steering group:

EC DGs (Mare, ENV, TREN, JLS, INFSO, TAXUD, ENTR, JRC) FRONTEX, EDA, EMSA, ESA



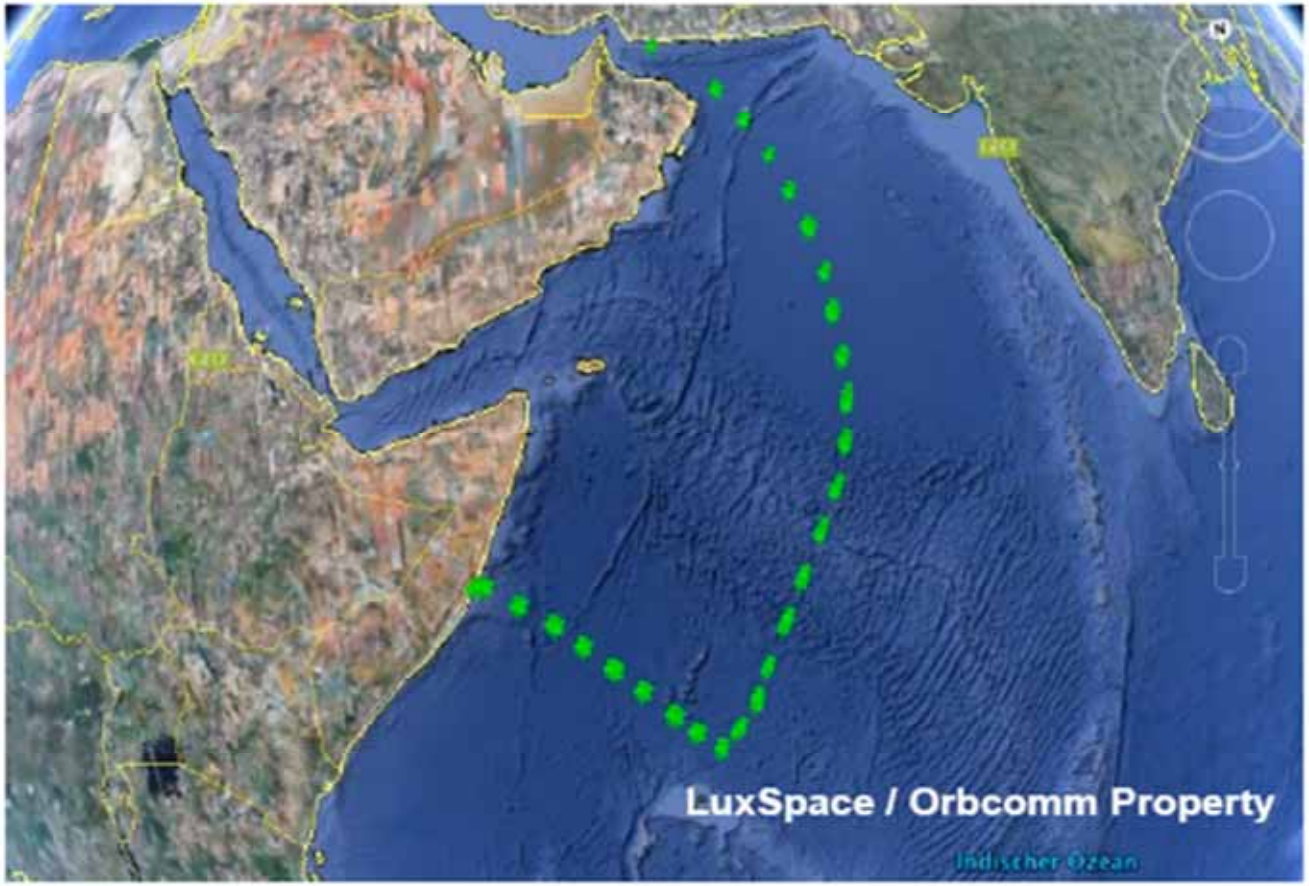
SAT- AIS Space Node in the SafeSeaNet Server

SAT-AIS
Services

1. Maritime Security services: support of security operations, maritime security threats
2. Law-enforcement services: anti-piracy, illegal fishing, enforcement of international /national regulations, support of enforcement ops
3. Search and Rescue (SAR)
4. Maritime surveillance services: monitoring of vessels in sensitive areas (international waters), anti-drug smuggling, border control
5. Environmental services: hazardous cargos monitoring, prevention of pollution caused by ships, pollution response
6. Maritime Safety services: vessel traffic/navigation monitoring, vessel traffic management, support of safety operations
7. Fleet management services for commercial users (shipping companies, owners,…)

Demonstration: Tracking Pirates

„POMPEI"

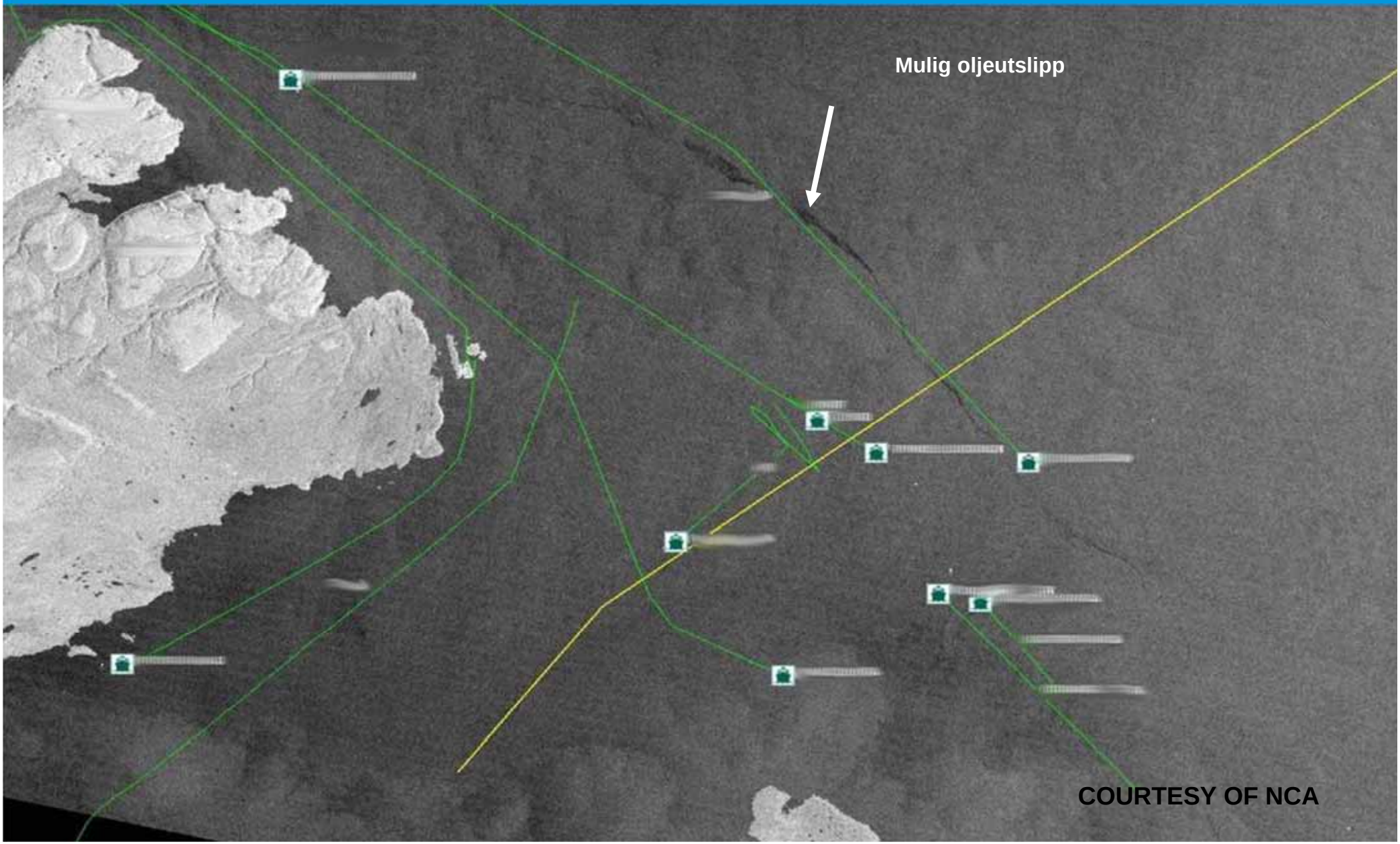


Ship was hijacked 700 nm off Somalia coast and 100 nm from destination (Port Victoria / Seychelle Islands)

- Request of DG MARE based on information demand of Belgium Crisis Centre, having lost the vessel POMPEI and asking for latest position at 14:00 on April 21, 2009
- Delivery of latest vessel position by LuxSpace at 16:00 (captured at 7:00 of the same day)
- Request for vessel track of the past days at 19:00 of 21 April
- First information available at 22:00 on 21 April
- Second information with final anchor place (4:56) on April 22 at 23:00

COURTESY OF LuxSpace

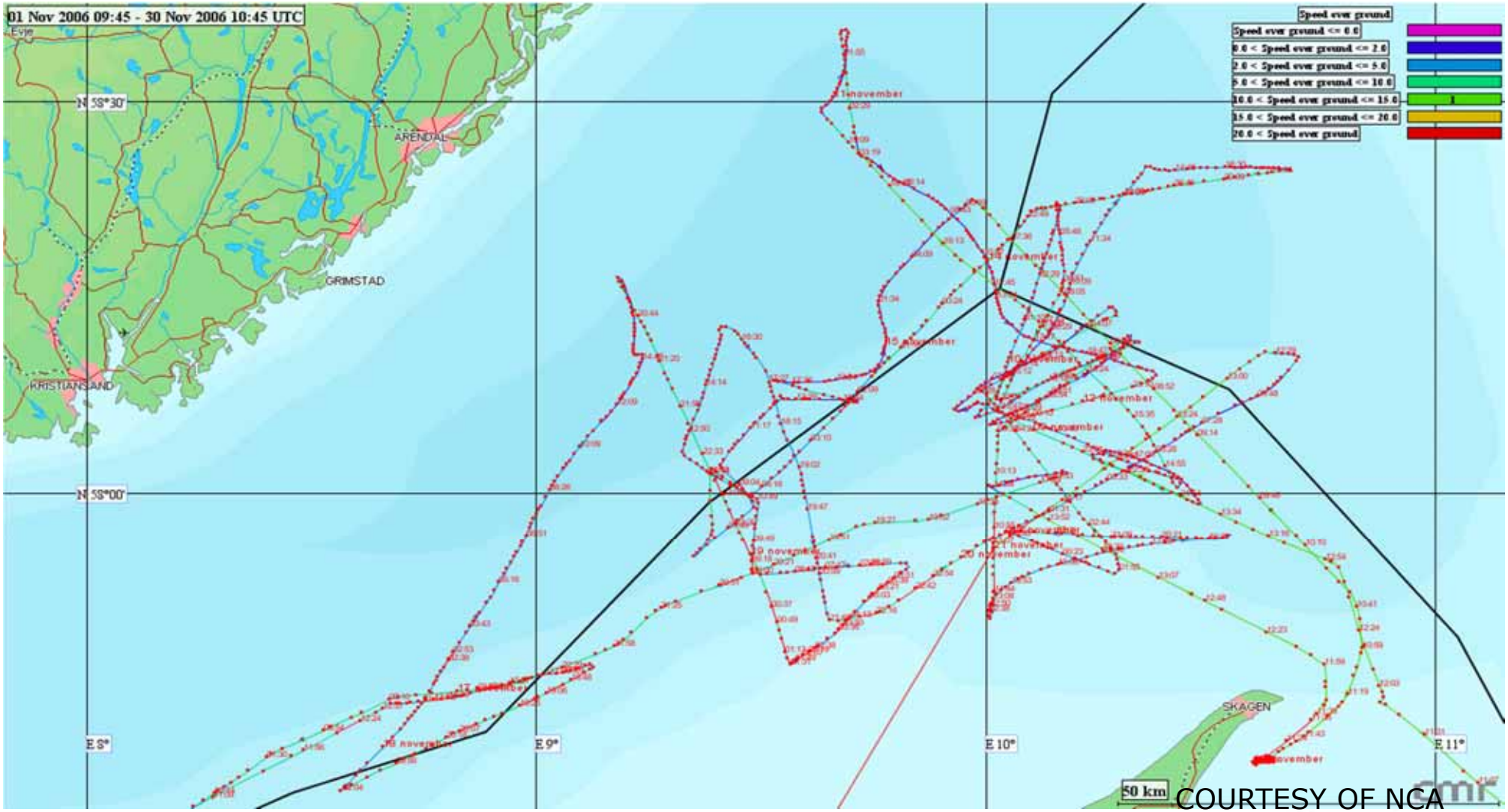
Integration: SAR, Sat-Nav & Satellite AIS data



Transport of toxic water from Sløvåg

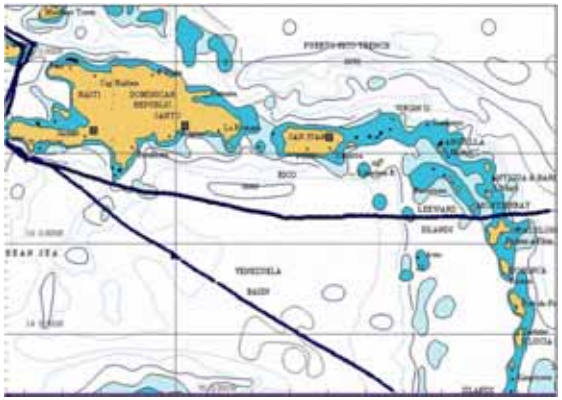
COURTESY OF NCA

Legal business ?



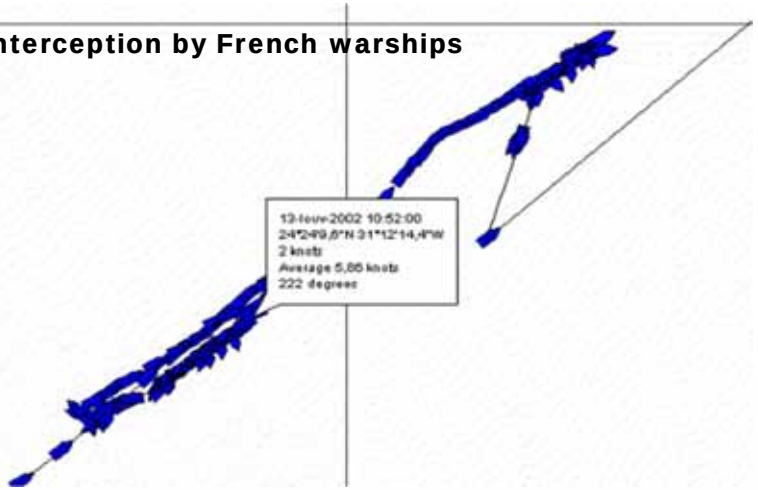
COURTESY OF NCA

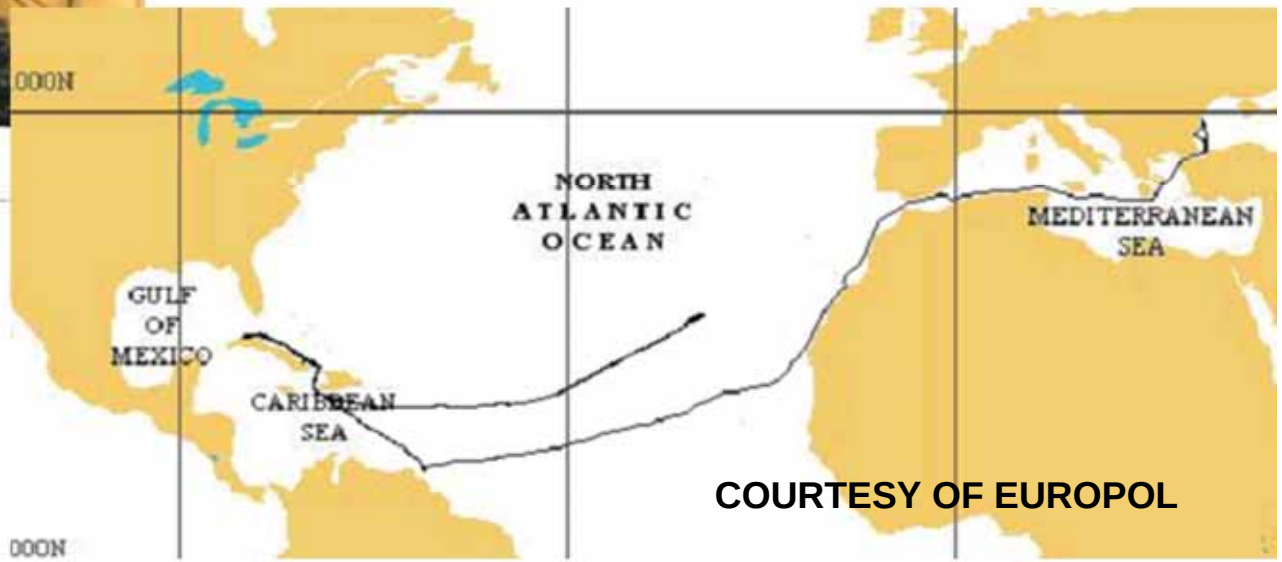
Cocaine Trafficking – M/V Winner, Bolivian flag



Loading point

Interception by French warships





COURTESY OF EUROPOL

SAT-AIS

Support for the Blue Belt Project

THE BLUE BELT PILOT PROJECT

The aim of the Blue Belt pilot project is to explore new ways to promote and to facilitate Short Sea Shipping in the European Union by reducing the administrative burden for intra-Community trade.

BENEFITS

Customs will benefit from an added degree of certainty with regard to the ship's voyage concerning participating vessels. This will be possible by using existing customs tools in combination with information from the EU vessel traffic monitoring and information system SafeSeaNet.

Customs authorities will receive reliable information on the current and past voyages of blue ships.

Ships' masters and agents will benefit from faster processing of goods through Customs when arriving at port.

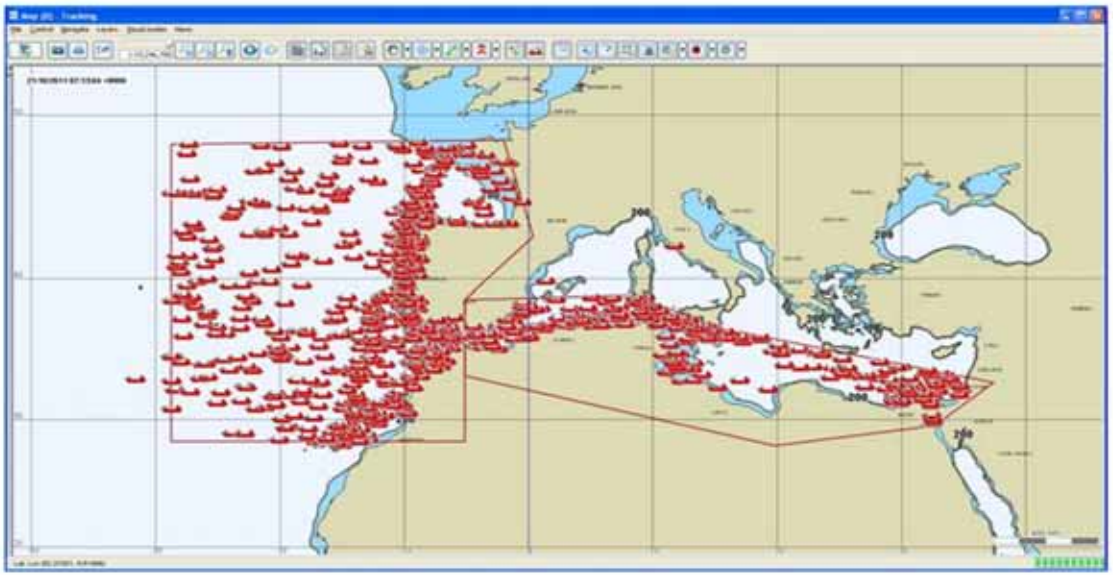
SAT-AIS support to Blue Belt

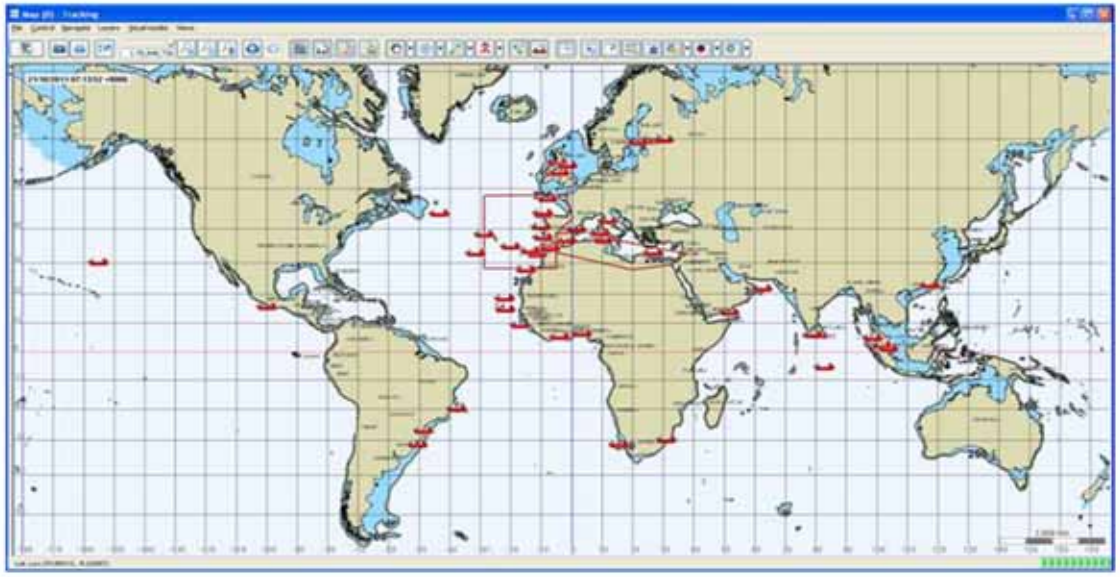
Ships sailing outside the coverage zone of terrestrial AIS (until 40 nautical miles from the coast) can still be tracked by Satellite based AIS and this voyage information will be provided to customs

www.emsa.europa.eu

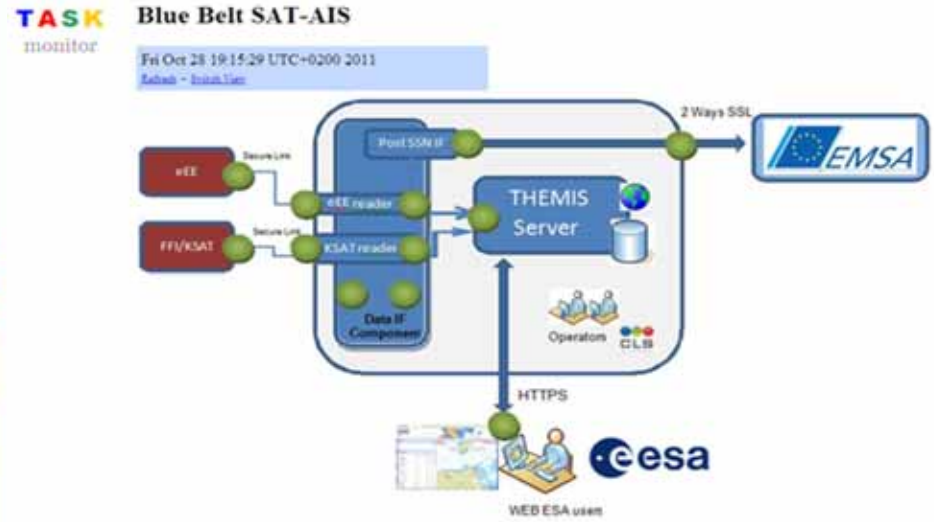
SAT-AIS

Support for the Blue Belt Project (2)





Positions provided since 20th Oct: All ships focus on both Areas of Interest



Positions provided since 20th Oct: Only Blue Belt ships globally

ARTES 21, SAT-AIS
Possible B interest

HP Payload Requirements
Potential Platform – PROBA-V
Potential Ground Segment - Redu

European Space Agency

SAI-EST-PRS-1022

ARTES 21 - Implementation
Draft Programme Proposal

The public funding to develop the required space segment complement would come from ESA with a budget of 150 MEURO:

- One High Performance satellite (including launch and In Orbit Testing)
  for improved performance in high traffic zones
  Data delivered exclusively via EMSA to end user
- Two (or more) Medium Performance satellite (including launch and In Orbit Testing)
  for improving time update interval
  R&D co-funding from industry for next and innovative generation commercial satellites
- Development of new SAT-AIS applications / services
  in order to evolve the SAT-AIS market

It is assumed that the EC contribution for operational cost covers the following with a budget of 50 MEURO:

- Ground Infrastructure (Operation Centre, Reception Stations, Network) and associated operations

SAT-AIS
Potential Belgium Contributions

1. **Satellite Platform (Proba Evolution)**
2. Additional Optical IR Payload for Ship Detection
3. Satellite Control Ground Segment

SAT-AIS PAYLOAD: DESIGN DRIVERS

1. Several payload and satellite architectures are being currently traded-off in the SAT-AIS Phase B1 activities run in ESA.

2. Two Main design drivers for SAT-AIS payload and system design:
    a. Maximize probability of detection in High Traffic Zones.
        - **HIGH PERFORMANCE PAYLOAD (reduced number of satellites)**

    b. Maximize the revisit time world wide.
        - **HIGH NUMBER OF SATELLITES AND PLANES (LOW/MEDIUM performance payload)**

SAT-AIS SATELLITE

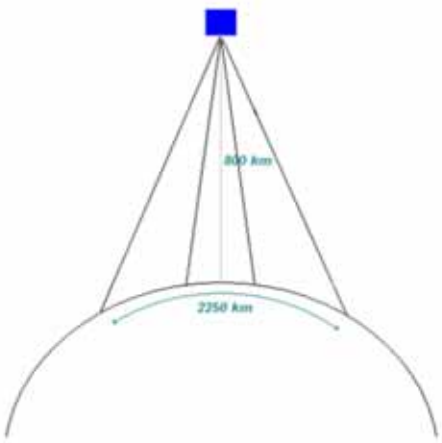
1. The high level payload characteristics presented here correspond to a **HIGH PERFORMANCE PAYLOAD** that consist on:
    a. An advance VHF antenna able to segment the Field of View in different beams
    b. An on-board receiver sampling the antenna outputs
    c. Additionally, the satellite shall accommodate a Payload Data Handling unit that transmits the sampled AIS channels to the ground stations
2. This payload shall be embarked in a satellite with the following characteristics:
    a. Satellite lifetime
        – The target satellite lifetime is 5 to 7 years
        – The target satellite reliability is 0.8 (TBC)
    b. Orbit:
        – Sun-Synchronous orbit with a height of 650 to 750 Km.
        – The Local Solar Time is To Be defined (depending on the constellation configuration)

SAT-AIS High performance payload characteristics

1. **Payload mass**
    a. Antenna mass: 40 to 50 Kg (1 m x 1 m x 0.5 m in stowed configuration)
    b. Receiver mass: 10- 15 Kg (30x30x30 cm)
    c. Data Handling unit: 15 Kg
2. **Payload telemetry link**
    a. Frequency band is C or X band (TBC)
    b. Payload data rate requirements 50-100 Mbps
3. **Payload power**
    a. The average required payload power ranges between 30-50 W.
    b. The peak required payload power (downlink active) is 100 W (approximately 10% of the orbit time)
4. **Propulsion**
    a. Embedded delta V requirement is minimum 100m/s (350 m/s is desirable to ease deployment phase) allowing for in plane and out of plane orbit control capacity.
5. **AOCS:** Permanent nadir pointing of the antenna(s), the pointing accuracy shall be +/- 2.5°

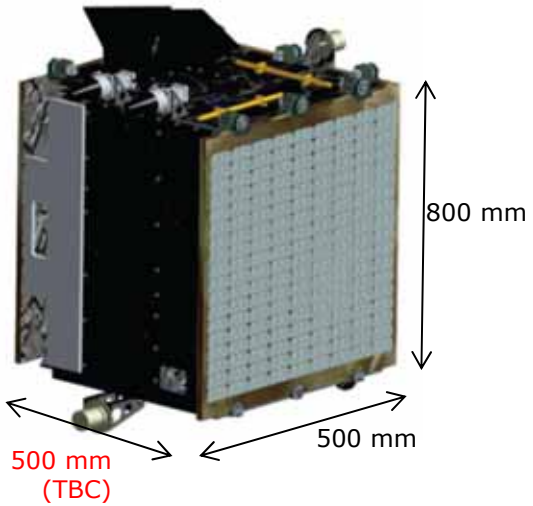
PROBA-V Overview

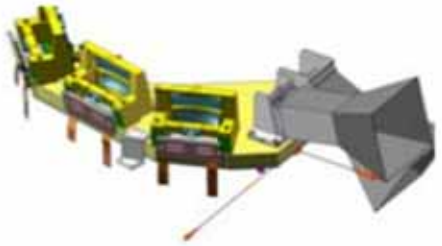
1. Proba-V(egetation) will fly a reduced-mass version of the Vegetation instrument currently on board the Spot satellites to provide a daily overview of global vegetation growth. It is a gap-filler between the SPOT-5 and sentinel 3 missions
2. The spacecraft has the following characteristics:
    a. Satellite lifetime:
        - The satellite lifetime is 2.5 with possible extension to 5 years
    b. Orbit:
        - Sun-Synchronous polar orbit with a height of 800 to 820 Km
        - The Local Time at the Descending Node is 10:30 AM
    c. Main payload requirements:
        - Field of View 102.6°
        - Swath width: 2250 km at 800 km altitude
        - Ground Sample Distance: 1km and 300m
        - Daily coverage for latitudes above 35°
        - Complete global coverage in two days



PROBA-V Characteristics

1. **Payload mass**
   a. ~25 kg
2. **Payload volume**
   a. 200 mm x 800 mm x 500 mm
3. **Payload telemetry link (optional)**
   a. Frequency band is X band
   b. transmitter data rate up to 100 Mbps
4. **Payload power**
   a. average available payload power ~ 30 W.
5. **Propulsion**
   a. NO on-board propulsion
6. **AOCS:**
   a. NADIR pointing (three-axis stabilised)
   b. Pointing accuracy +/- 100 arcsec





Comparison SAT-AIS versus PROBA V Payload Requirements

	SAT-AIS HPP	PROBA V PL
Payload mass	Antenna: 40-50 kg Receiver: 10-15 kg	25 kg
Payload Volume	Antenna: 1x1x0.5 m^3 (external) Receiver: 30x30x30 cm^3 (internal)	TBC (external) 20 x 80 x 50 cm^3 (internal)
Telemetry link:	C or X band 50-100 Mbps	X band up to 100 Mbps
Payload Power	30-50 W	~ 30 W
Propulsion	ΔV > 100 m/s	No on-board prop
AOCS	Nadir pointing Accuracy +/-2.5°	Nadir pointing Accuracy +/- 100 arcsec

SAT-AIS
Potential Belgium Contributions

1. Satellite Platform (Proba Evolution)
2. **Additional Optical IR Payload for Ship Detection**
3. Satellite Control Ground Segment

SAT-AIS
Optical IR Payload

Detection of ship based on turbulent wakes
analyzed in Phase A and on-going B1 by OIP and RMA:

- Small fishing vessels (24-30m) have a wake length between 200 and 300m with a typical width around 12-15m
- Cargo and tanker wakes are going from 300m to 1km length and more than 15m width
- Wakes dimensions will be significantly reduced at high sea state and low speed

Operations:

- **Police mode:** Imaging of predefined areas of interest, which results in typically 10 % (TBC) imaging during an orbit.
- **Alarm mode:** Imaging defined upon user request over a specific area during specified time frame. The alarm mode is overriding the police mode.

Preliminary Characteristics:

- Mass: 30 kg
- GSD at Nadir: 80m
- Scanned swath width: 1000 km

Power: 34 W during imaging

GSD at FOV edge: 146x 107m

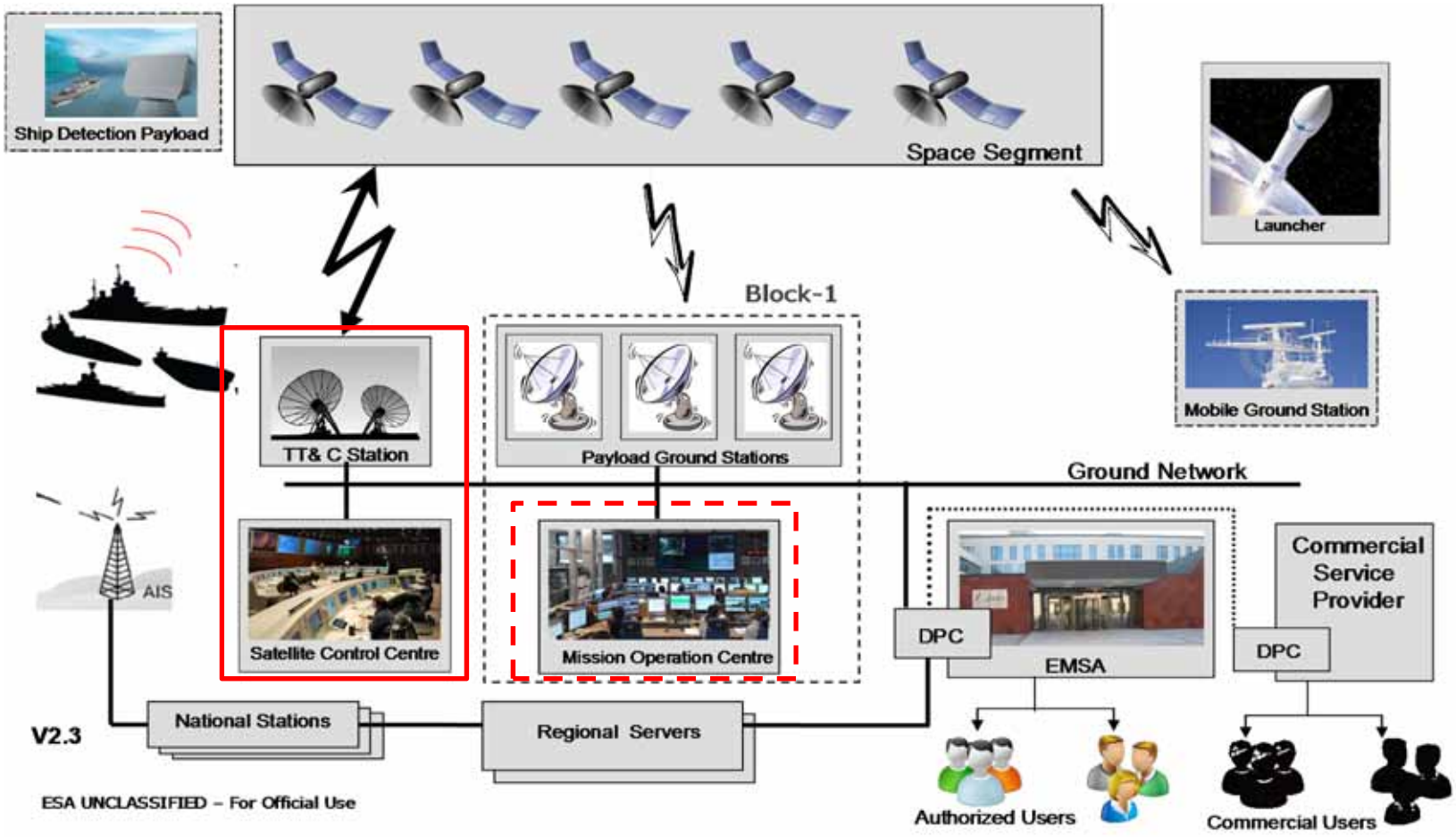
OIP Sensor Systems

SAT-AIS
Potential Belgium Contributions

1. Satellite Platform (Proba Evolution)
2. Additional Optical IR Payload for Ship Detection
3. **Satellite Control Ground Segment**

SAT-AIS Overview
Space and Ground Segment Architecture

SAT-AIS end-to-end architecture

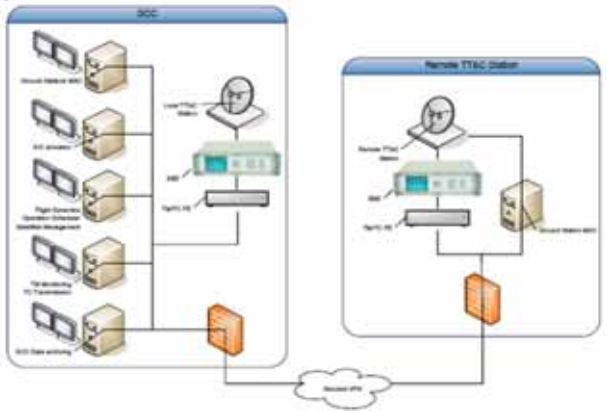


Potential Elements for Belgium Contributions via Redu

SAT-AIS Ground Segment: Redu

See proposed concept in Phase-B1 study from RSS under Prime LuxSpace (AIS-ESAIL-RSS-TN-GP-0001):

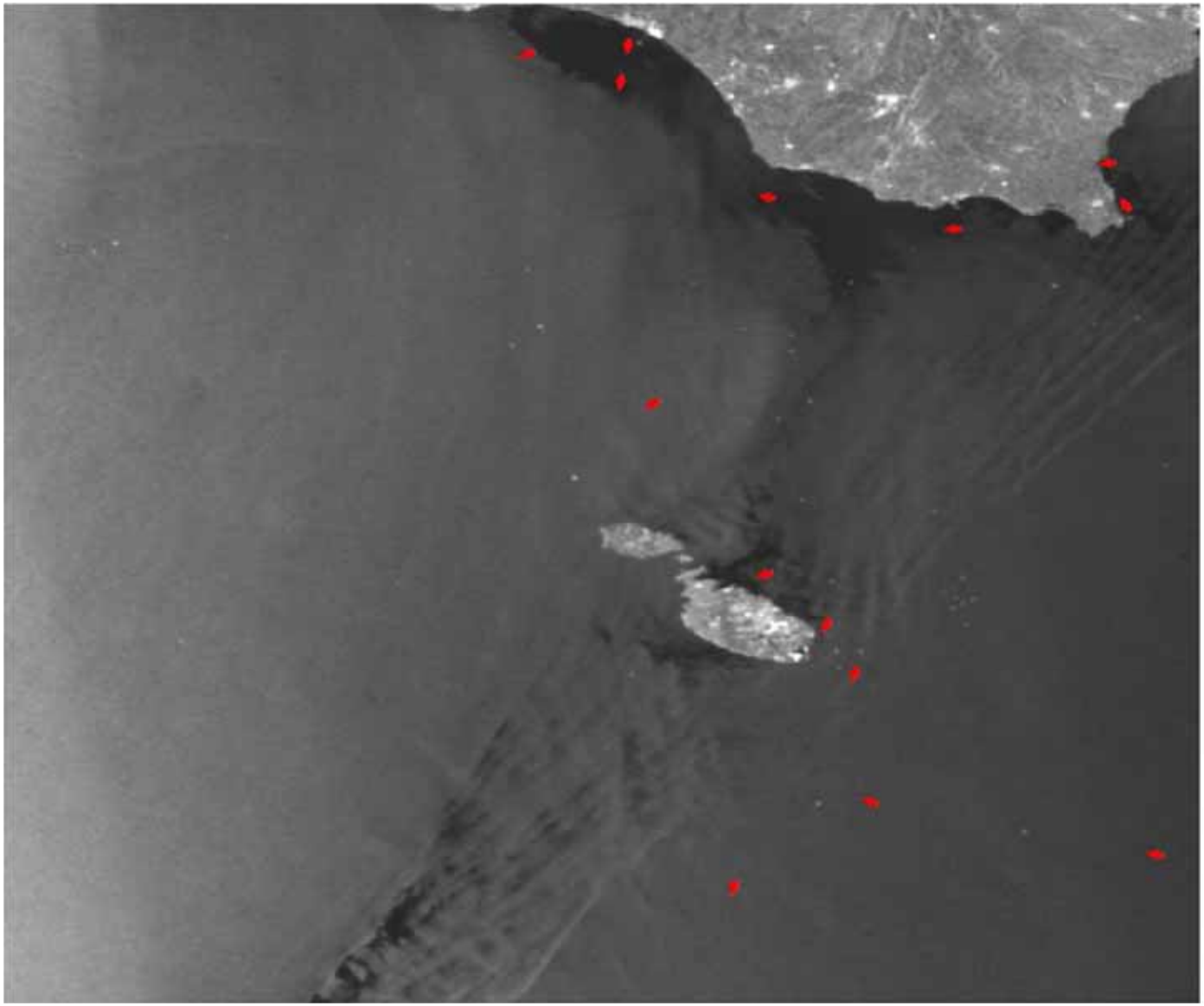
- "The Redu site, which hosts multiple ground stations, is located in the Ardennes region, about 1 km from the village of Redu which is in the Belgian province of Luxembourg. "
- "The Redu site is made available to ESA, based on an international agreement between ESA and the Belgium government. "
- "The Maintenance and Operations (M&O) activities of the site are performed by Redu Space Services S.A. (RSS), a standalone Belgian company, affiliate of SES ASTRA TechCom and QinetiQ Ltd, appointed by ESA to run the station. "
- "RSS assumes the overall end-to-end operations of the ESA Station on behalf of ESA, which is used on a day-to-day basis for conducting satellite operations activities and missions for ESA satellites. "



SAT-AIS
Potential Belgium Contributions

1. Satellite Platform (Proba Evolution)
2. Additional Optical IR Payload for Ship Detection
3. Satellite Control Ground Segment
4. **SAT-AIS Receiver (Antwerp-Space / CGS) TBC**

Integrated Application
Satcom, Nav, EO & UAS



AIS tracks from ships

SAR detected ships

Correlation SAR & AIS

Remaining uncorrelated ships & UAS for identification

➔ Mission Video

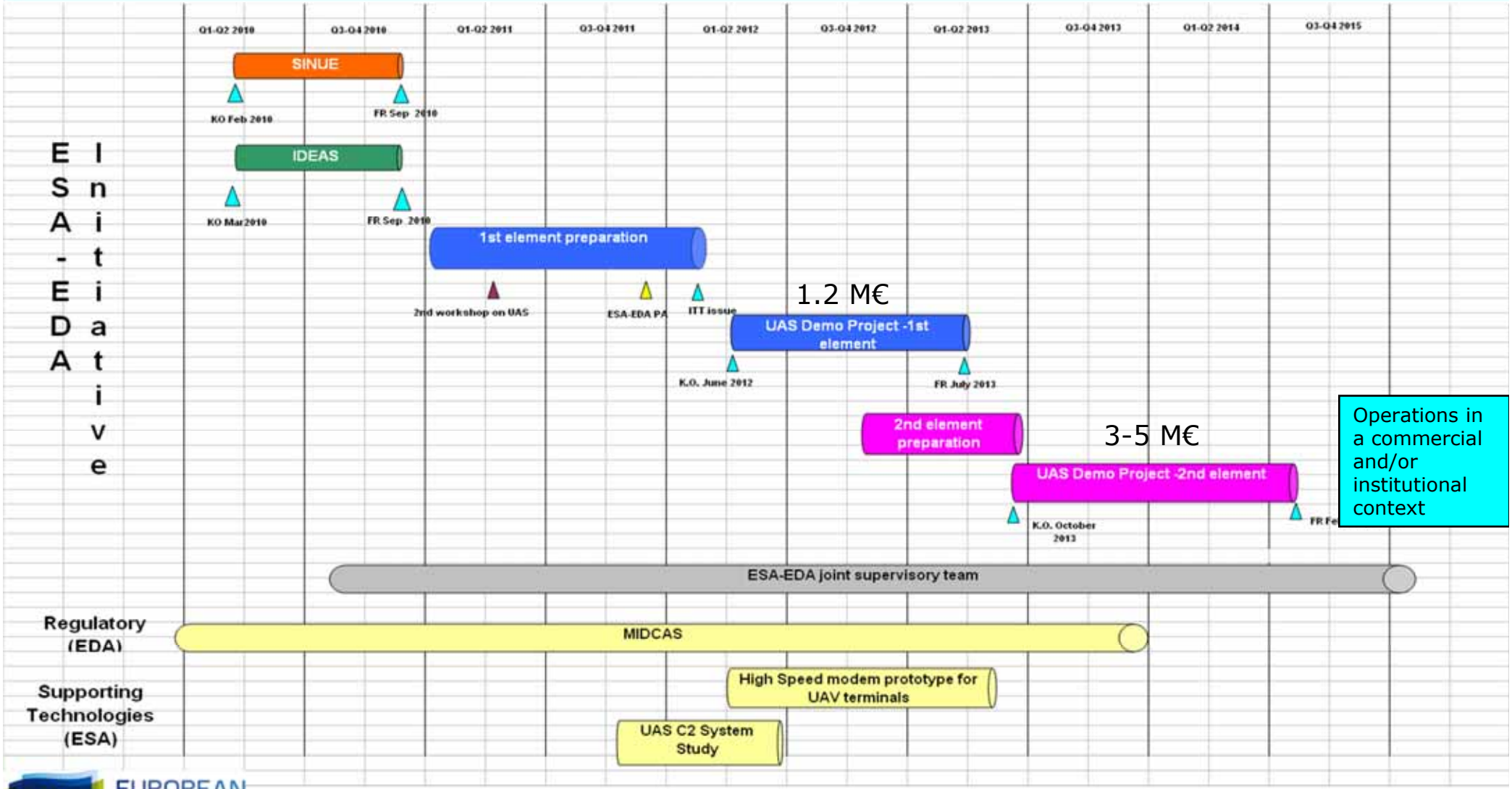
UAS supported by integrated space systems (Security & Safety)

- **Background:**
  - **UAS (Unmanned Aerial Systems) steadily become more important for e.g. surveillance tasks**
  - **Until now, UAS have only been deployed routinely in segregated airspace because of safety reasons**
  - **The safe and secure integration into "non-segregated airspace" is still a challenge**
    - **Technology is not proven**
    - **Regulation is missing**
    - **Little practice and experience**

IAI Heron UAV in flight

- **Investigate the technical and economical feasibility of UAS services in non-segregated airspace supported by space systems for:**
  - **Command & Control, Sense & Avoid, Air Traffic Control**
  - **Operational service provision (UAV Payload data transmission, e.g. camera, radar, etc.)**
- **Simulations and demo project preparation specifically in the civil domain: pipeline monitoring**

EDA-ESA Joint Roadmap for UAS



EUROPEAN DEFENCE AGENCY


esa
Third Party
Funding
European Space Agency

3rd Party funding

- Satellite–Enhanced e-Health & telemedicine for sub-Saharan Africa Initiative, 4.16M€ by EIB/LUX Development and on same subject 0,5M€ from DG-DEV
- Innovation Fund: 1st fund launched by MT Innovation Fund in cooperation with DLR/Bavaria/ESA http://www.mt-innovation-fund.de/
- Space 4 Med, with EIB, signature on June 25th 2012 in ESA HQ, Paris

SPACE FOR ENTREPRENEURSHIP
Space & Innovation

Opportunities to create an Partnership for Space Innovation Fund

ESA / IAP

=<50%€

= 0 €

Space / Non Space company

- ***Funds (€)***
- ***In kind***

PROJECT

EIB

<=100% €

Equity partner / Government

- ***Funds (€)***

MT Innovation Fund

MT Innovation Fund - der F...

www.mt-innovation-fund.de

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MT INNOVATION FUND

Über uns | Profil | Team | Standort | News

Suchwort eingeben.

MT INNOVATION FUND

Der MT Innovation Fund, eine Initiative der Augsburger MT Aerospace AG, unterstützt die wirtschaftliche Entwicklung vielversprechender Innovationen aus der Luft- und Raumfahrt, aber auch aus den Bereichen Verkehr, Sicherheit und Energie. Er bietet Start-up-Unternehmen Know-how, Strategieentwicklung und finanziellen Invest sowie Zugang zu einem breiten Netzwerk aus Industrie, Forschung und Politik.

Zusammen mit unseren Partnern, dem Deutschen Zentrum für Luft- und Raumfahrt DLR und der Europäischen Raumfahrtbehörde ESA, fungiert der MT Innovation Fund als Bindeglied zwischen wissenschaftlich-technischer Forschung und dem Markt – und stärkt damit den Vorsprung neuer Unternehmen im weltweiten Wettbewerb.

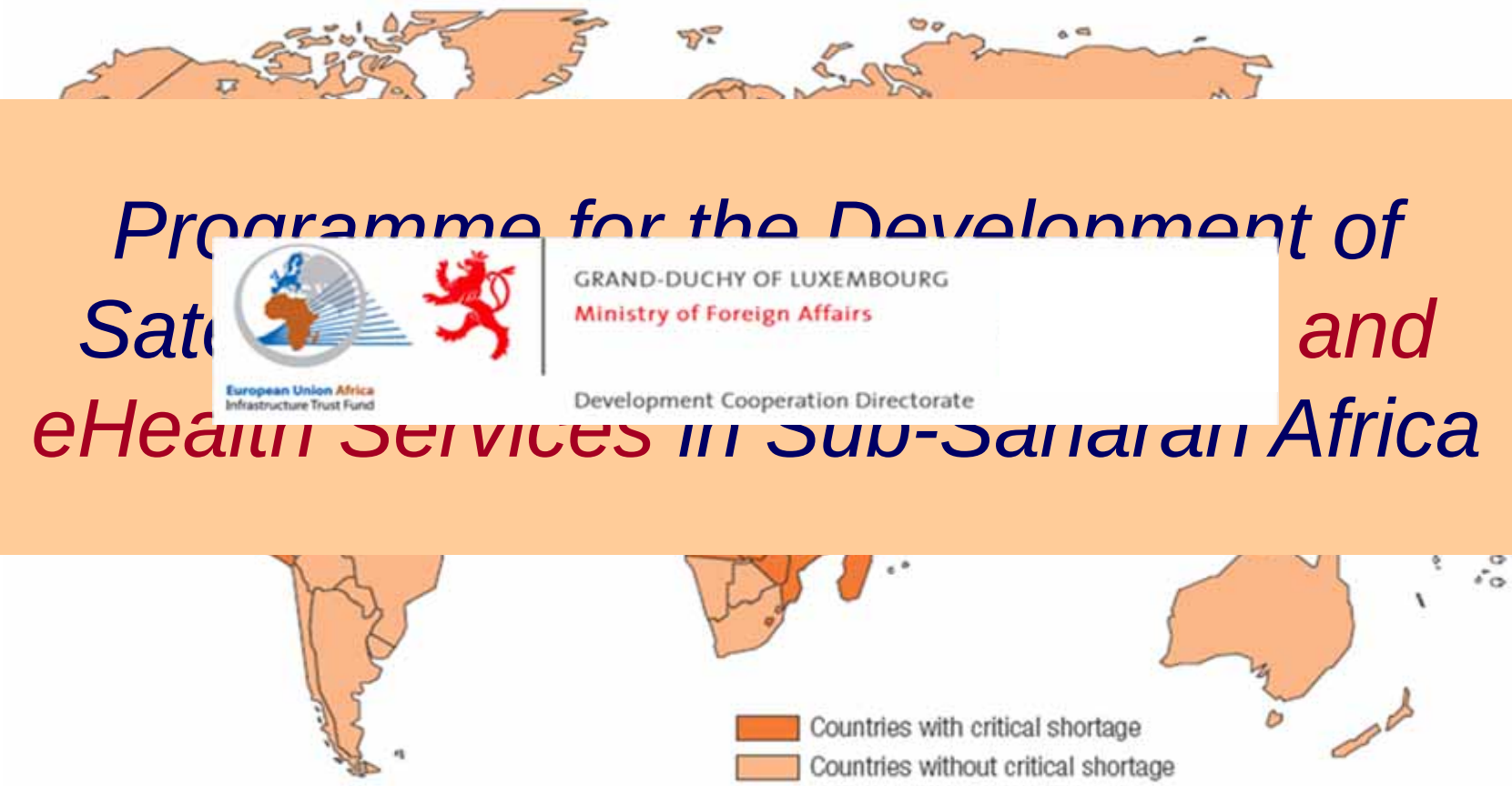
News

- Mit Technologien aus Luft- und Raumfahrt, Energie und Verkehr neue Geschäftsfelder erschließen: das...

Design und Programmierung www.creationell.de

EC / EIB / ESA eHealth Services Project in Africa

Countries with a critical shortage of health workers (doctors, nurses and midwives)



Programme for the Development of Satellite and eHealth Services in Sub-Saharan Africa

European Union Africa Infrastructure Trust Fund

GRAND-DUCHY OF LUXEMBOURG
Ministry of Foreign Affairs
Development Cooperation Directorate

Millennium Development Goals (MDGs) and counteracting Health workforce crisis

European Space Agency

Satellite Financial Services for Africa *(SatFinAfrica)*

- **Background / Objectives:** Development and validation of a service platform based on the Sat3Play / ASTRA2Connect technology for the provision of financial services (e.g. Money Transfer and ATMs) in rural areas of African countries
- **Consortium:** Prime Contractor Sea&Space (B), with SES (L) and Newtec (B) as sub-contractors
- **Users**: Remote branches of financial institutions in Africa, generally not large enough to justify the investments associated to classic corporate VSAT systems
- **Project Status / Achievements**: On-going. A new company "SatADSL" (B) has been created as service provider, with already more than 100 paying customers among Money Transfer branches

Money Transfer in Cameroon

SatADSL enters Ghanaian market

Story: Charles Ikenni Okina

AN international satellite service provider has entered the Ghanaian market to provide affordable and reliable services to institutions, particularly those in the financial services sector.

The move is to enable the institutions to reach out to the remotest parts of the country with their services.

Announcing the entry of the company at a news conference in Accra, the Chief Commercial Officer of SatADSL, Mr Jerome Van Der Putt, said the services of the company was strong enough to allow companies to set up in rural areas and communicate effectively through the company's satellite facilities at a reasonable price compared to competition worldwide.

SatADSL offers the best and most affordable satellite service for transactional applications, standard internet access including web surfing, email, Voice Over Internet Protocol (VOIP) and similar applications.

The service comes at a time when the rural areas have been mostly abandoned by many companies because of difficulties in communication which allows for efficient services.

For instance, even in the capital, many Automated Teller Machines (ATMs) of banks malfunction because of what they describe as satellite challenges due to bad weather.

Mr Van Der Putt said the services of the company have been so designed and positioned so as to eliminate those challenges.

"In the next couple of months, we are installing and configuring the entire system and have to ensure that no amount of weather changes can affect the delivery of services to our clients", he said.

• Mr Jerome Van Der Putt, CEO, SatADSL

He said the company has the system to prioritise a small amount of traffic specifically dedicated to what he described as "critical business transactions to avoid delays in the system".

Mr Van Der Putt said the company had specifically targeted the financial services sector because of the low penetration of their services in the remotest parts of the country as is the case in many other developing countries.

He said people in the rural areas also deserve financial services and are willing to get on board should they be given the opportunity.

Mr Van Der Putt also mentioned the impact of the satellite services in such areas saying "it will open up the country to allow companies to set up their branches in those areas to avoid rural-urban migration among others".

On security, he said the company had been able to complete researches to ensure that their systems are not hacked by fraudulent persons across the globe.

"The security of our system is paramount to us and that is what has driven many customers to us and that is the same we intend to deploy in Ghana", he said.

Mr Van Der Putt said the service is best with a reasonable bandwidth usage and a limited number of computers on the LAN and that providers of money transfers services can also benefit.

Satellite ways for education *(Swayedu)*

- **Background / objectives:** developing of a satellite ICT (Information and Communication Technology) solution to support three main activity areas in Africa: a) "Electoral eTraining"; b) "Rural Radios" services; c) "Space4Edu": literacy eLearning
- **Consortium:** Prime Contractor Openet (I), with SES (L) and Newtec (B) as external service
- **Users**: a) The Electoral Management Bodies of ECCAS (Economic Community of Central African States) to prepare for electoral cycles; b) Farmers, workers and in general the population located in rural areas of Democratic Republic of Congo for recommendations and guidelines in favor of food security and rural subsistence; c) Teachers of rural schools in South Africa for literacy teaching certifications
- **Project Status / Achievements**: On-going. The kick-off of the pilot activities is planned in late July 2012 with 25 pilot sites spread over 12 African countries.

Electoral eTraining

Rural Radios

Space4Edu

Satellite ways for education *(Swayedu)*

- Regarding Sway4edu, it is worth mentioning that there is no contributions of the Belgian delegation although Newtec (B) is supporting the project activities as external service (i.e. 100% funded by the project) with the procurements/configurations/shipments of the Sat3Play terminals. The Belgian delegation contributed to the SatElections activities with Newtec (B) till CCN#2 (inclusive), whose relevant activities can be considered completed.

Space4Edu

Rally to Read
AREAS MAP 1998-2011

RALLY TO READ AREAS MAP 1998 - 2011

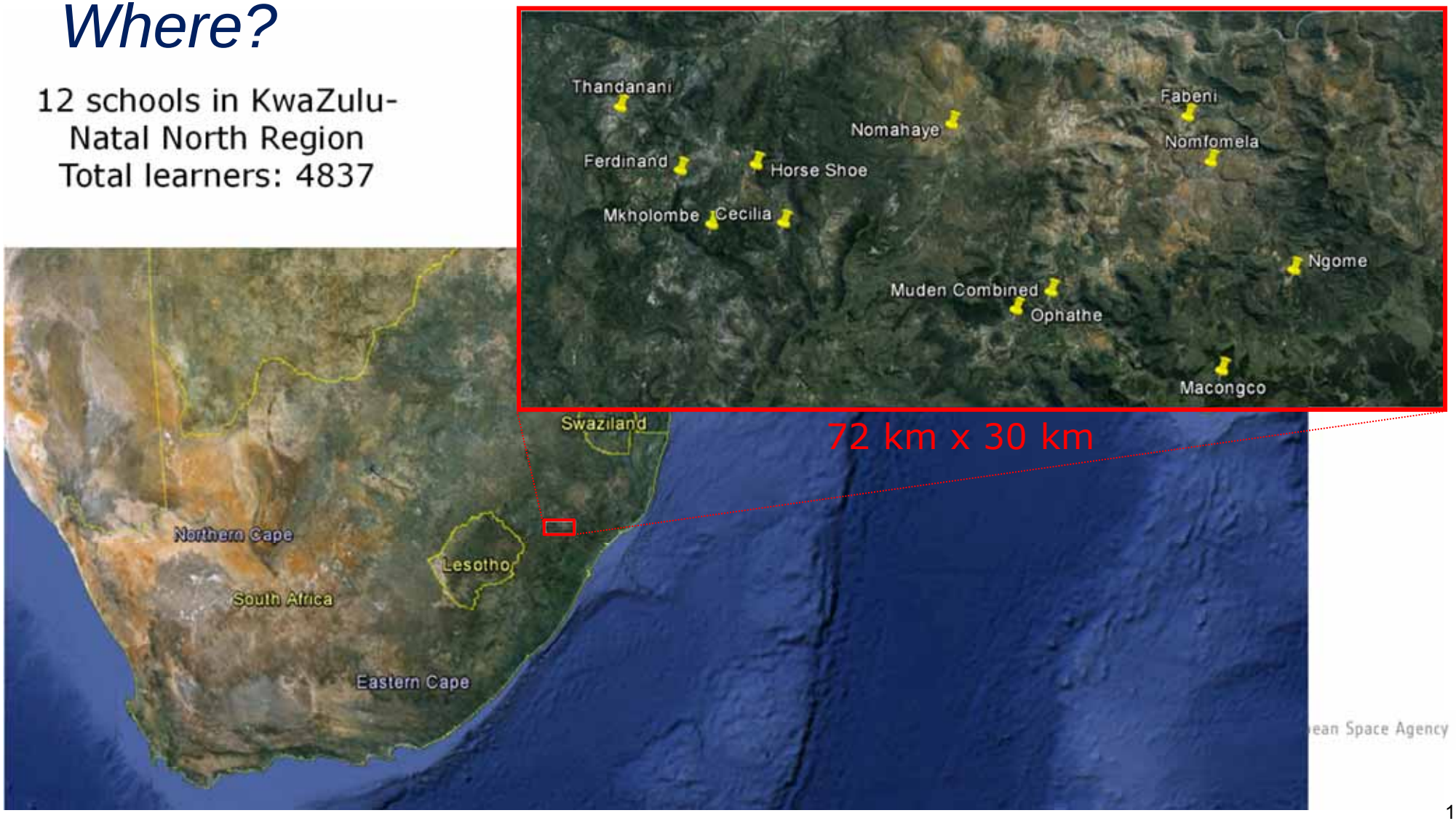
1	Nkandla / Entumeni	1998
2	Cedarberg	1999
3	Badplaas / Songimvelo	1998
4	Centane / Kei River	2000
5	Ixopo /Coleford	2000
6	Sekukuneland	2000
7	Robertson / McGregor	2001
8	Dullstroom area	2001
9	Groot Marico area	2001
10	Phuthaditjhaba area	2002
11	Kuruman / Hotazel / Kimberely	2003
12	Hogsback / Katberg	2003
13	Cathedral / Peak area	2003
14	Soutpansberg / Thohoyandou	2003
15	Grabouw / Witsand	2004*
16	North of Pilanesberg	2004
17	Umzimkhulu / Oribi Gorge	2004
18	White River / Kruger Park border	2004
19	Green Kalahari / Augrabies Falls	2005
20	Fouriesburg area	2005*
21	Willowvale / Qora Mouth	2006
22	Mkuze / False Bay	2006
23	Southpansberg / Thohoyandou	2006
24	Swartberg / Harding	2007
25	Chrissiesiake / Swazi border	2007
26	Zeerust / Madikwe	2007
27	Cedarberg	2007
28	Kuruman / Red Sands	2008
29	Ermelo	2008
30	Prince Albert / Laingsberg	2008
31	Phuthaditjaba / Bethlehem area	2008
32	Hogs Back / Katberg	2009
33	Cathedral Peak area	2009
34	Soutpansberg / Thohoyandou	2009
35	Weenen	2010
36	Pedi / Hamburg	2010
37	Malumelele	2010
38	White River / Emboniseni	2011
39	Lower Loteni / Southern Berg	2011
40	Malelane	2011
41	Wolmaransstad / Ottosdal	2011
42	Danielskuil	2011

* Depicts schools being revisited in 2011

Space4edu Project

Where?

12 schools in KwaZulu-Natal North Region
Total learners: 4837



Space 4 Education, examples "Rally to Read" and ISIDE4Africa

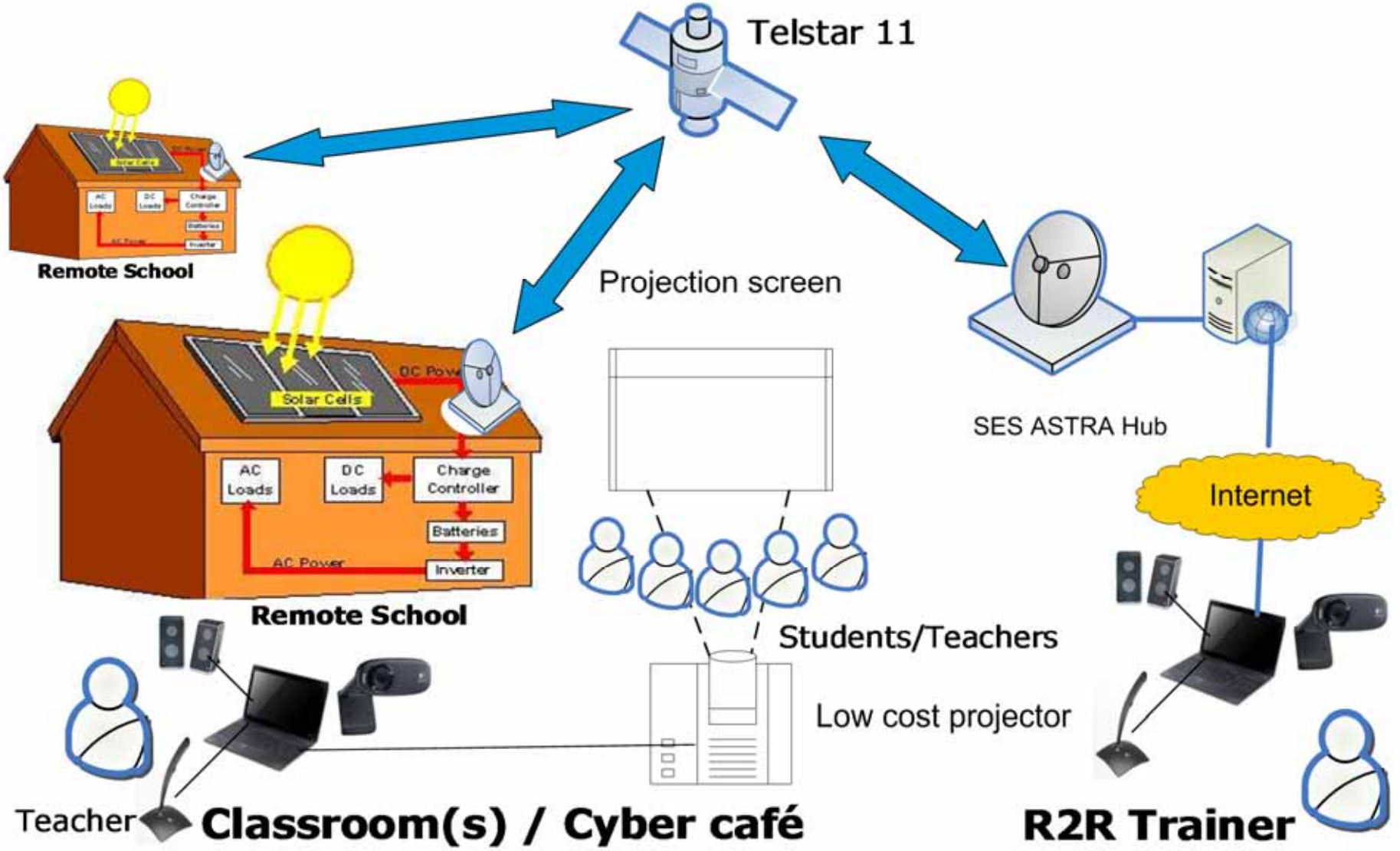
Traditional lesson (Greytown - South Africa)

Vocational Training, including Internet Browsing (Kinshasa - DRC)

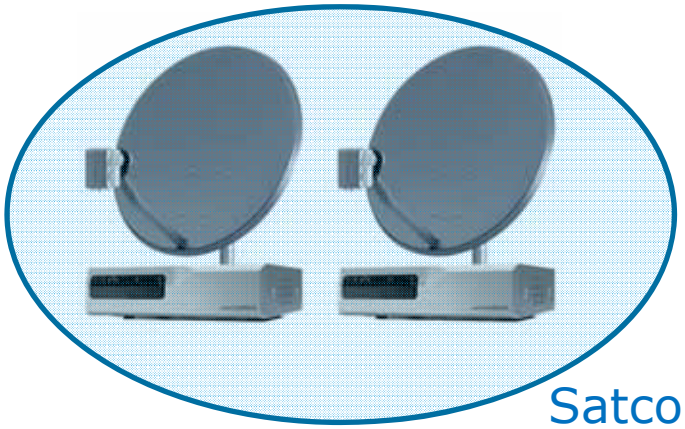
Lesson about local History (Burundi)

Entertainment for pupils (Kinshasa - DRC)

“Space4Education”



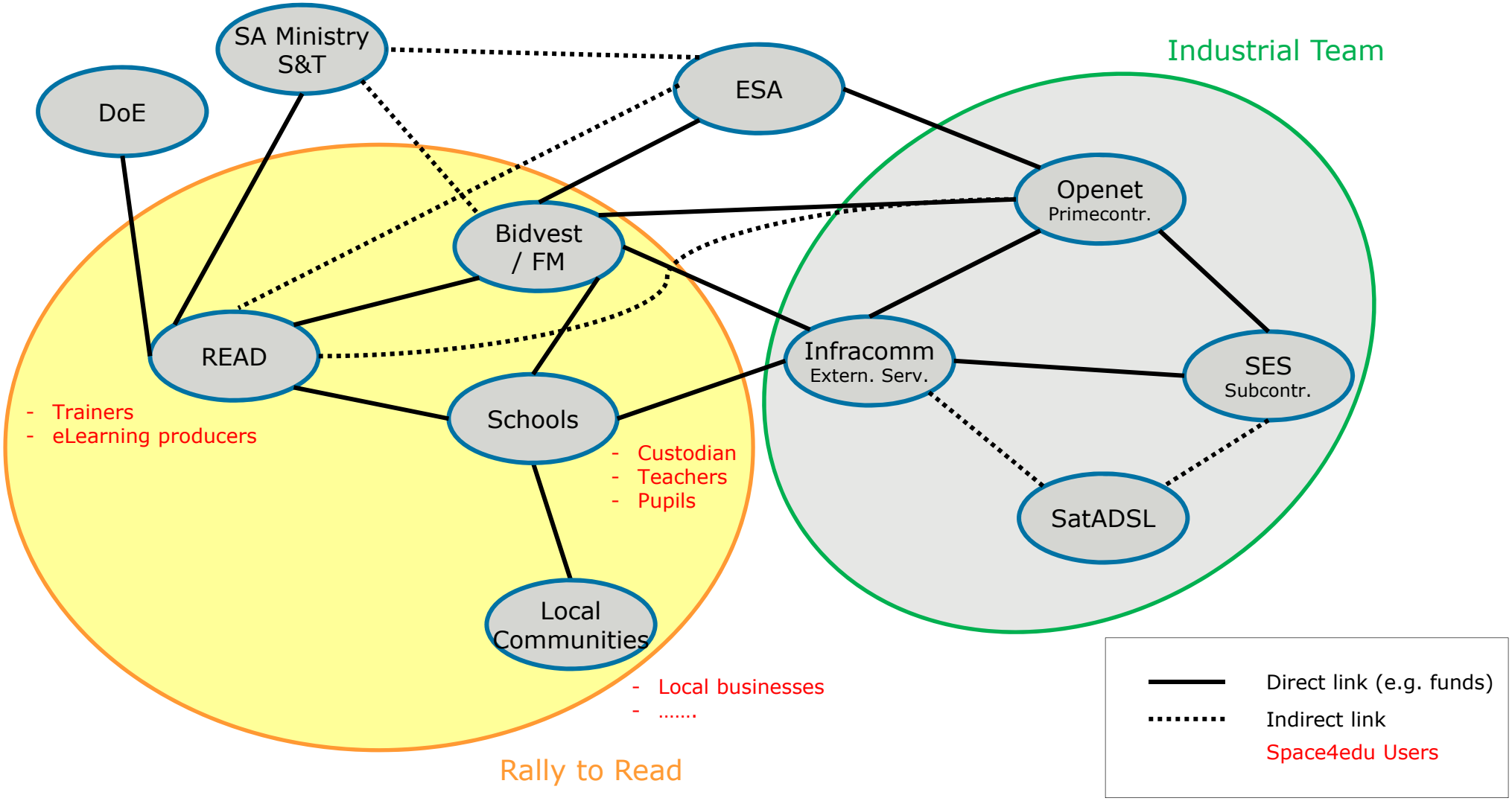
Space4du equipment: What will be installed at each pilot school?



Satcom

Power

Space4edu Stakeholders



Going to the schools

- 10 Rallies in 2012, period May-June
- Rally 9 - Kwalazulu-Natal North Region
- 6 teams, visiting 2 schools each
- Our team (team 5): 9 vehicles, 27 guests
- Visited schools: Muden Combined (228 pupils) and Nomahaye (580 pupils)
- ~500 km in two days

Muden Combined school

Nomahaye school

Muden Combined school

“Space for Med”
Space for Mediterranean
a Common EIB/ESA Initiative

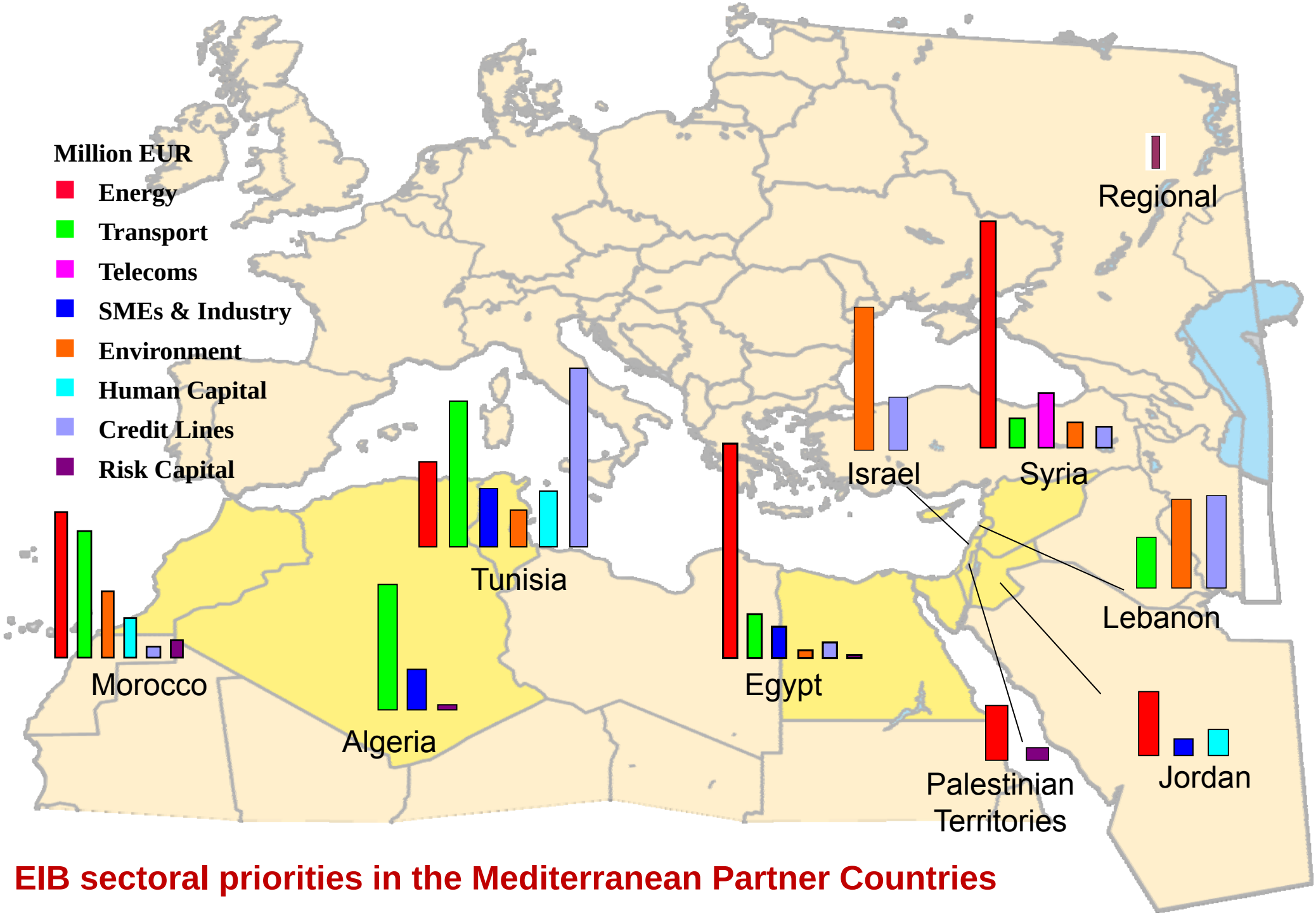
European Space Agency

Background

- **Mediterranean sea:**
  - Approx. 2.5 millions of Km^2 of sea extension, 21 countries surrounding it, 195 million habitants.
  - One of the most touristic areas of the world due to history, weather, quality of beaches and beauty of landscapes.
  - Abundance of solar resources and stable climate makes it attractive for renewable energies
  - Threats: biodiversity in danger, pollution, overfishing, tourism malpractices, etc.

- **EIB and ESA initiated cooperation in 2009:**
  - Broadband development studies, in relation to the BB-MED initiative.
  - eHealth for sub-Saharan African programme (on going)

- **FEMIP (Facility for Euro-Mediterranean Investment and Partnership):**
  - EIB's instrument to assist the economic development and the integration of the Mediterranean partner countries
  - Main task: encouraging modernisation and opening-up of partner countries' economies.
  - ESA and EIB proposed the "Space for Med" initiative to their "respective boards".



EIB sectoral priorities in the Mediterranean Partner Countries

EIB achievements in the Mediterranean

In terms of financial impact, since October 2002, FEMIP has

- invested EUR 13 bn in the Mediterranean region
- disbursed close to EUR 10 bn
- mobilised over EUR 30 bn of additional financing
- been the largest recipient of EU grants for investment projects (EIB benefited from EUR 222 M out of EUR 277 M of NIF so far)
- co-financing roughly 2 out of 3 projects (with EU bilaterals)

In terms of institutional/policy impact, FEMIP has

- Dialogue through FEMIP Ministerial, FEMIP Committee, FEMIP Conferences
- Upstream work through partnerships (UfM, CMI, ASCAME, UNIMED, ATO, etc)

Objectives

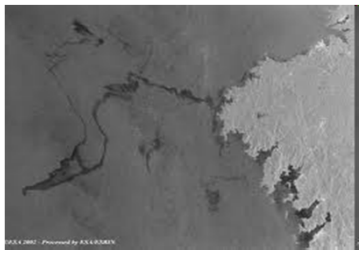
"To focus on key application sectors where the bridging of the digital divide via tailored satellite-based services will bring economic growth of direct benefit for the Mediterranean region"

- **Specific areas of interest:**
  - ***Energy and Renewable Energy.***
  - ***Transport and Logistics***
  - ***Water Management***

- **Other areas can be included if complementing on-going efforts or in response to an emerging demand**

Examples of Potential Activities

- **Energy and renewable energy:**
  - Small scale power plant management
  - Smart Grid Monitoring and Control
  - Pipeline Monitoring
  - Improved forecasting for Concentrating Solar Power (CSP)



- **Transport and Logistics:**
  - Intermodal transport of hazard goods
  - Harbour pollution monitoring
  - Intermodal Freight transport.

- **Water Management:**
  - Farming water usage optimisation
  - Early flood warning
  - Desertification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Conclusion
European Space Agency

General Summary of Achievements

In the ESA AGENDA 2015 ESA Director General underlined that:

The rapid success of the Integrated Applications Promotion (IAP) Programme, which was included in Agenda 2011 is a clear demonstration of the ability of ESA, Member States and the Executive together, to initiate new operational services based on existing space infrastructures.

The bottom line is to maintain existing operational services (meteorology, navigation, environment and security) and to develop new services based on existing space infrastructures (e.g. IAP) since the return on investment is important, considering the low level of investments required based on partnerships.

Where we are now

1. Now, after 3 years of effective operation, we have:
    a. initiated >75 activities; in partnerships
    b. >50 studies and projects currently underway;
    c. Annual cruise level of 21 studies, 18 Demo and 3-5 pre-operational services
2. Five projects have now moved into an operational service or a pre-operational phase:
    a. IAEA nuclear site monitoring - operational
    b. FlySafe - operational
    c. Tempus aeronautical telemedicine has spun-off a pre-operational IAP service AMAZON;
    d. Talking Fields – pre-operational
    e. GrapeLook – pre-operational.
3. Initiated a new European user driven mission, in partnership with EMSA, the SAT-AIS
4. Established partnerships with entities where new source of funding is available for commercial space missions and space related sustainable services

The Economic Case for IAP:

An Analysis of Selected Market Opportunities and European Benefits

Overall Approach and Methodology

- A two-part evaluation methodology was adopted:
  - Top-down assessment of historical growth and future prospects of global and European satcoms, GNSS and EO markets; and
  - Bottom-up analysis of selected case studies identifying IAP market opportunities, with a preliminary quantification of the benefits.
- The top-down analysis highlights the sustained growth of downstream space services over the past decade, however:
  - DTH-TV has been the main driver and is showing signs of saturation, so new markets will have to be opened up and new applications developed;
  - Other big opportunities are in broadband satcoms and location-based services utilising existing and new GNSS platforms; and
  - EO shows promise for services to broader consumer and business markets, but revenues are tiny compared to satcoms (2% vs 76%).
- Securing continued high growth therefore depends upon new markets that require more powerful integrated solutions.

Case Studies: Potential for IAP to Stimulate Major Growth

1. In assessing the potential for IAP, the bottom-up analysis investigated several major industries through detailed case studies.
2. The aim was to identify areas that meet the following criteria:
   - Very large near- and longer-term market potential for space-based services;
   - Pan-European benefits; and
   - New capabilities are needed to realise the opportunity, and can be delivered by integrated applications utilising existing space assets.
3. The economic case for IAP was delivered at the end of January, containing case studies on three markets:
   - Development of offshore wind power;
   - Valuation and monitoring of forest carbon; and
   - Insurance and risk management.
4. Further case studies will be analysed and added progressively.
5. The Report outline the prime, but not the only opportunity identified in each market – a decision now has to be made on how to address the opportunities, e.g. with detailed roadmaps or promotional actions.

On the way to 2012 ministerial council

1. ARTES 20 NEXT PHASE PROGRAMME PROPOSAL FINALISED: KEY SUPPORTING ELEMENTS IAP ACHIEVEMENTS AND IAP ECONOMIC CASE;
2. ARTES 20 IMPLEMENTING RULES ENHANCED TO MEET EXPECTATIONS OF DIFFERENT STAKEHOLDERS;
3. SPECIFIC ENANCHEMENTS HAVE BEEN PROPOSED IN THE FOLLOWING AREAS:

- Awareness: to devote basic activities budget to support the sustainability of the AP network;
- Fast-track FS (<50 KEuro) to speed up implementation;
- To speed up implementation of DP resulting from successfully FS.

On the way to 2012 ministerial council

Artes 3-4 & IAP is an open and effective programme in support of economic growth and B Industry:

a. Proposed IAP Phase II annual budget of 30M€ is less then 1% of ESA annual budget
b. Participation/collaborating in relevant projects
c. Initiation of B projects or services in line with IAP/Artes 3-4 objectives
d. Participation in relevant 3rd party (e.g. EIB) programmes (Space 4 Med,-Africa)


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Thank You!
European Space Agency