



Integrated Applications Promotion (IAP)

ESA Creating Value, Along the Value Chain

Space for Civil Protection Workshop
ESPI, Vienna, May 5th & 6th 2011

Prof. A. Ginati
European Space Agency (ESA)



European Space Agency

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18 Member States

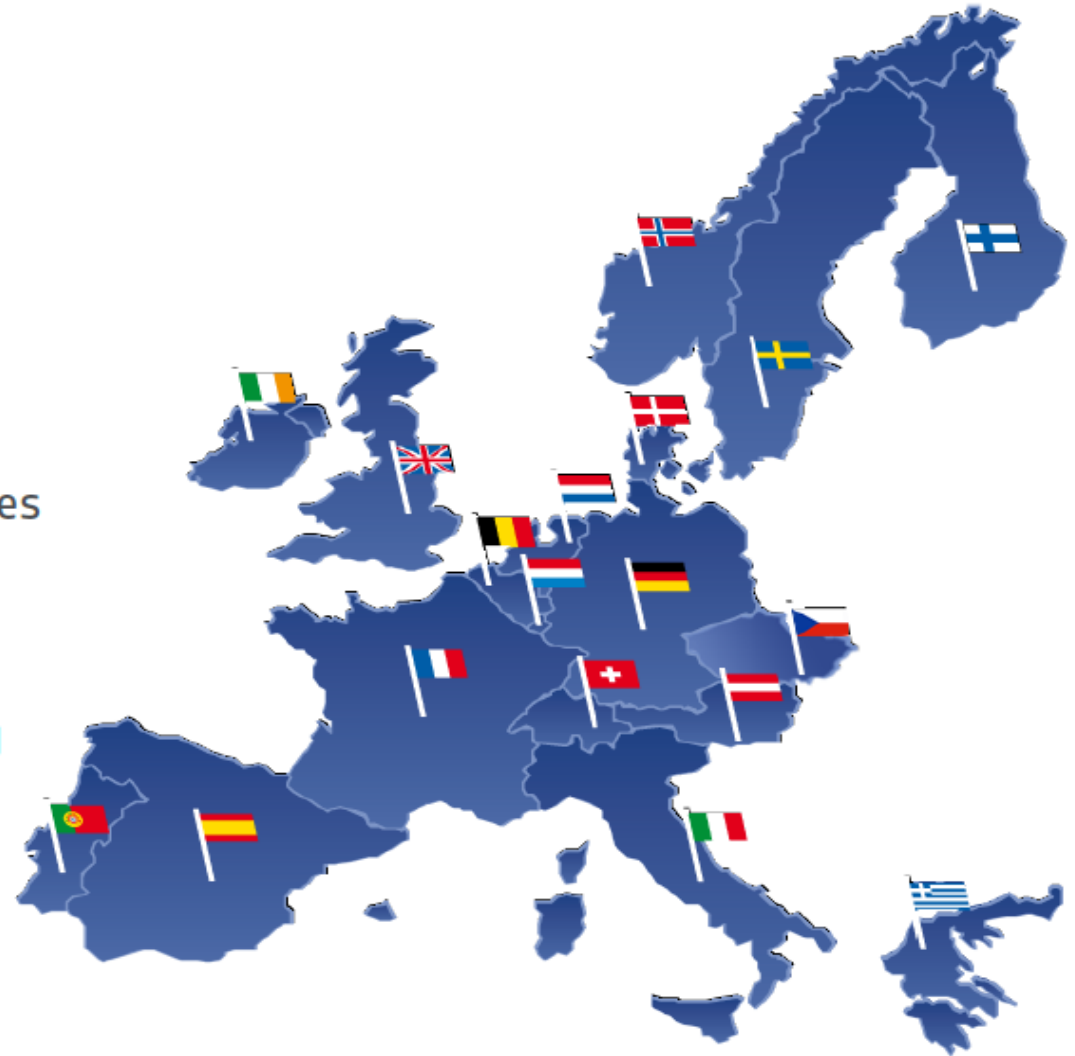


Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Norway, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Canada takes part in some programmes under a Cooperation Agreement.

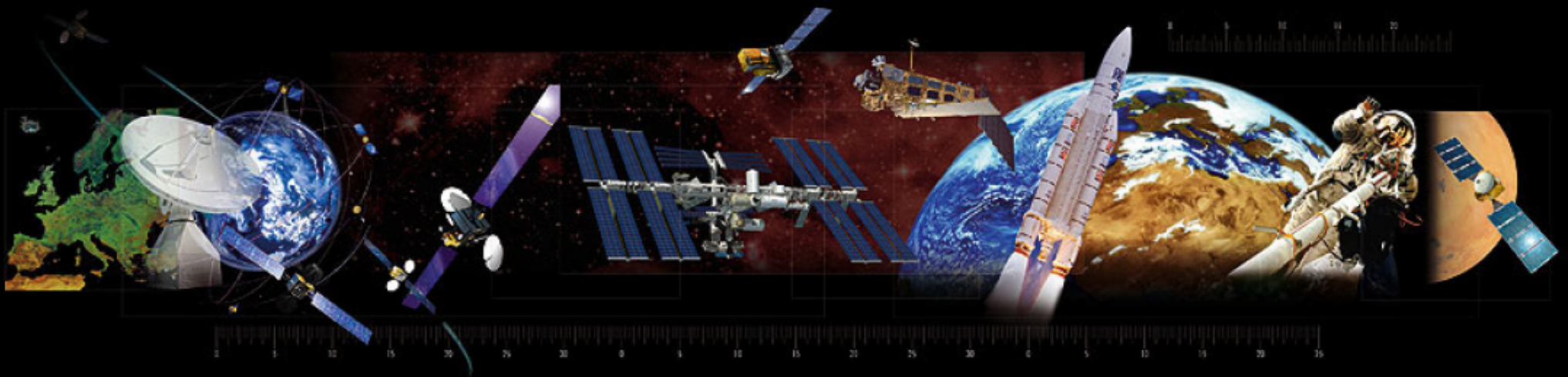
Hungary, Romania, Poland, Slovenia, and Estonia are European Cooperating States.

Cyprus and Latvia have signed Cooperation Agreements with ESA.



ESA is one of the few space agencies in the world to combine responsibility in nearly all areas of space activity.

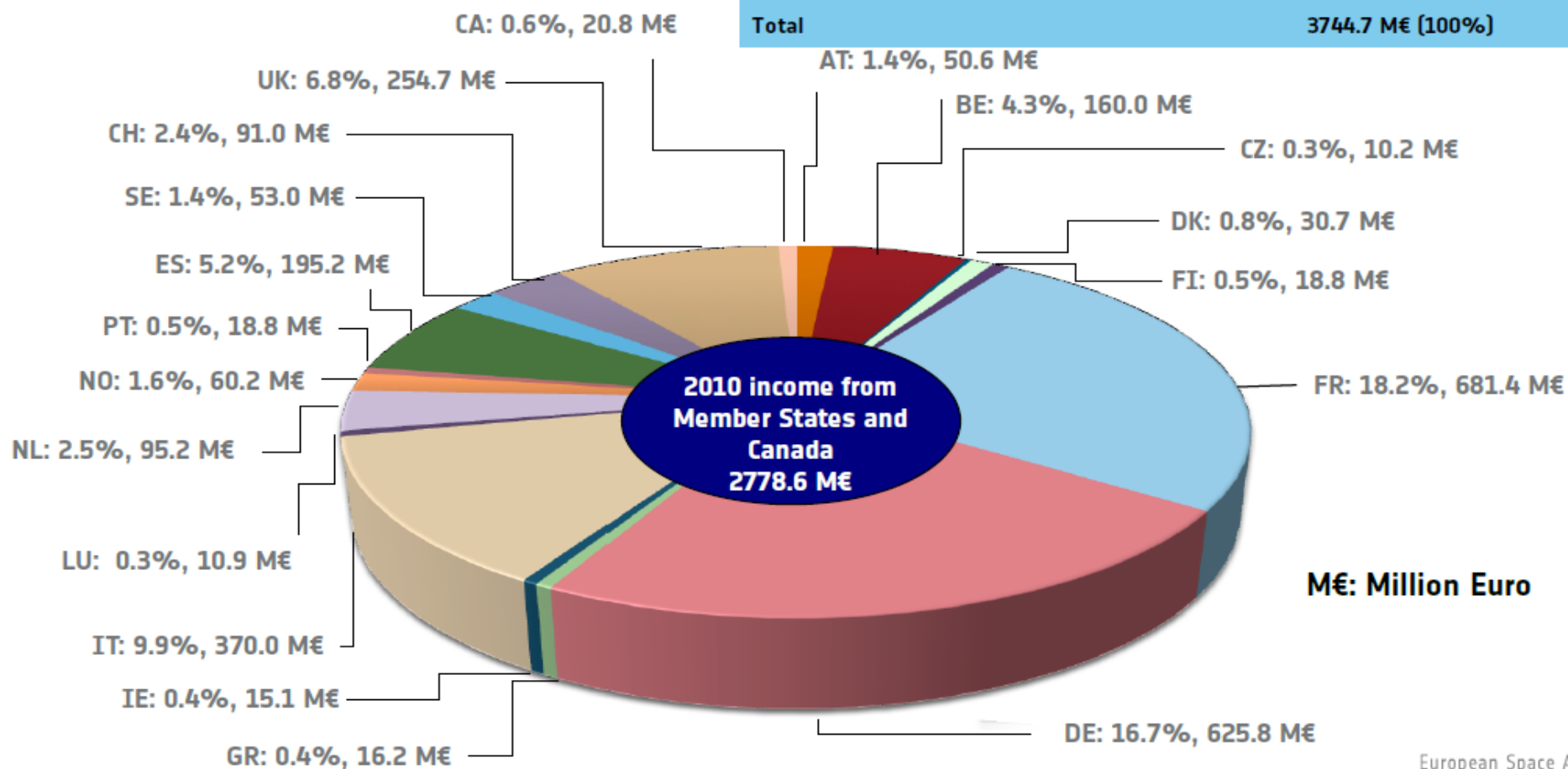
- Space science
- Human spaceflight
- Exploration
- Earth observation
- Launchers
- Navigation
- Telecommunications
- Technology
- Operations



ESA Budget 2010



Income from Member States and Canada	2778.6 M€ (74.2%)
Income from EU	754.8 M€ (20.2%)
Income from ECSA	5.2 M€ (0.1%)
Other income	206.1 M€ (5.5%)
Total	3744.7 M€ (100%)



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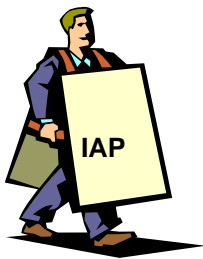
European Space Agency



→ TELECOMMUNICATIONS & INTEGRATED APPLICATIONS

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ARTES Applications & User Driven Missions



Awareness

ARTES 3-4

Satcom Demonstration



Product
Driven
Application

ARTES 20 (IAP)

Feasibility

Demonstration



User
Driven
Application

ARTES 21

SAT-AIS Initiative



User
Driven
Mission

New Culture

Third-Party Funding /Innovation Fund



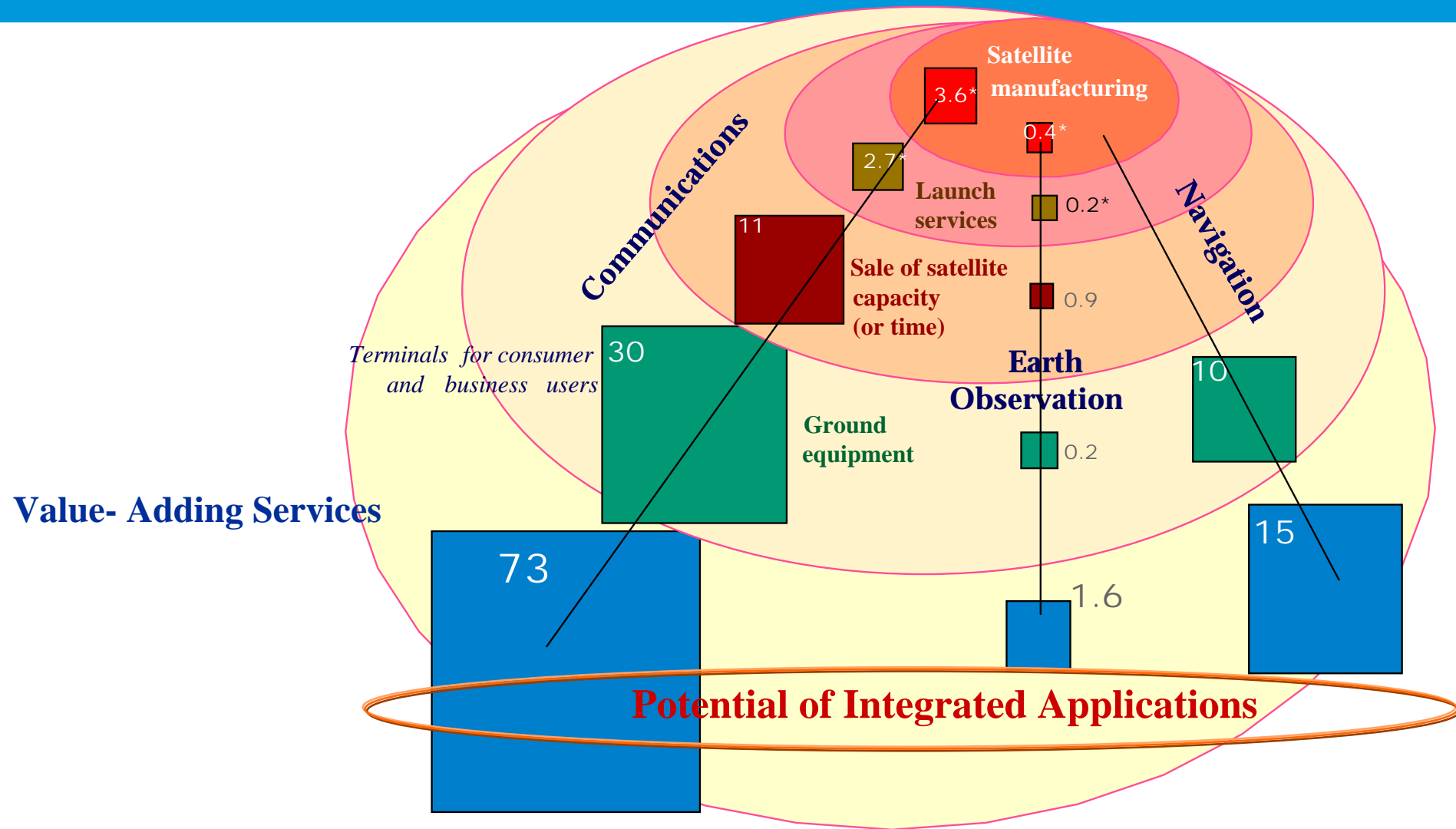
Co-Funding
Approach

SECURITY



In
Preparation agency

The Three Value Chains in Commercial Satellite Applications

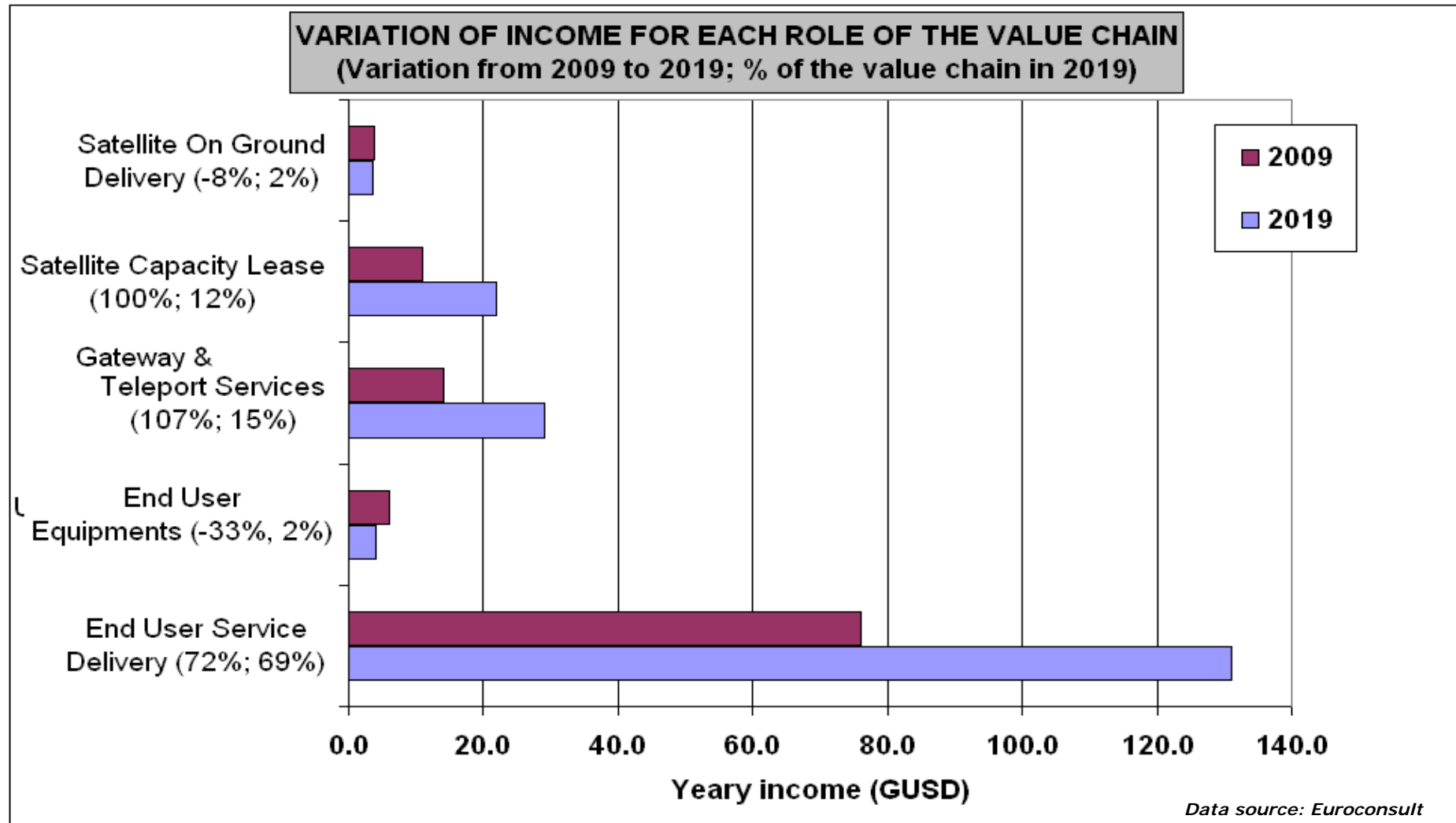


Values for the year 2009 in billions of € (Satcom)

European Space Agency

COURTESY OF Euroconsult

2009-2019: Revenues shifting downstream in the value chain



Thematic Areas addressed by Satcom Applications Projects



(153 projects, 250M€, 108M€ ESA)

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)



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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

ESA's Integrated Applications Promotion Programme (IAP / ARTES 20)



**Earth
Observation**

**Tele-
communication**

Navigation

→ **Developing new services for new user communities**

**User
Demand**

**Feasibility
Study**

Demo

**Operational
Service**

**Manned
Space Flight**

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=> 39
- IAP Demo projects: 2+8+4 =>14
- ARTES 3- 4 Open Call: 15
- ARTES 21 SAT-AIS: 4+
- 3rd Party Funding: 2

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

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



**Climate →
Energy,
Health ...**

European Space Agency

Awareness ARTES 20 and 3-4

3rd Party funding



- **IAP Awareness Activities in development**
 - IAP Advisory Committee (**IAPAC**) 4th meeting in March 2011
 - **Web portal** gateway in operation (<http://iap.esa.int>)
 - **Ambassador platforms** (AP) in Austria, UK, Norway, Spain, France, Fin. and Italy
 - IAP **events** across Europe (workshops, symposia, roundtable discussions)
 - Theme: „**Space for Africa & Africa in Space**“
 - Preparation of a dedicated IAP approach documents for:
Baltic, Alpine region, Ireland, Arctic.
- **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/>

Integrated Application Promotion Ambassador Platforms (AP)



Geographic and or Thematic AP representation



NO: *AP for E-Health in inaccessible regions (by NST)*



UK: *AP for Enhanced mobility*



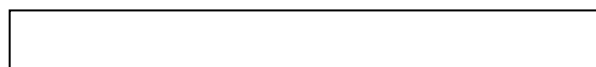
FR: *AP for Environmental Risks & Hazards in the Mediterranean Region (by Pôle Risques)*



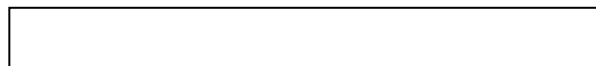
FI: *AP for the Baltic Sea Region (in prep. Q2 2011)*



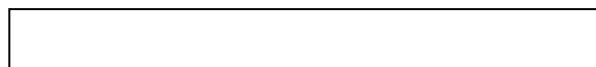
ES: *AP for EU adoption of renewable energies (CENER)*



CH: *AP for alpine environment (in prep. Q3 2011)*



IT: *AP for maritime Security (in prep. Q3 2011)*



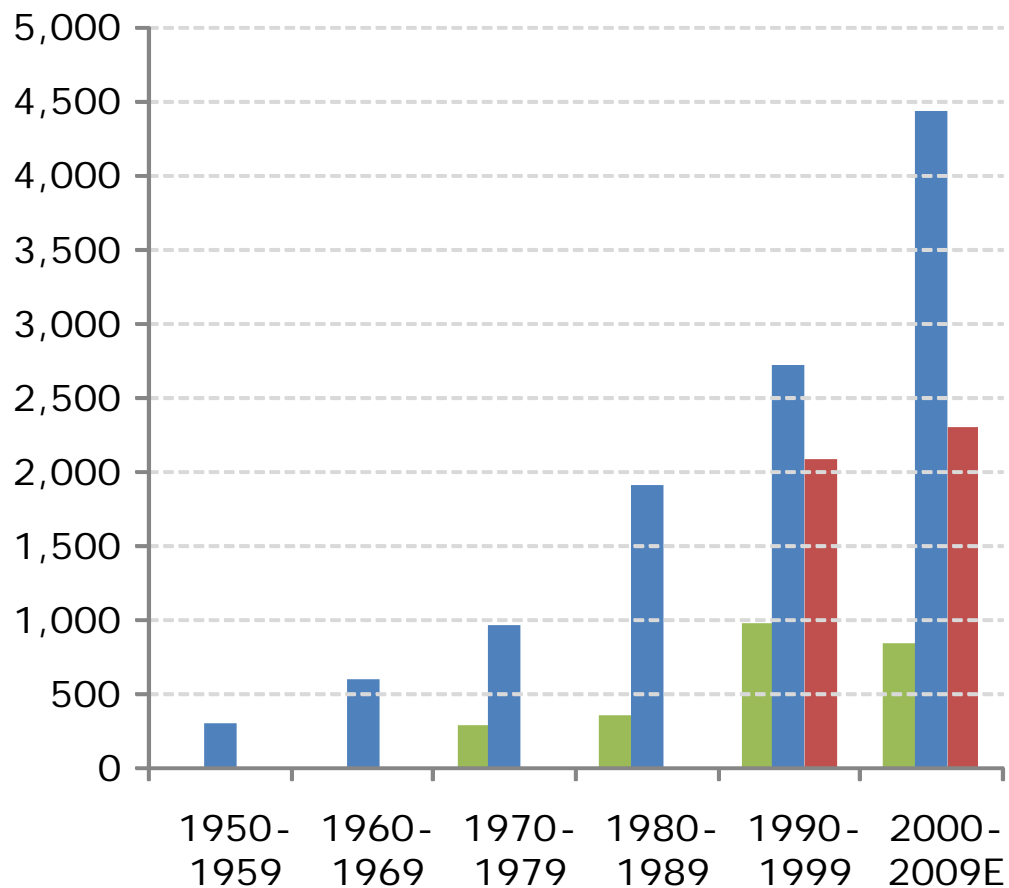
GER: *AP topic not yet fixed (in prep. Q4 2011)*

Disaster prevention & recovery

Sector overview & primary stakes



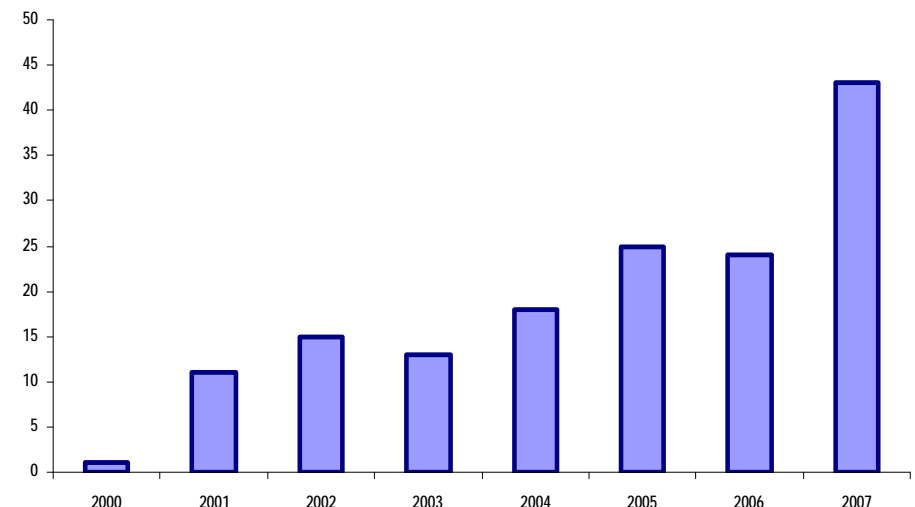
An increasing impact of disasters per decade



Source: ISDR, Euroconsult estimates

- Fast growing number of disasters reported in the different world regions
- Over 2 billion people impacted
- Economic damage over \$500 billion

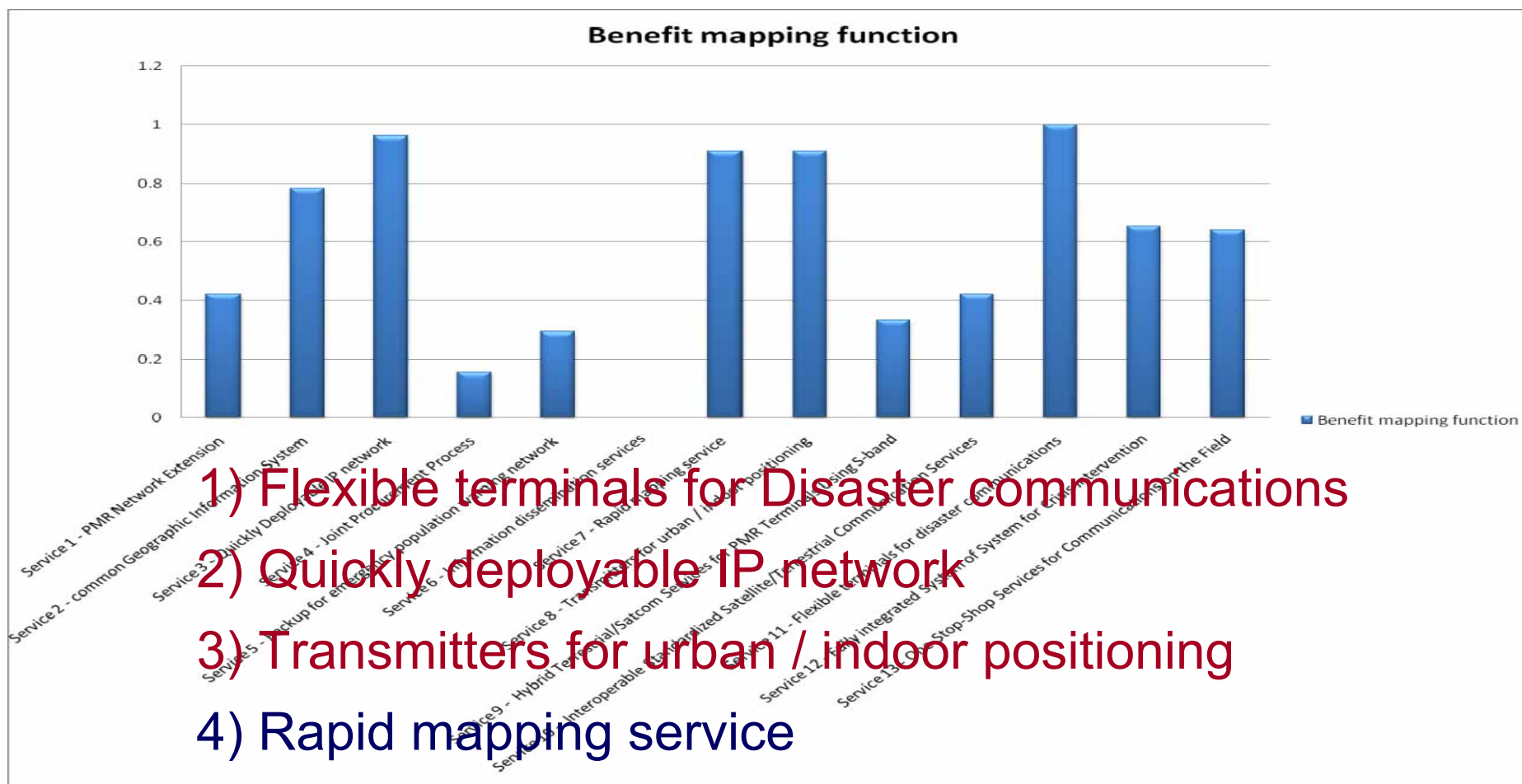
International Charter Activations by Year



Source: International Charter

Future Sat-based Services for European CPs

19 national CPs involved in 2 surveys, a list of **13 services** was proposed to the CPs. On the basis of the answers collected, a single **Benefit Metrics** was defined to elaborate an effective ranking and select the most successful **Services**:



ARTES 20 Demonstration Projects

User Driven & in partnerships



8 On-Going Projects with a total commitment of 17.2 M€ ($\geq 50\%$ co-funding):

- SpaceGrid: **Power grid management**; 1.05 M€; Users: **TERNA** (I)
- T4MOD: **Telemedicine** for Medical Operations in Distant Areas, 2.05 M€, Users: **MoDs** from F, D, I, E (Djibouti, Herat, Masar-e-Sharif)
- Talking Fields: Integrative Use of Satellite Techniques to **Optimise Agricultural** Production, 1 M€, Users are **PC-Agrar GmbH and Land-data Eurosoft**, representing 30.000 farmers in Europe.
- AMAZON: Real Time Satellite-based **Telemedicine Service** for Professional Clinical Users in Remote Locations, 700 k€, Users: **International SOS**
- S2BAS: Space Service Benefits in **Aviation** Systems; 1.3 M€; Stakeholder: Techno Sky (I), representing Air Traffic Control users for **local airports**.
- WaterWatch: Space Based Services for **Water Irrigation** Management of Vineyards in South Africa; Users: **Dept. of Agriculture** of South Africa; 0,31M€
- SAT-AIS Data Center: Data Processing centre for **Sat-AIS Services**; 4M€; **EMSA**
- Blue Belt: **Cargo ships transport** between European harbours: **Custom, Ship owners**, *idea >approval within 3 weeks*

4 Under preparation:

- UAS: UAS Demonstration Mission 1st Phase; 1,2M€; User: **EDA**
- ...

2 Operational Service:

- FlySafe **bird strike risk reduction** in aviation be operated by **KNMI** (Royal Netherlands Meteorological Institute).
<http://public.flysafe.sara.nl/bambas/index.php>
- IAEA: **Nuclear site monitoring** (Hungary, Armenia, Ukraine); Users: **IAEA**; Successfully operating. Additional 8 nuclear sites are in preparation.

Examples of Established Operational Services

- FlySafe, Bird Strike Avoidance
- Safeguard Services for IAEA

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



FLYSAFE Web Service



The FlySafe Bird Avoidance Model - Microsoft Internet Explorer

File Edit View Favorites Tools Help



Address <http://public.flysafe.sara.nl/bambas/migration/index.php?radar=glons&subwindow=nw>

Web Search Bookmarks Settings Get IE8 now! Translate Page Mail My Yahoo! Answers Games Anti-Spy



The FlySafe
Bird Avoidance Model

European Space Agency

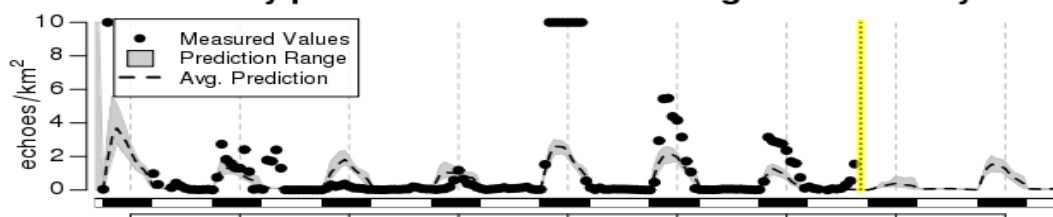
ESA Home Migration Spatial Models More information Legal Disclaimer

Welcome to the FlySafe bird migration prediction module

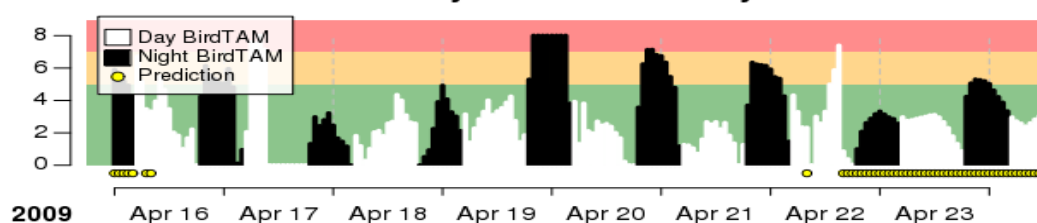
This page provides a 72-hour forecast of bird migration intensity for the **Central Belgium** location. The predictions are provided in two formats. The **Hourly predicted and measured migration intensity** plot shows the measured bird density values in bird echoes/km² (black dots) as well as the mean predicted bird density (dashed line) and prediction range (gray). The prediction range is produced by an ensemble forecast of ~50 models. The **Hourly BirdTAM Intensity** plot shows the bird densities converted to BirdTAM warning levels for pilots from seven days in the past and three days into the future. If the measured value is available, the BirdTAM intensity reflects that measured value. If no measurement is available, the mean bird migration density prediction is used (indicated by small yellow circle).

These predictions are made using the European Centre for Medium Range Weather Forecast Deterministic Model. The most important weather variables in the predictions are visualized in the plots on the right. Wind speed and direction at multiple pressure heights in the top plot. The tails point in the direction FROM which the wind is coming, and the barbs indicate the speed of the wind. Following plots are surface pressure (hPa), hourly precipitation (mm) as well as the percentage of cloud cover. Cloud cover is given in both a **lower** and **total** component. The final plot provides temperature (deg).

Hourly predicted and measured migration intensity

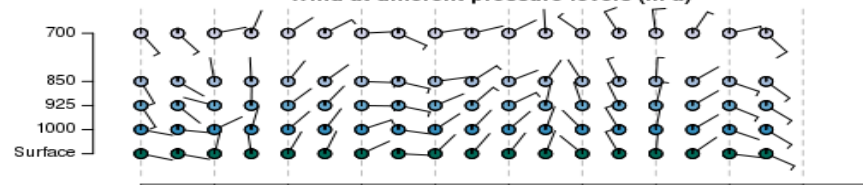


Hourly BirdTAM Intensity

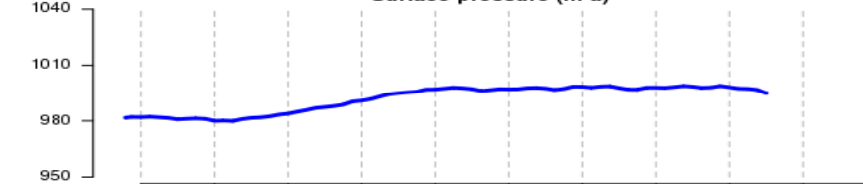


Location: Central Belgium, Last modified: Wed Apr 22 2009, 6:18 pm, Next run: Wed Apr 22 2009, 6:48 pm

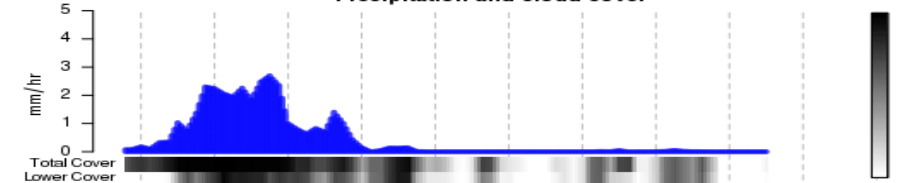
Wind at different pressure levels (hPa)



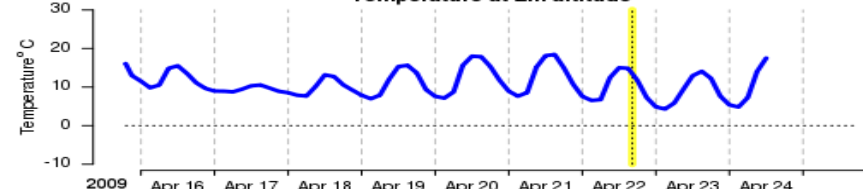
Surface pressure (hPa)



Precipitation and cloud cover



Temperature at 2m altitude



Last modified: Wed Apr 22 2009, 6:17 pm, Next run: Wed Apr 22 2009, 6:47 pm



vle





FlySafe follow-on (military aviation)

Pre-operational services hosted by KNMI (2011):

Sustainable within existing cooperation between Air Force and KNMI

24/7 automatic running of models

2 B + 2 NL locations

24/7 automatic extraction from weather radars

3 B + 2 NL locations

FlySafe-2 (2011-2013):

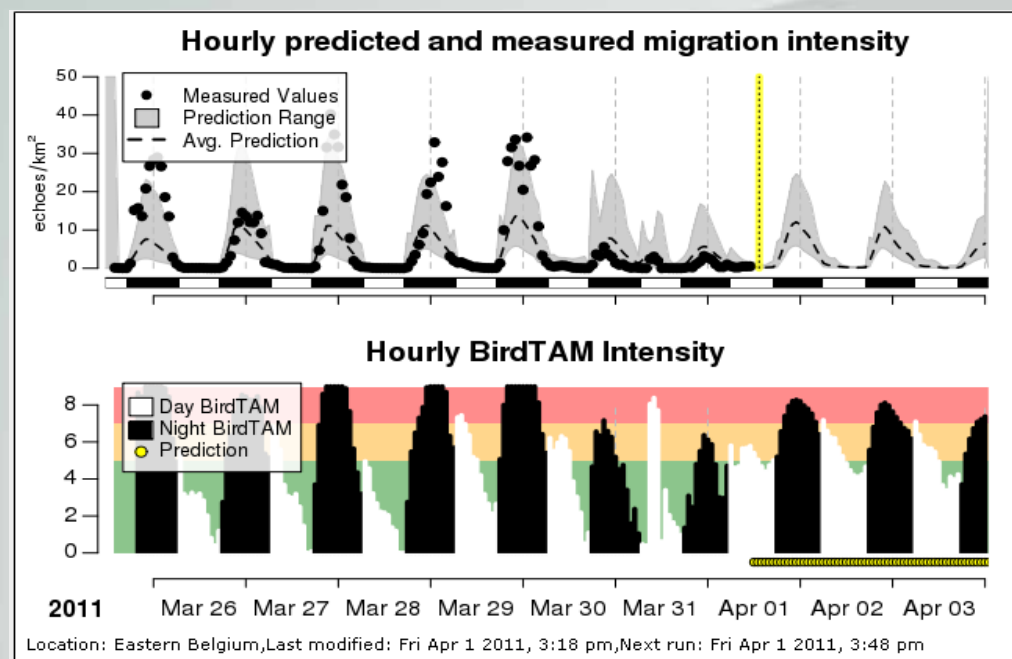
- Building upon FlySafe-1, RNLAf funded
- additional time-based modelling using weather radar
- new modelling of altitude based on weather radar
- addition of >6 weather radars in **neighbouring countries**
- teaming up with EU *Lifewatch* program



BIRDTAM forecast

« For AF's, a way to save money »

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

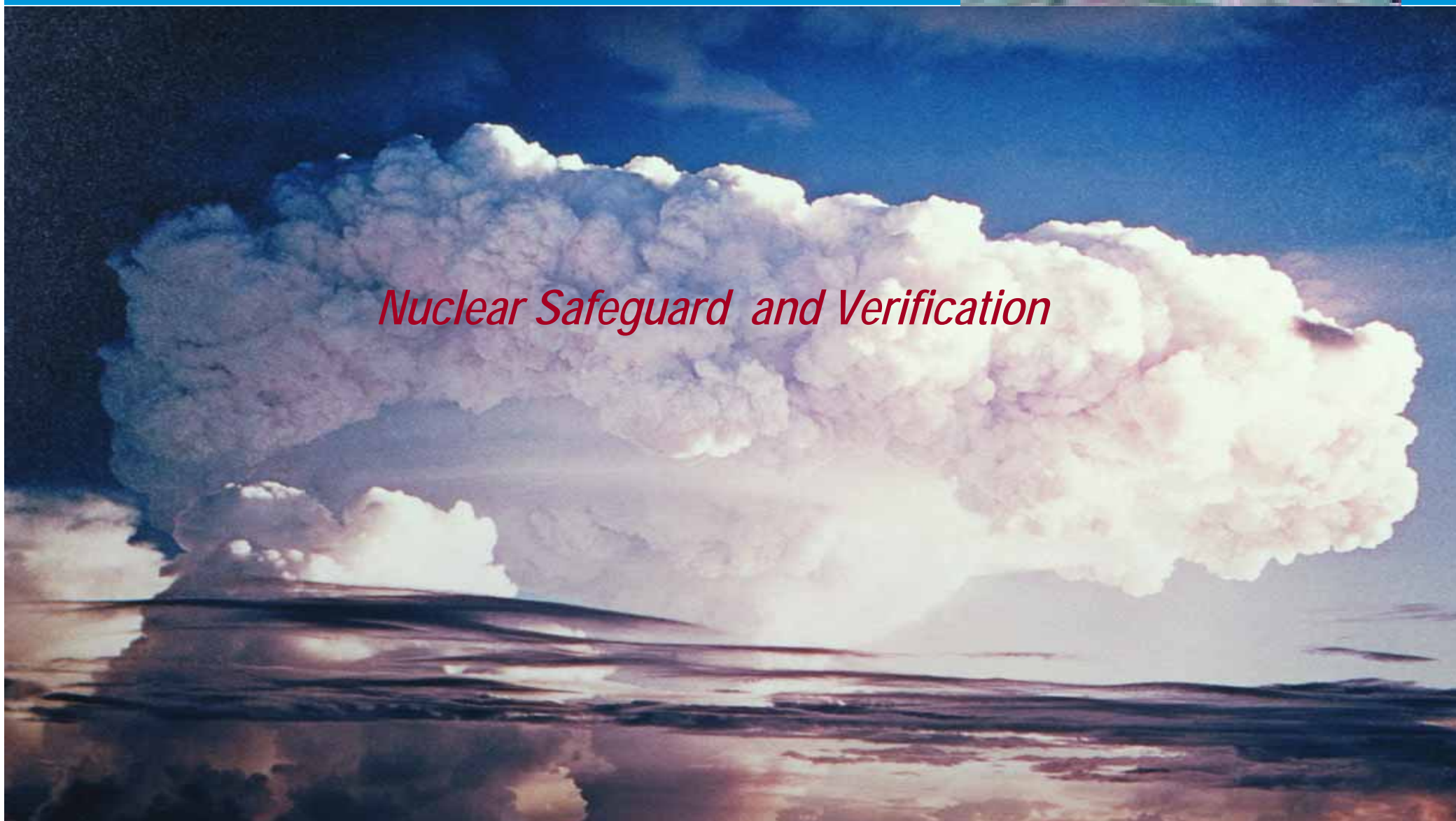


- Better flight planning, better time and human resources management => money saved

Integrated Satellite-Based IAEA Safeguard Services



Nuclear Safeguard and Verification



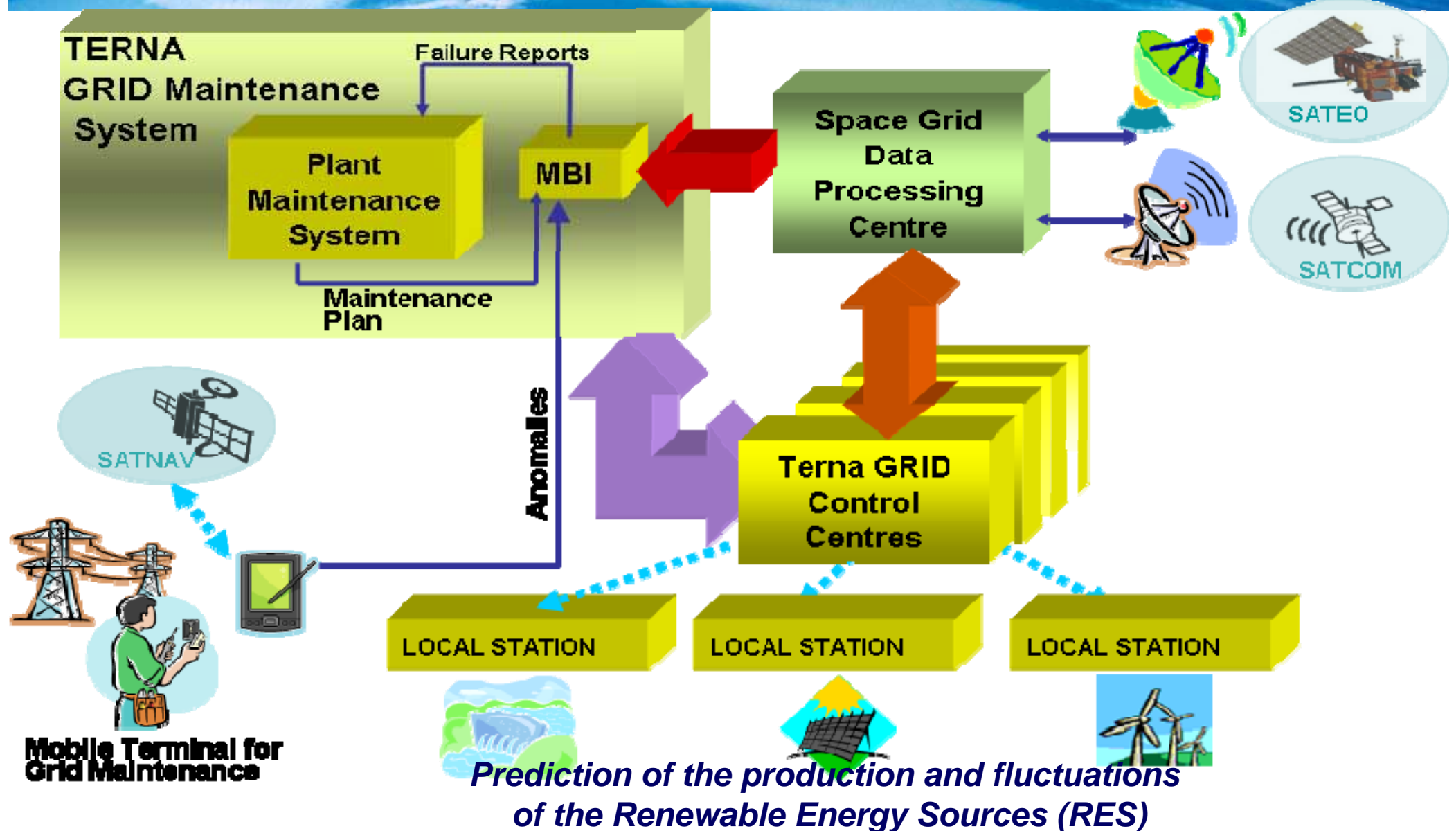
Chernobyl



IAEA

ESA - IAEA Satellite Project







Management of Medical Emergency for commercial aviation: 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



Integrated Application Promotion
VOYAGE – Telemedicine on Board of Airplanes



- **Background:**

Box 1: Pitt Review

In the exceptional events that took place, 13 people lost their lives, approximately 48,000 households and nearly 7,300 businesses were flooded and billions of pounds of damage was caused. In Yorkshire and Humberside, the Fire and Rescue Service launched the “biggest rescue effort in peacetime Britain”.^{*} Across Gloucestershire, 350,000 people were left without mains water supply – this was the most significant loss of essential services since the Second World War. Other critical infrastructure was damaged and essential services including power supplies, transport links and telecommunications were disrupted.

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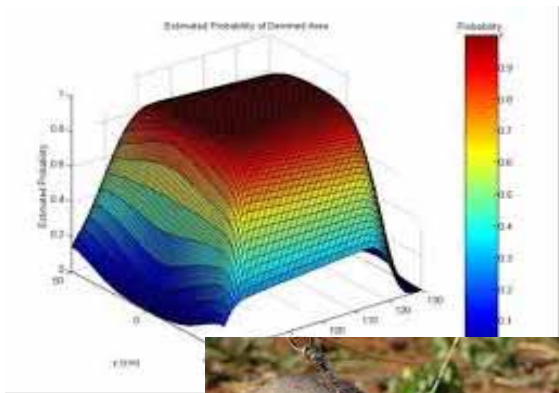
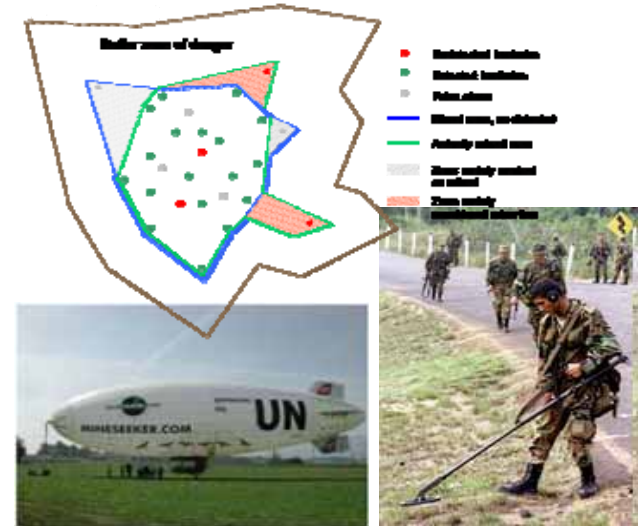
^{*} General Secretary Matt Wrack, Fire Brigades Union Press Release 28 June 2007



- **Added value of meteorological information:**
 - Numerical Weather Prediction Models shall be re-checked using satellite imagery.
 - Actual weather status using satellite data shall be incorporated as well
- **Other space assets:**
 - Satcom, to grant communication when terrestrial infrastructure is not available or damaged.
 - SatNav to locate deployed resources.

• Background:

- The UN estimates that approximately 110 million land mines are presently scattered in about **70 countries**;
- Mines claim between 15,000 and 20,000 **new victims** in countries that suffered war recently.
- Resources (arable land, infrastructure, water, etc) located within areas suspected of mine **contamination** cannot be exploited



- **Added-value of meteorological information:** Conditions such as soil moisture, humidity or temperature derived from meteorological satellites help to find out what tool/methodology is the most appropriate and where to use it.
- **Other space assets:**
 - GNSS is used for field survey work, precise ground referencing and tools positioning.
 - Satcom will be of help if the area under survey is located in a remote region

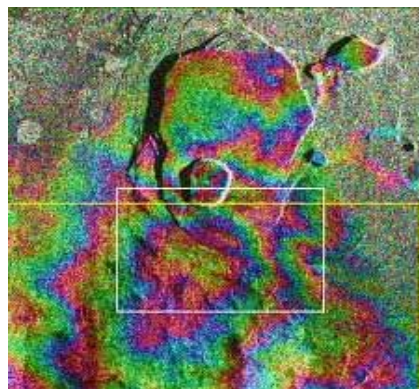
Landslide & Subsidence Affecting the Transport Infrastructure (Safety)



1. Background:

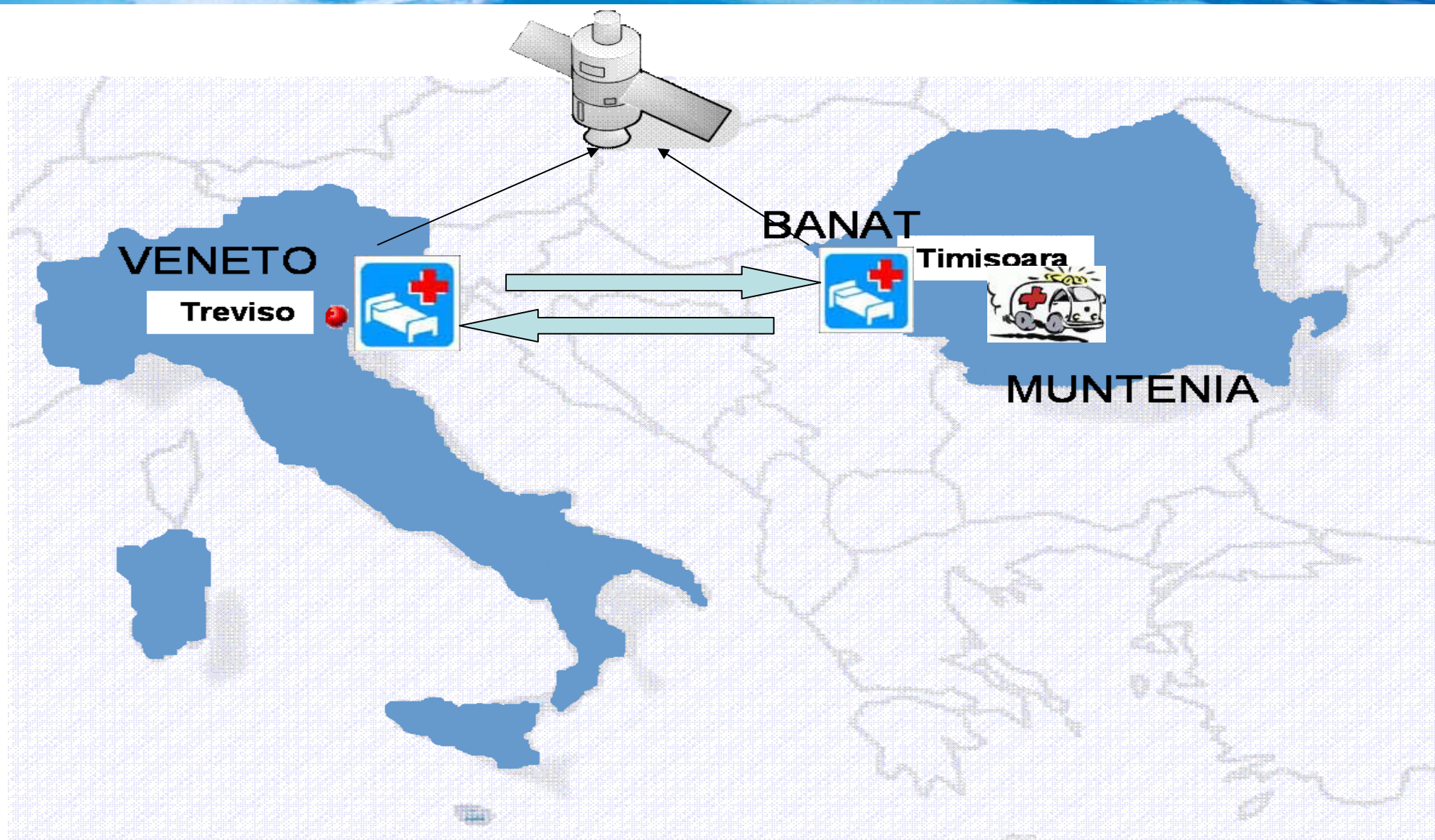
- a. World-leading Scottish Road Network Landslides Study identifies 100 “hot spots”
- b. So far nobody has been killed:
Government priority is to keep it that way.

- 2. Need: to monitor extensively the environment of the road including clays, shales & hard rocks; natural & man-made slopes; subsidence, landslips, rock falls; known hot spots & unknown vulnerabilities.



- 1. Added value of meteorological information:
Prediction of heavy rain over risky areas is a must to be known.
- 2. Other Space Assets:

- a. EO data sources (SAR interferometry) to monitor land displacements
- b. GNSS data can complement SAR measures.
- c. Satcom will collect GNSS data if the area has no terrestrial link coverage



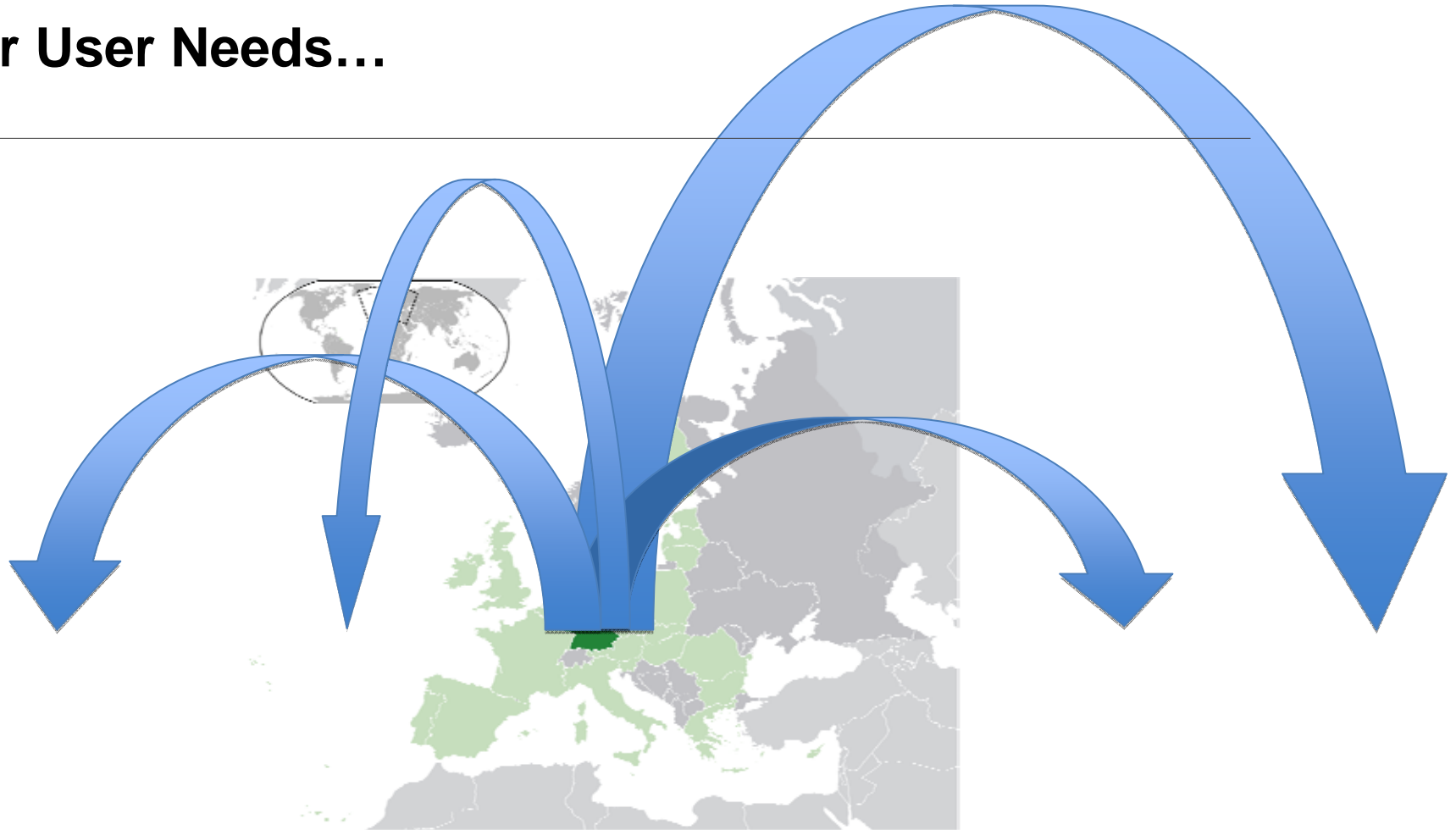
T4MOD: Telemedicine for the French, German, Italian and Spanish Ministries of Defence

ARTES Applications Workshop
5th-6th April 2011

Major René Mathieu, Dept. of Neurosurgery, Federal Armed Forces Hospital, Ulm



Clear User Needs...

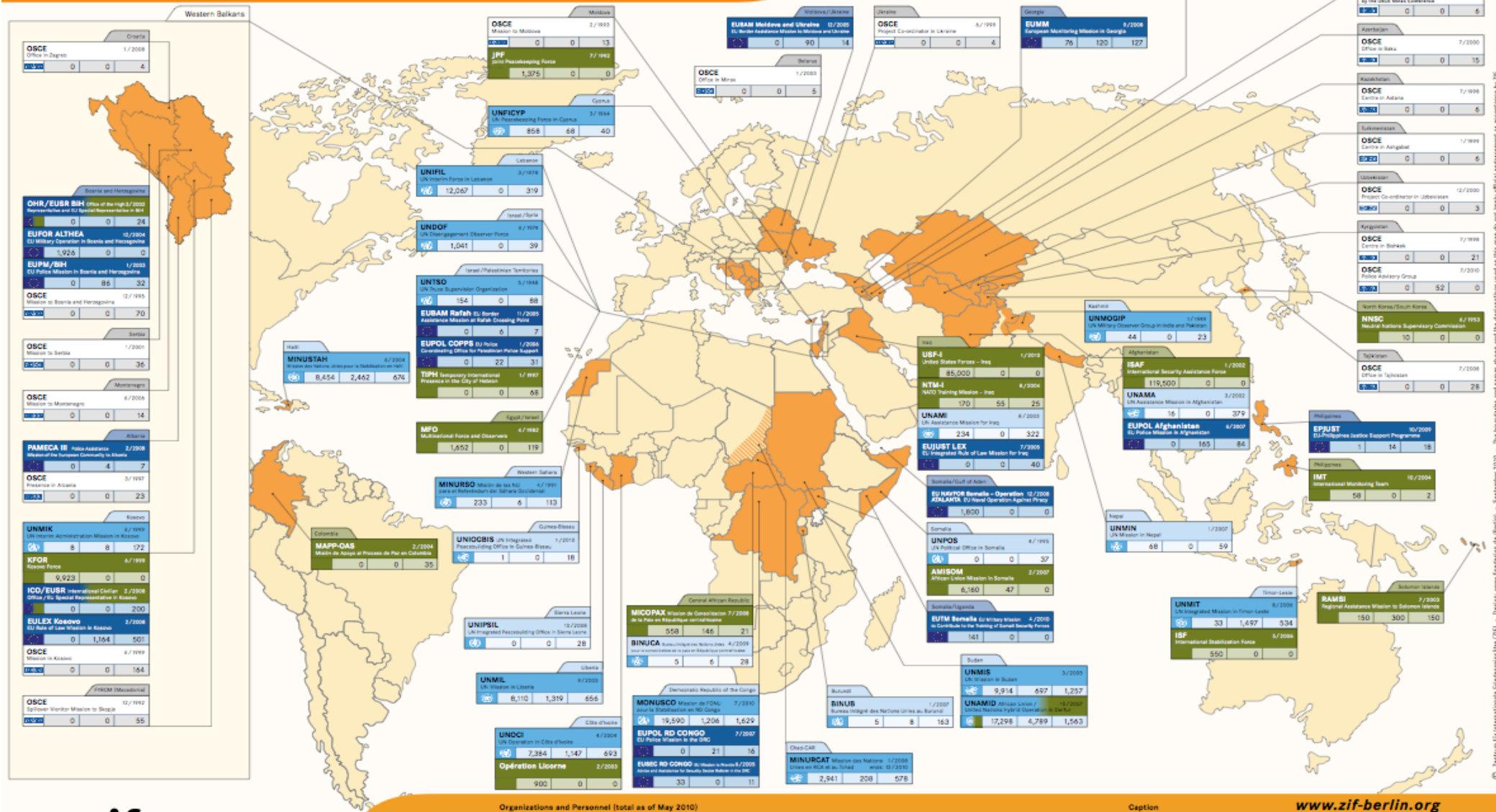


Why do we need to bring *expertise* to medical field operations?

Dept. of Neurosurgery, Federal Armed Forces Hospital, Ulm

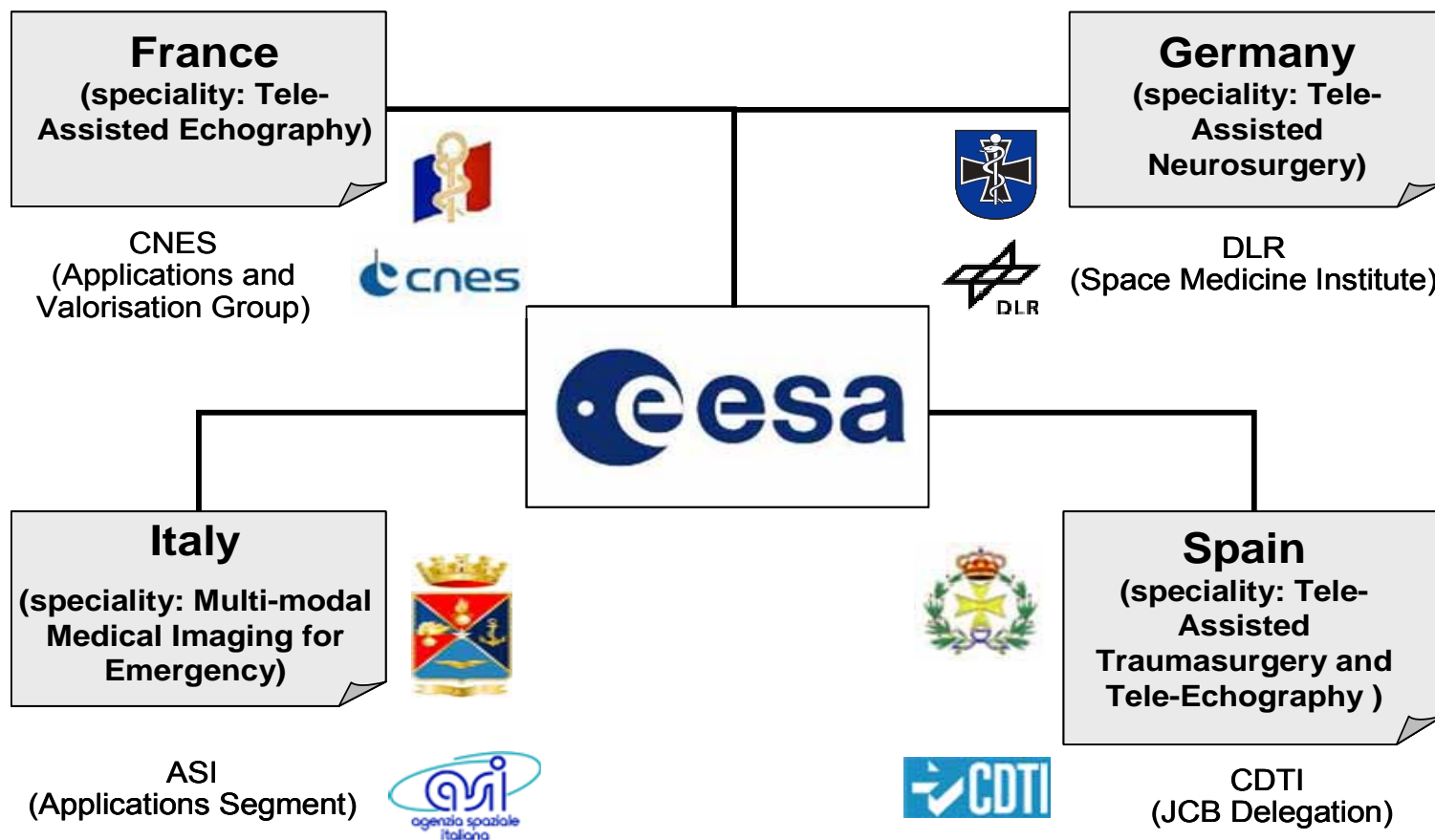


Crisis Prevention and Peace Operations 2010





Participants



Dept. of Neurosurgery, Federal Armed Forces Hospital, Ulm



Users Driven European Satellite AIS Mission



Source: [European Commission & McDaniel/CargoLaw](#) International Salvage Union, 2003

SAT-AIS Programme

*DG-MARE / ESA
Joint*

*Action Team
&*

European

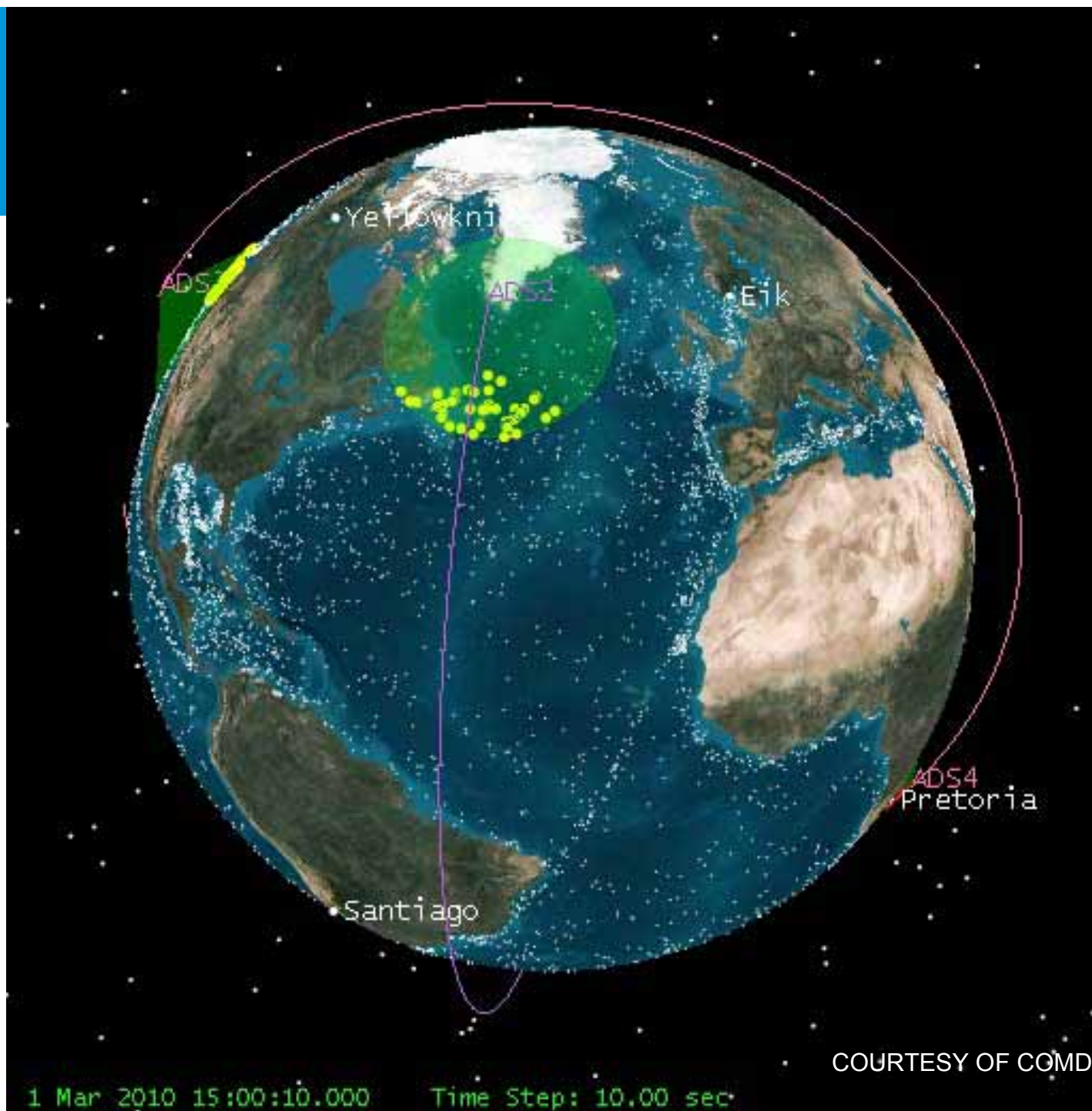
Steering group:

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

&

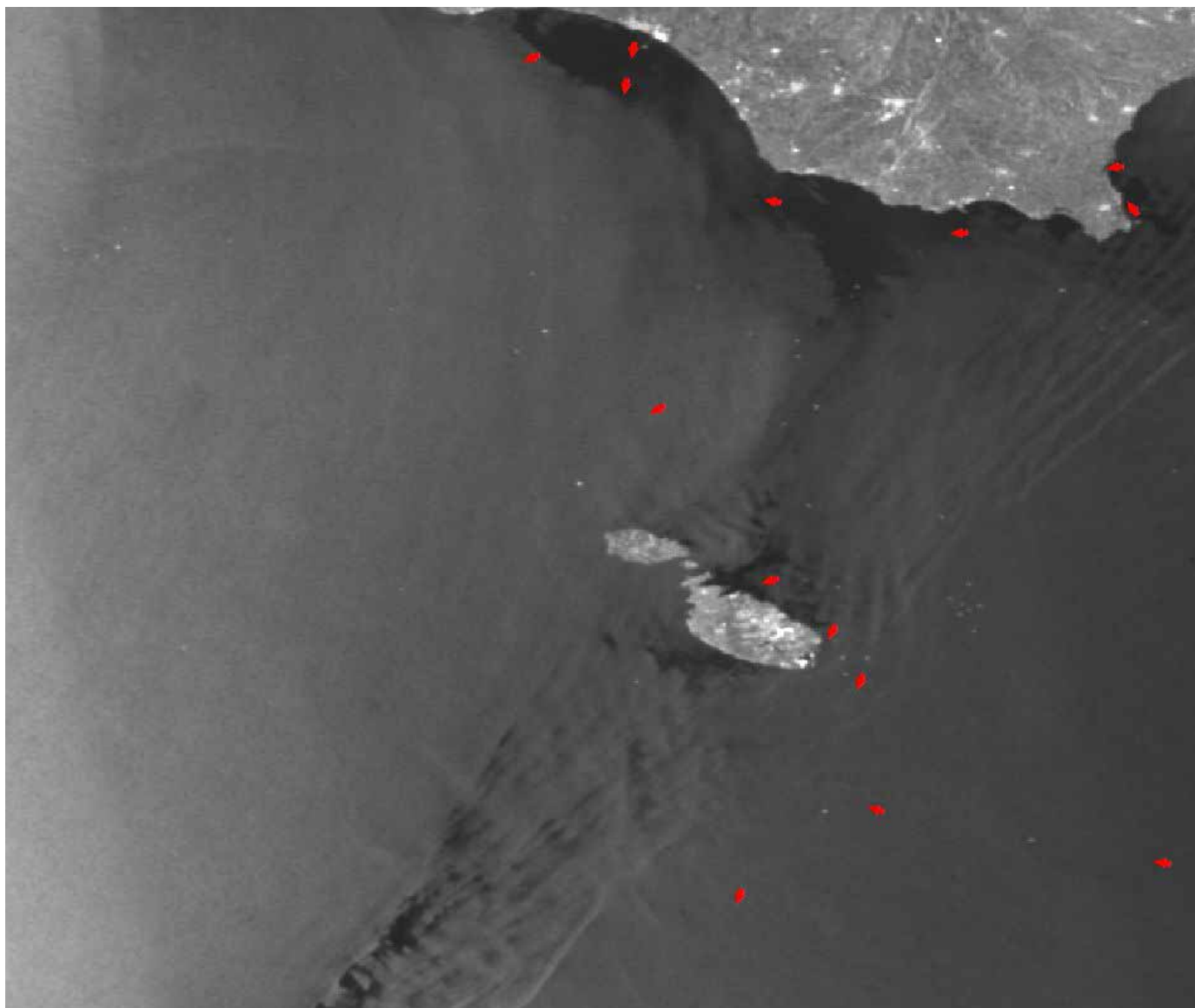
EMSA / ESA

Partnership



Integrated Application

Satcom, Nav, EO & UAS



AIS tracks from ships

SAR detected ships

Correlation SAR & AIS

Remaining uncorrelated
ships & UAS for
identification

[!\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\) 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

Demonstration System to be used

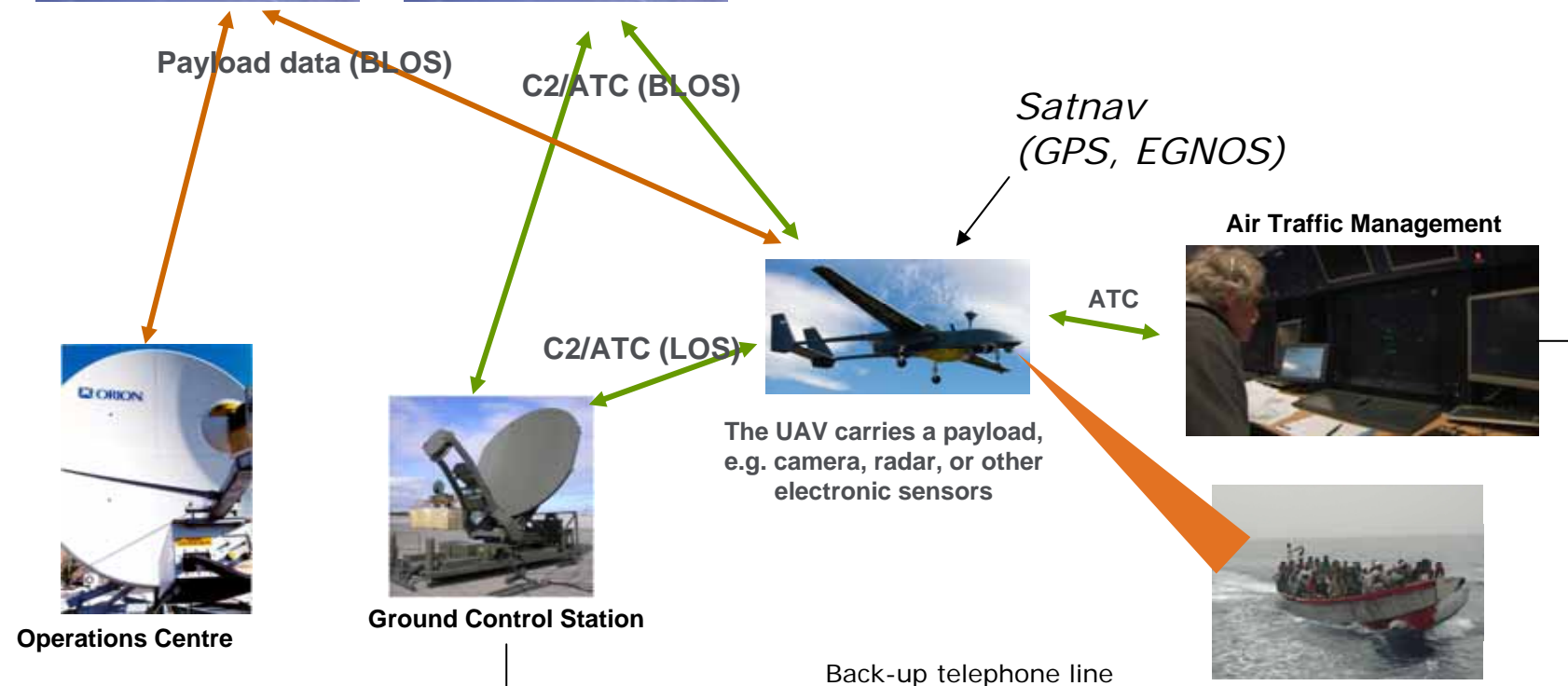


Satcom assets



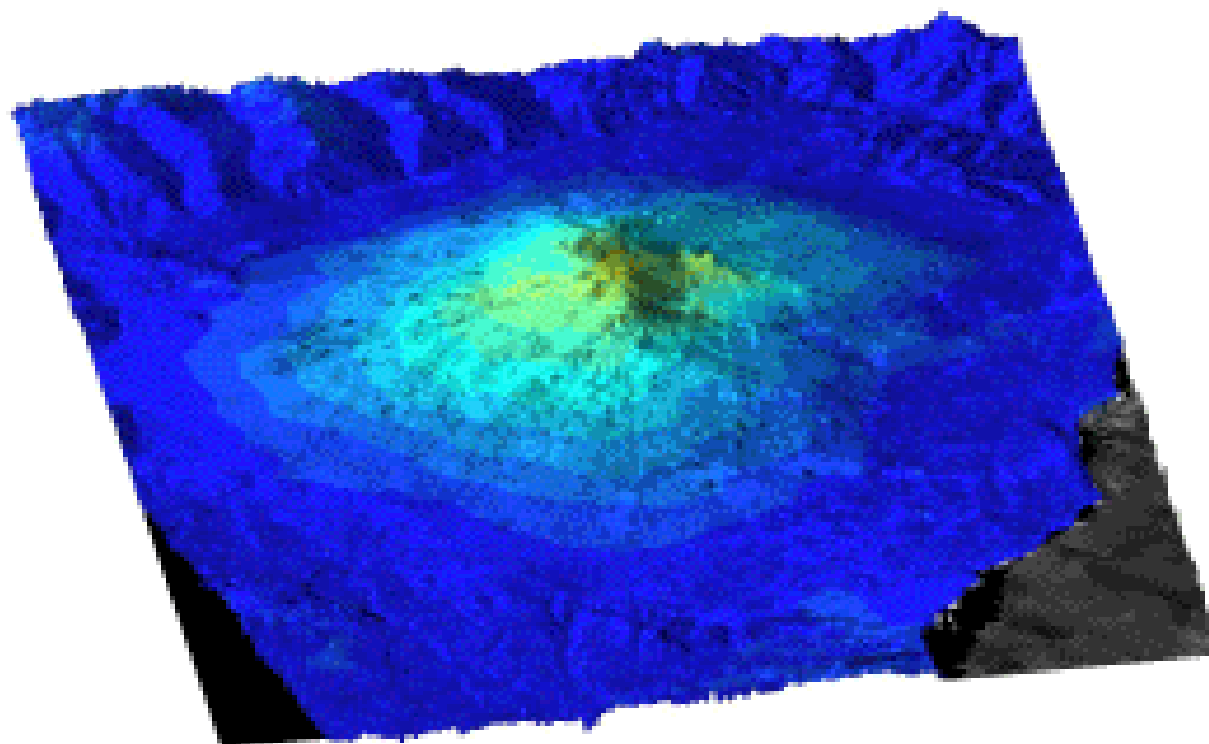
Satellite Relay of

- Payload Communication (sensor control and data) and
- Command and Control (C2),
- VHF Aeronautical Communication (ATC)



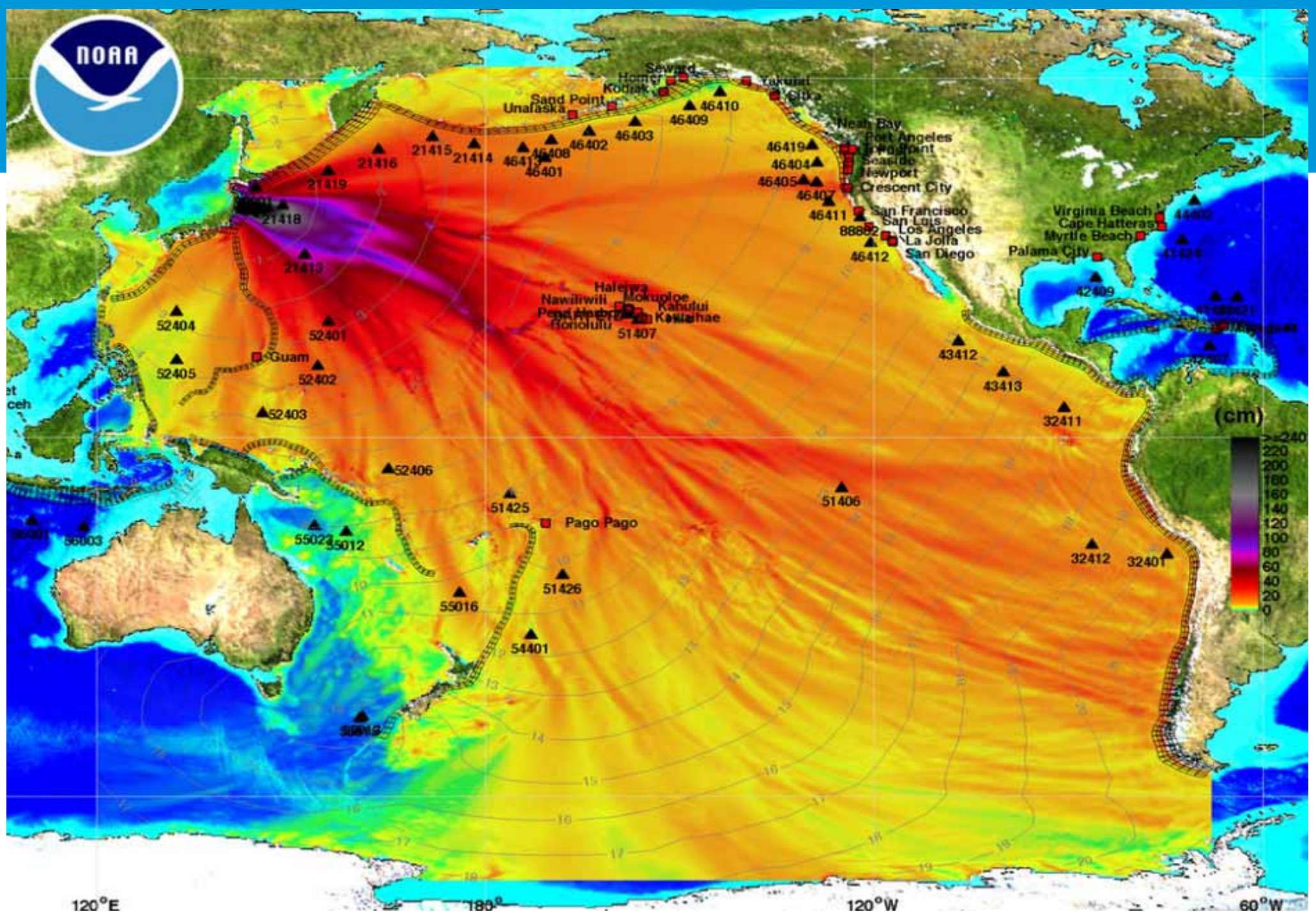


The Breathing of ETNA





Volcanic ash cloud monitoring



- Main **growth** in the value chain :Ground Systems (Terminals) and User Driven **Applications**
- **CP's** are a key niche-market, ready to be **discovered**
- The IAP initiative is an opportunity for European & Canadian **operators and Industry** to tailor their expertise for new lines of **sustainable business** driven by **CP's needs**
- The **IAP** initiative is an **opportunity** for Europe to promote the **added-value of Space** in support of **Crisis Management**
- Dialogue platform and **partnership** between **CP** and **ESA IAP** can lead to harmonised European operational capability in support of **CP community**
- This “**Space 4 CP**” WS, can be considered as 1st step in a series of **events & actions** to follow 😊



Thank You!

Open Call, June 15th 2009,
IAP web portal:
<http://iap.esa.int>

European Space Agency