Introduction to Space Weather in ARTES Applications

Added Value of IAP Space Weather Activities

TIA-APS

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Introduction

IAP stands for

ESA's Integrated Application Promotion Programme, utilizing the data of multiple existing space assets to support the creation of new commercial and sustainable applications and services.

Why are we supporting the implementation of space weather services ??

The services IAP is targeting for Space Weather are tailored to "paying" customers, involving those customers already early in the development of the services.
IAP is situated "downstream" of the SSA programme, making use of the existing Space Weather Data and combining them with other space assets such as EO data, SAT-NAV or SAT-COM data.

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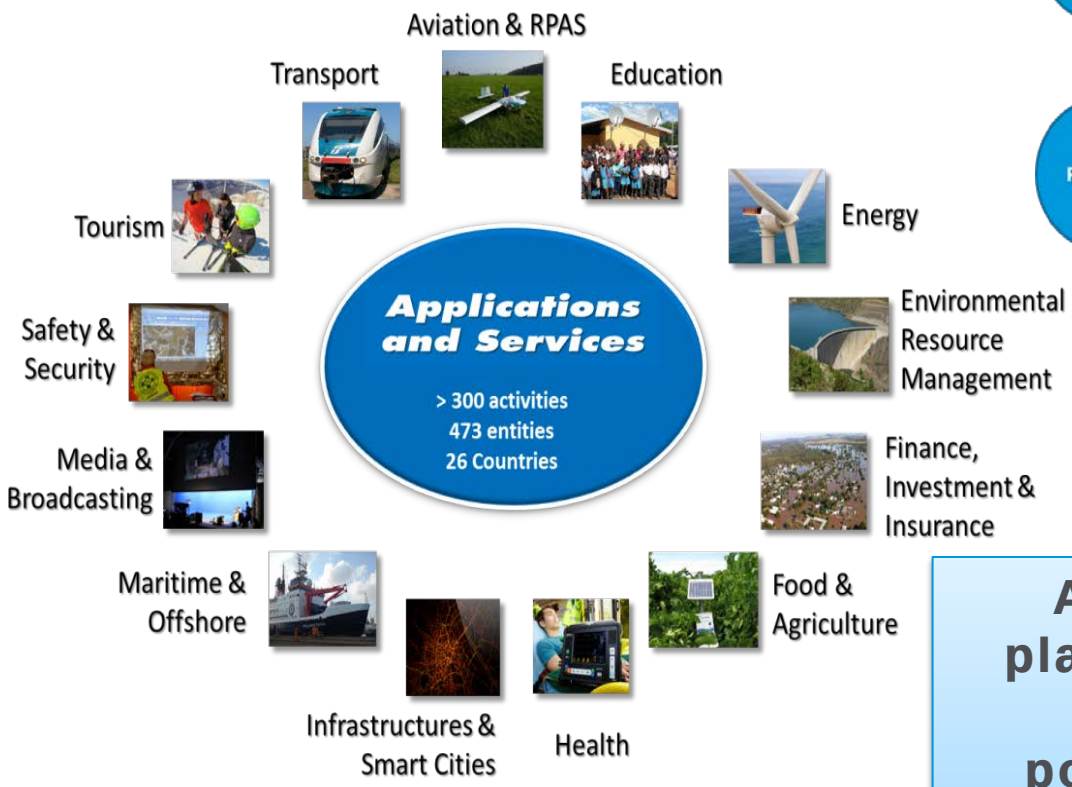
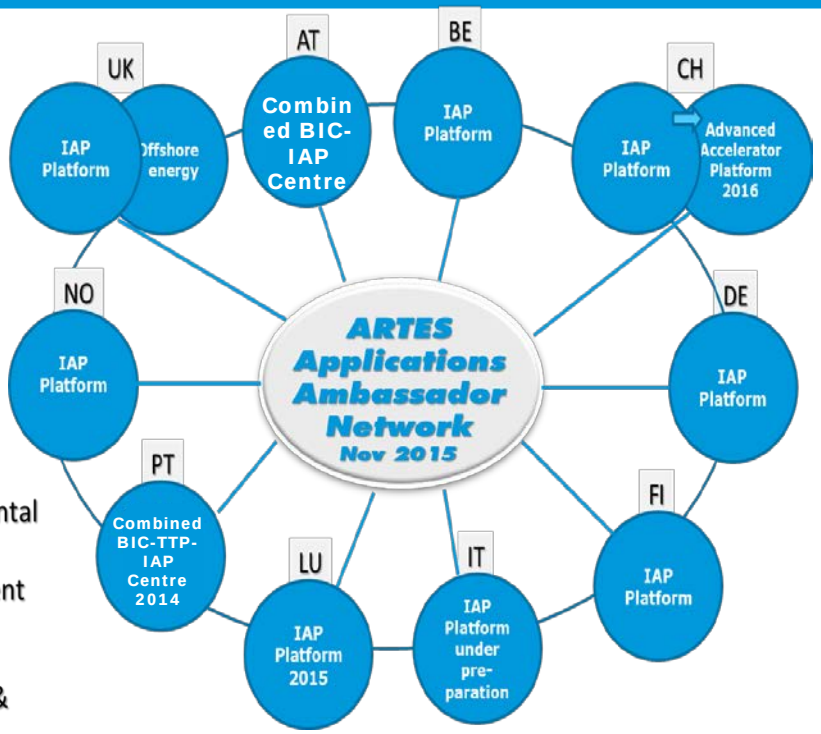
IAP is active in a wide variety of thematic areas, with a wide network of Ambassadors.





A Network of ambassador platforms (AP) across Europe create the dialogue with potential user communities, thereby stimulating ideas for innovative and sustainable services.

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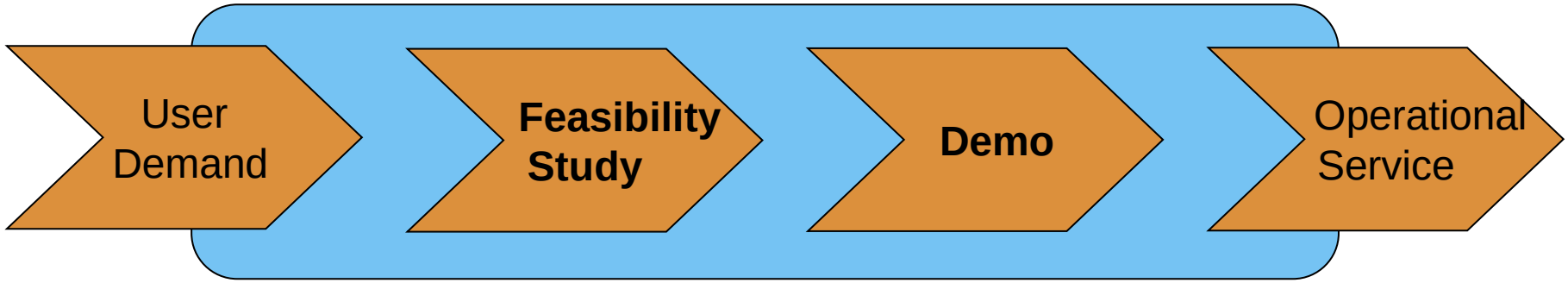
The tools of ARTES IAP



User with demand but no contact to industry

Funding by ESA:

- 100% - ESA initiated activities
- 50% * - industry initiated activities

Funding by ESA:

- 50% - initiated by ESA or industry

Support etc.

* For Feasibility Studies only:
Work carried out by universities and research institutes and justifying no further commercial interest in the final solution may be funded 100% by the Agency

What ESA provides:
Financial support, technical expertise, business development, ESA branding/ recognitions, facilitating partnerships, (….)

IAP Space Weather Activities Background

- There has been renewed interest in space weather in recent years to understand the potential impact of space weather events and to plan how to mitigate against these events.

- Space weather events have been added to the National Risk Registers in the UK, the Netherlands, Norway and Sweden.
- A number of reports have been published to raise awareness.

Cover pages - 'Extreme space weather: impacts on engineered systems and infrastructure' Royal Academy of Engineering, 2013. 'Space Weather –It's impact on Earth and implications for business' Lloyd's 360° Risk Insight, Lloyds & Mike Hapgood, 2010. 'Solar Storm Risk to the North American Electricity Grid', Lloyds 2013. 'National Risk Register of Civil Emergencies', Cabinet Office, 2012 edition

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Value chains for Space Weather services

Upstream → Downstream

Space Weather Missions / Sensors → Spacecraft Operator → SSA Programme → IAP Programme → Commercial Service providers → Customers

SSA and collaborating SWE sensors

SSA programme
- calibration, validation
- latest data service
- R2O
- Expert Service Centres

General and tailored SWE services for European and global operational end users

IAP Programme
- Use of additional space assets
- Up to 50% of co-funding
- Access to wide user community and established European network
- Dedicated operational services to non-expert end-users

Commercialised SWE services tailored to needs of targeted customers

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Impact of Space Weather

Industry	Impacted Area	Problem
Aviation	HF Communication	Loss of communication in polar regions
	GNSS Navigation	Degraded accuracy/loss of signal
	Radiation	Affects systems/increased dose for crew
Power Grid	Induces GIC	Loss of power/damage to transformers
Maritime Navigation	GNSS Navigation	Loss of signal
Railways	Signalling systems	Additional currents disrupt the signals
Pipelines	Induce GIC	Diminishes corrosion protection
Resource Exploitation	Directional drilling Surveying	Drilling accuracy reduced Accuracy reduced
Financial Services	GNSS time stamps	Errors in timing of financial transactions

GIC – Geomagnetically Induced Currents

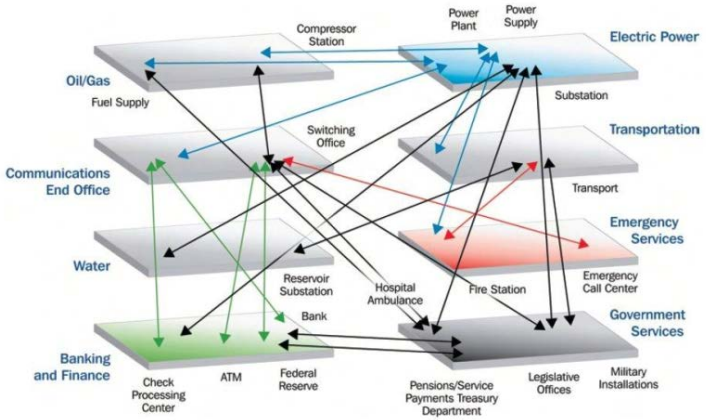
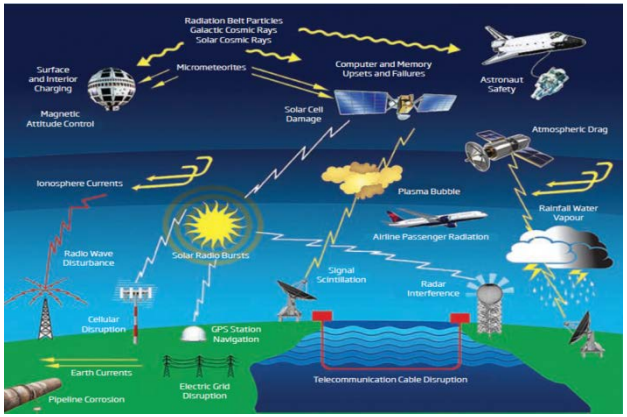


Image – Severe Space Weather Events –Understanding Societal and Economic Impacts: A Workshop Report – Extended Summary (2009)



Areas affected by Space Weather
(Royal Academy of Engineering, 2013)

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Potential Space Weather Applications and Services for the Arctic

- High-latitude regions are the most vulnerable to space weather impacts.
- Earth's magnetic field acts as a barrier that protects the Earth from energetic particles.
- Space Weather has an impact on both communication and navigation systems that may reduce the availability and the quality of the services.
- This is the case for both terrestrial and satellite-based services, including Safety-of-Life services.
- The potential impact of Space Weather on Satellite Communications and Satellite Navigation is especially important at polar latitudes.
- Transpolar aircraft routes are particularly sensitive to Space Weather due to its potential disruption to Communications, and radiation effects for crew and frequent-flyers.
- Geomagnetically Induced Currents (GIC's) can severely affect terrestrial systems such as power grids, pipelines, geophysical surveys, railways …

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Potential Application areas of IAP supported space weather services

Power grids

Tourism

Railways

Polar flights

Resource Exploitation

Maritime

Pipelines

One specific example

NEXT PRESENTATION

Swair - Space Weather Impact on GNSS service for Air Navigation Present Technologies

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Space Weather Initiative

ESA IAP is inviting companies, organizations and private or public institutions to submit at any given time a proposal against the

ARTES 20 IAP "Call For Proposals".

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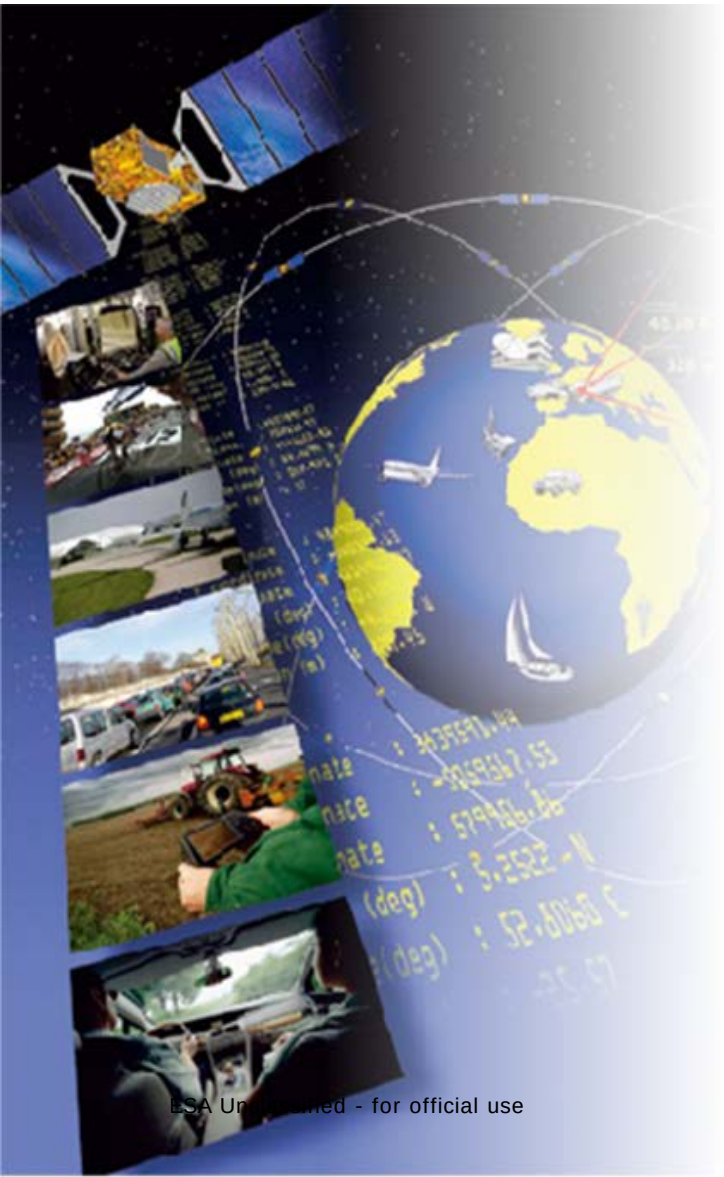
Contacts and further information



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- IAP Website: **http://artes-apps.esa.int**
- IAP Open Call for co-funded activities online on
  - EMITS: **http://emits.esa.int** (AO6124 & AO)
- Information on IAP Open Competitive Tenders online on
  - IAP website **http://artes-apps.esa.int/intended-tenders/all**
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