

Space Weather Effects and Risk Assessment (SWERA)

Space Weather Proposal in Response to the GMES Service Element Call

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Outline

- GSE requirements
- SW & GMES
- Objectives / WBS
- Consortium
- Work organisation

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Proposal Objective

To integrate the overall Space Weather service consolidation activity currently monitored by the SWWT into the GSE activity

Mainly but not exclusively the SW Pilot Project

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Characteristics of the two programmes

	GMES Service Element	Space weather Pilot Project
Date of approval	november 2001	Initial contracts : april 2000
ITT	10 / 09 / 02	08 / 07 / 02
Duration	1st phase : end 2003	End of 2004
Origin	ESA / EOP directorate	ESTEC / TOS / EMA division
Contents	List of priority themes 10 to 15 contracts	15 (17) projects co-funded

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Characteristics of the two programmes cont'd

	GMES Service Element	Space weather Pilot Project
Budget	83 M€ over 5 years 750 to 1500 k€ per contract	ESA contribution : 15 x 100 k€
Bidders	Companies organisations of member states	Pairs of users providers

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Characteristics of the two programmes cont'd

	GMES Service Element	Space weather Pilot Project
Main selection criteria	User driven programme continuity of the service long term sustainability maturity of the methodology & existence of precursors integrated EO and non EO data sources multisatellites, models, assimilation forecasting links with the environmental security policy, directives, conventions	idem

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Characteristics of the two programmes cont'd

	GMES Service Element	Space weather Pilot Project
Links with other European Programmes	EUMETSAT / SAF ECHO TESEO GALILEO	COST 724 FP6 / EO1 10 proposals submitted by the SWWT
Structures	Forum steering committee thematic & technical WG's support team	similar

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GSE Requirements

- Information needed
- Services provided
- Benefits for Europe's citizens
- Cost Benefit analysis

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SWWT Monitored Activities

- Preliminary evaluation & feasibility studies : RAL + ASPI
- SW Application Pilot Project (SWPP)
- COST actions : 724 & (271)
 - 724 : Developing the scientific basis for monitoring, modeling & predicting SW
 - (271 : SW Effects on communications)

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SW Observations Relevant to GMES

- Solar UV radiation
 - Effects on magnetosphere, thermosphere, ionosphere on space based and ground based systems ; ozone layer ; human health ; ...
- Geomagnetic perturbations
 - Solar flares, CME's, wind disturbances ---> spacecraft anomalies ; ionospheric transmission properties ; GIC's ; ...
- Energetic particle radiation
 - Solar eruptions, solar wind ---> spacecraft operations, ionospheric transmissions, health of airline passengers, ...

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Information Needed

SW raw data

- Geomagnetic activity
- TEC & scintillation measurements
- Thermospheric wind & density
- UV
- Atmospheric & space radiation

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Services Provided

- Ground based power distribution systems : *GIC occurrence strength & probability*
- Prospecting : *navigation accuracy and integrity*
- Mobile communications systems and users: *channel availability and characterisation*
- Ground-to-ground communications : *channel availability and characterisation*
- Over-the-horizon radar : *channel availability and characterisation*
- Space-based communications services : *channel availability and characterisation*
- Space-based navigation services and users : *accuracy & integrity*

Services Provided cont'd

- Spacecraft development and operations (including drag effects) : *EO accuracy & reliability*
- Scientific spacecraft users (instrument interference and campaign planning)
- Space launcher operators : *risk assessment*
- Manned space programmes : *radiation level*
- Aircrew radiation exposure monitoring : *radiation level*
- Aircraft avionics : *radiation level*
- Spacecraft and launcher insurance : *risk assessment*

Benefits for Europe's Citizens

Industry

- Commercial operators, designers & insurance companies
- Improved satellite design, preparedness & efficiency in satellite operations
- Reduced radiation exposure for astronauts & aviation aircrew
- Improved reliability for power generation and supply utilities
- Better risk evaluation and mitigation

Benefits for Europe's Citizens

Economy

- To offer opportunities for European autonomy, through collection and provision of data, leadership through new methods of reliable forecasting and analysis.
- To provide European infrastructure & opportunities for commercial spin-off companies

Benefits for Europe's Citizens

Security

- To have access to additional data, new models & interpretation
- To draw on advances in civilian research
- Different considerations (Defence) ---> identify cause of failures & determine whether it is a hostile act or not

Benefits for Europe's Citizens

Research

SW programme would stimulate basic research in

- Solar terrestrial physics, plasma physics, atmospheric physics, geophysics
- Large distributed data distribution
- Large scale computation

Cost - Benefit Analysis

Estimated value of damages resulting from SW is 200 millions € per year

Exceptionally strong effects

Large scale disruption to the North American power system during march 89 geomagnetic storm

Telecommunications satellite losses & communication disruptions during desert storm military operations

Permanent impacts

Appear on a regular basis ---> temporary disruption to satellite communications

Utility / Credibility of Service Proposed for Consolidation

- Response to environment or EU security policies
- Reliability & affordability of services
- Compliance with user domain standards
- End to end service from data source to end user
- Benefits offered to users from an EO based solution

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Objective of the study / WBS

- WP 1000 : Public Policy Analysis & Strategic Planning
- WP 2000 : Service Portfolio Construction & Delivery
- WP 3000 : Sector Infrastructure Analysis
- WP 4000 : User Federation

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WP 1000 : Public Policy Analysis & Strategic Planning

Inputs

- To identify the target public policy sector
- Environmental & security policies of EU & ESA Member states
- State-of-art reviews from relevant scientific domains and programmes
- Plans & reports of relevant existing national & international bodies & programmes
- Precursor Systems Inventory

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WP 1000 : Public Policy Analysis & Strategic Planning

Tasks

- Identification of user-segments based on national commitments to specific environmental policy directives and conventions
- Complete definition of services and their planned evolution [2,5,10y]
- Definition of user needs for service availability, reliability and affordability
- Developing a strategy to scale-up from existing niche or national services to systematic services, and to deliver over European territory, main regions and globally
- Definition of service and product quality levels per end-user-segment
- Cost-Benefits Analysis for service-portfolio, based on alternative scenarios for growth
- Risk analysis, contingency planning and mitigation measures

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WP 2000 : Service Portfolio Construction & Delivery

Inputs

Existing precursor services; strategic plan; Global user needs directory; service partnership agreements (from the PP)

Tasks

- Delivering the service-portfolio to the core-user-group
- Definition of service and product quality levels per user segment
- Validating the performance of relevant software tools and of existing/new models
- Implementing independent validation processes for specific end-user applications
- Implementing and complying with end-user standards
- Defining and providing service access conditions suited for each end-user-segment
- Negotiating suitable conditions of access to all required EO data sources
- Identification of end-user needs & requirements for Earth Watch missions

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WP 3000 : Sector Infrastructure Analysis

Inputs

Strategic plan; Global user needs directory; key user segment profiles; service prospectus; service portfolio specifications; user standard handbook

Tasks

- Scoping and sizing the full service infrastructure needed, for integration of multi-satellite data, non-EO data & models, to operationally deliver the service-portfolio
- Trading-off alternative configurations for provision of service
- Validating performance and availability of key data sources (EO & non- EO)
- Identifying upgrades required to existing ground segments on EO supply & user sides

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WP 4000 : User Federation

Inputs

Strategic plan; service prospectus; global user needs directory; key user segments analysis; service utility reports

Tasks

- Promote the service portfolio to new end-user-segments and end-user-organizations
- Organise & deliver at least five briefing sessions for different end-user segments
- Organise & deliver three 2-day Training courses for different end-user-segments
- Gather feedback from end-users and decision-makers
- Analyze feedback, report & produce recommendations for service evolution

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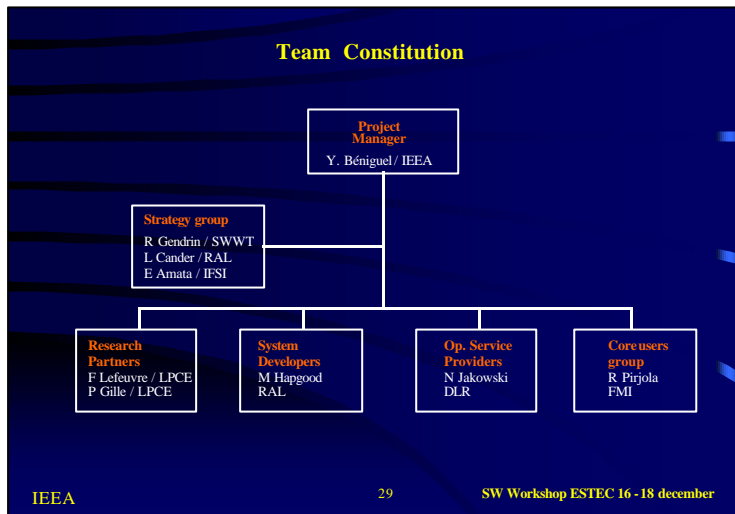
Consortium

Work organisation

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- ### Team Profiles
- #### Strategy group
- Expertise in
- Environmental & security policies,
 - Research fields,
 - User organisations
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- ### Team Profiles cont'd (1)
- #### Core end users (FMI)
- key end user segments, end user organisations
- #### Operational service providers (DLR)
- have operational experience and capability in EO based services
have appropriate operational assimilation, modelling & forecasting capability
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- ### Team Profiles cont'd (2)
- #### System developers (RAL)
- Capability to define & implement large international infrastructures
- Have expertise in EO technologies and systems
- Have specialist skills in designing and implementing complex data processing systems
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Team Profiles cont'd (3)

Research Partners (LPCE)

- Are at the forefront of developing the EO application methodologies
- Are developing next generation data assimilation and modelling and tools
- Are currently developing new algorithms and products

Team Profiles cont'd (4)

Expert consultants

- Have a proven track record on Cost-Benefits Analysis
- Can provide specific skills that the other members do not possess
- Independent expertise & evaluation
- Can conduct unbiased technical audits of existing infrastructure
- Have specific expertise in the user domain

Deliverables

User side Dossier

Global user needs directory, key user segment profiles, core user needs Dossier, user standard handbook, service utility reports, core user group executive report

Supply side Dossier

Strategic plan, service prospectus, service partnership protocol, service portfolio specifications, service operations reports, delivered services, precursor systems inventory, infrastructure systems analysis, system standards guidelines

Common Dossier

Policy foundations review, CBA, service validation protocol, service validation reports, CB elements from infrastructure analysis, training plan, training package, training review, promotion plan, promotion package, promotion review,

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Planning / Execution of the work

2 phases ----> 2 x 10 months

Phase 1 : WP 1000 to 4000 ----> first delivery of documents

Mid term Review ----> ATP from ESA representatives

Phase 2 : WP 5000 to 8000 ----> Refinement of the delivery

Coherency with PP & SWWT

This work should be done in close connection with the different projects supported in the Pilot Project

(Progress Meetings participation) and access to the public domain information of the different projects in due time

Meetings of the different groups should stand simultaneously with the SWWT meetings