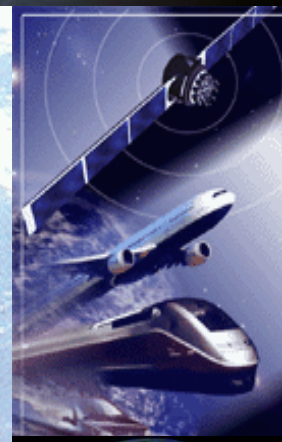
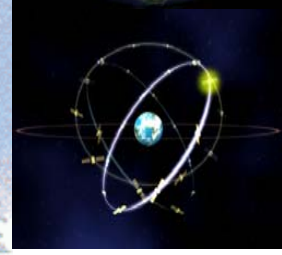
Promote the use of Satellite Navigation through Applications:

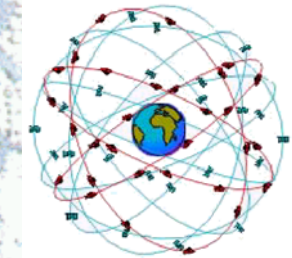
Italian Initiatives





Mario Caporale
Director, Satellite Navigation Unit
Italian Space Agency

agenzia spaziale italiana



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- Italian Space Agency
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  - Aeronautical Macro Project
  - Hazmat Macro Project
  - Maritime Macro Project
- Macro Project Technological Products
- Innnovative Applications

Italian Space Agency

The **Italian Space Agency (ASI)** is a government agency, founded in 1988, having the responsibility:

- to promote, coordinate and manage national programs and bilateral and multilateral cooperation programs
- to promote and support Italian scientific and industrial participation in the European Space Agency (ESA) programs, in harmonization with national programs

Italy's space related policies are devised under the National Space Plan (PSN) that ASI produces every three years

ASI Navigation Unit

ASI Navigation Unit:

- Participates to the decisional and control committees and technical evaluation structures of European GNSS Programmes (EGNOS, Galileo)
- Promotes, supports and controls national projects, mainly focused on the pre-competitive development of applications related to satellite navigation

The **national projects** answer to a specific public demand:

Increase the Safety in the Transport Sectors

according to the National Space Plan polices and the objectives of the Italian Law (10/2001) that finances the initiatives

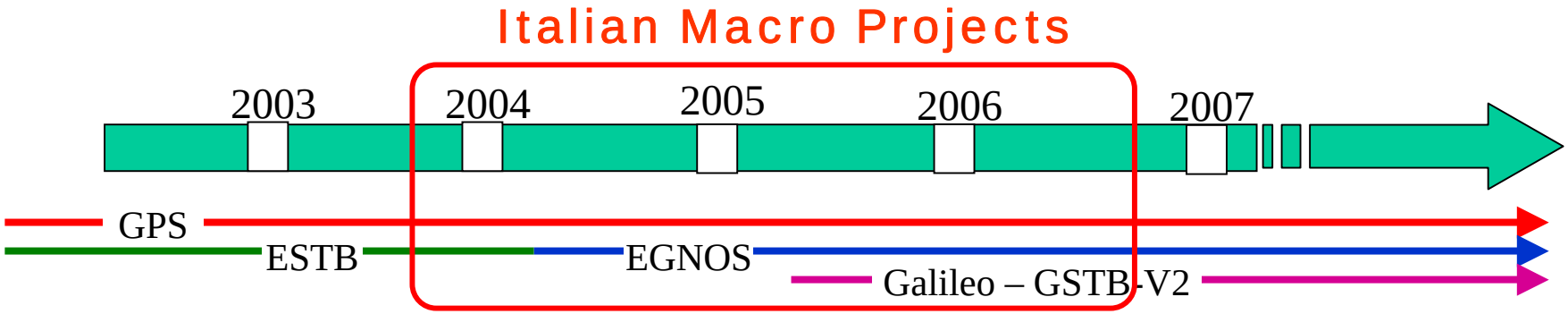
Applications to promote the use of GNSS

ASI is launching **Macro Projects** in Transport Application domains to:

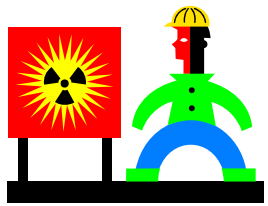
- Give an immediate answer to the institutional operational needs, by means of innovative applicative solutions based on the Satellite Navigation Systems (GPS, GLONASS) present or available in a short time frame (EGNOS)

- Pave the way to the Galileo advent, developing the applications in perspective and starting preparing the national infrastructures to fully benefit of Galileo Services

- Experiment future services and components of Galileo to concur, along with other international initiatives, to the system consolidation process



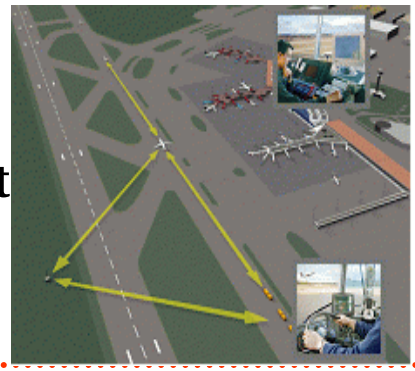
Macro Projects Areas



Aeronautical Macro Project

- Support En-Route Air Traffic Management

- Monitor & Control Ground Traffic Movement at Airport



Applications:

- Satellite NAV/COM for Aeronautical Services (Surveillance, ATS, AOC)
- Satellite NAV for the Management and Control of the Ground Traffic at Airports

Involved Organizations (Potential):

- Italian Aviation Administration (ENAV, ENAC), Airport Operators and SPs, Airlines, Fire Department, Universities and Research Centres

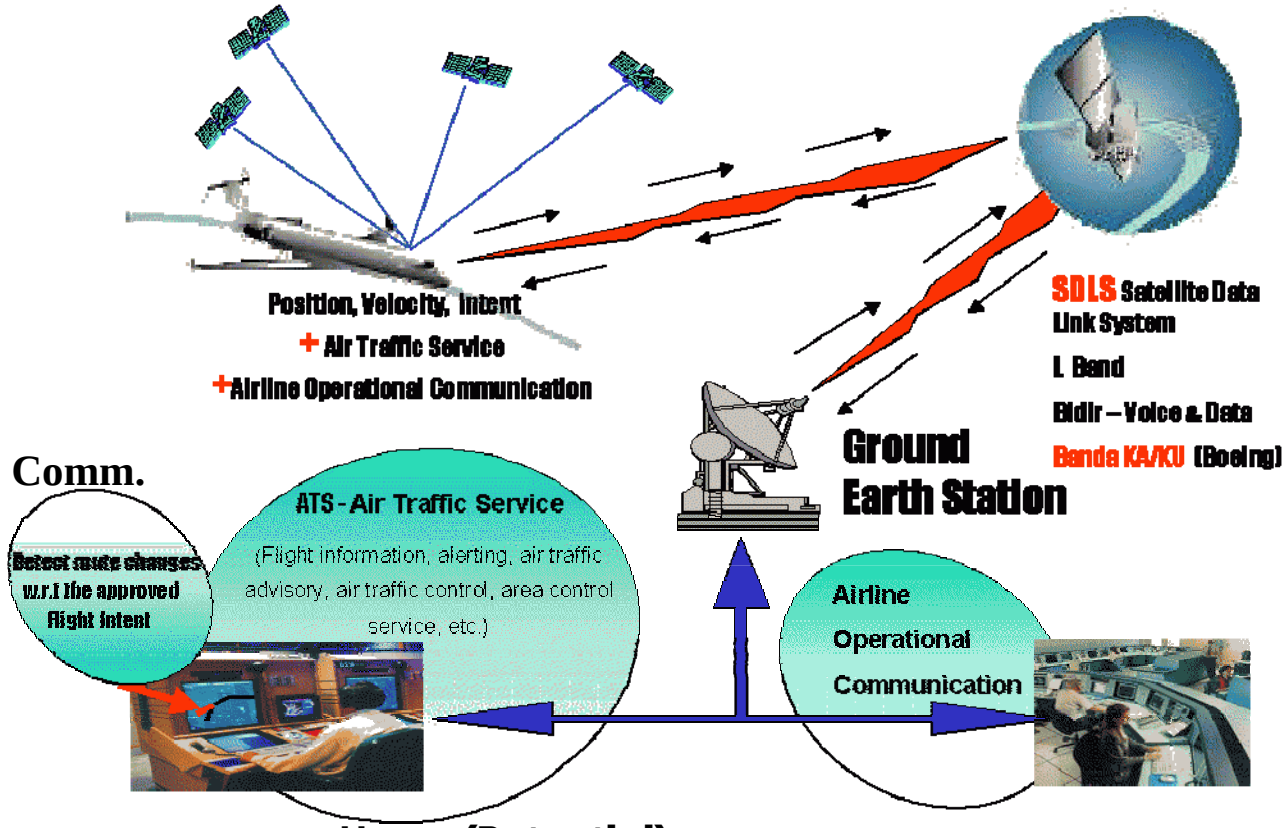
Project Goals:

- Test and validate satellite NAV/COM services, based on the integration of EGNOS/Galileo and Satellite Communication, devoted to:
  - Detect and promptly notify any possible aircraft deviation from the planned route, especially outside the radars and terrestrial communication coverage
  - Make available, in real time, the aircraft flight data (position, speed and intended flight path) to the proper organizations (ATC units, CFMU, airports operators, Airlines, military ATC, etc.), regardless the relative aircraft location
  - Support the "free routing" in the airspace under the satellite coverage, without being constrained by the location of the terrestrial navigation aids
  - Enlarge the ATM SPs operational capability beyond the national borders, in order to operating flights wherever in the European airspace, with the aim at supporting the implementation of the European Single Sky

Satellite NAV/COM for flight services

Services:

- Navigation
- Surveillance
- ATS - Air Traffic Service
- AOC – Airline Operational Comm.



Technology:

- GPS/EGNOS/Galileo
- Artemis EMS /Inmarsat MSS
- Satellite Data Link System (SDLS)

Users (Potential):

- ENAV
- Airlines
- Eurocontrol CFMU (Central Flow Man. Unit)
- Airports

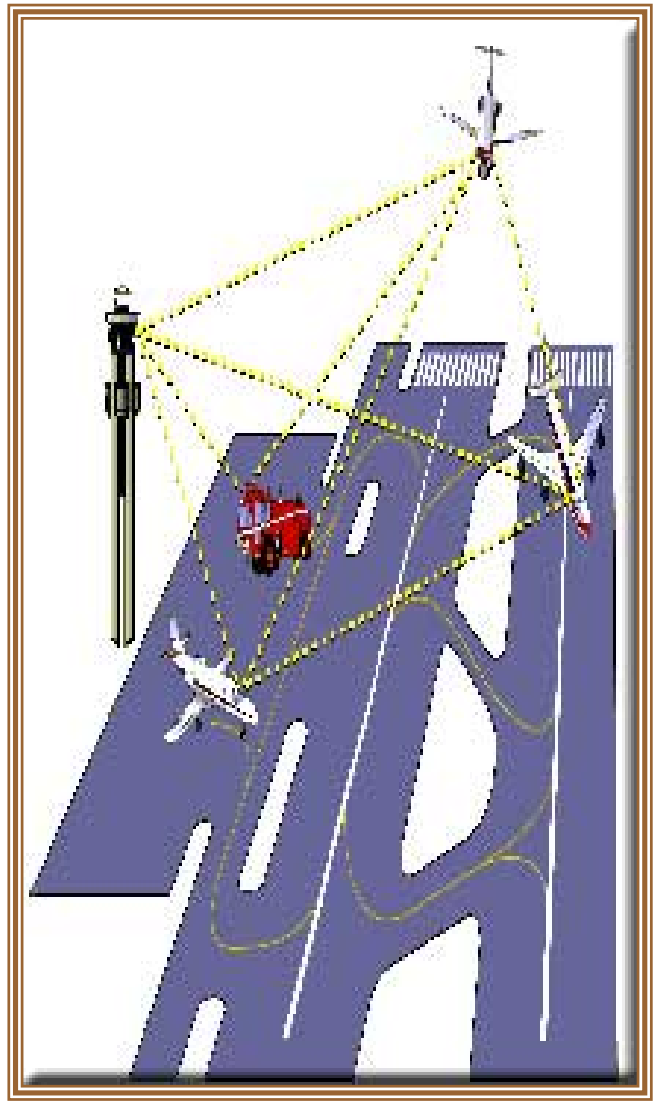
Satellite NAV for the management and control of the ground traffic at airports

A-SMGCS (Advance Surface Management Guidance and Control Systems)

Project Goals:

- Promote the use of the satellite navigation technology for the management and the control of the surface movement of the aircrafts and service vehicles at the airports, to improve the safety and the efficiency in any weather condition

- Test and validate concepts, requirements and technological solutions for the A-SMGCS, to contribute to the definition of national standards, subjected to a possible future regulation



Satellite NAV for the management and control of the ground traffic at airports

A-SMGCS (Advance Surface Management Guidance and Control Systems)

Services:

Surveillance:

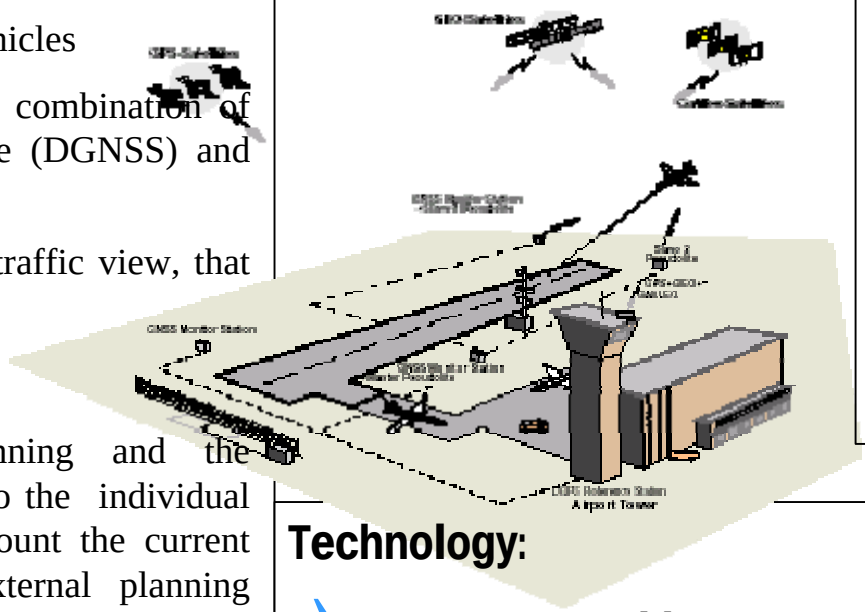
- Detect the position of aircrafts and vehicles
- Compose the "traffic picture", as a combination of information coming from cooperative (DGNSS) and non-cooperative (Radar, etc.) systems
- Give to the controller an elaborated traffic view, that includes the aircraft/vehicle ID

Routing/Planning:

- Support the surface traffic planning and the assignment of routes and schedules to the individual aircraft and vehicle, taking into account the current traffic, the constraints and the external planning schedules

Control:

- Asses the traffic situation and detect conflicts (runway incursions, taxi conflicts) Raise Warning/Alarm
- Prepare conflict resolution plans



Users (Potential):

- ENAV
- ENAC
- Airlines
- Airports
- Airport SPs
- Fire Department

Technology:

- GPS/EGNOS/Galileo
- GBAS –Ground Based Augment. System
- LAAS – Local Area Augmentation System
- Autom. Dependant Surv. - Broadcasting
- Updated Cockpit avionics
- Moving Map Display

Aeronautical Macro Project

- *trajectory-based Services*, based on combined use of Satellite Data Link System (SDLS) and GPS/EGNOS/Galileo, for Air Traffic Control (in line with "ATM Strategy for the Years 2000+") and Services to Flight Companies.

- *Take-off and Landing Services*, in airports, requiring high performances and extensve use of local augmentation of satellite navigation (GBAS CAT 1,2,3).

- *Surface movement in Airport services (*A-SMGCS*)*, (runaways) to improve operational safety, in any environmental conditions.

HAZMAT Macro Project

Project Goals:

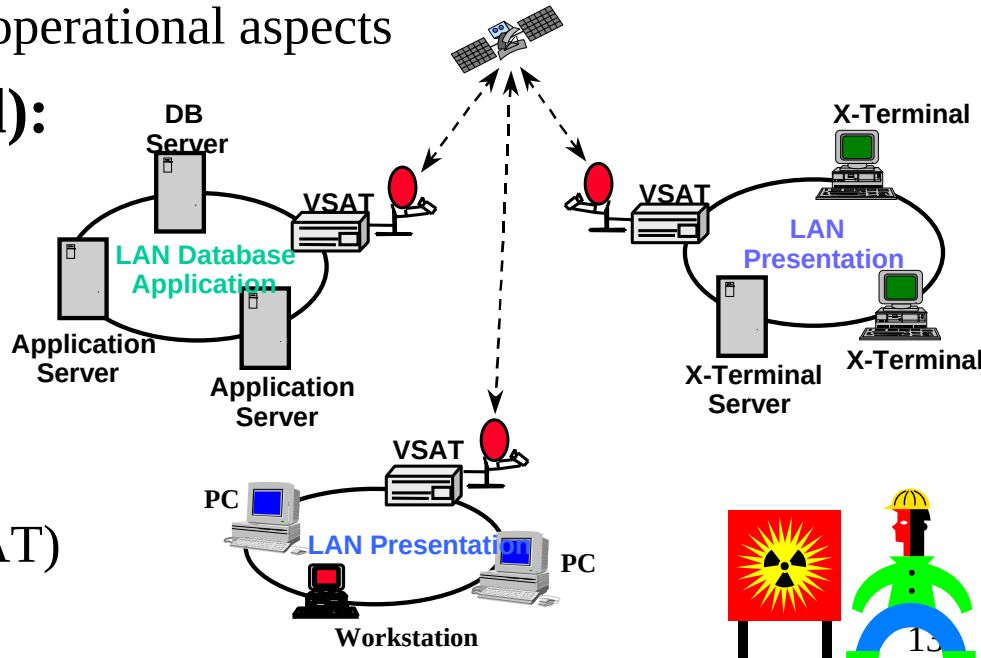
Develop a pre-operational **Wide Area System for Monitoring, Management and Control of Hazardous Goods (HAZMAT) Transportation** in multi-modal (road, rail, sea and inland waterways) transport

Major Functions:

- **Monitoring**: collection, processing and distribution of information to relevant users
- **Management**: use of information for planning purposes
- **Control**: optimisation of the transport operational aspects

Involved Organizations (Potential):

- Ministry of Transport
- Regional and Local Administration
- Civil Protection
- Fire Department
- National Red Cross
- Environment Protection Agency (APAT)
- Universities e Research Centres



HAZMAT Macro Project

Risk Management Phases

Knowledge & Prevention

Analysis:

- Vulnerability
- Hazard

Decision:

- Prevention
- Mitigation

Emergency

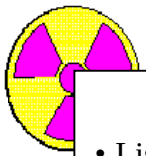
Analysis:

- Damage (type, size)
- Emergency Response (potential)

Decision:

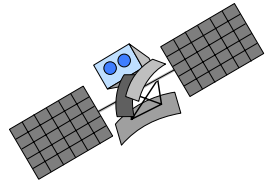
- Response
- Recovery

HAZMAT Macro Project
Pre-Event – Route Selection

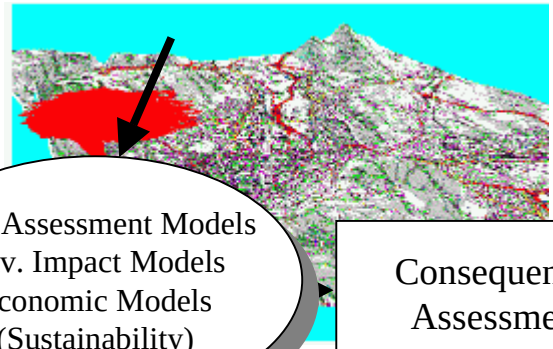


- List of Dangerous Goods
- List of Transp. Systems
- List of Routes

Alternatives



Satellite Technology (NAV, TLC, EO)



Stakeholders

Scenarios (Uncertainties)

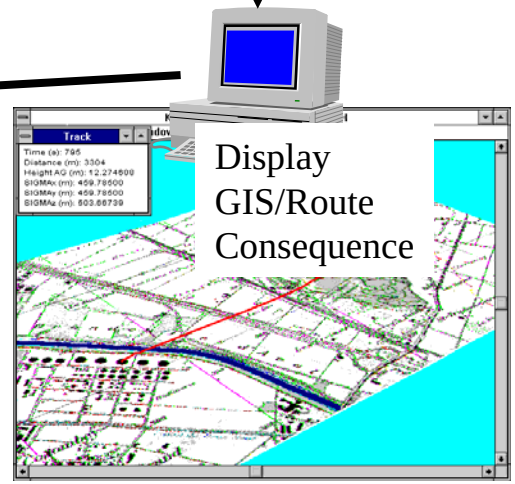
Risk Assessment Models
Env. Impact Models
Economic Models
(Sustainability)

Consequence Assessment

- Heath Impacts
- Environmental Impacts
- Benefits

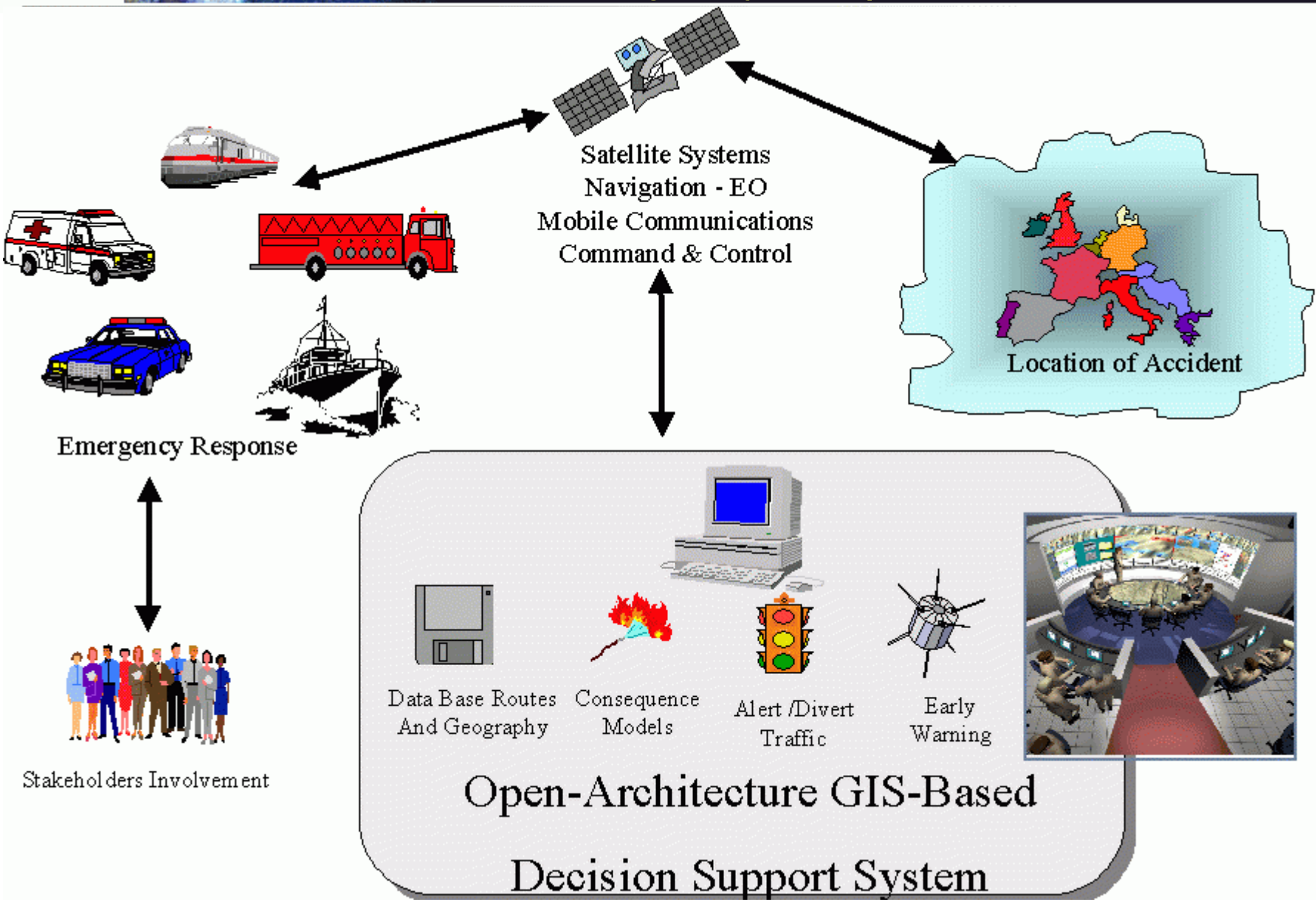
Attributes

Decision Making Process



Display GIS/Route Consequence

HAZMAT Macro Project
Emergency Response



HAZMAT Macro Project

1.Dangerous Goods Transport Knowledge & Prevention

- Transport planning
- Dangerous Goods movement control
- Knowledge & prevention (preparedness)

2.Emergency Management Support

- Accident control & management
- Damage mitigation
- Field support system

Vehicle positioning control (instant by instant);
Dangerous Goods parameters monitoring;
Contingency routing management;
Continuous link between vehicles and Control Center;
Links between vehicles and Service centers;
Coverage according to the area of interest (local, regional,..);
Public Administration links (Civil Protection, Police, Fire Brigades, Hospitals);

Maritime Macro Project

Project Goals:

- Improve the **Safety of Navigation**
- Improve the efficiency of the administration in **Search and Rescue** and **Law Enforcement** at sea
- Develop and test the use of **EGNOS** (MTB, ESTB, EGNOS) **for maritime applications**, also with the aim at paving the way to the Galileo System
- Experiment the integration between Automatic Identification System (AIS) and Vessel Traffic System (VTS)
- Complement Dangerous Goods Services by the satellite navigation and communication technologies

Involved Organizations (Potential):

- Ministry of Transport
- Coast Guard
- Harbor Authorities
- Environment Protection Agency (APAT)
- Universities e Research Centres

Maritime Macro Project

- *Traffic Monitoring and Control Services*, to support current Vessel Traffic Services (VTS), based on the use of Automatic Identification System (AIS), with use of satellite navigation;

- *SEA MOTORWAYS Services*, to improve transport efficiency while increasing safety at sea, with the use of satellite navigation;

- *Search & Rescue Services*, significantly improved by GALILEO

Maritime Preliminary Project 1/2

Applications, for local, coastal and deep sea navigation:

- **Traffic Monitoring and Control**, in support to Vessel Traffic Services (VTS) already existing, based on AIS (Automatic Identification System), using newcoming satellite tecnologies (EGNOS and the future GALILEO)
  - Speriment the **integrity concept**, the signal guarantee, introduced by EGNOS and GALILEO while setuping a process of review of procedures and rules currently in operation, on the light of the technological enhancement induced by GALILEO
  - Analyse further the establishment of local elements networks, necessary for improve accuracy, from one side, and monitor signal interferences, from the other side

Maritime Preliminary Project 2/2

- **Support to Sea Highways**, where the efficiency of transportation, which plays an important role to affirm this transport modality with respect to the terrestrial one, can proficiently use the satellite navigation
  - Speed up of loading and unloading of goods in the harbours, guarantee of respect of arrivals and departures, not to waste the advantage deriving from fast ships. In this context the local elements play an important role in many aspects related with the port area

- **Search and Rescue**, which will be particularly enhanced by GALILEO, improving the performances of the current COSPAS-SARSAT System
  - Improvement in the localisation of distressed people, the alert time will be dramatically reduced, giving back to the distressed people the acknowledge of the distressed message

Macro Project Technological Products

Pursuit Innovation through Research

- **Navigation Local Components**
- Technological Improvement for the **Traffic Management Control Centres**, in various transport modes
- New **Terminals,** for various transport modes (SW Radio, Ibrid., MMI,…)
- **Service Centres** (EO, Meteo,.. Contents Prod.)

INNOVATIVE APPLICATIONS

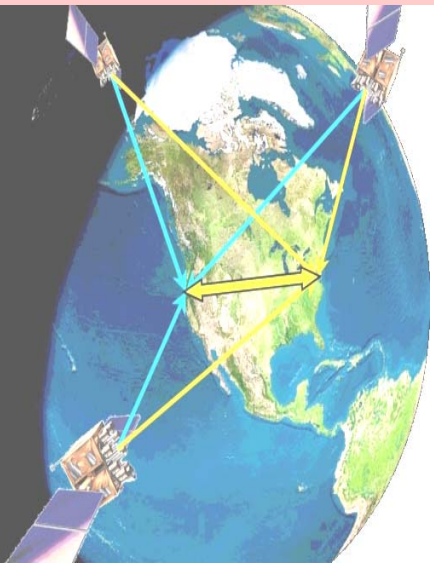
Some application themes (as example):

Satellite Navigation Support to Emergency Number 112

Satellite Navigation Support to Local Meteo Forecast

High precision movement monitoring by combined use of Satellite Navigation and Earth Observation

Support to High Energy Cosmic Rays Research throughout Sparce matrices of simple detectors



Network of Stratospheric Platforms for Traffic monitoring, Environmental Surveillance and Information Dissemination

INDOOR Positioning and Localisation

RTK Applications of Satellite Navigation