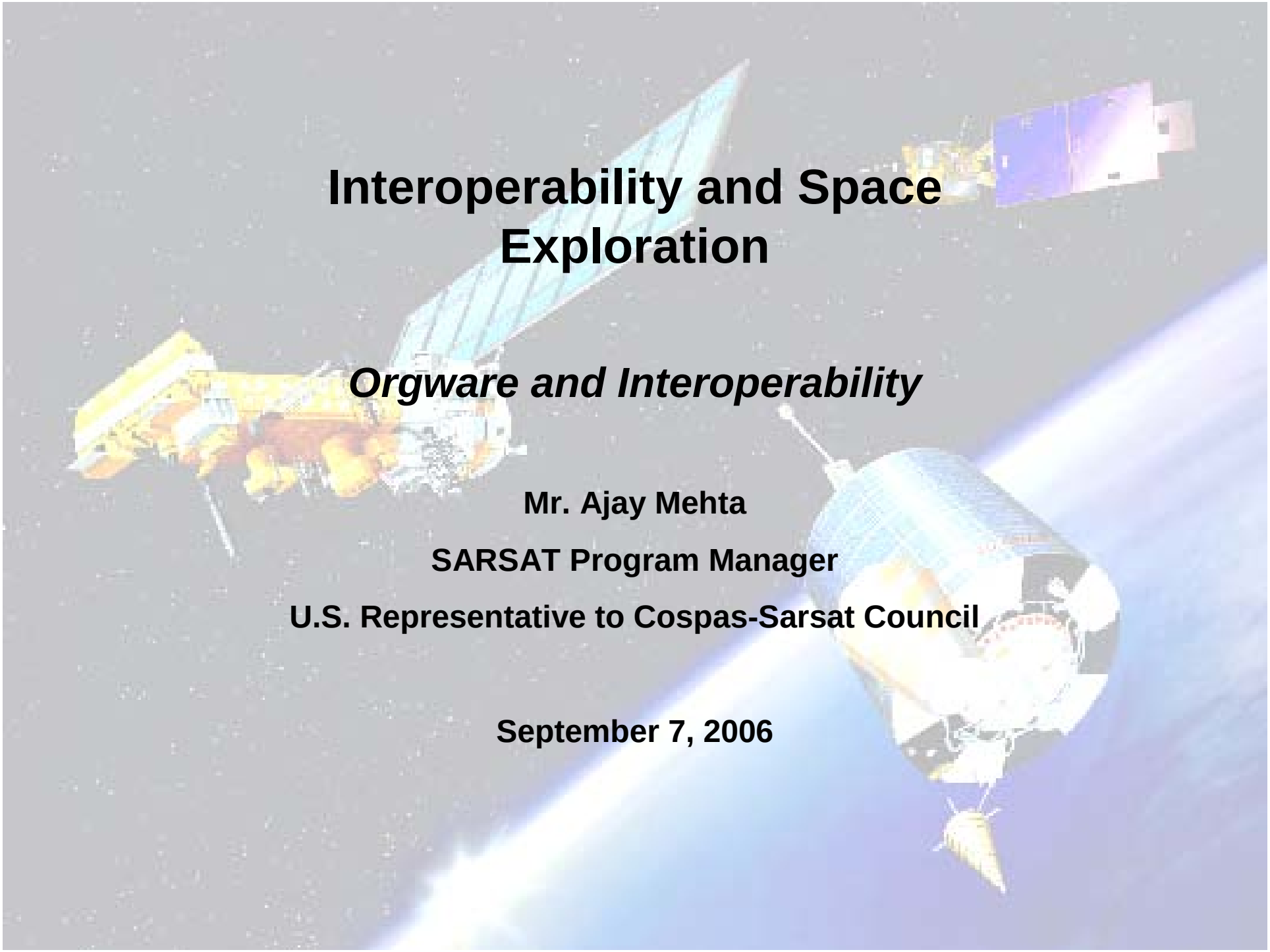


Interoperability and Space Exploration

Orgware and Interoperability

Mr. Ajay Mehta

SARSAT Program Manager

U.S. Representative to Cospas-Sarsat Council

September 7, 2006

Outline

- Program Overview
  - Mission
  - Societal Needs and Benefits
  - History
  - System Concept and Description
  - Management
- Cospas-Sarsat Elements of Interoperability
- Orgware
  - Goal
  - Politics
  - Policy
  - Organization

Mission

The SARSAT program protects life and property by providing accurate, timely and reliable distress alert and location information to search and rescue services in an effective and efficient manner

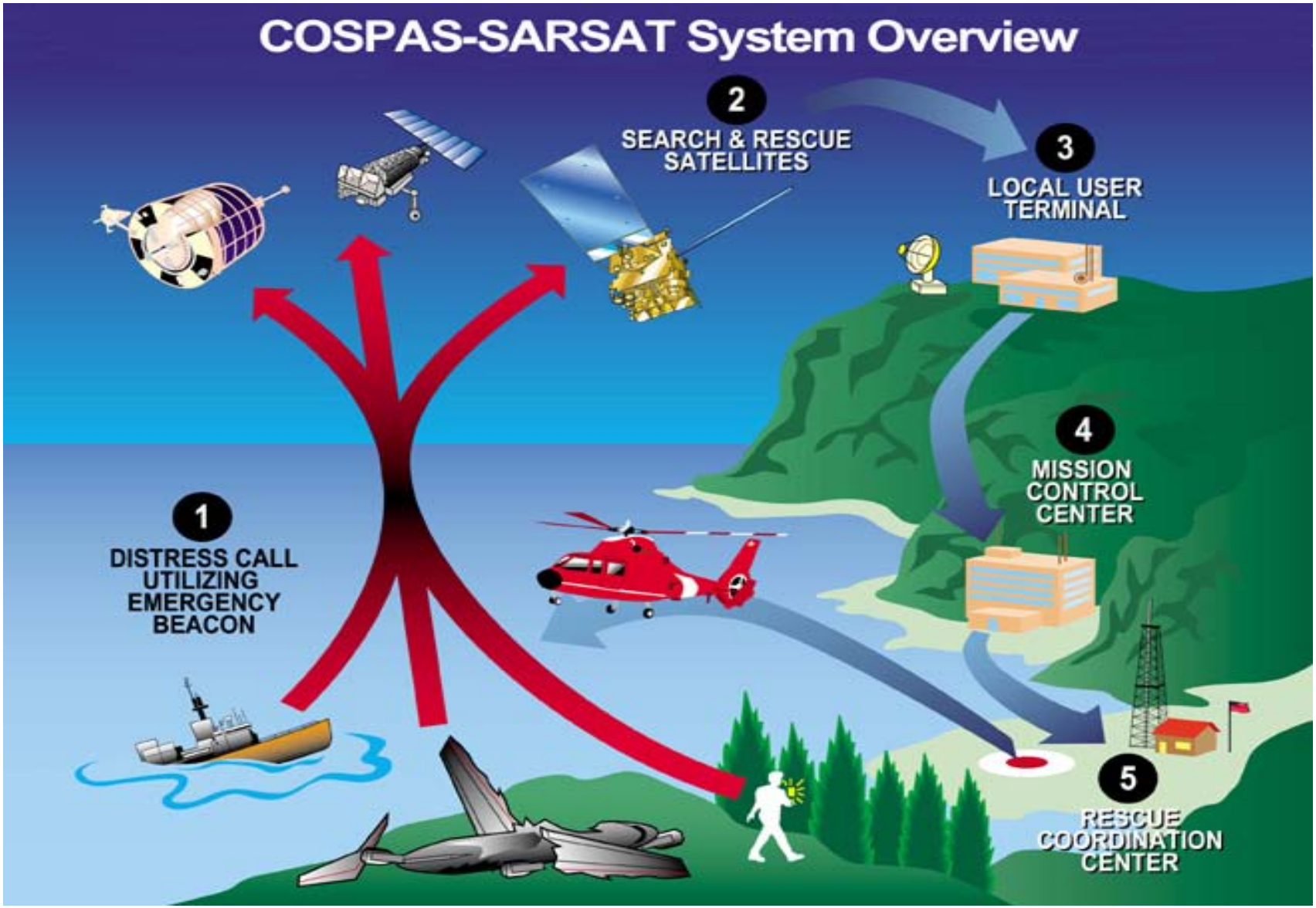
To fulfill its responsibilities, the U.S. SARSAT program:

- **Collects and distributes distress alert data using satellite ground stations and a mission control center.**
- **Coordinates with national and international organizations on frequency management, satellite, emergency beacon and search and rescue issues.**
- **Maintains a national register for 406 MHz emergency beacons.**
- **Jointly manages and operates the System and represents the United States to the International Cospas-Sarsat Program.**

Societal Needs and Benefits

- **250 persons rescued annually in the U.S., 1,300 persons rescued internationally.**
- **Commercial fishing ranked one of the most hazardous occupations in U.S. according to Bureau of Labor Statistics and U.S. Coast Guard – *150 deaths per 100,000 workers.***
- **600 lives lost annually prior to U.S Coast Guard notification – *Emergency beacons could help reduce that number.***
- **General aviation (GA) is significantly larger then commercial aviation in the U.S. - *More than 200,000 GA aircraft; 600,000 GA pilots; 31 million hours flown; 6-8 million passengers.***
- **Economic value – *Net benefits in excess of $250M on an annual basis.***

System Concept



History

1950s First satellites launched
Doppler technology developed

1960s Emergency 121/243 MHz beacons first used by military

1967 16-year old girl dies after two months waiting for rescue

1970 Congress mandates carriage of 121.5 ELT on general aviation aircraft

1972 Congressmen Boggs and Begich lost in Alaska plane crash

1975 Apollo-Soyuz Test Project

History

1976 Canada, France and USA begin development of SARSAT program

1979 MOU signed between Canada, France, USA and former USSR

1982 Launch of Cospas-1

First Save

1983 Launch of SARSAT-1

1985 COSPAS-SARSAT declared operational

1988 International Cospas-Sarsat Program Agreement signed by Canada, France, USA and the former USSR

1992 Russia assumes responsibilities for the former USSR

History

1998 Geostationary space segment becomes operational

1998 Cospas-Sarsat announces termination of 121/243 MHz service starting in 2009

2005 U.S. passes 5000 rescues

User Segment

- **175,000 aviation users in U.S.**

  Mostly mandated general aviation users

- **37,000 recreational boaters in U.S.**

  FCC disallowing maritime use of this frequency by 2007

- **600,000 total users worldwide**

- **121.5/243 MHz satellite alerting to be terminated in 2009**

Not designed for satellites, analog signal, low power, no identification, false alerts

User Segment

- **9,300 aviation users in U.S.**

  Business jets and mandated aircraft under ICAO Convention

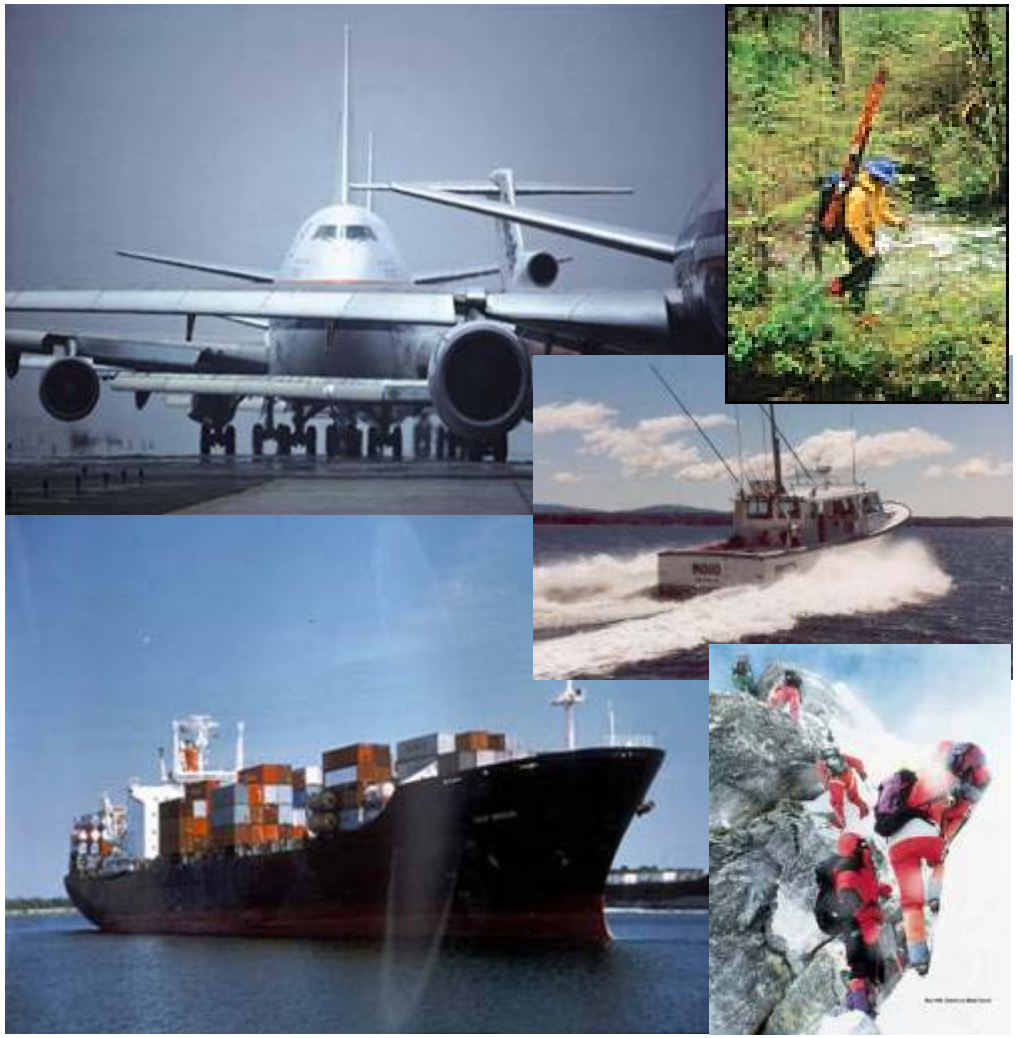
- **124,000 maritime users in U.S.**

  Divided between commercial and recreational vessels

- **10,000 land-based users in U.S.**

  Recreational use plus some aviation and maritime use

- **Approximately 420,000 users worldwide**



Space Segment

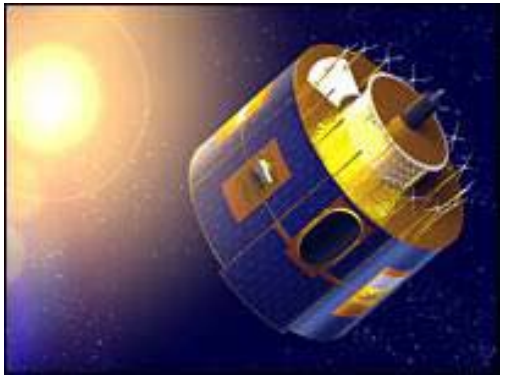
NOAA – POES
(5 in operation)

NOAA – GOES
(3 in operation)

Russian –
Nadezdha (2 in
operation)

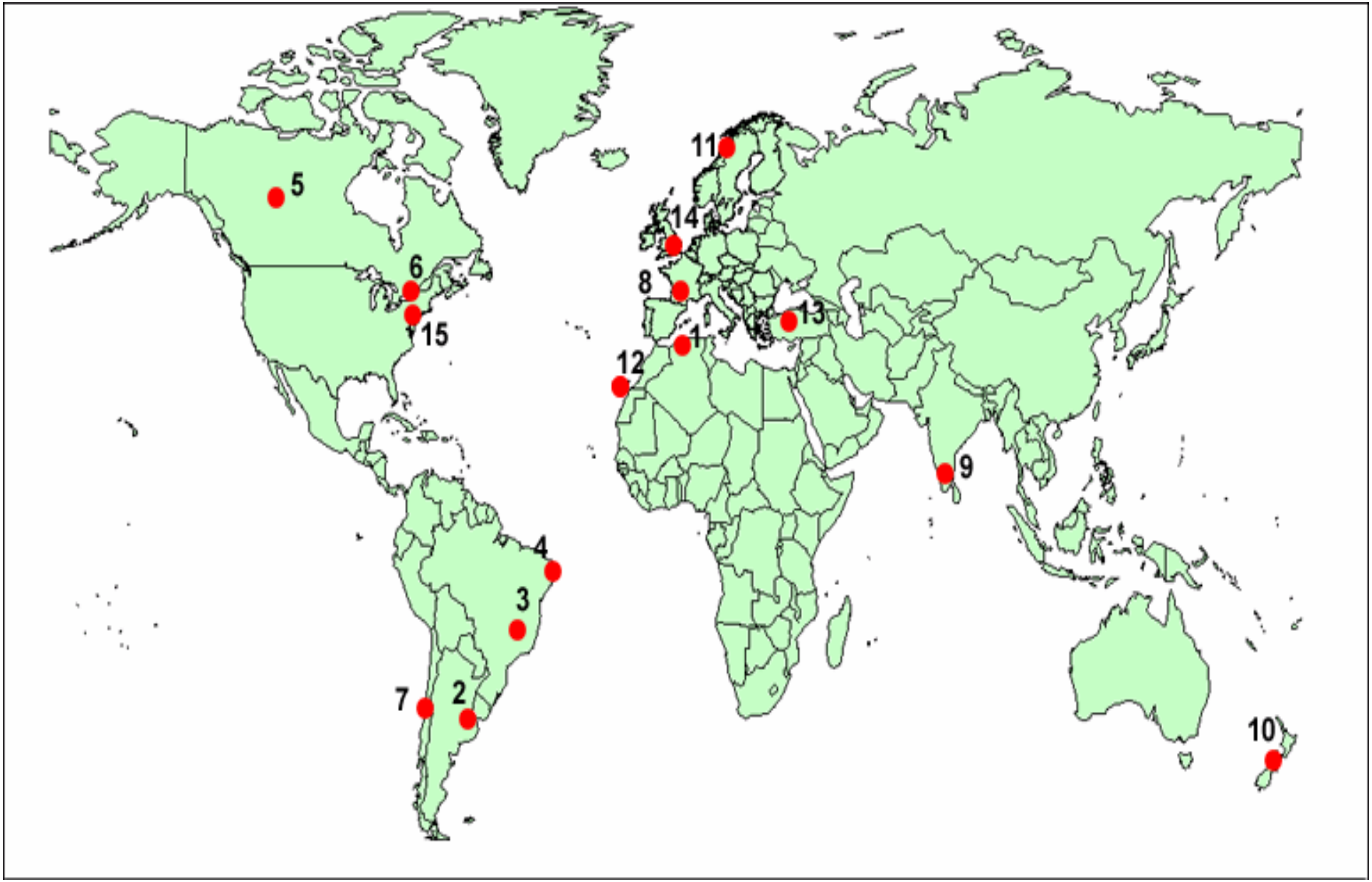
Indian – INSAT

European - MSG

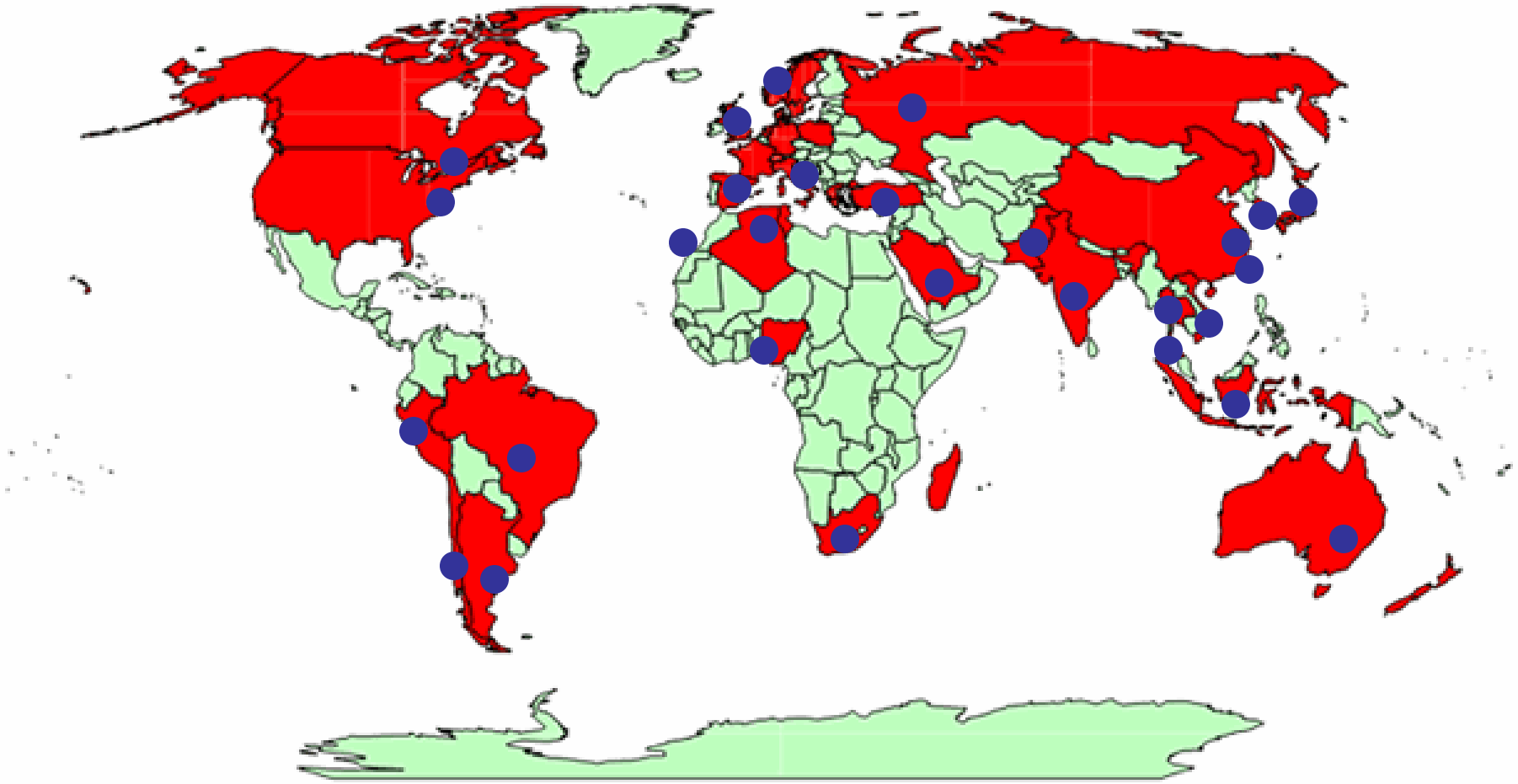


Ground Segment – LEO Satellite Stations

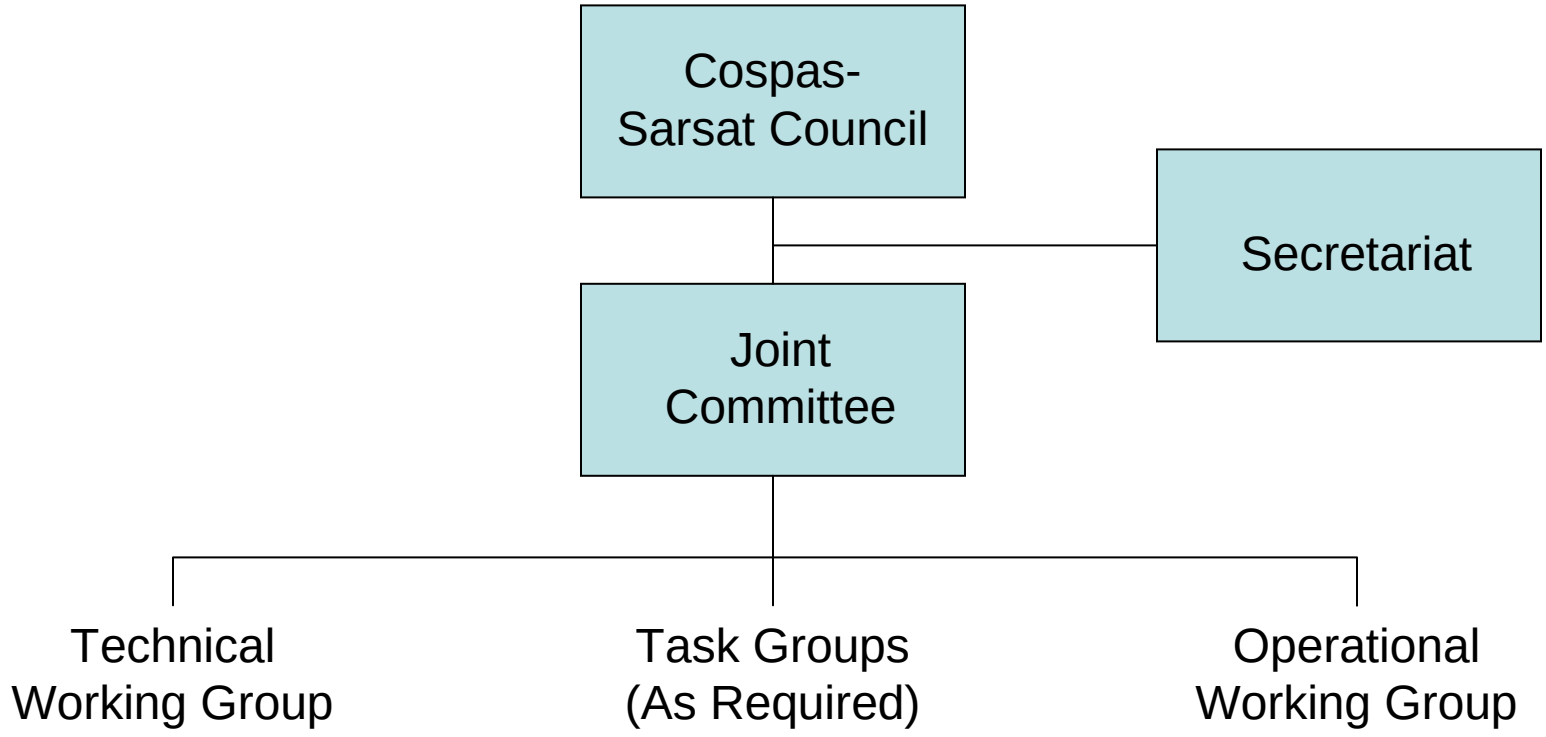
Ground Segment – GEO Satellite Stations



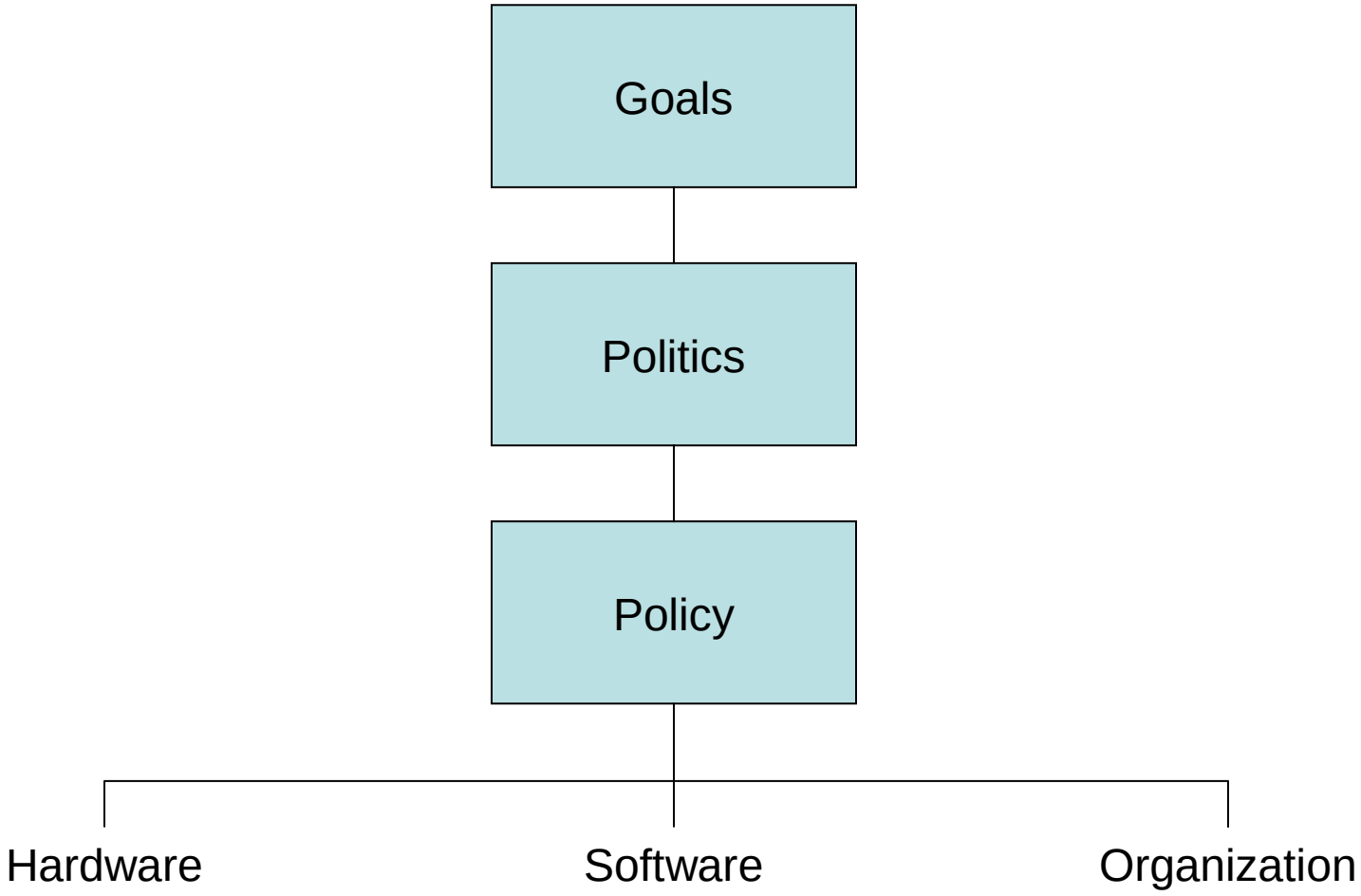
Ground Segment – Mission Control Centers



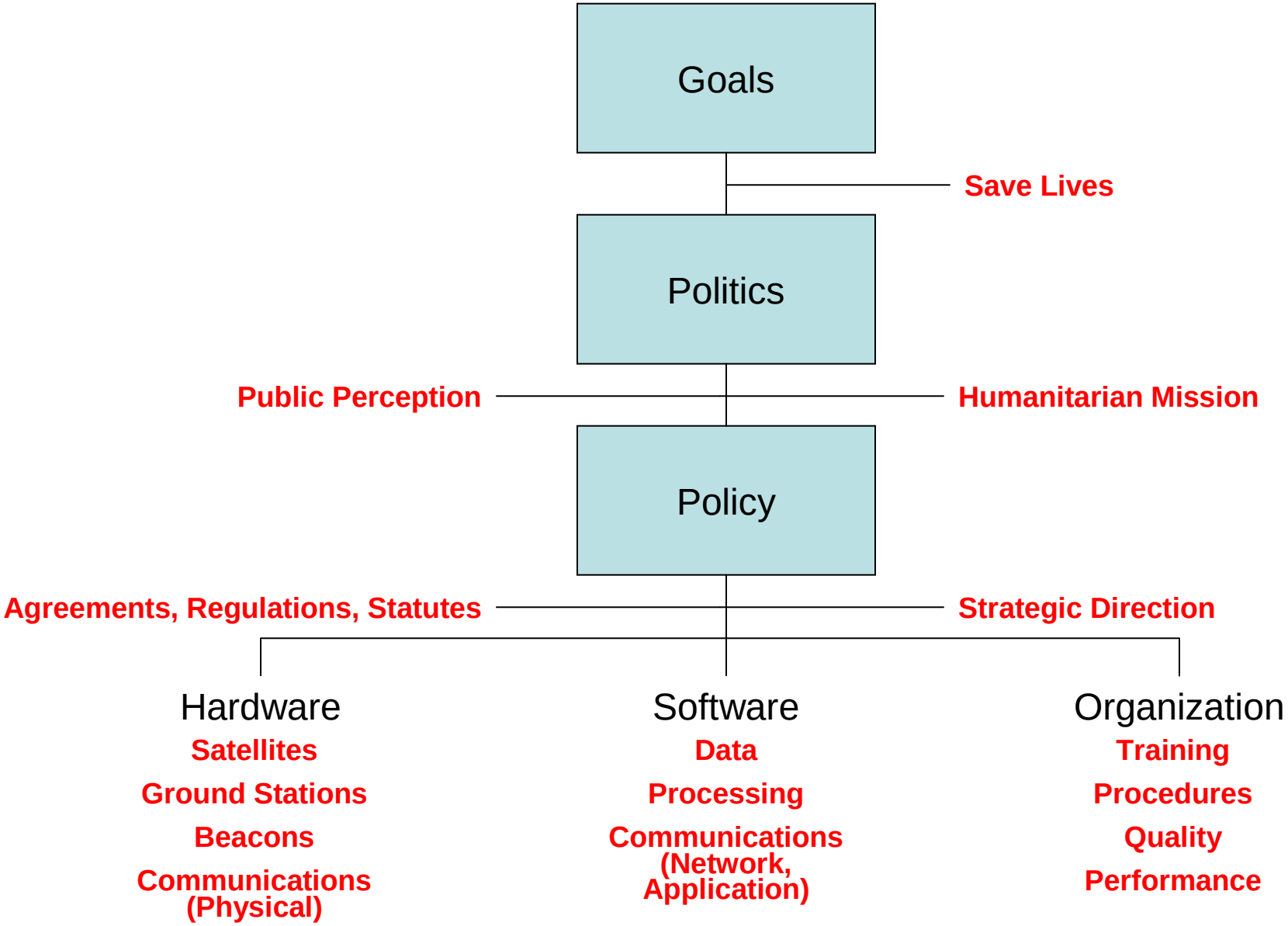
Cospas-Sarsat Management



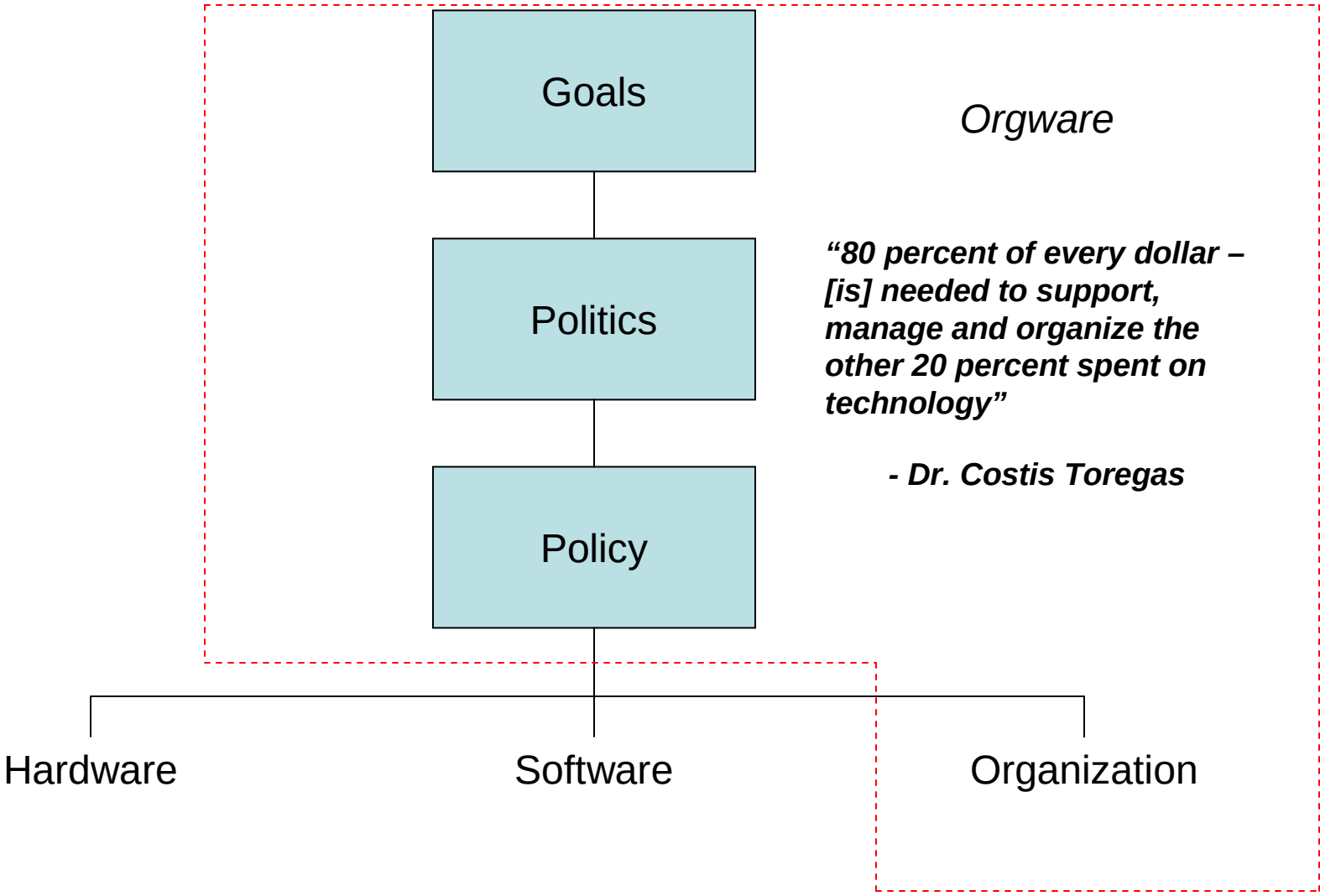
Cospas-Sarsat Elements of Interoperability



Cospas-Sarsat Elements of Interoperability



Cospas-Sarsat Elements of Interoperability



Orgware

"80 percent of every dollar – [is] needed to support, manage and organize the other 20 percent spent on technology"

- Dr. Costis Toregas

Orgware

Goal:

- **Goal is common to all participating States – save lives**
- **Supported by other international organizations**
  - **International Civil Aviation Organization**
  - **International Maritime Organization**
  - **UN Committee on Peaceful Uses of Outer Space**
- **Meets basic needs of society**

Orgware

Politics:

- **Humanitarian mission**
- **Prestige associated with space activities**
- ***"Without minimizing the great political and ideological distances between us, we want to seek and find avenues of rapprochement in areas where this is of vital importance for our two countries and for all humankind... … Russian word, perestroika, can be applied to the process now underway all over the world of rethinking the realities of a nuclear and space age…"*** **General Secretary Gorbachev**
- ***'"The two leaders welcomed the conclusion of negotiations to institutionalize the COSPAS/SARSAT space-based global search and rescue system, operated jointly by the United States, the Soviet Union, France, and Canada"*** **– Joint Statement Ronald Reagan and General Secretary Gorbachev**

Orgware

Policy:

- **International Cospas-Sarsat Programme Agreement**
  - **High level association from each member State – ensures individual programs have appropriate visibility, management attention and resources**
- **Supporting statutes and regulations in member States for carriage and certification of emergency beacons**
  - **Ensures that no matter where you buy or use an emergency beacon, it will meet a certain level of performance and be able to be processed by the regional SAR system.**

Orgware

Organizational - Procedures:

- **Data distribution concept evolved to common procedures for exchange of data**
  - **Minimizes processing of redundant data**
  - **Keeps appropriate SAR services informed**
  - **Allows for easy backup and contingency operations**
  - **Expectations of SAR services similar**
- **Minimum performance specification and design guidelines**
  - **Ensures interoperability**
  - **Ensures minimum level of performance**
  - **Assists in similar implementation**

Orgware

Organizational – Procedures (continued):

- **Monitoring and reporting**
  - **Maintains interoperability**
  - **Identifies proper (e.g., most important) system elements to monitor**
- **Commissioning of equipment**
  - **Ensures interoperability**
  - **Ensures minimum level of performance**

Orgware

Organizational – Procedures (continued):

- **Beacon specification and type approval**
  - **Ensures interoperability of space and ground segments**
  - **Ensures consistent processing and performance**
  - **Ensures users can have same expectations**

Orgware

Organizational – Procedures (continued):

- **Training**
  - **Identified as a weakness in recent strategic planning efforts**
  - **While similar data reaching SAR services, different States have different levels of understanding**

- **Quality and Performance Management**
  - **Information on status of system collected – however, fact based decisions on operational status of system lacking**
  - **No clear performance goals identified for member States**

Orgware

Area	Cospas-Sarsat Documents
Data Distribution	A.001, A.002,
Specifications and Guidelines	A.005, T.002, T.005, T.009
Monitoring and Reporting	A.003
Commissioning	A.006, T.004, T.010, T.013
Beacon Specification and Approval	T.001, T.007, T.008, T.012
Policy	P.001, P.002, P.005, P.006, P.011

Orgware

Conclusions

- Cospas-Sarsat founded on principles of hardware interoperability
- Original agreement allowed interoperability to extend to software and orgware – increasing system effectiveness
- System still evolving in terms of orgware especially as it relates to training and quality and performance management
- New system recognize the benefits of being interoperable with Cospas-Sarsat (primarily due to orgware)
  - SAR payloads on GNSS satellites
  - Security alerting functions