

# International Space Safety Efforts on Debris Mitigation and SSA

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- Private, non-profit foundation founded in 2007
- HQ just outside of Denver, offices in DC and Vienna (Austria)
- Dedicated to the *secure and sustainable use of space for the benefit of all humanity*
- *Inform, facilitate, advocate*
- Strong role in both the international and domestic policy communities, linking technical and policy/legal initiatives

- International space forums, treaties, and “progress”
- The IADC Debris Mitigation Guidelines as a workaround
- The Rise of Space Security
- Current international initiatives
- Space situational awareness around the world
- Future initiatives and Civil SSA

## INTERNATIONAL SPACE

“Beware, there be monsters here...”

- United Nations has two major forums where space issues are discussed
  - Committee on the Peaceful Uses of Outer Space (COPUOS)
    - Formed in 1959 and Located in Vienna, Austria
    - Has 69 member States and 27 permanent observers (*consensus body*)
    - Deals with civil space and peaceful uses
  - Conference on Disarmament (CD)
    - Formed in 1979 Located in Geneva, Switzerland
    - Has 67 member States
    - “One-stop-shop” for multilateral disarmament and arms control negotiations
    - Deals with military space
- Space issues are also occasionally discussed at the Committees, Security Council and General Assembly in NYC

- Five major treaties form the basis of international space law
  - Outer Space Treaty (1967)
  - Rescue and Return of Astronauts (1968)
  - Liability Convention (1972)
  - Registration Convention (1975)
  - Moon Treaty (1979)
- ***None explicitly deal with space debris*** but a few touch on it and lay out general principles
- Since 1980 there has been ***deadlock*** in these forums on new legally binding agreements
  - Mainly due to US policy and strategic importance of space for several nations

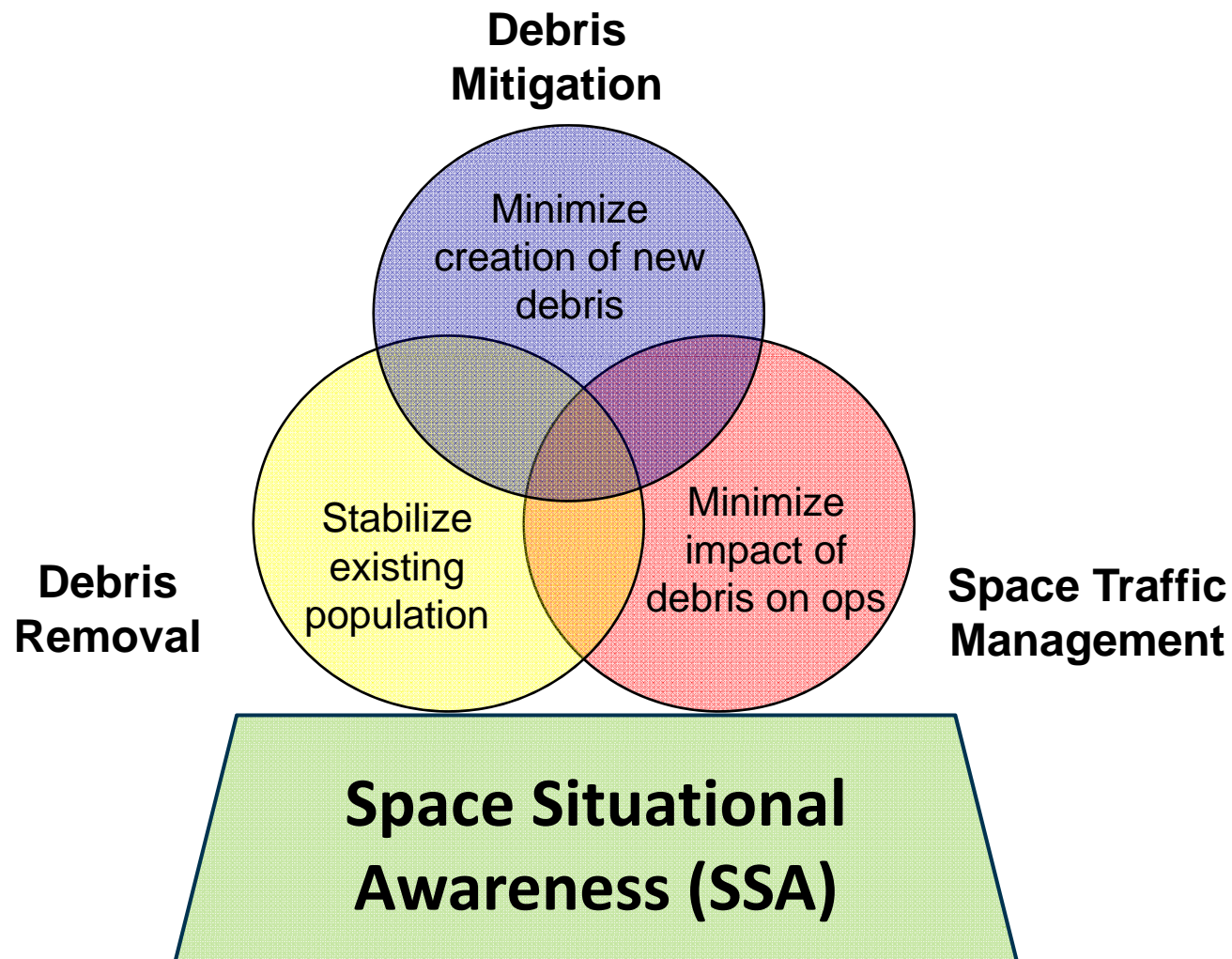
- Many realized that debris was an issue and needed a way to get around this
- The Interagency Debris Coordination Committee (IADC) was formed in the mid-1990's
  - Made up of representatives from the space agencies of the major space powers
  - Sidestepped the lawyers and diplomats and worked from a **technical standpoint** and not a legal or diplomatic one
- Produced the IADC Debris Mitigation Guidelines in 2007
  - Set of **voluntary guidelines** for minimizing the creation of debris through activities in space
  - Focuses on launch, on-orbit, and re-entry phases
  - Can be found at <http://www.iadc-online.org>

- The IADC Guidelines were injected back into UN COPOUS through the Scientific and Technical Subcommittee (STSC)
  - Developed UN COPOUS version of guidelines in 2008
  - Guidelines were then endorsed by a full General Assembly Resolution
  - Completely bypassed the Legal Subcommittee
- Since the guidelines are *voluntary*, it is up to each State to *implement through national mechanisms*
- US, China, Russia, France, Canada, Germany, Japan, and several others have either implemented or are implanting debris mitigation regulations (with varying degrees of effectiveness)



# THE RISE OF SPACE SECURITY

- Many definitions
  - US: need to protect our space assets because they are essential to ***national and economic security***
  - Europe: space is essential for ***providing human security*** for our citizens
  - Asian: a little from column A, a little from column B, some don't know  
(see the work done by GWU's Space Policy Institute for details:  
<http://www.gwu.edu/~spi> )
- Secure World's definition
  - Guaranteeing the ***long-term sustainability*** of space
  - Freedom of access to space for ***socioeconomic benefit*** for all of humanity
  - Peaceful use of space for ***human and environmental security*** on Earth



- COPOUS adopts new agenda item for “Long Term Sustainability of outer space activities
- CD agreed on work plan for the first time in 12 years
  - Nuclear weapons, fissile material, arms race in outer space, security guarantees to non-nuclear States
- Progress on “Code of Conduct” proposed by Europe
  - Voluntary code that would establish what is responsible and irresponsible behavior
- A great deal of discussion and interest in SSA

# SPACE SITUATIONAL AWARENESS

“Do you see what I see?”

- SSA has been mainly associated with military use of space in the past
- More States are recognizing the strategic need for SSA to protect national security assets in space from natural and unnatural harm
- But there is an emerging consensus that some degree of SSA is also important for civil use of space
  - Many more States have civil and commercial space assets than military ones
  - Space is becoming an essential part of the global economy
  - Increasing interest in human spaceflight (tourism?)
- Precedent in other services like GPS, remote sensing, weather

- All actors in space have a responsibility to operate in a safe and secure manner
- Certain actions in space can have severe long term consequences
- The actions of one or two actors in space can potentially affect all actors
- Most actors in space do not have the resources to provide indigenous SSA capabilities
- States that do have resources to provide SSA are often limited by national security and military restrictions from sharing it

- Civil SSA requires a geographically distributed network of optical and radar sensors
- Very expensive for one State to do this unilaterally
- Much of the sensor capacity to do this already exists
- Two big questions going forward:
  - How can we *link all the existing SSA assets in a data sharing scheme?*
  - How do we provide *analytical capacity to all space actors for civil uses?*



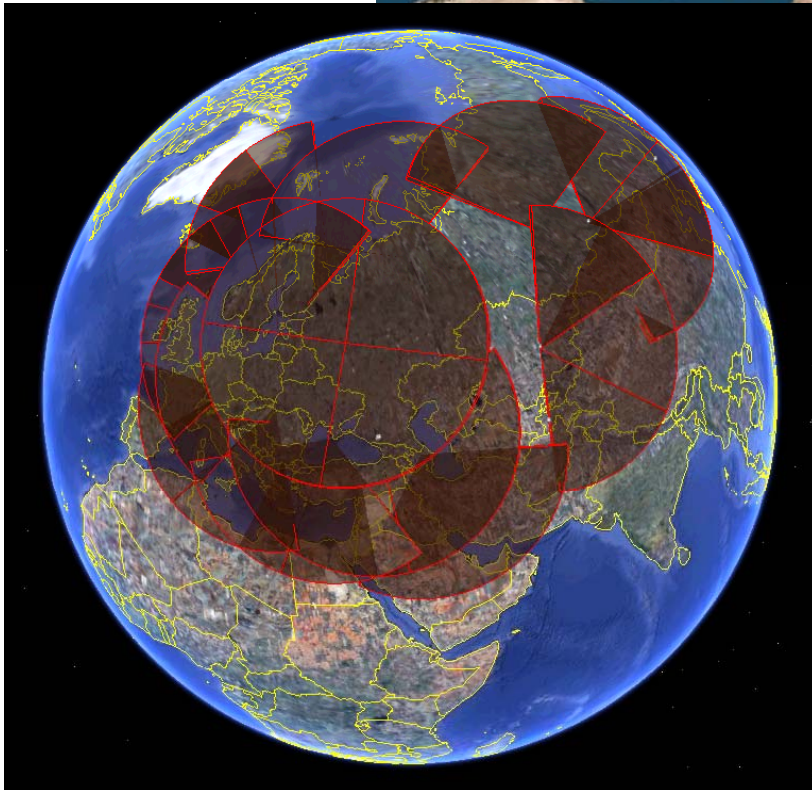
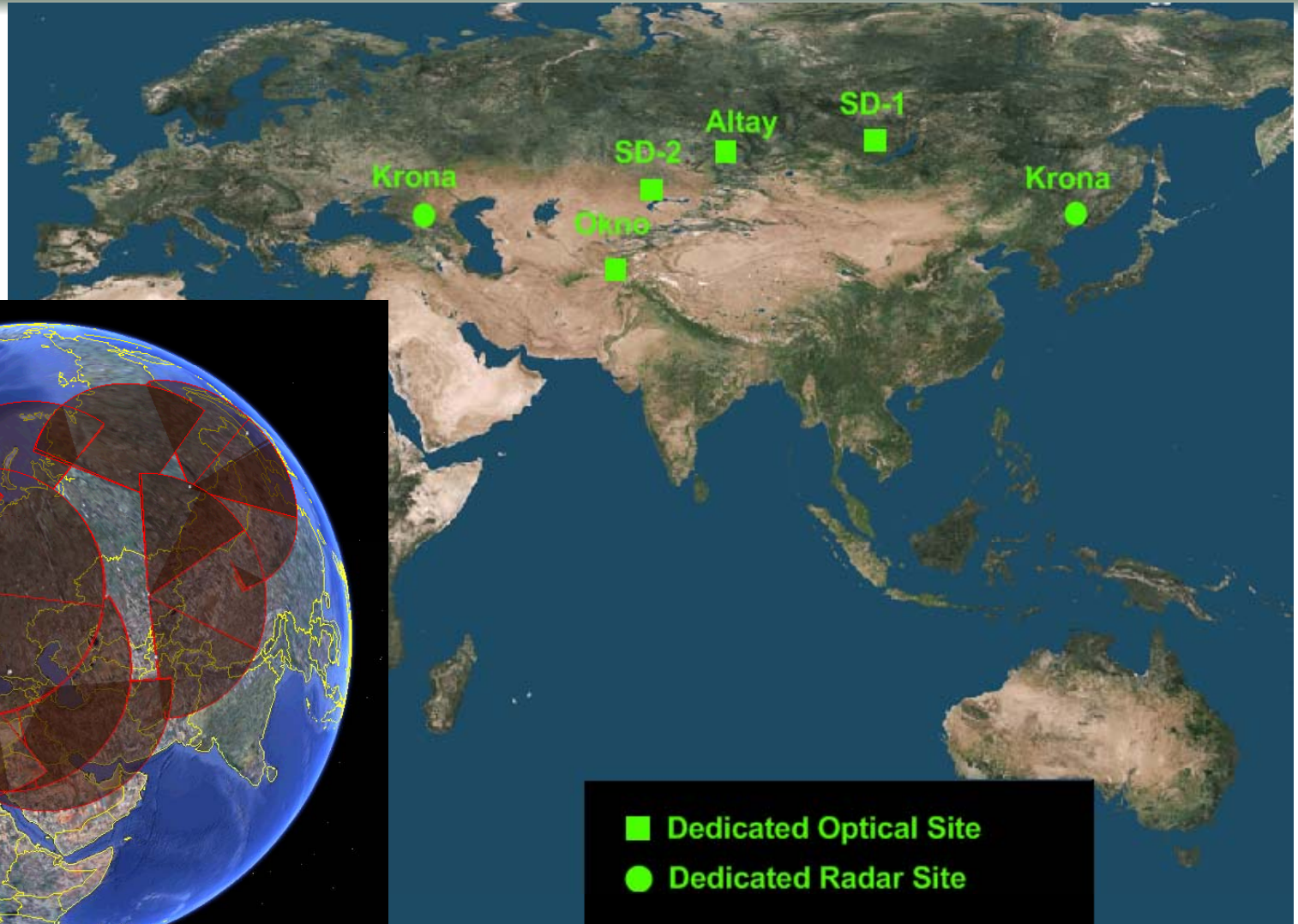
- Several countries in Europe have SSA sensors but there is no overall network



- Europe started a program to develop indigenous SSA capabilities in 2009
  - Three parts: *space surveillance, space weather, NEO tracking and warning*
  - Originally sought \$300 million over 10 years
  - Council of Ministers approved \$50 million over 3 years for first phase
    - First phase is study on best way forward
    - Second phase is connecting existing sensors to share data
    - Third phase is construction of new sensors
  - Few technical hurdles but many policy and legal hurdles
    - Concern over “federalization” of national military assets
    - Separation of civil and military use
    - Data security

# Russian SSA capabilities

*Promoting Cooperative Solutions for Space Security*



# Okno ("Window") and Krona

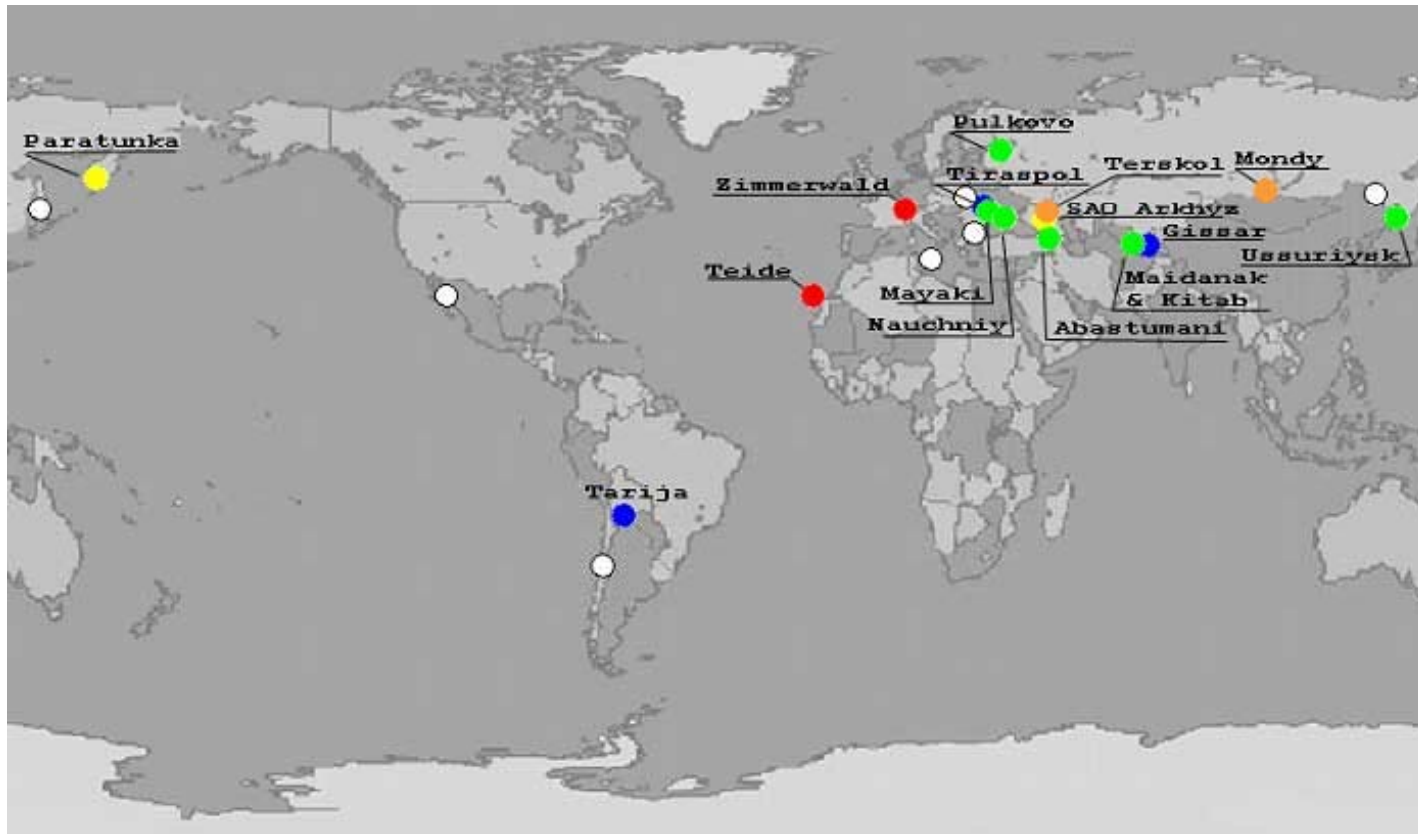
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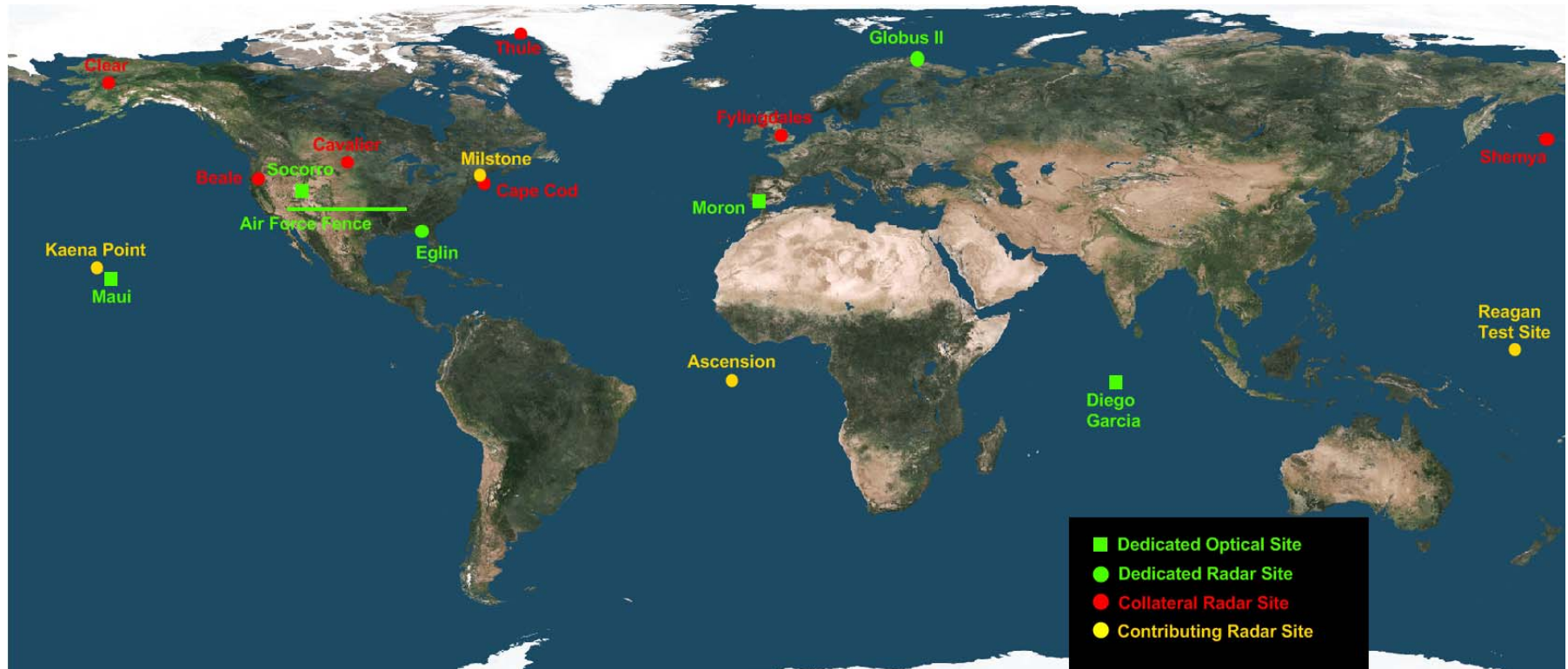
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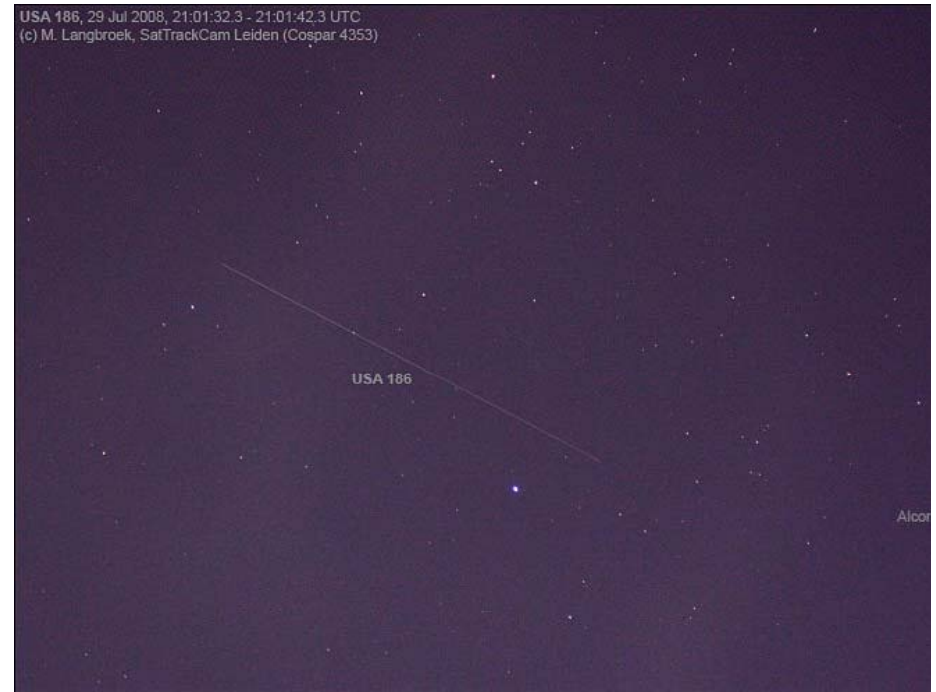
- 25 telescopes at 18 institutions in 9 States
- Coordinated through Russian Academy of Sciences
- SP-quality data, looking to move expand past GEO/MEO to LEO



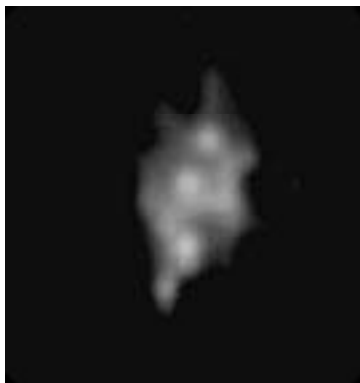
- No Southern Hemisphere coverage
- No coverage over South America, Africa, Asia
- Limited deep space capacity

*“The last Titan rocket, 4B-26, was launched on Oct 19. It deployed USA 186, a classified NRO satellite, into polar orbit. **Hobbyists have observed the satellite and determined its orbit to be 264 x 1050 km x 97.9 deg. This confirms that the satellite is one of the imaging reconnaissance satellites, replacing a satellite launched in 1996.**”*

– Jonathan's Space Report, Nov 2005



**USA 186**



**USA 193, as imaged by  
amateur in England**



- Amateurs alerted that DSP 23 was going to drift through the Hotbird (13°E), ASTRA (19°E), and ASTRA (23°E) clusters **two weeks** before USG did:

“Yes, DSP-23 is in trouble. In **addition to not receiving radio signals from it** on the 6th Nov 2008 (see my SeeSat report around about that date) the satellite is no longer keeping station **but is slowly drifting eastward with a rate due to gravity alone**. Radio signals were received from it on the 23rd November by Paul Marsh and by myself on 24th November when I tried again but appeared weaker than previously.

Optically it looks the same – I’ve just finished observing for tonight and this was one of the objects observed and I saw nothing unusual in its behavior and its still drifting”

- Message posted to See-sat list on 15 Nov 2008

- ISO space safety standards (data interoperability, design and engineering)
- Re-entry warning and COLA with air traffic
- Code of Conduct of responsible ways to operate on-orbit
- Active debris removal

- International Association for the Advancement of Space Safety
  - Holds a major space safety conference about every 18 months
  - 3<sup>rd</sup> Conference was in Rome in Oct 2008
- Designing safety into space vehicles
- Safety on long duration manned missions
- Safety of extravehicular activities
- Launch range safety (current and future)
- Spacecraft re-entry safety
- Payload safety
- Nuclear safety for space systems
- Human factors and performance for safety
- Safety critical software design and IVV
- Safety risk management
- Probabilistic risk assessment
- Organizational culture and safety
- Regulations and standards for safety
- Space-based safety critical systems
- Space traffic control and management
- Space materials safety
- Lessons learned from space accidents

## Fourth IAASS Conference

International Association for the Advancement of Space Safety



*Making Safety Matter*

Huntsville (AL) - USA  
19-21 May 2010



# Questions?

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