



Commercialization progress in the Global TT&C market.

An update of the state of commercial TT&C
services for satellite launch and operations.

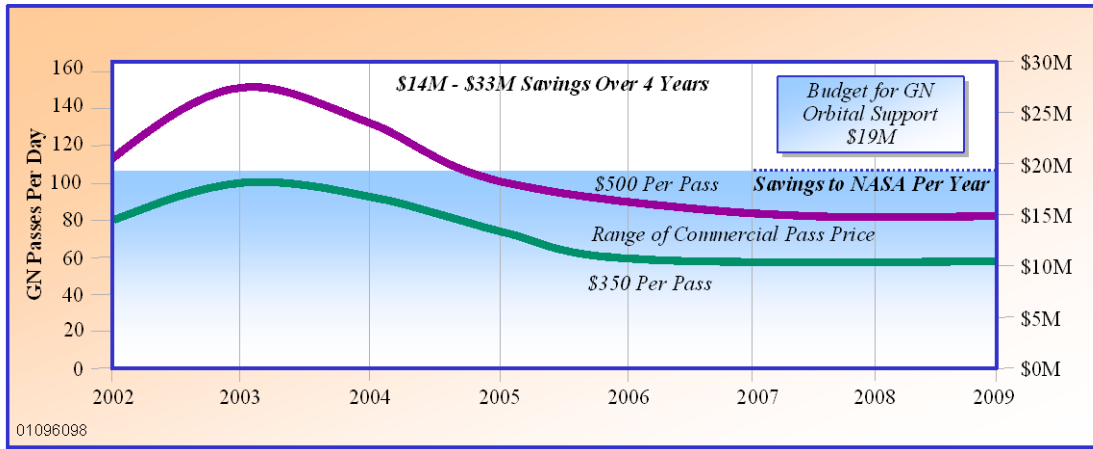


- Commercial TT&C and data services providers have matured to the point where they are being utilized for augmentation and replacement of in-house capabilities
- The economic argument has been there from the beginning, however the operational and mission-critical support argument required time and experience
- Several Gov't agencies, satellite manufacturers, satellite operators and launch providers are benefitting from commercial services on a regular basis
- The purpose of this presentation is to highlight a growing trend where commercial networks have been used to successfully augment or replace in-house TT&C services

PrioraNet Global Ground Station Network



Access to Commercial Ground Stations allows ground network users to cost-effectively augment in-house capabilities

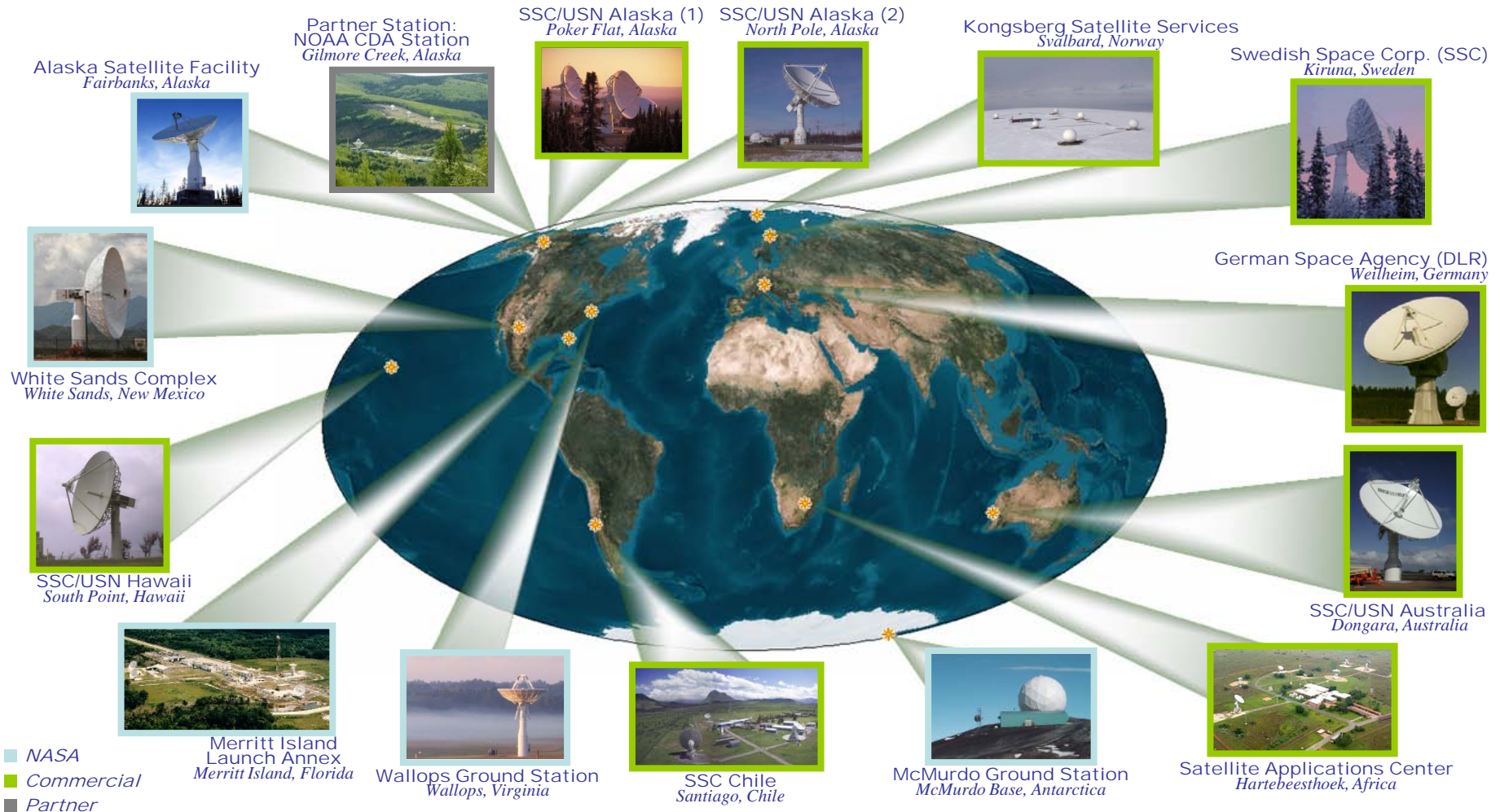


- Savings shown is O&M only
- Savings from reductions in civil service/blue suit labor not included
- Savings do not include substantial reduction in sustainment and development spending as well

- NASA owned sites were expensive to maintain and presented international challenges
- In 80's NASA began transitioning assets to TDRS to allow closure of Ground Network
 - TDRS transponder cost/weight/power limited use for many near Earth spacecraft
- Commercial TT&C assets developed to fill gap by providing low cost alternatives
- NASA determined need for core NASA owned capability—Manned Space Flight
- In Feb 2008, with USN purchase of HTSI/DataLynx assets, NASA commits to close 2 NASA owned Polar antennas
- Only Remaining NASA GN assets are:
 - UAF, White Sands, Wallops and Mila--support Manned Space Flight
 - McMurdo (No current commercial Business Case)

**NASA is Achieving Significant Cost Savings with
Very Low Mission Risk**

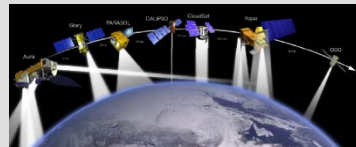
Current NASA - NEN Configuration



Scheduling



Pre-mission Planning & Analysis



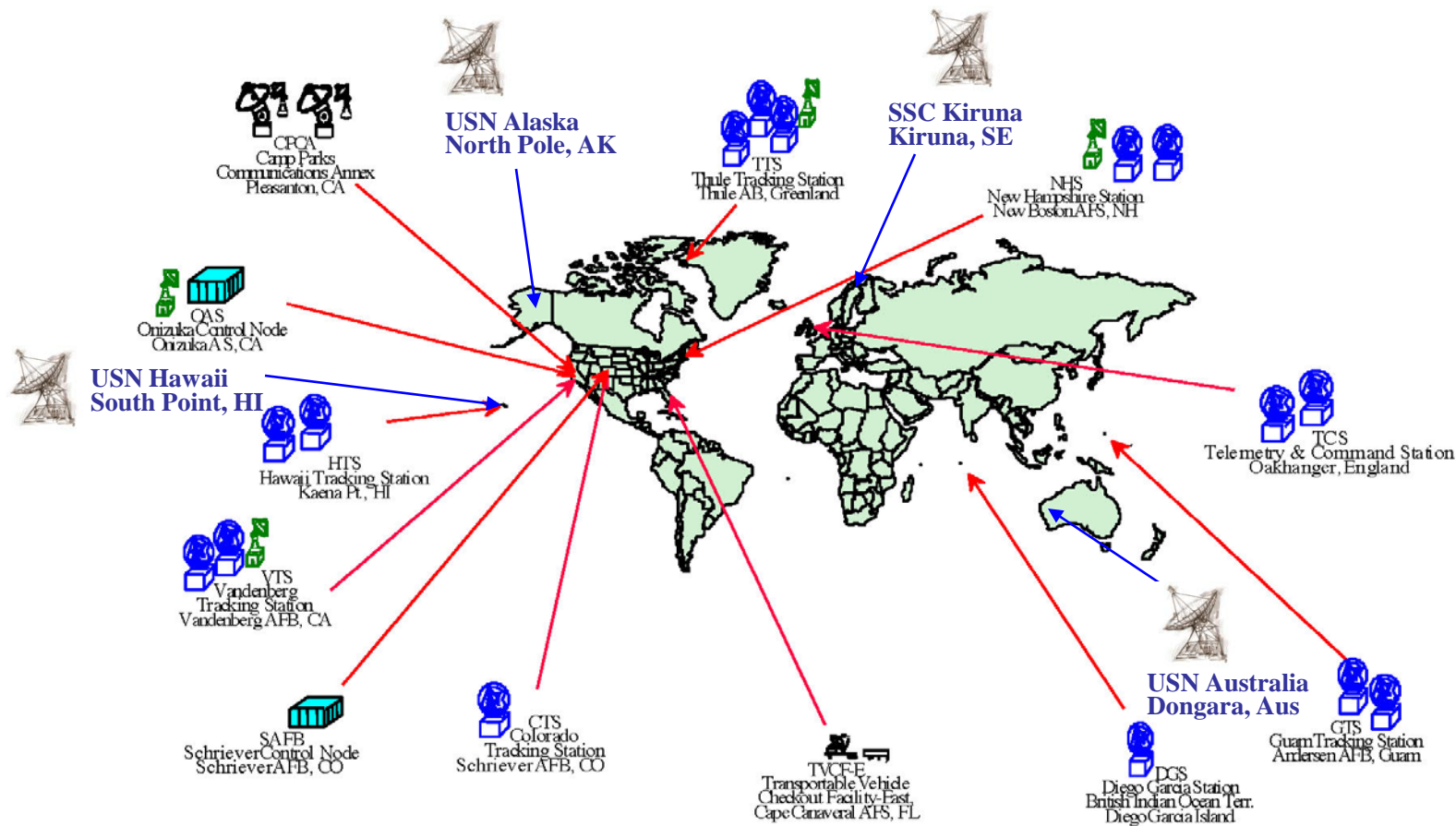
Pre-mission Testing



Network Monitoring & Coordination



Commercial Support of DoD has been successful but for limited use only



- USN, SMC, SMTDW, and 50th SW demonstrated commercial SGLS capability can meet DoD requirements
 - Successfully demonstrated full SGLS support in Alaska and USB compatibility with the CCS-C ground control system from 2004-2006
- DoD has used commercial X-Band downlink services from USN for Coriolis, STP-R1, NFIRE, and SBSS
- Boeing is procuring USB and SGLS support for orbit raising and in-orbit checkout of all Wideband Global Satcom (WGS) launches
- SMC is now studying options for the future of the Air Force Satellite Control Network including what services could be acquired from commercial TT&C providers

Cost Effective DoD Mission Support is a Proven Commercial Capability

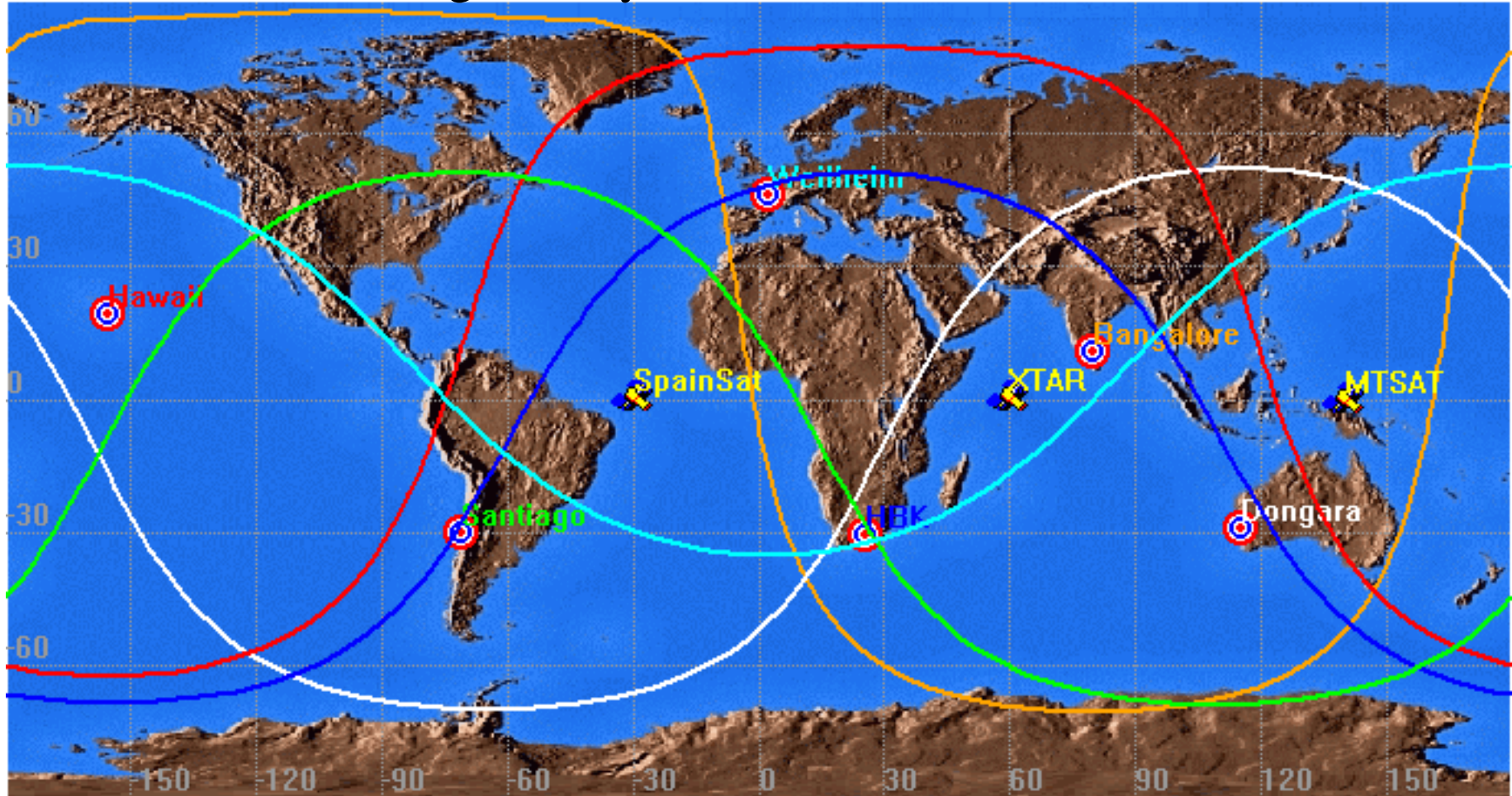
Integrated Gov't Agency and Commercial S-Band launch network



ESA, DLR and other European agencies use similar integrated approaches

Commercial Example

Geostationary Launch and Orbit Raising Network – Fully outsourced and integrated by Commercial Services Provider



- The industry, Gov't agencies and commercial manufacturers, are all addressing the issue of risk and control versus cost
- Use of commercial shared infrastructure allows:
 - Reduction of TT&C infrastructure and associated investment and maintenance costs
 - Leveraging of commercial investment that can be amortized over a large customer base.
 - Expanding the number of network sites to reduce overall risk
 - Paying for TT&C services only when needed
- Agencies give up absolute control over the availability of the assets and rely on a network provider for support
- Commercial TT&C services are now a mature, low risk product with proven prioritization schemes that ensure assets are available when needed.
- Government agencies and commercial manufacturers are increasingly integrating commercial TT&C assets into their networks.