POSITION STATEMENT

SPACE-BASED REMOTE SENSING TECHNOLOGIES

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Carefully targeted investments in space-based remote sensing and geospatial imaging technologies are urgently needed to enhance the operational effectiveness of public and private sector earth observation programs that advance scientific knowledge, promote economic growth, improve public safety and ensure national security in increasingly competitive global markets. IEEE-USA recommends that the U.S. government adopt space-based remote sensing policies and provide adequate funding for programs that

- Preserve vital radio-frequency spectrum segments for safety-critical remote sensing applications,
- Promote closer collaboration between public and private entities that provide remote sensing products and services,
- Support standardized calibration and validation activities at public agencies and private organizations with remote sensing missions and capabilities,
- Incentivize the use of advanced remote sensing technologies, such as hyper-spectral radar altimetry, synthetic aperture radar and light detection and ranging (LIDAR) imaging,
- Encourage private investment in U.S. commercial remote sensing ventures and
- Utilize remote sensing data products for public education purposes as well as to improve training for graduate engineers and research scientists.

This statement was developed by the IEEE-USA Committee on Transportation and Aerospace Policy, and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of the more than 205,000 engineers, scientists and allied professionals who are U.S. members of the IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE or its other organizational units.

BACKGROUND

For more than 50 years, remote sensing technologies have helped to develop the intellectual foundation for space exploration. Space-based remote sensing has produced an extraordinary range of applications, with increasing utility for humanity. As with all earth-orbiting spacecraft, political borders have little significance and wide-area views can be easily obtained. Although most of the available satellites are civilian or military, the commercial segment is growing rapidly in both capability and capacity. Typically, remote sensing is accomplished both passively, by detecting naturally emitted frequency-specific electromagnetic radiation from the subject of interest, and actively, by employing transmitters, such as lasers or radars.

The National Aeronautics and Space Act of 1958 authorized the National Aeronautics and Space Administration (NASA) to conducts air borne and space based observations of the earth, other planetary bodies, the solar system and the universe beyond in preparation for manned and unmanned space expeditions The agency continues to employ vehicles ranging from suborbital balloons, airplanes and rockets to interplanetary probes and deep space telescopes that carry remote sensing devices and geospatial imaging systems.

NASA’s Office of the Chief Technologist (OCT) and the National Research Council’s Aeronautics and Space Engineering Board recently developed a set of 14 Space Technology Area Roadmaps. These tools are intended to serve as a basis for charting NASA's future investments in technology-- identifying the agency’s exploration systems requirements, earth and space science operational needs and other critical national needs in space technology. Remote sensing technologies include components, sensors and instruments that are sensitive to electromagnetic radiation, photons and electromagnetic fields. In addition, remote sensing has been broadly applied to sensing acoustic energy, seismic energy, and other physical phenomena that science requires in a key technology roadmap item[1]. Remote sensing resource applications address issues found everywhere--from the interior and surface of the Earth--to the air and space that surround it.

The National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD) and other federal agencies also operate aerial and space-based remote sensing devices to help protect life and property, improve military and homeland security, stimulate economic growth, and advance scientific knowledge. Recent advances in remote sensing include very high resolution optical imaging technologies that have important civilian and military applications.

After decades of success, the United States has reached a critical phase in its development of remote sensing capabilities. Collaboration by NOAA, NASA and DOD on the National Polar-Orbiting Operational Environmental Satellite System - a next-generation platform for monitoring the earth's atmosphere, ocean and land surfaces,

[1] http://www.nasa.gov/offices/oct/home/roadmaps/index.html

and near-space environment – was cancelled in 2010. And plans to deploy NOAA's Joint Polar Satellite System and DOD's Defense Weather Satellite System in its place have been put on hold.

Tight budgets and changing priorities are delaying the next generation of polar-orbiting satellites. Ironically, America's prospects for continued polar-orbiter coverage may depend on its relationships with the European Community, which is successfully flying sensors like those the U. S. has flown in the recent past.

The European Space Agency, Germany and Italy are currently operating Synthetic Aperture Radar (SAR) satellites of their own and developing new remote sensing capabilities. And while there is very little basic SAR research and only a handful of related educational programs in the United States, European and Asian nations are moving rapidly ahead in a field the United States pioneered in the 1970s.

In order to achieve a more effective and efficient remote sensing industry; continue its vital earth observation and measurement programs; and compete successfully with state-supported remote sensing businesses in other parts of the world, the U.S. government must adopt policies that balance private-sector growth with public-sector capabilities. Training the engineers and scientists needed to design, develop and deploy satellite remote sensing applications will also require substantial public and private sector investments.

Some examples of applications of space-based remote sensing include:

- To locate sub-surface commodity deposits, map ocean bottoms and detect sub-surface threats (e.g., mines).
- To assess earth deformation resulting from earthquakes, volcanism, subsidence, erosion and desertification.
- To measure crop growth, manage water resources and monitor forest fires.
- To detect air, ground and water pollution.
- To measure glacier melt, snow and ice depth, levels of atmospheric CO_2 and ocean acidity.
- To predict weather, assess gaseous and particulate composition in the atmosphere and monitor air temperatures.
- To detect threats to communications from solar storms and measure variations in the Earth's magnetic and gravity fields.
- To track changes in currents, sea ice, surface temperature and ocean color.

- To monitor disaster relief efforts, provide data on the energy crisis and improve earthquake, tsunami, and tornado predictions.

- Encourage the combined use of advanced remote sensing technologies, such as hyper-spectral imaging, radar altimetry, synthetic aperture radar imaging and lidar imaging

- Encourage private investment in U.S. commercial remote sensing venture

- Encourage, advocate, fund and support using remote sensing data products as an educational tool for all age levels, and in particular, in training graduate-level scientists to continue this research tradition in satellite remote sensing.