Name(s): optional

Organization: optional

Email address: optional

Phone number: optional

OSTP invites you to submit public comments (limit 5 pages) on the technical feasibility of developing microsatellites that can be deployed at equal or lower cost compared to current satellites to meet the sustained missions of the civil Earth observation community. For the purposes of this study, OSTP considers microsatellites as having a mass of less than 100kg. For more details about this request, see the background section below.

OSTP welcomes public input on the following topics:

1. Identify the measurement categories (see background section) highlighted in the National Plan for Civil Earth Observations relevant to your mission;

2. Describe the technical near-term (1-5 years) capabilities of microsatellite system(s) related to Earth observations capabilities as defined in the background section;

2. Describe the technical near-term (1-5 years) capabilities of microsatellite system(s) related to Earth observations capabilities as defined in the background section; (continued)

3. Discuss the reliability, system lifetime, and maintainability of microsatellite systems;

4. Discuss the launch requirements including planned launch options (rideshare, microsatellite launch companies, etc.), if they exist;

4. Discuss the launch requirements including planned launch options (rideshare, microsatellite launch companies, etc.), if they exist (continued);

5. Describe any current technical limitations on microsatellites for operational Earth observing missions;

6. Provide broad estimates of development, launch and operational costs of specific systems, if possible.

Provide any additional comments on the microsatellite technologies suitable for civil Earth observations:

Background

In recent decades, the United States' Earth-observing capacity has grown in scale and complexity, with multiple Federal agencies collecting information about the state of the Earth system. Earth observation systems consist of sensing elements that directly or indirectly collect observations of the Earth, measure environmental parameters, or survey biological or other Earth resources (such as land surface, biosphere, solid Earth, atmosphere, and oceans). The platforms carrying these sensing elements may be mobile or fixed, and are space-based, airborne, terrestrial, freshwater, or marine-based.

Space-based observation systems have been used for decades to collect critical information used by the civil Earth observation community. The high vantage point afforded by Earth orbit provides the opportunity to conduct observations covering broad areas, over long periods with frequent revisit rates. Satellite platforms can be costly, and technology improvements are implemented on lengthy timeframes. As microsatellite technology improves, the cost of collecting sustained and scientific observations from space may decrease, not only reducing costs for current observations, but potentially enabling additional missions.

In 2013, the National Science and Technology Council (NSTC) released a National Strategy for Civil Earth Observations (http://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc_2013_earthobsstrategy.pdf) outlining a policy framework organized by Societal Benefit Areas (SBAs) to enable stable, continuous, and coordinated global Earth-observation capabilities for the benefit of society. Societal benefits accrue from Earth observations that inform scientific research, policy, and decision-making. SBAs are interconnected at local, regional, national, and international scales, and include scientific research, economic activities, and environmental and social domains.

Many SBAs involve critical government functions, such as the continuity of national government and the protection of life and property. The NSTC framework enabled the development of a National Plan for Civil Earth Observations informed by a government-wide assessment of the impact of more than 350 Earth observation systems.

The National Plan for Civil Earth Observations (http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/2014_national_plan_for_civil_earth_observations.pdf) published in July 2014, lists the highest priority **measurement groups** for observations as:

- **Weather and seasonal climate monitoring and prediction,** which characterize phenomena such as precipitation, storms, wind, floods, sea state, drought, wildfires, ice, air quality (including ozone), and weather risks to human health and transportation.
- **Dynamic land-surface monitoring and characterization** to support food and water security, water availability and quality, fire detection and suppression, human health, forestry, soil characterization (including soil moisture), hazards mapping and response, and natural-resource management.
- **Elevation and geo-location** to support food and water security, hazard and risk mapping, and natural-resource management.
- **Water level and flow** to support coastal inundation and inland flooding, water availability, hydropower management, transportation, human health, water equivalent of snow, and tsunami hazard preparedness.

In addition to these highest priority measurement areas, the National Plan (http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/2014_national_plan_for_civil_earth_observations.pdf)

specifies additional categories of measurement areas that are also important for sustained observations for public services. These categories include:

- **Ecosystem and biodiversity** resource surveys for terrestrial, freshwater, and marine ecosystems, including fisheries and wildlife management;
- **Environmental-quality monitoring**, specifically disease-vector surveillance, water quality, and air quality associated with changes in atmospheric composition, including particulate matter and short-lived climate pollutants;
- **Geo-hazard monitoring** for Earthquakes, volcanoes, landslides, regional and local subsidence (e.g., sinkholes), inundation, and tsunamis; and
- **Space-weather monitoring** of geomagnetic storms, sunspots, solar flares, associated x-ray and ultraviolet emissions, solar wind (including coronal mass ejection), solar energetic particles, traveling ionosphere disturbances, and associated changes of the Earth's geomagnetic field and ionosphere for their impact on human activities.

The National Plan also describes the following **measurement categories** as essential to the Federal government's research objectives:

- **Atmospheric state**, including measurements of temperature, pressure, humidity, wind, and ozone at the accuracy required for long-term climate research, and, as appropriate, to improve short and medium-range weather forecasting;
- **Cryosphere**, including measurements of ice sheets, glaciers, permafrost, snow, and sea ice extent and thickness;
- **Earth's energy budget**, including total solar irradiance and Earth's radiation budget, and the reflectance and scattering properties of clouds, aerosols, and greenhouse gases, specifically for understanding Earth's sensitivity to climate change;

- **Extremes**, including specific and routine observations for the study of extreme temperatures, drought, precipitation, and wind;
- **Geo-hazard research**, including monitoring land-surface deformation to better understand regional and local disaster potential and effects, and the monitoring of phenomena that precede natural disasters (such as seismic, stress, strain, geochemical, and temperature changes);
- **Greenhouse gas emissions and concentrations**, including understanding sources and sinks of greenhouse gases, as well as changes in long-lived greenhouse gas and short-lived climate pollutant concentrations over time;
- **Integrated geophysical and biosphere characterization (terrestrial, freshwater, and marine),** including long-term dynamics to understand ecosystem change and biogeochemical processes (particularly the carbon cycle);
- **Ocean state**, including observations of sea levels, temperature, salinity, pH, alkalinity, currents and characteristics of marine ecosystems;
- **Space weather**, including long-term understanding of the Earth-Sun relationship, solar dynamics, and the drivers of space-weather impacts at the Earth's surface (such as coupling between space weather and geomagnetic storms); and
- **Water cycle,** including the analysis of droughts, floods, and water availability (precipitation, soil moisture, snow-water equivalent, evapotranspiration, groundwater, surface water, and runoff).

Societal Benefit Areas

(http://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc_2013_earthobsstrategy.pdf)

- **Agriculture and Forestry**: Supporting sustainable agriculture and forestry.

- **Biodiversity**: Understanding and conserving biodiversity.
- **Climate**: Understanding, assessing, predicting, mitigating, and adapting to climate variability and related global change.
- **Disasters**: Reducing loss of life, property, and ecosystem damage from natural and human-induced disasters.
- **Ecosystems (Terrestrial and Freshwater)**: Improving the management and protection of terrestrial and freshwater ecosystems.
- **Energy and Mineral Resources**: Improving the identification and management of energy and mineral resources.
- **Human Health**: Understanding environmental factors affecting human health and well-being.
- **Ocean and Coastal Resources and Ecosystems**: Understanding and protecting ocean, coastal, and Great Lakes populations and resources (including fisheries, aquaculture, and marine ecosystems).
- **Space Weather**: Understanding, assessing, predicting, and mitigating the effects of space weather on technological systems (including satellites, power grids, communications, and navigation).
- **Transportation**: Improving the safety and efficiency of all modes of transportation (including air, highway, railway, and marine).
- **Water Resources**: Improving water resource management through better understanding and monitoring of the water cycle.
- **Weather**: Improving weather information, forecasting, and warning.

- **Reference Measurements**: Improving reference measurements—the underpinnings of all the SBAs—and the fundamental measurement systems and standards supporting them (such as geodesy, bathymetry, topography, and geolocation).