Revised

NOAA Satellite and Information Service
Technology Maturation Program (TMP)

Background:

Starting in the Spring of 2018, TMP is composed of a portfolio of several projects that aim to mitigate satellite risks by harnessing newer technology to support NOAA's adoption of smaller, newer, and more efficient satellite technology. For example, TMP will test the capabilities of CubeSat satellites, to support NOAA's Earth observation needs. CubeSats are smaller, much less expensive observing systems, which are potentially just as powerful as the larger, complex satellites NOAA currently uses for climate monitoring and weather prediction. TMP partners with NASA, Colorado State University, CIRES, CIMMS, Aerospace Corporation, and other NOAA line offices.

Highlighted Projects

TMP 18-26
Solar Sail Optimization & NASA Solar Sail Accommodations Studies

TMP 18-03
TMP 18-03: Accelerate Satellite Data Exploitation in the Era of Small Satellites

TMP 18-04
Exploitation of the New Approaches of using COSMIC-2 data in Numerical Weather Prediction in the Moist Troposphere

Impact:

- **Access Innovations:** TMP seeks to harness innovative technology developed by the NOAA's partners to suit NOAA's need for low cost, highly reliable observation systems. When one of NOAA's partners, like NASA, develops a new technology, TMP tests and determines whether and how this new technology can be used to advance NOAA's mission.
- **Close Gaps:** Satellites either fail or are decommissioned over time, which can threaten the quality of NOAA's work. Big satellites can often take over ten years to develop, which can make failed satellites difficult to replace. For this reason, NOAA needs satellites that are quick and inexpensive to replace. A satellite that can be quickly put in space can replace an important capability that is lost, ensuring the smooth continuation of NOAA's important work. TMP seeks to mature technologies to facilitate faster replacement cycles, with fresher technology, and faster on-orbit replacement.
- **Reduce Costs:** Projects with the potential to preserve capability at lower cost should be subjected to a life-cycle deployment analysis and categorized as an alternative to existing systems. TMP seeks to accelerate the preliminary analysis phase of technology adoption, which can be refined as technical success is achieved. A business case and return on investment (ROI) analysis are currently being conducted in Fiscal Year (FY) 2019 with plans to conduct ROI analyses for all future TMP proposed studies.

Latest Project: *JPL Cubesat Infrared Atmosphere Sounder (CIRAS)*

The Cubesat Infrared Atmosphere Sounder (CIRAS) primary objective is to reduce the cost of future IR Sounder Observations. CIRAS will serve as an on-orbit demonstration of both how the Midwave InfraRed (MWIR) sounding technology that will reduce the cost, size, weight, and power, and will measure upwelling infrared radiance at a very high spectral resolution that provides detailed atmospheric temperature and moisture observations. The observed radiances are intended for early assimilation into weather prediction models. CIRAS will provide on-orbit data from new technology for effective assimilation into weather prediction models. Early on-orbit data can reduce years of delay for the next generation to operationalizing new technology data.

NASA's Jet Propulsion Laboratory (JPL) was funded through TMP to design, build, and test an Engineering Model (EM) Prototype. JPL demonstrated the viability of technologies and designs supporting IR sounding in a CubeSat in an approximate 4U volume of a 6U CubeSat. CubeSat-sized IR sounders can provide mitigation of a loss by having the ability to rapidly deploy an IR sounder as the building and testing of CubeSats can be achieved in months versus years and CubeSat costs are a fraction of heritage sensor costs. In addition, deployment in new, alternate orbits can provide additional soundings at different times of day. Studies have shown that multiple IR sounder CubeSats can provide impact comparable

to a single Cross-track Infrared Sensor (CrIS) if flown in alternate orbits. In addition, two or three CubeSat IR sounders could potentially be flown in formation separated by 5-15 minutes to track features of water vapor in 3-D as they move in space and time. This information can be used to derive 3D Atmospheric Motion Vector (AMV) winds. CIRAS is a proposed pathfinder demonstration whose funding is currently under consideration. The data will improve weather forecasting, environmental monitoring, and climate monitoring, benefiting users like NWS/NWP, Research and Operational Modeling and Forecast Community.

Key Milestones:

Key Milestone Date	**Name of Milestone**
June 2018	FY2018 TMP Program Kick-off Meeting
October 2019	FY2018 TMP End of Year (EOY) Annual Review
June 2019	FY2019 TMP Program Kick-off Meeting
October 2020	FY2019 TMP End of Year (EOY) Annual Review
June 2020	FY2020 TMP Program Kick-off Meeting
October 2021	FY2020 TMP End of Year (EOY) Annual Review