

Dr. Tupper Hyde
Chief, Mission Engineering and Systems Analysis Division, GSFC

Dr. Hyde has provided exemplary leadership for the Mission Engineering and Systems Analysis (MESA) division at Goddard during a time when work has been uncertain. Managing over 422 people, Tupper has focused the division on creative ways to capture and support meaningful work as well as providing opportunities for people working to develop new technologies to advance NASA's missions. Following the launch of several flight missions, engaging most of the Division's personnel, a significant amount of the workforce was left without the direction of a flight mission. Tupper leapt on this as an opportunity to motivate people to be creative and innovative with the skills, tools, and contacts (internal and external) at hand. Tupper offered frequent "open lunches" as an opportunity for any of the division members to access him to discuss issues, needs, or creative ideas. Tupper also actively encourages engineers within the Division to speak to him and their line management about their innovative ideas and then looks for opportunities to secure small amounts of seed funding from various sources to help them explore their innovative concepts. These seed ideas can then evolve into larger development activities or critical mission technologies that will enable future GSFC science missions that would otherwise have never come to the table. Through these, as well as an open door policy, and frequent hallway conversations, Tupper consistently demonstrates his commitment to technology developments and innovative work within the division. He has become the voice and champion of the division for innovation activities, seeking any and all avenues to support the work.

One of the more prominent developments is that of the Goddard Reconfigurable Solid-state Scanning Lidar (GRSSLi). GRSSLi is a novel dual purpose Lidar used for Science and Proximity operations. Tupper has worked tirelessly to increase awareness by personally setting up tours and demos for the Applied Engineering and Technology Directorate management. He has advocated and pushed Center management, Headquarters personnel, and Science Mission Directorate (SMD) projects like Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (Osiris-REx) to visit the lab, see developments, discuss application, and create more advocacy for the work. In support of this effort, Tupper even donated the television in his office for presentations so the group was better able to see the lidar imagery and other data products. Tupper has worked relentlessly to pursue internal funding to continue development, including Directed Research and Technology as well as Internal Research and Development programs. Tupper has worked with GRSSLi leads to identify people internally at Goddard and Headquarters that would help further support of the work. His direct involvement has led to broader marketing and finding additional applications. Contacts have been developed with internal proposal teams to potentially use this technology, including the Venus Reconnaissance Orbiter proposal team, Resource Prospector Rover project management and even development groups at Ames. Tupper has found a number of opportunities for GRSSLi where previously not thought possible.

Tupper has had tremendous influence in supporting capture of Europa Clipper work, advocating for a number of elements of the project. He has been a champion for the Europa probe, working with center management to support funding on concept development of this unique mission addition. He was also the source of an innovative idea for Goddard propulsion to reach out to the Applied Physics Lab (APL) and negotiate being the provider of this complex propulsion system. This work structure is, in itself, innovative in its approach; Goddard has never provided a subsystem to APL before. Tupper leveraged his contacts internally and externally to support the capture of the system. The end result is Goddard will now build a >\$25M complex propulsion system with new technology developments, engaging the

propulsion branch with meaningful work when 75% of the branch was facing zero work for upcoming years. It was Dr. Hyde's innovative approach to finding this work that was key to the success we see today.

Tupper has championed a number of CubeSat developments and collaborations in the last year. He orchestrated a conversation with multiple subsystems to start a state of the art survey of technologies and pushed to open collaborations in the area of CubeSats with APL, tying together center research and development funding for more effective projects. He also identified a project Johnson Space Center was working with the Naval Academy on to build a micro meteorite orbital debris (MMOD) sensor called DRAGONS for testing on the International Space Station. Tupper saw an opportunity for Goddard to leverage that design for a free flying CubeSat as well as for an add-on to a mission like Joint Polar Satellite System (JPSS). Tupper saw the real need for this sensor at 600 km - 900 km altitude for polar sun-synchronous missions, where orbital debris is the heaviest. Goddard is now conducting a formal design exercise through the Mission Design Laboratory to design a CubeSat version of this sensor. If successful, this mission will be the first of its kind and will allow proper modeling of the orbital debris environment (current estimates are projections only) and thus, save missions from having to spend precious funds to needlessly shield components. Tupper, has also been a staunch advocate for the maturation of CubeSat scale electric propulsion technology within the division. The Micro Cathode Arc Thruster (MCAT) technologies have been a collaboration between the George Washington University, NASA GSFC and Yonsei University in South Korea. GSFC has matured the George Washington University designed thrusters and control electronics for application on an in space precision formation flying demonstration that Yonsei University is developing called "CubeSat Astronomy by NASA and Yonsei using Virtual Telescope Alignment experiment (CANNYVAL-X)." Tupper has not only advocated for the work but activity secured and donated funding and staffing for the in-house development efforts.

Dr. Hyde has been an incredibly vocal champion of bringing emerging green propulsion work to Goddard. He has worked with propulsion branch management to set up meetings with center management, other NASA center management, and reached directly to Headquarters to support collaborations, capture new work, and increase research funding for this effort. He has reached out directly to SMD projects at Goddard, convincing them to allow green propulsion system trade work to be considered during pre-phase A work. Through these creative means of funding and partnership, budgets for green propellant development work have increased significantly and Goddard has become a known player in the green propellant user community. Tupper was also critical to navigating the tricky political waters of international collaboration and NASA policy for key portions of the green propellant effort.

Tupper has also worked tirelessly to promote the technical capabilities as well as the technologies of the division with the intent to dramatically increase the number of Internal Research & Development (IRAD) awards to the organization. Spacecraft subsystem organizations frequently fail to receive regular IRAD investments given the science instrument driven nature of GSFCs work. Tupper has engaged the wider GSFC Lines of Business leads to not only advocate for the MESA divisions work but also educate others about the critical need for the innovations and technologies that are being developed within the division.

Multiple technologists within the division agree that he has been the most supportive and engaged division head they have ever worked with. Tupper is a champion for technology, innovation, and work for the division. He establishes critical collaborations, is unafraid to make strong statements in support of the work, promotes to those who might benefit from the work, and finds creative solutions to fund

the technologies. Dr. Tupper Hyde is an exemplary Champion of Innovation for the Mission Engineering and Systems Analysis division, Goddard Space Flight Center, and for NASA as a whole.