Emergent Space Technologies, Inc. Capabilities for the DARPA Phoenix Program

Emergent Space Technologies, Inc. (Emergent) is a Small Business that specializes in multi-satellite applications of guidance, navigation and control (GN&C) for cluster and formation flying; autonomous rendezvous, proximity operations and docking (ARPOD); and constellations. Headquartered in Greenbelt, Maryland, we have offices in Albuquerque, NM; Colorado Springs and Denver, CO; and Austin and Houston, TX. Our customers include NASA, DARPA, Air Force, and the Office of Operationally Responsive Space (ORS).

Emergent has expertise in a broad range of subjects relevant to DARPA's Phoenix Program, including GN&C systems engineering; GN&C algorithm and software development; absolute and relative navigation; LEO/HEO/GEO GPS engineering; orbital mechanics; mission analysis and design; software-in-the-loop (SIL)/hardware-in-the-loop (HIL) integration and test; and object-oriented flight and ground software (FSW/GSW) design and development. We combine this expertise with real mission experience from System F6, Orion/Multi-Purpose Crew Vehicle, HST SM4, Dextre Pointing Package, RESTORE, MMS, ANGELS, DART, Orbital Express, Iridium, and Globalstar.

For the System F6 project, Emergent is currently designing algorithms and performing analyses for multi-spacecraft cluster flight GN&C. This includes cluster ingress/egress, station-keeping and scatter/re-gather. Our holistic approach to the cluster GN&C problem incorporates fault detection, isolation and recovery as well as collision avoidance. In the next phase, we will be transforming the GN&C algorithms into proto-flight software based on a service-oriented architecture.

What sets Emergent apart from other Small Businesses in our space are our software capabilities. In addition to high-end GN&C engineering capabilities, we are a Capability Maturity Model-Integrated (CMMI®) Level 3 software organization that practices agile development techniques to deliver high quality software, on-time and on-budget. In addition to developing new software, Emergent has experience with integrating existing software architectures, tools and components, many of which belong to NASA and can be readily reused for Phoenix. Relevant examples include the Goddard Mission Services Evolution Center (GMSEC) middleware-based ground systems architecture, the Core Flight Software/Core Flight Executive (CFS/CFE), the General Mission Analysis Toolkit (GMAT), and the Orbit Determination Tool Box (ODTBX), amongst others. We can do mission design and analysis using GMAT and navigation analysis using ODTBX. We can rapidly build SIL/HIL simulations using NASA JSC's Trick. We can also build robotic simulations of the SPDM and FREND arms for satellite servicing mission analysis and design. In this manner, we don't always have to build software systems from scratch. We can be more agile and responsive through the proper reuse of existing Government software.

Since its inception in 2001, Emergent has established a proven track record of providing superior technical solutions on time and at lower cost than its competitors. Emergent has also established an excellent reputation and working relationships with our customers, industrial partners, prime contractors and renowned experts in the field of spacecraft GN&C. In fact, our employees have been awarded:

- GSFC Nominee for George M. Low Award in Small Business Category (2011)
- Orion Flight Dynamics Team Excellence Award (2009)
- Robert H. Goddard Individual Engineering Excellence Award (2008)
- Contractor Excellence Award for GSFC's Mission Engineering & Systems Analysis Division (2005)
- NASA Group Achievement Award for the GMSEC Core Team (2006)
- NASA GSFC AETD Science & Technology Advancement Award (2006)

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