

Executive Summary

The Naval Research Advisory Committee was asked to study autonomy for the Navy after discussions with the ASN-RDA and OPNAV N2/N6 staffs in late 2011. In a compressed schedule of about four months, the autonomy Panel (a subset of the NRAC) met with over 80 subject matter experts and visited a number of organizations that focus on the study and application of autonomous systems.

The topic has been recently studied by the Defense Science and Naval Studies Boards as well as the CNO's Strategic Studies Group. This study corroborates their conclusions but with specific emphasis in two key areas. It was clear to the Panel that there are two essential keys to implementation of autonomy as a transformational capability: *build a community* and *build trust*. These themes led to the major recommendations of the report.

Autonomy is viewed here as a capability enabled by a set of technologies. When implemented, autonomy represents a transformational – and potentially disruptive – capability for the Naval Service. Unfortunately, the communities engaged in autonomous system research and development and acquisition are very diverse and distributed.

The level of autonomous system implementation will only be raised by intentional focus on autonomy as an overarching capability. An autonomy community, led by a senior advocate – as in previous “disruptive” Naval technology transformations – is essential to bring about this focus. This *Naval Autonomy Community* will facilitate strong cross-domain interaction – bringing technologists and Fleet operators together to identify Naval needs and work common technical challenges. The community will be able to identify synergies within and across domains and work to eliminate barriers to delivering autonomous systems to the Fleet.

The Panel found ample evidence that the autonomy domain is still significantly driven by technology “push”. In order to create requirements “pull” and to ensure user

adoption of autonomous systems, it is critical to build user trust. Trust-building begins in the design and development phases by requiring Fleet involvement throughout the development process – not just during the final stages of experimentation. If autonomous systems are to be accepted and used effectively, lifecycle support elements (e.g., manning, training and logistics) must be addressed in the design phase. Also, legal, ethical, safety and security issues must be considered very early in the process. Failing to address these issues can result in significant setbacks in fielding and acceptance of autonomy technologies.

There are four specific recommendations from the study:

1. Establish a Naval Autonomy Community – led by a senior champion – composed of technical, acquisition, requirements, and operational experts to focus on autonomy for Naval needs (Action: SECNAV/CNO),
2. Periodically commission an outside market survey to access, analyze and assess global autonomy markets that may be relevant to its efforts (Action: CNR),
3. Ensure that resource allocation reflects the urgency of introducing this capability to address Naval needs in key enabling technology areas. (Action: CNO N8 lead, CNO N2/N6 and CNO N9 support),
4. Develop protocols and enhance facilities as necessary to support autonomous systems testing and “trust building” (Action: CNO N84).