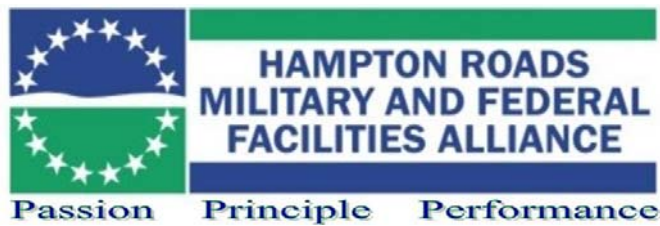


ROBOT VENTURE

An initiative to establish Hampton Roads as a.....



2007 REPORT



...a Nexus...for Unmanned Systems Integration

This report summarizes activities and results of the Robot Venture initiative in 2007. Since Hampton Roads Military and Federal Facilities Alliance (HRMFFA) Board approval to evolve the Robot Venture concept in February 2007, the effort has focused on identifying and creating an environment in which to connect federal, regional, local, and private unmanned systems interests across Hampton Roads. Filling the role as an enabler and catalyst for creating synergy, Robot Venture has struck a cord that is bringing together federal and other organizational efforts focused on or relating to unmanned, robotic, and/or autonomous systems integration.

The Robot Venture effort has followed the group development theory postulated by American psychologist Bruce Tuckman in 1965 – that described a process of forming, storming, norming, and performing.¹ 2007 activity was dominated by ‘forming’ and ‘storming’ stages. The effort is well positioned to transition to a ‘norming’ phase in 2008, ultimately leading to readiness to begin ‘performing’ depending upon the pace of development in the norming. Robot Venture is ready to establish a more formal character in 2008 and create an organizational structure capable of pursuing the Robot Venture mission and achieving the vision.



Frank Roberts
Executive Director

**Bringing Together Military and Federal Unmanned Systems
Interests with Hampton Roads Resources**

Introduction

In the next few years the federal government will invest billions of dollars in air, ground, and maritime unmanned systems technology. As Figure 1 shows, the Department of Defense (DoD) alone is spending over \$24B between 2007 and 2013; the Department of Homeland Security (DHS) is also making key investments in unmanned systems.



Unmanned Systems Funding (RDT&E, Procurement, O&M (\$M))

UAS	FY07	FY08	FY09	FY10	FY11	FY12	FY13	Total
RDT&E	\$760.8	\$814.8	\$1,246.7	\$1,334.9	\$1,181.8	\$859.1	\$839.5	\$7,038
Procurement	\$878.4	\$1,370.3	\$2,025.1	\$2,010.5	\$1,725.7	\$1,750.8	\$1,585.7	\$11,346
O&M	\$590.0	\$382.9	\$415.4	\$479.5	\$514.5	\$558.2	\$610.0	\$3,551
								\$21,935
UGS								
RDT&E	\$198.2	\$215.4	\$199.8	\$167.5	\$129.3	\$58.5	\$20.0	\$989
Procurement	\$106.5	\$39.3	\$29.7	\$18.3	\$17.9	\$156.3	\$481.5	\$849
O&M	\$156.0	\$5.7	\$8.8	\$10.3	\$11.0	\$12.1	\$12.7	\$217
								\$2,055
UMS								
RDT&E	\$41.5	\$27.7	\$44.2	\$50.9	\$59.6	\$68.0	\$97.5	\$389
Procurement	\$0.0	\$0.0	\$27.6	\$28.1	\$72.7	\$52.8	\$51.4	\$233
O&M	\$0.0	\$0.0	\$0.0	\$0.0	\$0.4	\$2.1	\$3.2	\$6
								\$628
TOTALS								
RDT&E	\$1,000.6	\$1,057.9	\$1,490.7	\$1,553.3	\$1,370.7	\$985.7	\$957.0	\$8,416
Procurement	\$984.9	\$1,409.5	\$2,082.4	\$2,056.9	\$1,816.4	\$1,959.9	\$2,118.6	\$12,429
O&M	\$746.1	\$388.6	\$424.2	\$489.8	\$525.9	\$572.4	\$625.9	\$3,773
Grand Total	\$2,731.5	\$2,856.0	\$3,997.3	\$4,099.9	\$3,712.9	\$3,518.0	\$3,701.5	\$24,617.1

Figure 1. Unmanned Systems Funding

Federal investment in unmanned systems capabilities will only grow throughout the decade for research and development, test, experimentation, fielding, and operations of such systems. While military applications and sponsored research of unmanned capabilities are maturing rapidly; development is predominately stove piped and there is value in enabling intra-federal research sharing and focused synchronization. Other markets and applications across air, ground, and maritime domains have yet to be fully explored.

In February 2007, the Hampton Roads Military and Federal Facilities Alliance (HRMFFA) Board of Directors approved the Robot Venture initiative as a long-term, strategic effort within the core mission of protecting, preserving, and growing military and federal capabilities in Hampton Roads. The objective of Robot Venture is to act as an enabler in developing a synergistic federation of military, federal, civil, academic, research, and private interests in

unmanned systems interests across Hampton Roads and to tie such efforts to other regionally focused initiatives such as the modeling and simulation strategic effort being spearheaded by the Hampton Roads Partnership (HRP).

Many Hampton Roads federal organizations are already involved in unmanned systems. U.S. Joint Forces Command (USJFCOM), for instance, has recently assumed oversight for the DoD Joint Unmanned Aircraft Systems (JUAS) Center of Excellence (COE) and is a key member of the newly created UAS Integrated Product Team (IPT) that is developing the future management structure for DoD UAS acquisition and operations; the Army Applied Aviation Technology Directorate (AATD) at Ft Eustis has long been involved in developing, testing, and fielding leading edge unmanned air systems technology in support of Army requirements; the National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) is developing both ground and air robotic/autonomous technologies; the Naval Surface Warfare Center – Dahlgren Division (NSWC-DD) Combat Direction Systems Activity (CDSA) at Dam Neck will be a key participant in a Navy experiment integrating air and maritime surface unmanned capabilities in 2008. USJFCOM, AATD, and LaRC all enjoy status as federal laboratories which provide formalized pathways for transfer of key technologies to the commercial sector.

At the state level, The College of William and Mary's Virginia Institute of Marine Science (VIMS) Autonomous Systems Laboratory owns and operates the longest continuously operating autonomous underwater system – Fetch – in support of National Oceanic and Atmospheric Agency (NOAA) research. In addition, Hampton Roads is home to the National Institute of Aerospace (NIA) which has as one of its core technology pillars – Autonomous Collaborative Vehicles.

Hampton Roads is optimally and almost singularly and uniquely suited to further evolve into a globally recognized center of unmanned systems integration. In addition to the unique concentration of military organizations, federal research activities, and university base, Hampton Roads is located in a geographically unique confluence of air, land, coastal, and maritime environments in a centric mid-Atlantic coastal location. The Robot Venture initiative aligns well with DoD goals of establishing partnerships with non-DoD activities to achieve mutually desirable goals. By taking actions to positively impact the state of unmanned systems integration efforts within Hampton Roads, Robot Venture will strengthen the ties of federal organizations to these efforts within the region.

Robot Venture Mission

Provide the enabling impetus that networks the broad-based group of unmanned systems researchers and users of those systems already in the region, and attract others from without, to form a dynamic community that significantly and positively impacts the state of unmanned systems integration.

Robot Venture Vision

Hampton Roads becomes a nexus for innovating unmanned air, land, and maritime systems; where government, armed forces, business, and academia can research, develop, experiment, and

operationalize unmanned systems technologies for military, homeland security, civil, and private sector applications.

2007 – Identifying the Community of Interest

Efforts in 2007 concentrated on identifying the community of interest and potential stakeholders. Interest and response from the region was overwhelmingly positive and confirmed that key organizations and individuals saw value in coming together to enable synergy and innovation. With national headquarters approval, in April the 100+ member Hampton Roads chapter of the Association of Unmanned Vehicle Systems International (AUVSI) agreed to a formal partnership with HRMFFA in support of Robot Venture. In May, Dr. Runte at Old Dominion University embraced ODU also becoming a partner. In July, Dr. Lindberg at the National Institute of Aerospace (NIA) authorized NIA to also become a Robot Venture partner. This Robot Venture partner group, along with support from the HRP and the Hampton Roads Research Partnership (HRRP) has guided the forming and storming stages of Robot Venture community of interest (COI) development. The COI has continued to grow with over 90 individuals representing over 20 different military, federal, civil, academic, and private business entities now part of the regular dialogue. Five COI meetings have been held in May, June, July, August, and November;

In early August, a Robot Venture overview was presented as part of a panel discussion at the annual USJFCOM-Greater Hampton Roads Chapter of the National Defense Industrial Association (NDIA) sponsored Industry Symposium attended by over 700 people from the area and around the country. A week later, over 100 individuals visited the Hampton Roads Economic Development Alliance (HREDA) exhibit booth at the annual AUVSI Unmanned Systems North America symposium in Washington, DC, in which the Robot Venture initiative was featured; numerous valuable contacts were realized extending the Robot Venture outreach outside Hampton Roads. In September, a Robot Venture representative was invited to observe a DHS sponsored emergency response exercise held at Fort Pickett in Virginia.

In October, insight about the federal laboratory technology transfer process was obtained through participation in the Federal Laboratory Consortium Mid-Atlantic Region (FLC MAR) annual meeting. Of note, Robot Venture was recognized by FLC MAR leadership as the second best of six nominated partnerships in their “Hot Partnerships” competition.



Outreach to further broaden the partnership base and COI membership was accomplished with the Deputy to the Commander, Combined Arms Support Command (CASCOM) at Fort Lee; Commanding Officer, CDSA; the Virginia Fire Chiefs Association; NSWC-DD; the Hampton

Roads Chiefs of Police; USJFCOM Joint Capabilities Director; AATD Systems Integration Division Head; and at the annual Hampton Roads Technology Council (HRTC) sponsored Sensors World Conference in Williamsburg.

Figure 2 summarizes Robot Venture efforts in 2007.

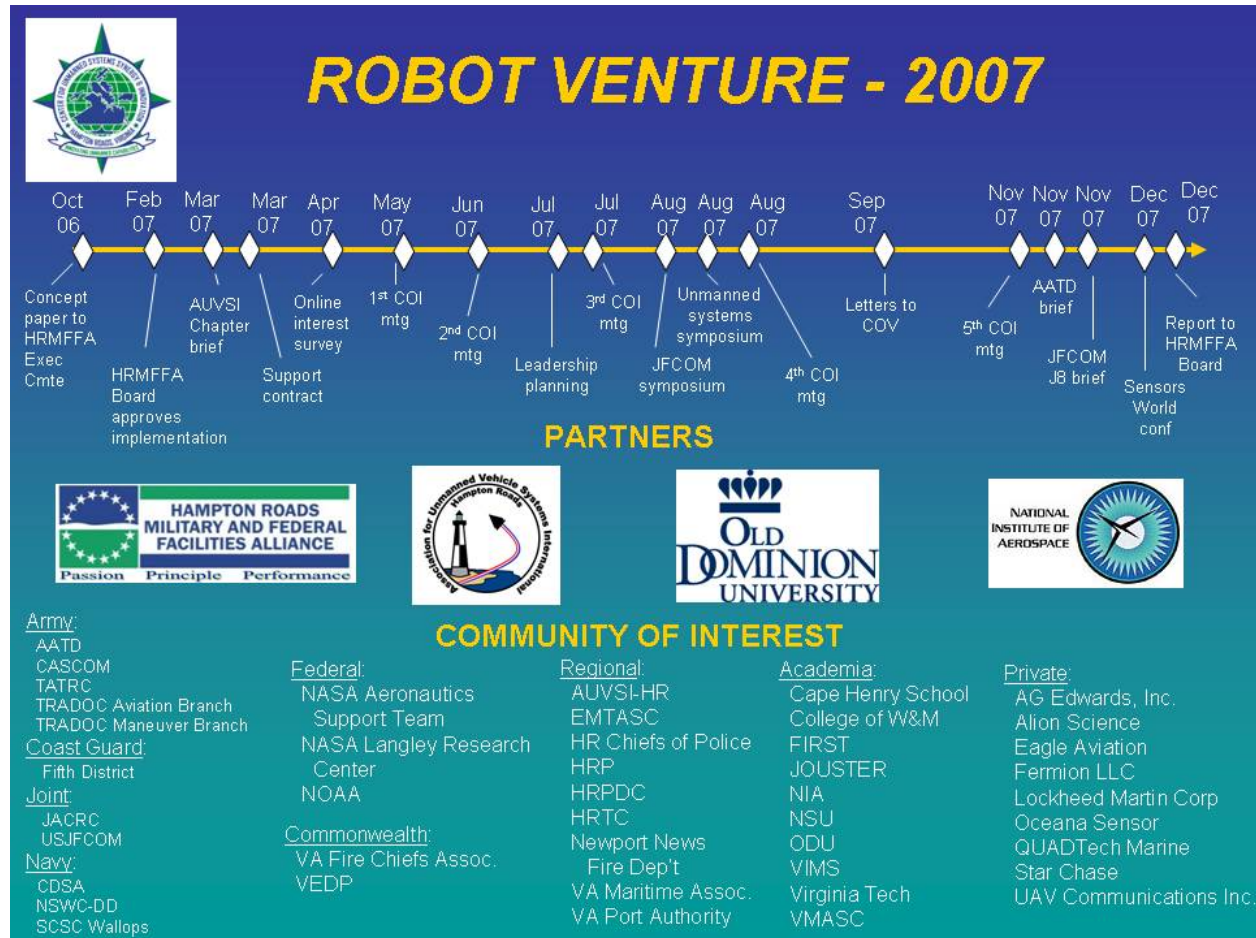


Figure 2. Robot Venture - 2007

Management

\$43,000 of the 2007 Virginia National Defense Industrial Authority (VNDIA) Military Strategic Response Fund (MSRF) \$250,000 grant awarded to HRMFFA was used to launch the Robot Venture initiative and provide necessary management support. In March 2007 a fixed price contract, structured with two option periods, was awarded to Klett Consulting Group, Inc. – a Virginia Beach based disabled veteran owned small business - to accomplish specific tasks in evolving the Robot Venture concept (first option period) and developing and executing a plan (second option period). Contract scope included tasks to:

- Identify and coordinate with potential Hampton Roads stakeholders in the public (federal, state, regional, and local) and private sectors.

- Schedule and coordinate stakeholder meetings to evolve the Robot Venture vision and develop materials for the August AUVSI symposium.
- Coordinate AUVSI exhibit hall display with HREDA and other potential participants.
- Initiate follow-up actions resulting from the AUVSI symposium.
- Identify and coordinate the Robot Venture concept with potential partners outside the Hampton Roads region.
- Coordinate and develop a long range implementation plan for use by HRMFFA to move from concept to action.

Summary of Robot Venture expenditures in 2007:

Contract support	\$40,000.00
Travel (Executive Director & support team)	\$ 3,646.94
Administrative expenses (printing, etc.)	\$ 477.75
TOTAL	\$44,124.69

2008 – Transitioning to a Community of Practice

While 2007 was the year to identify and nurture the COI, 2008 provides the opportunity to harvest the value realized thus far and transition the COI into a community of practice (COP) – marked by the start of coordinating and collaborating activities. Building on the strategy of first socializing the initiative (forming and storming), and then further formalizing it (norming), specific objectives for 2008 include initiating activities (performing) that further develop relationships, responsibilities, and roles with key stakeholders in the region.

To accomplish this, additional VNDIA MSRF grant funds were awarded to provide full time support to the Robot Venture initiative in 2008. Key efforts will include maturing the relationships with key military organizations including USJFCOM and AATD and coordinating the technology transfer relationships that could leverage their status as federal laboratories. Formalizing a Robot Venture Board to steer the effort and realize the broadest value across Hampton Roads will also be undertaken. The Board will be asked to develop an integrated strategy to positively impact the following unmanned systems domains:

Military

- Bringing together a COP within Hampton Roads that significantly contributes to furthering advancing practical application of unmanned systems within DoD. The many, mostly disparate, unmanned systems initiatives in the area will benefit from sharing ideas and aligning efforts wherever it makes sense.
- Providing unmanned systems expertise to USJFCOM to assist in their oversight role of the JUAS COE.
- Developing a network that promotes closer collaboration between users and researchers. Although there is a tremendous amount of DoD sponsored unmanned systems work being done in the area, they are often disparate efforts that would benefit from a sustaining forum that promotes cross-awareness.

- Enabling an engagement strategy that recognizes Robot Venture as an official liaison resource starting with USJFCOM and AATD.

Emergency First Response

- Acting as a catalyst to further develop the region’s role in support of DHS first responder activities by focusing on improving unmanned systems integration as critically effective tools available to first responders.
- Actively engaging with the DoD FirstLink program to enable the transfer of DoD sponsored technology to the First Responder community.

Research

- Acting as a catalyst to further integrate locally based federal and university research initiatives into a more coherent effort to more efficiently meet the need of stakeholders – enable the synergy possible within the massive efforts conducted by and on behalf of locally based organizations.

Education

- Acting as a catalyst to support and further develop an integrated technology education plan which starts at the middle and high school level and feeds into local university technology curriculums to further develop, and then sustain, Hampton Roads as a nexus for unmanned systems integration.



The Robot Venture Partnership framework is contained in Attachment 1. The ultimate objective is to reinforce the value that Hampton Roads based military and federal activities find in being based in this region. A secondary but very valuable objective is enabling the synergy within the emergency first responder, education, and research interests that develops Hampton Roads into a center for unmanned systems integration.

Summary

The Robot Venture strategy is centered on creating the conditions that foster coordination and collaboration. Integrating efforts creates the synergy and value that has and will sustain the initiative. This will create the return on investment in which stakeholders receive more value than the resources they expend – the dividend of the synergy. There has already been significant interest by military and other federal organizations. Our forthcoming efforts will seek to increase this interest and convert it into sustaining efforts and collaborations to the benefit of the military and federal activities so important to the Hampton Roads region, the region in general, and unmanned systems at large.

Hampton Roads is perfectly situated to become a nexus for unmanned systems integration. By bringing together key national stakeholders who are locally based, it allows for regular and sustained advances in unmanned systems technology integration – by regularly integrating the needs of policy makers, program developers, leading researchers, and users of the technology. There are few other regions that can bring together such a group of stakeholders on a regular and persistent manner. 2008 will be the year to complete storming and begin norming in order to position for performing.

Attachment 1

Robot Venture Partnership Framework

Expectations for all Partners

1. Support Robot Venture vision, core values and strategy
2. Provide an individual to participate in Robot Venture leadership and strategy planning
3. Assume responsibility for providing leadership and support for planned events
4. Seek to infuse technology and collaboration for Robot Venture
5. Work with partners to define and achieve common goals
6. Protect intellectual property and patent rights of Robot Venture participants
7. Leverage internal partner resources for Robot Venture common goals
8. Provide human or operational & technical resources to benefit Robot Venture Initiative (i.e. data, M&S tools, facilities, experiment opportunities, evaluations)
9. Protect proprietary information brought to the Robot Venture initiative by industry and academic partners
10. Facilitate government, professional, academic and industry involvement
11. Facilitate relationships (legal, contractual or other) between external parties and participants

Federal, State or Local Government Partners

1. Support partner leverage of the intellectual property and research and development investments
2. Facilitate efforts for Robot Venture partners to participate in government training
3. Allow all parties to maintain confidentiality of research results free from disclosure through Freedom of Information Act

Academic and Institutional Partners

1. Collect access and preserve Robot Venture product history
2. Provide students the opportunity to engage in Robot Venture initiatives for experience and credit
3. Provide access to capabilities of the other universities
4. Hold the right to patent inventions resulting from the Robot Venture efforts, but give partners fee-free license to inventions that are developed under the Robot Venture initiative
5. Promote and hold symposiums and workshops

Industry Partners

1. Speed commercialization of Robot Venture developed technology.
2. Hold the right to patent inventions resulting from the Robot Venture efforts, but give partners fee-free license to inventions that are developed under the Robot Venture initiative
3. Allow partners to leverage the intellectual property and the R&D investments of partners
4. Work to leverage partner products with the partner party's concurrence

Professional Organization Partners

1. Protect proprietary information brought to the Robot Venture initiative by industry partners
2. Promote and host symposia and workshops
3. Host Robot Venture partner speakers at monthly meetings

ENDNOTES

¹Group Development Theory, Bruce Tuckman, 1965

Forming. In the first stages of team building, the forming of the team takes place. The team meets and learns about the opportunity and challenges, and then agrees on goals and begins to tackle the tasks. Team members tend to behave quite independently. They may be motivated but are usually relatively uninformed of the issues and objectives of the team. Team members are usually on their best behavior but very focused on themselves. Mature team members begin to model appropriate behavior even at this early phase. Sharing the knowledge of the concept of "Teams - Forming, Storming, Norming, Performing" is extremely helpful to the team. Supervisors of the team tend to need to be directive during this phase.

Storming. Every group will then enter the storming stage in which different ideas compete for consideration. The team addresses issues such as what problems they are really supposed to solve, how they will function independently and together and what leadership model they will accept. Team members open up to each other and confront each other's ideas and perspectives. In some cases *storming* can be resolved quickly. In others, the team never leaves this stage. The maturity of some team members usually determines whether the team will ever move out of this stage. Immature team members will begin acting out to demonstrate how much they know and convince others that their ideas are correct. Some team members will focus on minutiae to evade real issues. The *storming* stage is necessary to the growth of the team. It can be contentious, unpleasant and even painful to members of the team who are averse to conflict. Tolerance of each team member and their differences needs to be emphasized. Without tolerance and patience the team will fail. This phase can become destructive to the team and will lower motivation if allowed to get out of control. Supervisors of the team during this phase may be more accessible but tend to still need to be directive in their guidance of decision-making and professional behavior.

Norming. At some point, the team may enter the norming stage. Team members adjust their behavior to each other as they develop work habits that make teamwork seem more natural and fluid. Team members often work through this stage by agreeing on rules, values, professional behavior, shared methods, working tools and even taboos. During this phase, team members begin to trust each other. Motivation increases as the team gets more acquainted with the project. Teams in this phase may lose their creativity if the norming behaviors become too strong and begin to stifle healthy dissent and the team begins to exhibit groupthink. Supervisors of the team during this phase tend to be participative more than in the earlier stages. The team members can be expected to take more responsibility for making decisions and for their professional behavior.

Performing. Some teams will reach the performing stage. These high-performing teams are able to function as a unit as they find ways to get the job done smoothly and effectively without inappropriate conflict or the need for external supervision. Team members have become interdependent. By this time they are motivated and knowledgeable. The team members are now competent, autonomous and able to handle the decision-making process without supervision. Dissent is expected and allowed as long as it is channeled through means acceptable to the team.

Supervisors of the team during this phase are almost always participative. The team will make most of the necessary decisions. Even the most high-performing teams will revert to earlier stages in certain circumstances. Many long-standing teams will go through these cycles many times as they react to changing circumstances. For example, a change in leadership may cause the team to revert to *storming* as the new people challenge the existing norms and dynamics of the team.