A New Paradigm for US Academia and the National Security Space Community

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ABSTRACT
In the past three years, multiple efforts are underway to improve the United States National Security Space (NSS) posture. New moneys are being added at the Federal level to develop new protection and resiliency technologies, improve operational constructs, accelerate military and civilian expertise in space systems, and evaluate new policy changes, all with the ultimate goal of maintaining the US's dominant role as guarantor of freedom in space. However, even with the new resources being made available, it isn't enough to completely remake the NSS. Instead, the US Government is going to need to tap into the proven intellectual, developmental, and operational expertise maturing in the small satellite community, most notably within US Academia. Institutions with a commitment and proven success record as developers of space systems and space experts are already being included in prototype efforts. This talk will highlight multiple, parallel efforts the USG is investigating with respect to accelerating outreach to US "space universities" using innovative student-government training programs, establishing a cadre of cleared subject matter experts that reside within US Academia, and providing a streamlined way to introduce new technologies and capabilities into the NSS through the US intelligence community. This talk will also highlight and promote the next series of Space Intelligentsia workshops to be held at Wright-Patterson AFB in 2016.

BACKGROUND
A significant amount of public pronouncements across the capability spectrum have indicated that the United States Government (USG) Department of Defense (DoD) and Intelligence Community (IC) are interested in investigating greater cooperation with US academic institutions. This coincides with equally prominent and frequent public policy speeches and acquisition program announcements that the US DoD and IC are facing a future environment where previous US dominance in area access, cyber/net-centric activity, military industrial capacity and innovation, and space utilization for national security are being threatened. This is manifested by potential adversaries in the development of anti-access/area denial (A2/AD), cyberwar, industrial espionage, and space control capabilities.

Specifically in the space topic area, the USG through the National Security Space (NSS) community has been acting since 2014 to fulfill the President’s direction to formulate and execute a Strategic Space Initiative (SSI). The SSI represents a wholesale evaluation of the nation’s space architecture. Key parts of this backed by somewhere between $5B - $20B of new funding being added to NSS budgets from FY2015 - FY2020 include:

- Assessing the NSS architecture’s vulnerabilities and capabilities
- Recommending and executing protection, resiliency, and space control investments
- Rebalancing the existing workforce and strategically planning for manning the NSS enterprise in the future with a highly qualified, space savvy workforce

Of interest to this conference, the NSS has already indicated clearly through Science Advisory Board studies\(^1\), SBIR / STTR submissions (SBIR Solicitation 16.2\(^2\)), and public statements by senior leaders\(^3\) that small satellite bus and technology development are going to be key enablers for the NSS going forward. The fact that most of the innovation within the US in small satellites are derived from US Academia pursuits (even the NewSpace companies are leaning heavily on manpower and intellectual capital derived from the academia progress in small satellites) means that leading “space universities” in the US are poised to reap great benefits from the DoD and IC community if they have the structure, vision, and resources to support the outreach opportunities.

US Academia can be a significant force for good in assisting the NSS with their needs. The following discussion will discuss the mechanisms being put place today to allow greater collaboration between the NSS and US Academia communities.
A BRIEF HISTORICAL OVERVIEW

Indeed, US Academia has been a trusted partner of the NSS for decades. Numerous examples can be called out in historical details by other pieces, but in contemporary work, US Academia involvement in the NSS has been focused on a few opportunities:

- **Support by the University Affiliated Research Center’s (UARC) with specific space equities**—Johns Hopkins University APL, Utah State SDL, University of Texas- Austin ARL, and Georgia Tech Research Institute (GTRI) being most prominent. Notable though is that none of the “traditional” NSS entities (AF Space Command & affiliated wings / centers, National Reconnaissance Office, DoD IC production centers focused on space, Joint Functional Combatant Command for Space) have a UARC defined. NASA Ames has a UARC relationship with the University of California Santa Cruz, but research there typically has not directly supported NSS priorities.

- **Bilateral research relationships between NSS entities and military affiliated universities**; the United States Air Force Academy (USAF), United States Naval Academy (USNA), Air Force Institute of Technology (AFIT), and Naval Postgraduate School (NPS) have received direct funding to research topics of interest to the NSS as well as perform a training function for the space cadre in the uniformed force.

- **Select bilateral engagements between NSS entities and civilian universities**; AFRL outreach programs, the University Nanosatellite Program, AFOSR research grants, and one off tech demo missions / special topic studies / fundamental research funded by NSS offices all fall under these guidelines.

Starting in 2012, a realization within the IC members of the NSS occurred. The thought went that with the rapid pace of innovation and asset development going on within the US Academia community, specifically with small satellites, there was unused utility for the NSS enveloped by these programs. Additionally, the pressure to increase the percentage of successful new hires due to sequestration and a fast growing threat environment caused the NSS IC to re-evaluate how they were recruiting the next generation of space cadre within the NSS.

Personnel at the USAF’s National Air & Space Intelligence Center (NASIC), the NSS IC production center with the largest manpower and requirement loading for space work within the DoD IC, began a dialog with select universities to address three major issues. First, how could NASIC and the rest of the NSS IC better access the talent base coming out of “space universities”-- potential new hires with formal space engineering education and real world experience in space operations resulting from small satellite projects--for recruitment. Second, how could NASIC establish a more sustainable dialog with space universities that did not have the UARC access for the purposes of leveraging the subject matter expertise of faculty and staff at the university, supporting studies and intelligence analytic activities. Third, how could US Academia advancement in small satellite platforms and missions be utilized by the NSS IC without introducing a huge burden on the academia community for classification and operational security concerns.

A TURNING POINT- SPACE INTELLIGENTSIA 2014

Because of NASIC’s unique position of straddling the apex point between the NSS intelligence, operations, policy development, acquisitions, and research communities, NASIC personnel were able to take some of the lessons learned from the academia exchanges and socialize those with other NSS entities. Enough interest was generated so that a decision was made to hold a formal workshop in 2014.

The structure of the workshop, dubbed “Space Intelligentsia 2014”, was for members of the NSS community to present to an audience of US Academia members three major items from their organizations: who they were and what their place is in the NSS (familiarization), what problems they had unique to their organization that US Academia could help with (from research to recruiting), and what mechanisms they had available today (and what they would like in the future) to work with US Academia. Over the course of three days, nearly 30 NSS entities presented to over 20 US Academia institutions represented. A key success story to this workshop was the ability to hold it at a classified level to enable complete transparency and context to the NSS problem sets. A complete proceedings and lessons learned report were completed and stored on a classified network accessible to NSS community members.

Coming out of the workshop, a few key findings were developed for NSS members and US Academia participants to work:

- US Academia participants are in many cases limited in the ability to network with NSS entities because of the difficulties in maintaining security clearances at the appropriate levels. While communications access would be ideal, many
academics just need the ability to attend conferences / workshops / industry days without worrying about the event occurring in the gap of having no security clearance between classified contracts.

- NSS actors do not have effective contract vehicles and programs to enable “reach back” into US Academia for subject matter expertise easily and frequently.

- NSS actors need to establish “recruiting pipelines” to these space universities so as to gain access to a highly trained new hire workforce (in many cases with initial security clearances), that will save the USG tremendous amounts of money in training, investigations, and “ramp up” time.

ADDRESSING THE ISSUES

Momentum was generated out of the 2014 workshop resulting in a number of initiatives being revitalized, created, or revected to solve some of the problems identified in the key findings. Additionally, in parallel (and in some cases without knowledge of the Space Intelligentsia effort), other NSS entities have begun their own programs to increase collaboration with US Academia.

To address the security clearance issue, NASIC is working with DIA and AF Space Command to investigate innovative, low cost contract vehicles that would allow universities that meet a minimal set of criteria to establish a limited number of long term security clearances for a small cadre of key faculty and staff involved in NSS areas of interest. This would allow the academia members to attend important workshops / conferences / industry days for the purpose of networking with other members of the NSS (both government and commercial) and to understand the full context of the problems being presented. This benefits the government in that the responses to problem calls from academia and partners working with academia can be more direct at addressing the problems in hand—a more efficient use of limited research resources. Progress is being made so that a finalized program can be announced sometime in FY2017.

A classified co-op program for students initially run by the NRO is also being revitalized with congressional support that would allow universities with the proper staff and infrastructure in place to place select students into co-op positions with a NSS partner. Past performance within this program has shown that a student can be selected, cleared by security, participate in an off campus co-op, and return to campus to continue their work in an 18-24 month period. A government executor of the program is still being decided upon, with the program hopefully kicking off in FY2017.

Other potential ideas being executed or discussed to increase the collaboration between NSS and academia include:

- Establishment of the “Boulder Lab” in Colorado by Space and Missiles Systems Center (SMC) so that academia as well as other researchers can have access to real overhead infrared and weather sensors on DoD satellites. The intention here is to advance the state of IR and weather sensor data utility for NSS and non-NSS customers. The facility will be able to host researchers at a variety of security levels, including unclassified, and annual calls will be issued for proposal ideas that can be funded from NSS and other entities.

- NASIC is funding a team led by Integrity Applications Incorporated personnel to conduct extended utility studies of existing and already funded small satellite missions, space situational awareness capabilities, and ground operations efforts by US Academia (and commercial entities). The idea is to look for “underutilized” capabilities, where for a low investment by the government, the NSS receives a large return in additional capability—without impacting the existing program or their primary customer. A few pilot studies have already been conducted proving the viability of this approach.

- Enhanced targeted recruiting efforts by NSS actors to go out and get next generation engineers, intelligence analysts, acquisition professionals, and policy wonks who come pre-baked with space knowledge into the NSS community. NASIC is leading the way for the DoD IC in establishing “recruiting pipelines” to select pre-evaluated universities across the nation.

- Continuation of the Space Intelligentsia workshop to foster collaboration and information exchange between NSS and cleared US Academia entities. The next workshop is tentatively scheduled for Winter 2016-17 at Wright-Patterson AFB, co-hosted by NASIC and AFIT. Security levels will likely be at the Top Secret SCI level, and the theme of this workshop will be US Academia presenting to NSS members their capabilities.

- Expansion of academia – NSS personnel exchange programs, such those out of AFRL and DIA. This would allow for qualified personnel on both sides
to participate in limited time sabbaticals to either an NSS office or a university with the proper security infrastructure to gain both experience and expand the diversity of their expertise in NSS topic areas.

- Utilization of the existing academic programs in place that are explicitly conducting space systems, space operations, space situational awareness, and space policy education—either degree granting or not—to enhance NSS training and retention programs for their employees. Not insignificant resources are being spent within NSS agencies and office to develop “in-house” training programs which parallel available formal education programs at local or online universities.

Much of the funding and motivation for this is tied to the budget increases associated with the Space Security Initiative. This means that there is an open, but limited in time scope, window for additional efforts to be proposed and enacted.

A COMMITMENT BY ACADEMIA

Pragmatically, the academia members who will most benefit from these programs will be those who have the institutional will and infrastructure in place to support working or at least communicating in a classified environment. This means that the school will probably have to have a cadre of continuously cleared faculty and staff to cover over gaps of individual contracts. Access to a classified facility nearby campus, either university owned, or used in partnership with a government office or cleared defense contractor, will be a discriminating benefit. Having a strategic vision for what the university wants to accomplish with these NSS partnerships, as well as having the formal university policies in place to facilitate and not restrict participation, will be key also.

The success of these programs is inherent though on the continued interest and investment by US Academia in their own space capabilities. None of these programs being proposed by the USG will likely have enough resources made available to completely justify or cover the costs of standing up a program at a university from scratch. There must be an investment of time and resources by the university to in good faith provide cost sharing opportunities where possible.

Additionally, there also has to be a recognition and cultural shift by university leadership that many of the activities the faculty and staff will be participating as part of these NSS outreach efforts will not be measurable by traditional academic success metrics. A standard tenure committee or board will not have access to the successes by the faculty participating in these NSS efforts because of classification and releasability concerns. Publication in open journals may be limited. Ability to accept foreign graduate students by the particular faculty or staff member may be reduced. The participating academic may be subject to workplace harassment or intrauniversity ostracizing due to the association with “classified national security research”. These are all trade-offs in being able to work with the NSS, much of which is still engaged in a continuous fight to protect extremely sensitive capabilities and associations from potential adversaries.

CONCLUSION

The opportunity now through 2020 is greater than it ever has been for US Academia to engage and assist in solving some of the nation’s most pressing NSS related problems. New USG programs and activities, backed by sufficient resources, are coming available across the NSS spectrum for universities at a variety of entry points, institutional experience, and professional vs student involvement levels. The small satellite development community within US Academia is particularly poised to assist due to the inherent culture of innovation and rapid problem solving that is being sought by NSS participants. However, some cost will have to be shouldered by institutional academia as the security environment explicitly linked to NSS activities must be accounted for.

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REFERENCES
