Opportunity Title: Advanced Propulsion for Small Satellites
Opportunity Reference Code: IC-17-15

Organization Office of the Director of National Intelligence (ODNI)

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Application Deadline 3/31/2017 11:59:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement**:

Affordable Access to space severely limits the strategic missions and opportunities for on-orbit technology innovation of space flight systems. However, with the emergence of “new space,” many low-cost, small-satellite designs, some with novel on-orbit propulsion systems, are enabling a diversity of new mission objectives. Therefore, even more advanced propulsion could further increase the utility and diversity of such missions. Options available in the near term for 20-200W small satellite propulsion include Iodine Hall, microfluidic electrospray propulsion (MEP), and solar sails and are applicable to 3U, 6U, 12U, and greater spacecraft after achieving escape orbits; however, payload capabilities are limited. Options available for 200-600W Evolved Expendable Launch Vehicle Secondary Adaptor Payload (ESPA) class satellite propulsion include Iodine Hall and can provide as much as 10km/s ΔV thus enabling transfer orbits to Asteroids, Comets, the Moon, and even Mars. Near term propulsion options for 600W ESPA Grande satellites (as much as 300kg mass) also include Iodine Hall, and Long Life Hall; while volume limitations require high density propellant, it’s possible to achieve near order of magnitude reduction in cost. Finally, for the 600W –1500W class of maneuvering satellites, advanced propulsion can achieve high ΔV using propellant volumes fitting within the ESPA ring and deliver propulsion to a diversity of payloads at many different orbits.

Example Approaches:

For this investigation, the proposed post-doctoral research could pursue radical improvements to one or more of these near term capabilities for small satellites, or in the alternative, aggressively investigate mid-term capabilities such as monopropellant liquids, small ion, long-life, low-power Hall, or some other viable mid or far term approach. Figures of merit include specific impulse density (at a system level), cost, and lifetime. Proposals could also consider additional figures of merit including environmental handling, ease of thermal control, and overall operational utility (e.g. ease of maneuverability), etc.

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Some examples of near term, state-of-the-art approaches include cold gas (e.g., GN2), pulsed plasma thrusters, green liquid-propulsion, water electrolyzed, hydrazine, micro electrospray propulsion, Iodine Hall propulsion, Long Life Hall, and mini-Ion. The solutions have been to varying degrees applied to small satellites ranging from cubesats to the ESPA class satellites described above.

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Business** (11)
  - **Chemistry and Materials Sciences** (12)
  - **Communications and Graphics Design** (6)
  - **Computer, Information, and Data Sciences** (16)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (10)
  - **Other Non-Science & Engineering** (13)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (28)