

Opportunity Title: Autonomous Control for Small Uninhabited Air Vehicles

Enabling Monitoring of Infrastructure

Opportunity Reference Code: ICPD-2021-11

Organization Office of the Director of National Intelligence (ODNI)

Reference Code ICPD-2021-11

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.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at:
<https://orise.ora.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@ora.gov. Please include the reference code for this opportunity in your email.

Application Deadline 2/26/2021 6:00:00 PM Eastern Time Zone

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

Having small unmanned aerial vehicles (UAVs) conduct inspection and monitoring of national infrastructure (i.e., bridges, railroads, power lines, pipelines, traffic flow, etc.) is becoming more common, but if the systems could do the job autonomously (flight control, obstacle avoidance, and navigation) it would enable even more frequent and affordable use. This topic would focus on autonomous behavior for small UAVs that enable them to operate safely with a minimum of human intervention.

Example Approaches:

As referenced in the topic paragraph, inspection and monitoring of national infrastructure is more frequently done by small UAVs, but today that requires human hands-on control or, at the very least, supervised limited autonomy. In addition, a human being monitors the imaging (or other collections) and the human often directly controls them.

- If the UAV could autonomously fly along electrical power lines scanning for hot spots in the line with an IR imagery, it would also be able to scan for other things that might interfere with the power transmission (e.g., a tree branch that is leaning over the lines). The data could be stored and Geo-registered, as well as any anomalies identified for human assessment later. The autonomous vehicle has to ensure that safety will verifiably be better than the remote-controlled vehicle and the human piloted aircraft.
- Another example is bridge inspection, looking for damage, corrosion, etc. needing repairs to ensure the structural safety.
- A different example is traffic monitoring to update guidance for automobiles on the fastest way to get to work, school, home, hospital, etc. The guidance could




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be to a human driver or even an autonomous system on the automobile.

Relevance to the Intelligence Community:

Enabling safe, efficient, and radio frequency (RF) silent flight to monitor activity provides information useful to multiple Intelligence Community mission partners. Because technology is enabling the UAVs to be more efficient, smaller, quieter, less observable, and easier to blend in with other small UAV systems (such as the Alphabet (Google) Wing UAV delivery system), having an autonomous UAV will enable collection without being easily observed.

Key Words: UAVs, Autonomous Flight Control, Autonomous Navigation, Remote Monitoring, National Infrastructure, RF

Qualifications**Postdoc Eligibility**

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
 - **Chemistry and Materials Sciences** (12 )
 - **Communications and Graphics Design** (2 )
 - **Computer, Information, and Data Sciences** (17 )
 - **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** (2 )
 - **Physics** (16 )
 - **Science & Engineering-related** (1 )
 - **Social and Behavioral Sciences** (27 )