Agility Prime Area of Interest One (AOI #1): Air Race to Certification

Introduction and Description (adapted from Innovative Capabilities Opening--ICO)

This AOI is governed by the Agility Prime ICO (or Opening) and will help the Government assess the transformative vertical flight market and Vertical Takeoff and Landing (VTOL) technologies. This effort seeks to establish a collaborative strategy with industry and investors that accelerates fielding of the most promising technologies for savings and utility to the Government, as well as potential commercial market success. As these systems mature toward certified commercial operations, the Government will identify opportunities for early adoption, with the potential for procurement and fielding in the next three years.

The core technologies of interest include emerging electric VTOL (eVTOL) and urban/advanced air mobility (UAM/AAM) aircraft, although alternatives will be considered. These aircraft may incorporate non-traditional electric or hybrid propulsion for manned or optionally manned missions, with onboard pilot, remote pilot, or autonomous control. Based on emerging commercial trends, these transformational commercial vehicles are typically characterized by employment of distributed propulsion for vertical flight and potential use of a wing for horizontal flight, along with augmented flight control systems, and high levels of automation or autonomy. Besides aircraft, this effort will consider similar support to enabling technologies.

During this Opening, the Government intends to test the hypothesis that, compared to other ground and air vehicles, these aircraft could revolutionize mobility given: 1) lower maintenance cost and time, through mechanical simplicity; 2) improved safety and declining personnel demands, using autonomy; 3) affordable quantity, based on potential mass production; 4) improved acoustics, employing distributed propulsion; and 5) greater flexibility and reduced infrastructure needs, with runway independence. To mitigate risk, this hypothesis will initially be tested outside of the urban environment in scenarios that could potentially open a broad public-use market for early Government adoption prior to civil certification in a way that accelerates UAM. Modularity similar to a satellite bus or universal serial bus (USB) could enable vast use cases. These vehicles, referred to as ORBs, are not drones, cars, helicopters, trucks, airplanes, motorcycles, or SUVs, but might support similar missions. Given their flexibility, an ORB could act as an *organic resupply bus* for disaster relief teams, an *operational readiness bus* for improved aircraft availability, and an *open requirements bus* for a growing diversity of missions. ORBs could enable distributed logistics, sustainment, and maneuver, with particular utility in medical evacuation, firefighting, civil and military disaster relief, installation and border security, search and rescue, and humanitarian operations.

This effort expands on what has thus far been a fruitful but ad hoc engagement with industry in this sector through the following path: 1) requesting details regarding planned commercial technologies and markets; 2) identifying technologies that are likely to result in successful prototypes; 3) creating opportunities for collaborative test planning with the potential of offering test assets and expertise; 4) leveraging this campaign for near-term government airworthiness authorization as well as procurement of hardware, software, data, or services. The intent is to accelerate certification, while also assessing the value of early adoption and fielding. Near-term government use-cases could occur prior to civil certification and might provide revenue and data to help accelerate even broader adoption and technology development.

AOI Details
The Government, in collaboration with industry, seeks to develop a strategy to assess the above hypothesis using the submitter's specified technology. The objective of this AOI is to produce a prototype test report. This AOI provides the steps to that objective, which begins with a Solution Briefing from the submitter. For the purposes of this AOI, a prototype test report is the final document resulting from an aircraft test campaign. A successful prototype test report is one that accurately assesses the vehicle and shows that the vehicle can achieve an airworthiness authorization and eventual certification, as well as demonstrate value through cost and utility data for potential early government adoption.

Following the delivery of this prototype the Government may choose to purchase hardware, software, data, or services. While this AOI is open until 17 December 2020, early submitters with mature technologies (see Specification and Maturity section) will have priority scheduling for potential government resources. While the Government continues to investigate a broader set of technologies for future industry engagement, the focus here is on vehicles with significant commercial market potential and planned performance and safety to meet the following:

Specifications:
Payload: 3-8 personnel
Range: Greater than 100 miles
Speed: Greater than 100 mph
Endurance: Greater than 60 minutes
First Full-Scale Flight: Prior to 17 December 2020

This call is not intended for companies seeking early or developmental funding. However, those companies, as well as other companies not meeting the above criteria, are encouraged to help shape the Government strategy in this sector by providing inputs to the "Request for Information (RFI) on Vertical Take-off and Landing (VTOL) Capabilities and Associated Technology" posted at beta.SAM.gov: (https://beta.sam.gov/opp/2d5302c37bb4459ca81216bd7cf51787/view).

Agility Prime will have a launch event hosted by the National Guard at Camp Mabry, Austin, Texas, on 14 March, 1300-1600. Potential industry and investor partners are welcome to attend. Further details will be forthcoming and posted at https://www.afwerx.af.mil/industry-guide.html.

Proposal Guidance
1. This AOI will remain open until noon EST on 17 December 2020, although Solutions Briefs will be evaluated as they are received. Submitters who are not selected will be notified in accordance with the ICO.

2. Refer to the Agility Prime Innovative Capabilities Opening (ICO), FA8625-20-R-2028, posted at https://beta.sam.gov for submission instructions, requirements, and guidelines for Solution Brief submittal in response to this AOI. Specific to this AOI, include the following:
      a. Slides or a document with items identified in the "AOI-1 Information" section below.
      b. MS Excel data file (use attached format).
      c. Amplifying information or caveats to the MS Excel data file (slides or document).

3. Solution Briefs shall be submitted to the Agility Prime ICO organizational mailbox: ATTN: Mary DelRaso; flyorbs@afwerx.af.mil.

4. Submission subject lines shall read "(Insert Company Name) Agility Prime ICO AOI #1 Submission." Submissions received after the specified due date and time, or submitted through any other channels besides the established Organizational Mail Box, will not be accepted.

Specification and Maturity Data
This section should be submitted on the attached MS Excel file. Please provide best numbers and notes, including whether the information is derived from actual testing or from predictions: payload, range, speed, endurance.

Additionally, please provide the following planned or actual timeline (year and month):
- First/10th/100th full scale flight:
- First vertical takeoff and landing:
- First transition flight (if applicable--cruise mode, not simply hover transition):
- Planned civil certification date:

Also, provide the following:
- Number of hours/flights flown (current and planned by 17 December 2020):
- Number of flying full scale aircraft (current and planned by 17 December 2020):
- On a scale of 1-10, self-assess employment of digital engineering:
  (0=slide rule and 10=full digital twins for all aircraft through design, manufacturing, test, operations, and maintenance--please describe in the submission)

AOI #1 Information
1. **Overview:** Provide aircraft description, modes of operation, dimensions, three-view drawing, system masses (maximum gross weight, empty weight, battery/fuel weight, useful load, payload, other details) payload-range under defined operating conditions/mission profile; avionics; flight control scheme; use of software containers and Kubernetes
2. **Market:** Describe plans to transition/commercialize and the types of variants anticipated; include information on engagements and ideas socialized with potential customers, potential to capture sales in foreign markets, and include any feedback (commitments, partnerships, anticipated agreements, etc.); what technology or approach differentiates this platform; key financials and investors
3. **Development and Production:** Provide number of full-scale aircraft built, variants and descriptions, number of aircraft planned to be completed over the next 24/36 months; timeline of the objectives and risk reduction plans for development and continued operations, including key future milestones in support of airworthiness and FAA certification; key flight milestones and production schedules; near, mid, and long-term technology insertions and capabilities; targeted maturity by the end of 2023
4. **Certification:** Describe flight release/approval processes--clearances and authorities to date and for proposed phases; describe current and planned engagement with the FAA for civil certification; describe current or planned engagement with NASA; describe current and planned civil/military certification criteria, sources (e.g. 14 CFR Part 23, MIL-HDBK-516c, etc.), artifacts (e.g. analyses, models, flight test, etc.), and waivers

5. **Test Program:** Provide timeline and locations of flight tests conducted/planned with images; brief description of flight approval process; approximate flight test cost; operational tempo; special test equipment requirements, comm., ground stations, etc.; type of in-kind support would be most beneficial (range time, test support, operational user input, airworthiness review, etc.); approach to human factors testing
6. **Government Testing:** Possibility and timing for the government to procure aircraft/services for experimentation; describe the type of arrangement that would be beneficial to accelerate time to market and approximate cost to the government and/or the potential for in-kind exchanges; willingness to engage with DoD airworthiness processes to obtain limited flight releases for potential early use case flights
7. **Ranges:** Indicate test range preferences along with alternatives and whether testing will be conducted at an existing location or at a new facility; FAA, NASA, Department of Defense site, type of airspace, etc.; is there a desire or willingness to use a third-party contractor range; discuss number of aircraft involved in flight testing and aircraft transport requirements
8. **Ground Test:** Describe use of simulations, including pilot-in-the-loop, hardware-in-the-loop, and software-in-the-loop; use of test data to improve simulations
9. **Acoustics:** Describe expected acoustic signature and planned testing approach
10. **Traffic Management:** Explain testing for integration into the air traffic system
11. **Limits:** Describe robustness and any limitations with respect to temperature, pressure, and vibration in a flight environment; define operational constraints and hangar requirements
12. **Data:** Describe data to be acquired (i.e., lay out data delivery milestones that align with the program execution plan) and data reduction methods to evaluate test results (seeking to assess operational requirements and procedures, in addition to maintenance, reliability, cost, performance, and technical data)
13. **Supply Chain:** Describe "off-the-shelf" design, sub-systems, components and use
14. **Other:** relevant information--if absent, note any challenges in releasing the above data