At a Glance

What is it?
Aircraft technology includes fixed-wing, rotary wing, and Vertical/Short Takeoff and Landing (V/STOL) vehicle technologies, ship/aircraft dynamic interface, air vehicle management and control, aerodynamics, aeromechanics, sub-systems, and modeling, simulation, and analysis tools.

How does it work?
Core investments include:
- Advanced, efficient Computational Fluid Dynamics (CFD) techniques for modeling aerodynamics problems of Naval importance such as ship superstructure airwake, coupled ship/aircraft aerodynamics and aircraft maneuvering in ship airwakes
- Wind tunnel and in-situ testing of ships in support of ship/aircraft dynamic interface studies
- Technology development, computational modeling, and wind tunnel test of advanced V/STOL concepts
- Analytical and experimental investigations of rotorcraft handling qualities including identification of favorable vehicle response types for operation in turbulent ship airwakes and control systems for carefree near-ship maneuvering

What will it accomplish?
- Air Vehicle Technology will contribute to Navy and Marine Corps aircraft with enhanced performance, maneuverability, and survivability, reduced operating and support cost, and suited to the particular needs and environments of Navy and Marine Corps missions.

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The Navy and Marine Corps rely on fixed-wing, rotary-wing, and V/STOL aircraft to perform and support a wide variety of missions such as close air support, air defense, logistics, expeditionary operations, anti-submarine and anti-mine warfare, and search and rescue. The unique requirement to operate from ships at night and in bad weather and high sea states leads to a number of S&T challenges. Shipboard landings require precise relative navigation and ability to maneuver in highly turbulent ship airwakes to landings on pitching and rolling decks in high sea states. Shipboard operations also require unique designs to accommodate limited space and safe operations and support in densely packed areas. The Marine Corps depends on fast, agile air vehicles to execute its Ship-to-Objective Maneuver and distributed operations. These challenges require focused core investments, as well as close coordination and integration with other services and agencies that have substantial investments in air vehicle technologies.

The Air Vehicle D&I program invests in basic and applied research in both fixed- and rotary wing vehicles. Emphasis is placed on Naval-relevant issues requiring focused Navy investment. An ongoing program in ship airwake prediction has yielded advanced methods and in-house Naval expertise and has greatly enhanced the fidelity of piloted simulations of shipboard landings. Continued D&I focus in this area targets high-fidelity fully-coupled ship/aircraft airwake models operating in real-time for implementation in piloted simulations and ship and aircraft design studies. Another research topic area considers rotorcraft aeromechanics, with projects currently in multicyclic blade control for vibration reduction, hub drag prediction, and flow control. During FY 13-14, focus will shift towards research task areas identified under the recently designated Sea-Based Aviation National Naval Responsibility (NNR).

Research Challenges and Opportunities:
- Computationally efficient analytical tools for ship/aircraft dynamic interface simulation
- Advanced control systems for carefree shipboard landings in challenging operating conditions
- Automated shipboard landings and deck operations
- Efficient, high-speed V/STOL concepts for sea-based operations
- Flow control for improved air vehicle aerodynamics
- Innovative experimental methods for ship airwake measurement