NAVY Transition Assistance Program

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N07-031 - Advanced Rotorcraft Technology, Inc.

Innovative Rotorcraft Flight Control Systems Options to Enhance Shipboard Operations

NEED & CUSTOMER REQUIREMENT

Need: Advanced control design and evaluation for disturbance rejection is needed to improve rotorcraft handling qualities in turbulent environments throughout both military and commercial aviation activities. Applications include shipboard operations, urban operations, firefighting, and other natural disaster (e.g. hurricanes) rescue and relief. There are hundreds of rotorcraft operating in such turbulent environments. Both commercial companies and the military are increasingly relying more on computer aided analysis and simulation to maintain cutting edge technology while reducing operating costs. Therefore, the market need for advanced control options to effectively reduce pilot workload and enhance flight safely is significant.

Value to the Warfighter: The advanced control for disturbance rejection will improve handling qualities and reduce risk for helicopters operating in turbulent environments. Combat situations where this is applicable are shipboard operations, urban operations and Nap of the Earth operations.

Operational Gap: Current helicopter flight control systems do not address disturbance rejection. Consequently pilots must manage disturbances due to gusts by relying on flying skills. This draws attention away from combat operations and requires a higher level of training and experience on the part of the pilot.

Customer Specifications: An extension of ADS-33 to handling qualities requirements for shipboard operations is currently being developed. Current control designs do not take these requirements into account and consequently cannot provide adequate handling qualities for shipboard operations.

Technology Description: There are 2 commercial products that can be developed from our research. One is the unified control design and evaluation tool for the disturbance rejection and the other is the designed control products, such as turbulence rejection and mission task autopilot modules.

SPONSORSHIP of original SBIR/STTR Topic

SYSCOM: NAVAIR

Transition Target: PMA-275: V-22

Original Sponsoring Program:
PEO (A)

TPOC Phone Number:
(301)342-1382

TECHNOLOGY DEVELOPMENT MILESTONES (SBIR/STTR)

Milestone	TRL	Risk	Measure of Success	TRL Date
Conceptual demonstration of a unified disturbance rejection design and evaluation tool for helicopters	3	Low	Demonstrate reduced disturbance	Oct., 2007
Plan of Phase II work effort	3	Low	Plan Completed	Sept., 2008
Design of Unified Control Design and Evaluation Tool for Disturbance Rejection	4	Low	Design Completed	Nov., 2009
Implementation and testing of Unified Control Design and Evaluation Tool for Disturbance Rejection	5	Low	Test Successful	Nov., 2010

Open contract: N68335-09-C-0046 ending Nov. 24, 2010

TECHNOLOGY TRANSITION OPPORTUNITIES (PHASE III)

Other Potential Applications:
V-22 shipboard operations; SH-60 shipboard operations,urban operations and NOE operations;CH-53K shipboard operations; UAV shipboard and urban operations; Emergency medical evacuation; Firefighting

Business Model:
ART will design and test the controller using a blade element model of the XV-15 tilt rotor as a prototype. ART will then upgrade our blade element V-22 model to the current configuration and validate it against experimental data. The disturbance controller will then be applied to the V-22 model to demonstrate improved handing qualities in a shipboard operations environment. ART will team with Boeing to prototype and flight test the controller on the V-22. ART will seek Phase III funding from Boeing and/or the Navy to accomplish this and will license the controller technology to Boeing.

Objective:
Commitments from the V-22 office and Boeing to:
1) provide current V-22 control system data needed to update our blade element V-22 model (V-22 PM)
2) Provide flight test data for validation of the model with the current control system (V-22 PM)
3) Fund upgrades and validation of the model and design and testing of a V-22 disturbance controller (V-22 PM)
4) Provide support for implementing the controller on the V-22 flight control computer (Boeing)
5) Provide support for testing the controller with a V-22 in a shipboard environment (Boeing and V-22 PM)

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