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			5c. PROGRAM ELEMENT NUMBER 206022		
6. AUTHORS Kamal S. Ali			5d. PROJECT NUMBER		
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14. ABSTRACT In this research a HILS system in which a small autopilot can experience flight stimuli, such as pitch, roll, yaw, and GPS is investigated. These stimuli are controlled by a flight simulator hosting an airframe model that the autopilot in question fly's. Such a system allows the autopilot to fly the virtual model of the flight simulator while experiencing all flight stimuli as if it is in real flight.					
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					19b. TELEPHONE NUMBER 601-979-1183

Report Title

Final Report: A HILS System for the Simulation of MAV Flight

ABSTRACT

In this research a HILS system in which a small autopilot can experience flight stimuli, such as pitch, roll, yaw, and GPS is investigated. These stimuli are controlled by a flight simulator hosting an airframe model that the autopilot in question fly's. Such a system allows the autopilot to fly the virtual model of the flight simulator while experiencing all flight stimuli as if it is in real flight.

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Received

Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

Received

Paper

TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

07/25/2013 1.00 Kamal Ali, Justin Shumaker. Hardware in the loop simulator for multi agent unmanned aerial vehicles environment. ,
Americian Journal of Engineering and Applied Science (05 2013)

TOTAL: 1

Number of Manuscripts:

Books	
<u>Received</u>	<u>Book</u>
TOTAL:	

Received Book Chapter

TOTAL:

Patents Submitted

A HILS system for autopilot calibration and simulation. Kamal S. Ali and Justin Shumaker, Joint patent with ARL/VTD.
~~Patent number (8,566,071).~~

Patents Awarded

A HILS system for autopilot calibration and simulation. Kamal S. Ali and Justin Shumaker, Joint patent with ARL/VTD.
~~Patent number (8,566,071).~~

Awards

Graduate Students	
<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Names of Post Doctorates

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Names of Faculty Supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>	National Academy Member
Kamal S. Ali	0.30	
Mahmoud A. Manzoul	0.10	
Abdelnasser Eldek	0.10	
FTE Equivalent:	0.50	
Total Number:	3	

Names of Under Graduate students supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>	Discipline
William Munn	0.50	
Mathiew Byer	0.50	
FTE Equivalent:	1.00	
Total Number:	2	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields: 0.00

Names of Personnel receiving masters degrees

<u>NAME</u>
Total Number:

Names of personnel receiving PHDs

<u>NAME</u>
Total Number:

Names of other research staff

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

Many minor modifications were made to render the HILS system more operable. Two copies of the platform were built. One delivered to the Air Force Research Labs at Eglin AFB.

Technology Transfer

A copy of the HILS system was delivered to AFRL at Eglin Air Force Base, Fort Walton Beach, FL. The unit was transferred and its operation demonstrated using a Jackson State GPS Spoofer. The unit was delivered without the GPS Spoofer. The POC at Eglin AFB/AFRL is:

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