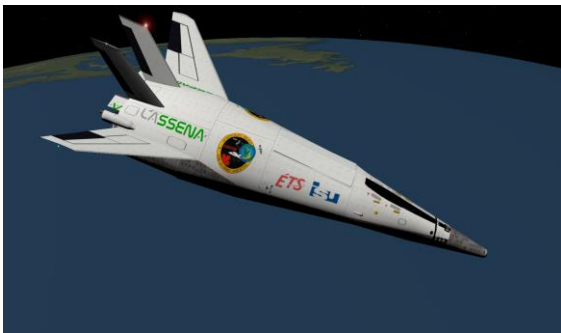


Autonomous Mission for On-Orbit Servicing (AMOOS)

International Space University (ISU) – Space Studies Program (SSP) 2014

Abstract

- The AMOOS Project aims to produce a business plan related to the design and execution of autonomous missions for on-orbit servicing based on orbital Unmanned Aerial Vehicle (UAV).
- The ISU Team will also design a virtual scenario simulation to demonstrate the capabilities of a modified orbital UAV to execute autonomous on-orbit missions on Low Earth Orbit (LEO) satellites.
- Project feasibility of AMOOS will be demonstrated by conducting complete virtual on-orbit missions synchronized with real-time execution of subscale drone missions near the Earth's surface. These virtual missions will also demonstrate the benefits of low cost Drones on daily life applications.
- Key enabling space technologies will be identified for (a) servicing satellites in order to extend their operational lives and enhance their performances, (b) transporting and deploying small and secondary payloads in LEO, and (c) deploying new technologies to reduce space debris.
- Investigations will be conducted into potential threats and risks associated with the utilization of drones for autonomous space missions.
- AMOOS Civilian Benefits: Investigation of potential economic and environmental benefits related to autonomous missions and new civilian applications using low cost commercial drones.
- **Team Project Schedule (9 weeks):** June, 9th 2014 to August, 8th 2014.



Objectives

- Identification and formulation of future key space technologies of unmanned space vehicle and robotic systems suitable for autonomous on-orbit servicing.
- Design and simulation of virtual scenarios for autonomous on-orbit servicing mission based on drones, robotics and wireless communication systems.
- Treatment of space debris issues by demonstrating the feasibility of orbital debris removal with an orbital UAV equipped with embedded robotic systems.
- Obtain commitments by government, space agencies and space industries about the financing of space exploration and space sustainability projects for our society.

Technological opportunities



• For future space technologies

AMOOS project promises to bring surprising and innovative ideas for the development of unmanned outer space exploration. The project will unravel the business case for autonomous on-orbit servicing by providing viable alternatives to complex, risky and expensive manned space missions. Specific benefits to be explored include: re-usability, reliability, cost effectiveness, quick mission turnaround, and secondary payloads.

• For Canadian Space Industries

The AMOOS mission will help strengthen Canada's presence in outer space by encouraging international cooperation in systems engineering, management, policies and laws. This project will also open doors for in-space activities for R&D, industries, academia, etc., enhancing ÉTS and Canada's reputation.

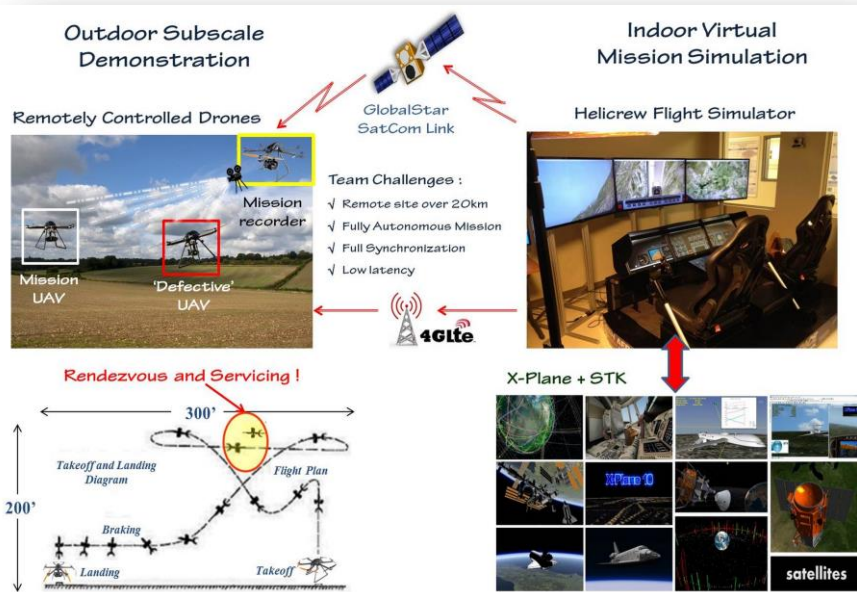
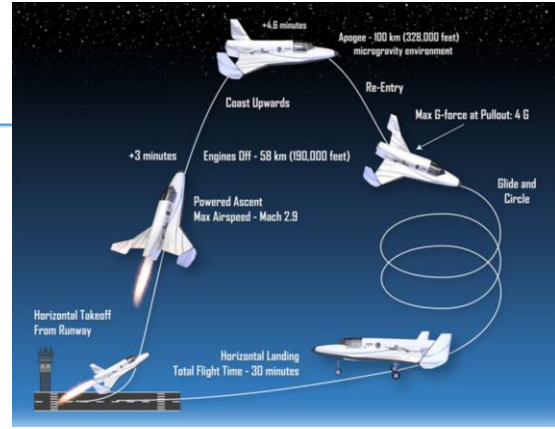
• For ISU Students and Participants

This research project will encourage the participants to combine the knowledge and skills that they have already gained from their own educational or professional backgrounds to conduct a relevant project for the international space industry. They will experience problem-solving, decision-making and organizing within an international, interdisciplinary and intercultural teamwork environment, in daily exchanges with some of world best educating and training space experts.

Scope of the ISU SSP 2014 AMOOS Project

Indoor Virtual Mission Simulation

This team project offers to participants the opportunity to design a virtual scenario to demonstrate the capabilities for a modified Unmanned Aerial Vehicle (UAV) to execute autonomous on-orbit servicing missions on a Low Earth Orbit (LEO) satellite. The team will execute all requirements needed for pre-mission analysis, planning, mission design and post-mission reporting. The mission will be executed with new space based UAVs on advanced flight simulators using both simulation software (X-Plane & STK) and hardware platforms (Helicrew, Helimod).



Outdoor Subscale Demonstration

The team project also aims to reproduce a subscale AMOOS mission with modified low cost commercial drones and wireless communication systems. Both LTE and Globalstar satellite communication technologies will be demonstrated. The participants will design wireless networks to remotely control drone (above 20 Km) using both LTE (for urban canyon environment) and SATCOM links (for remote access environment) with real satellites. The experiments will be remotely controlled from the ÉTS/LASSENA Ground Control Operation Center where the participants will analyze, plan, coordinate, design, synchronize and execute the mission. This experiment will also demonstrate the benefits of low cost drones for new civilian applications.

AMOOS Business Plan

At the end of the SSP (Space Studies Program) 2014, the group of professionals from the ISU team will produce a professional report in the form of a business plan. This report will be used as a basis to leverage government and industry for support of real AMOOS projects.

Actual Partners



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