A261

Session23: Advanced Technologies for Research and Operations in Polar Regions

Development of OPV (Optional Piloted Vehicle) for Polar Research

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OPV (Optional Piloted Vehicle) is one of the UAV (unmanned aerial vehicle) development techniques and methods that can provide economical and efficient unmanned systems. Conventional manned aircraft are evaluated through numerous flight operations in a variety of environments, including extreme cold, and can provide a reliable aircraft platform, engine and subsystem for operation. Developing UAVs using proven manned aircraft can therefore reduce development time and risk of accidents. In addition, since manned aircraft generally have a large payload and can operate for a longer time than UAVs, it is advantageous to explore a wide area with a variety of mission equipment. This paper describes the basic specifications of OPV development using CTLS aircraft. This includes plans to install basic devices for unmanned operation (flight control systems, control surface actuators, communication equipment, ground control equipment), and various mission equipment such as cameras, RADAR, and some sensors for polar research. CTLS is a two-seater aircraft designed specifically for the Light Sport category. By replacing the Rotax 912 ULS engine with the Rotax 912 IS engine to convert CTLS airplane to OPV, fuel efficiency can be improved more than 32%. It is also designed to be unmanned by control surface actuator, throttle and brake actuator. An alternator is added to secure the power supply for the mounted systems (unmanned system, sensor, etc.) and can be supplemented by the required power. In addition, a vehicle type ground control device capable of controlling the OPV from the ground is developed. Mission equipment can be equipped with various sensors through design changes. UWB (Ultra-Wide Band) radar antenna arrays will be installed on aircraft wings to observe the subglacial topography of Antarctica. The airplane is also designed for variable installation of Lidar, hyperspectral sensors, and SAR (Synthetic-Aperture Radar) for various polar researches. The communication device is comprised of an on-board communication device and a ground communication device, and is designed to control and monitor the OPV within a 50 km operation range via two line-of-sight data links. In addition, the satellite data link can be added to control and monitor the aircraft even at a distance of 300 km or more. The ground control system has a basic function of aircraft control, mission control and monitoring functions. It is reinforced with a Cockpit Display Traffic information (CDTI) that can display surrounding conditions and weather conditions to support safe operation.

By constructing a HILS (Hardware-in-the-Loop Simulation), it is possible to develop a more stable system by checking the operation mode, training the operators, improving the reliability of flight and unmanned platform and verifying tests. The HILS system can be used to carry out tests for each equipment and system and identify systems to be added or changed. ADS-B based unmanned aerial collision avoidance system is under development and further automatic takeoff and landing system and satellite data link will be developed in the near future. These functions will compensate for the inconvenience of operating distance and operability of vehicle. The OPV will be used for Antarctic exploration with various mission equipment and will be used for Antarctic exploration, beginning with test flights in Antarctica in 2022.

Program at a glance

** Lunch will be not offered.*
** Program is subject to changed.*

Venue: 2F, GrandBallroom A | Room #302 | Room #306 | Room #305

July 19-20	July 21 (SUN)	Time	July 22 (MON)	Time	July 23 (TUE)	July 24 (WED)	July 25 (THU)	July 26 (FRI)	July 27-29
Pre- Field Trip (Gyeonggi-do)	Pre-Field Trip (Gyeonggi-do)	08:00-	Onsite Registration						Post-Field Trip (Jeju Island)
		09:00 -09:30	Opening Ceremony	09:00 -09:40	Plenary Lecture 03	Plenary Lecture 05	Plenary Lecture 07	Plenary Lecture 09	
		09:30 -10:10	Plenary Lecture 01	09:40 -10:20	Plenary Lecture 04	Plenary Lecture 06	Plenary Lecture 08	Plenary Lecture 10	
		10:10 -10:50	Plenary Lecture 02	10:20 -10:30	Coffee Break				
		10:50 -11:00	Coffee Break	10:30 -12:30	S05-I / S09 / S04-I / -	S17-I / S02-I / S20 / -	S14-I / S02-III / S23 / -	S11 / S15 / S26 / S21	
		11:00 -13:00	S01-I / S12-I / S19-I / -						
		12:30 -13:30			Lunch			-	
		13:00 -13:45	Lunch						
	Onsite Registration 13:00-17:00	13:45 -15:00	Poster Session 2F, Lobby	13:30 -15:00	Poster Session 2F, Lobby				
		15:00 -17:30	S01-II / S12-II / S19-II / S16	15:00 -17:30	S05-II / S18 / S04-II / S07	S17-II / S13 / S02-II / S06 / S22	S14-II / S02-IV / S08 / S10 / S24		
	-	17:30 -19:00	-	17:30 -18:30	-	-	-	Post-Field Trip (Jeju Island)	
	Welcome Reception KOPRI, 1F Lobby	19:00 -21:00		18:30 -20:30		Banquet Dinner Sheraton Grand Incheon Hotel, 3F GrandBallroom			

Session No	Session Title
S01	Geological History of Victoria Land: Reviews and New Findings
S02	Structure, evolution, and heterogeneity of Antarctica's continental lithosphere
S03	Interpretation of Observed Seismic and Acoustic Signals from the Solid Earth and the Cryosphere
S04	Antarctic Volcanism and Magmatism: Past, Present and Future
S05	The Neoproterozoic to Cambrian Orogenies and their precursors in Antarctica and adjacent continental blocks
S06	Antarctic geothermal heat flux
S07	Circum-Antarctic Gateways: formation, evolution and global implications
S08	Evolution of Antarctic topography and bathymetry: understanding links between erosion, deposition, isostasy and ice sheet behaviour
S09	Permafrost and Periglacial ice free areas in Antarctica
S10	Modern landscape change in Antarctic ice-free areas
S11	Applied bathymetry for understanding Quaternary history and change
S12	Geological records of ocean and ice sheet change from the Ross Sea
S13	Past Climate Variability of the Southern Ocean and its Global Teleconnections
S14	Marine sedimentary records of Antarctic ice-sheet dynamics and Southern Ocean history during the Late Cainozoic
S15	Ice core sciences and Ice chemistry
S16	Significance of Antarctic Inland Freshwater Bodies - Revealing Past Processes and Projecting Responses to Change
S17	Paleoenviromental changes in Antarctica and Southern Oceans since the last Glacial Maximum
S18	Antarctic sea ice variability and ice shelf processes
S19	Tropical-Polar teleconnection and Antarctic climate change
S20	Evolution of the biota of West Antarctica: a Gondwana perspective
S21	Geomicrobiology of Antarctica and Patagonia

S22	Emerging Frontiers in Satellite Remote Sensing and Geoinformation in Antarctic Earth Sciences: Cross-disciplinary Advances
S23	Advanced Technologies for Research and Operations in Polar Regions
S24	Earth science informing environmental management and policy
S25	Future opportunities for the exploration of Antarctic subglacial environments
S26	General Topics