## ISAES 2019 Development of OPV for Polar Research

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## 1.1 Project Summary



Development of Basic Unmanned Platform for the Flight Test of Airborne Equipment

- Period : Jun., 2009 ~ May, 2014 (5 years)
- Project Leader : KARI (Korea Aerospace Research Institute)

[Developed Mission Components]



- ✓ GOAL ; Establishment of Basic Flight Test Platform using OPV to support the qualification of Aircraft **Components developed by Local Aero Industries.**
- Aircraft Type : OPV(Light Sport Aircraft)
- ✓ FCC Type
  - : Dual redundant electric mechanical Sys.
- Communication System : UHF, C-band
- Ground Control System
- ✓ Flight Test & Evaluation for Aircraft(OPV) & **Aircraft Mission Components**

\* OPV : Optional Piloted Vehicle

\* FCC : Flight Control Computer

**Flight Test System Ground Control System** 

#### **CFT(Commercial Flight Test System)**



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## 1.2 Development Process



#### LSA(Light Sport Aircraft)



Selection of Reliable LSA

#### **Check after Modification**



- Influence of Modification
- Influence to Aircraft Safety

#### **Manned Test Flight**



- Acquisition of Test Area Info.
- Test of Max. Comm. Range



#### **Development**



- Components and System
- Test on HILS, using S/W

#### **Pilot Flight & Evaluation**



- Performance of Unmanned Flight System
- Test Flight for the developed Mission Components

#### **Unmanned Flight**



- Flight Test for Unmanned System by Pilot
- Ground Test for Unmanned System
- Final Unmanned Flight







## 2.1 Aircraft



#### ✓ Aircraft

- Model : CTLS(2 seats LSA)
- MF : Flight Design(Germany)
- **Sold-out more than 2,500 aircrafts**



Weight	
MTOW	600 kg
Empty Weight	310 kg
Useful Load	290 kg
Fuel Capacity	210 L(Max)
Dimension	
Length	6.61 m
Height	2.34 m
Wing Span	8.6 m
Performance	
Cruise Speed $(V_c)/(V_H)$	185 kph / 222 kph
Stall Speed (V <sub>s0</sub> )	65 kph
Stall Speed (V <sub>s1</sub> )	81 kph
Never Exceed Speed ( $V_{NE}$ )	269 kph
Rate of Climb	805 fpm
Max. Range	1540 Km
Take-off Dist. (groudroll)	250 m
Take-off Dist. @50ft	450 m
Landing Dist. @50ft	480 m
ETC.	
Power Engine	Rotax 912 ULS(100HP)
Parachute	BRS 1350 airframe parachute
Nose Wheel	Steerable

## 2.2 Aircraft Modification





## 2.2 Ground Control System



#### **GDT** and Shelter



**Inner View/ Shelter** 

**Outer View/ GDT** 







## 3.2 Flight Test

#### Test

- Manual Mode : Control Plane Displacement Control
- Stick Auto Mode : Aircraft Posture Control
- ✓ Knob Auto Mode : Air-speed, Altitude, Heading, Roll-angle Numerical Control
- Programed Mode : Flight Path
- Return Home Mode : Communication Loss Reaction













## 4. Application in Antarctica

#### Exploring Inland of Antarctica

- $\checkmark$  So far, the exploration was confined around Jang Bogo Station using helicopter.
- ✓ Now, the mission is expanding into the Antarctic inlands through K-Route project
- $\checkmark$  So, a proper new platform has been required to explore the vast area.



in Remote and Vast Area





## 4. Application in Antarctica



- Installation of Various Exploring Mission Equipment
  - ✓ To get 3D Ice-sheet and Subglacial Topography
    - -> UWB(Ultra-Wideband) Radar, LiDAR, Hyper-spectral Sensor, SAR
  - ✓ To get Meteorological Data : Air Data Probe
  - ✓ To get Geomagnetic Data : Air-borne Magnetometer









## 5. Conclusion



- ✓ Light Sport Aircraft was successfully modified as Unmanned Aircraft through Project with KARI(Korea Aerospace Research Institute).
  - Payload & Endurance : 30KG/ 14 Hours or 60KG/ 10 Hours
  - Communication Range : 50~100km(Over 300km/ Satellite)
- ✓ Provision of Flight Test Platform to support the Qualification of Aircraft Components developed by Local Aero Industries

[Test Range & Capacity]

- Weight : 30 kg, Altitude : 12,000ft, Speed : 100~220KPH
- 12V, 24V Power Supply for the Component Operation
- IO, Data Recording and Real-time Monitoring in the GCS
- Aircraft reference Data Recording (Attitude, Speed, Position, Route, CTRL Surface Displacement, Engine Data etc.)
- ✓ New Challenge(Application) : Exploration of Inland of Antarctica with OPV

X Installation of Various Exploring Mission Equipment

(UWB Radar, LiDAR, Hyper-spectral Sensor, SAR, Air Data Probe, Air-borne Magnetometer)

# THANK YOU!



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