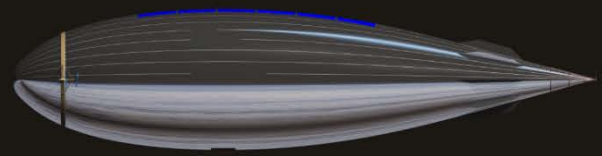
Very High Altitude Operations In China

From UTM to High Altitude Operations



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Contents

1 Our Works on HAPs

2 Characteristics of HAPs

3 Learn from UTM

Works on HAPs of China

China High-resolution Earth Observation System(CHEOS)

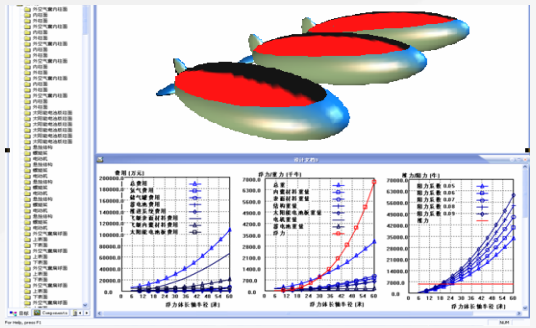
In order to improve the comprehensive capabilities of China's earth observation system, in 2010, the Chinese government approved to implement CHEOS. CHEOS will be completely activated by 2020, which is composited by

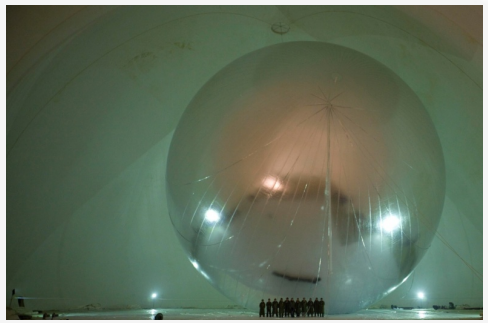
- Space-based System
- **Near space and Airborne System**
- Ground system
- Application System

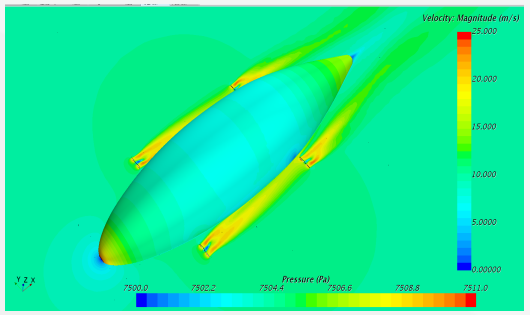
Our Works on HAPs

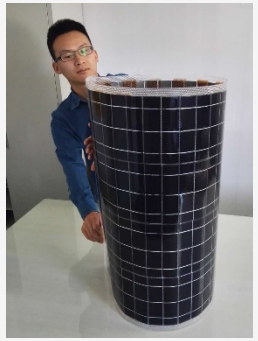
2006 2010 2015 2017 2019 2020 2022 2024

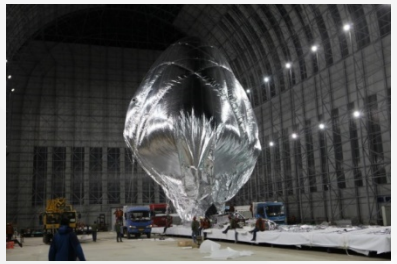
Demonstration of technology

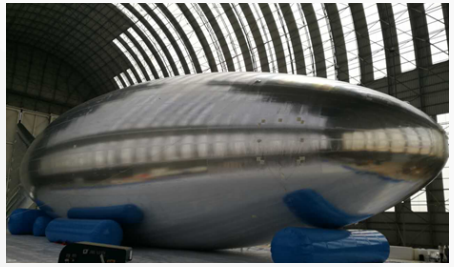












prototype platform design

flight test and improvement

Our Works on HAPs

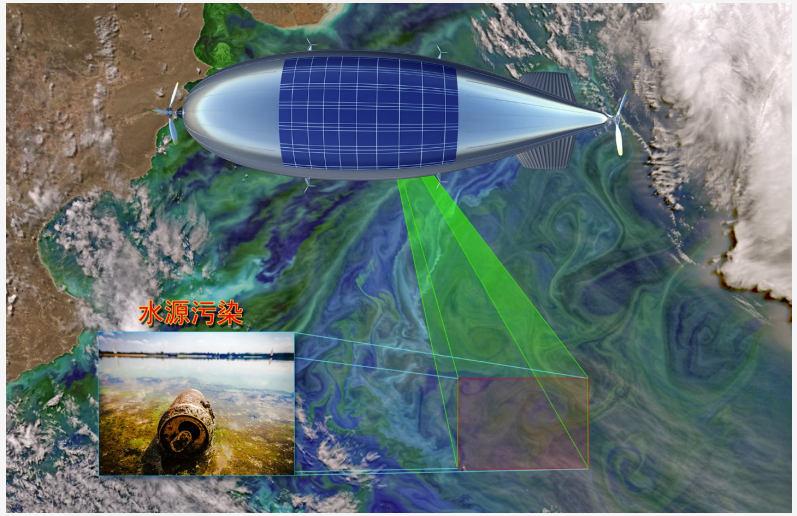
2006 2010 2015 2017 2019 2020 2022 2024

Demonstration of technology

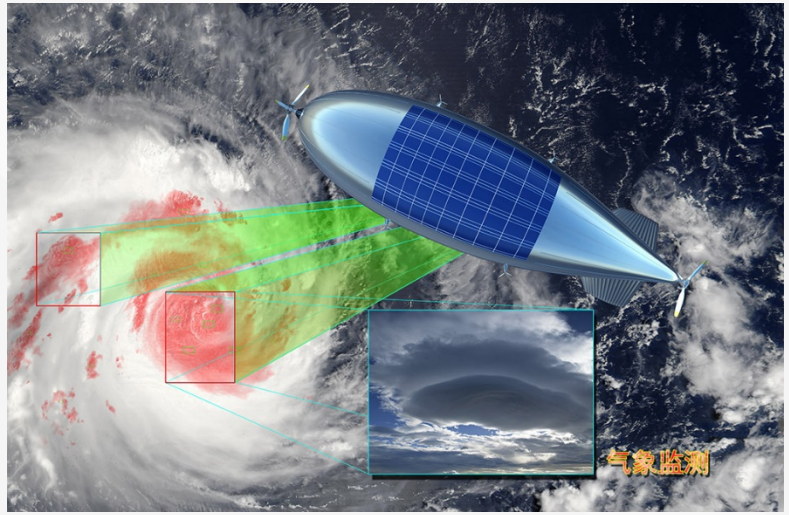
Missions demonstration

Production and Service

Telecommunications



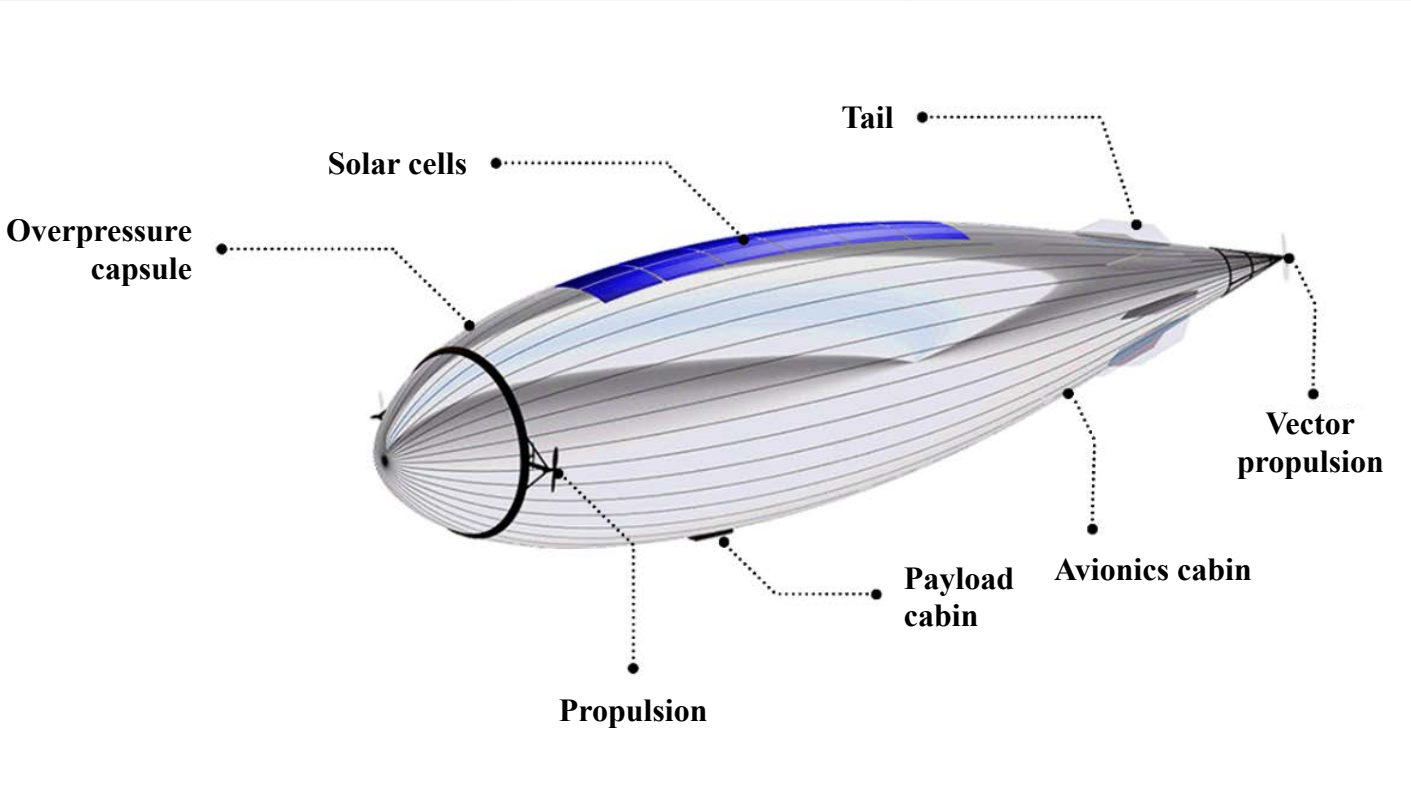
Remote sensing

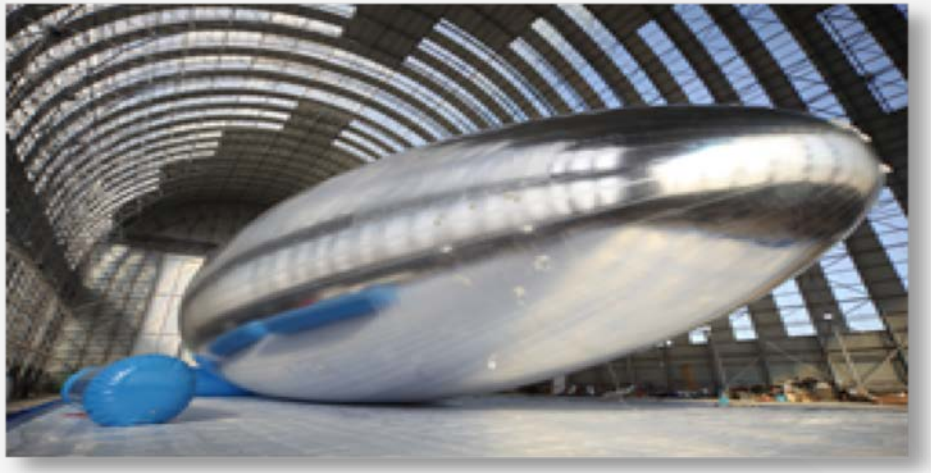


Weather Observation

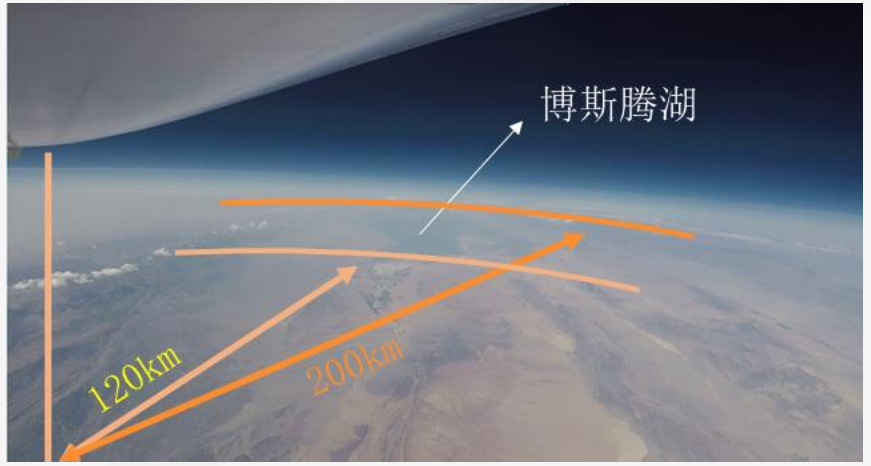
Our Works on HAPs

Our Stratospheric airship-LK01

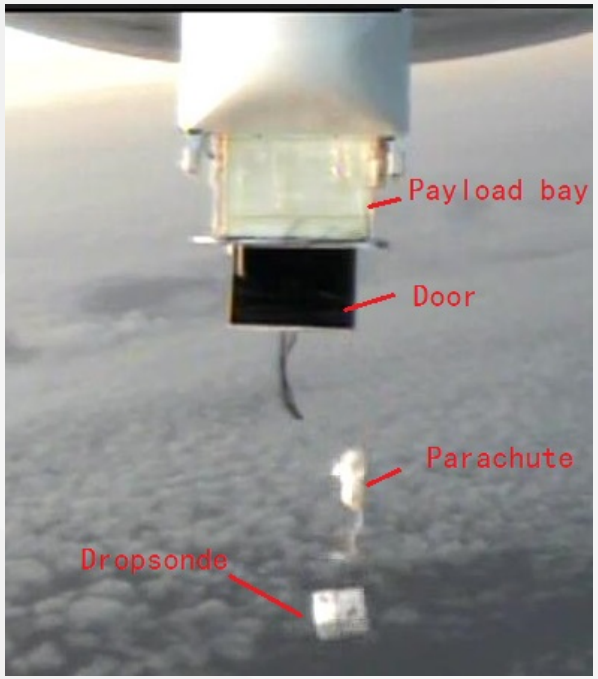


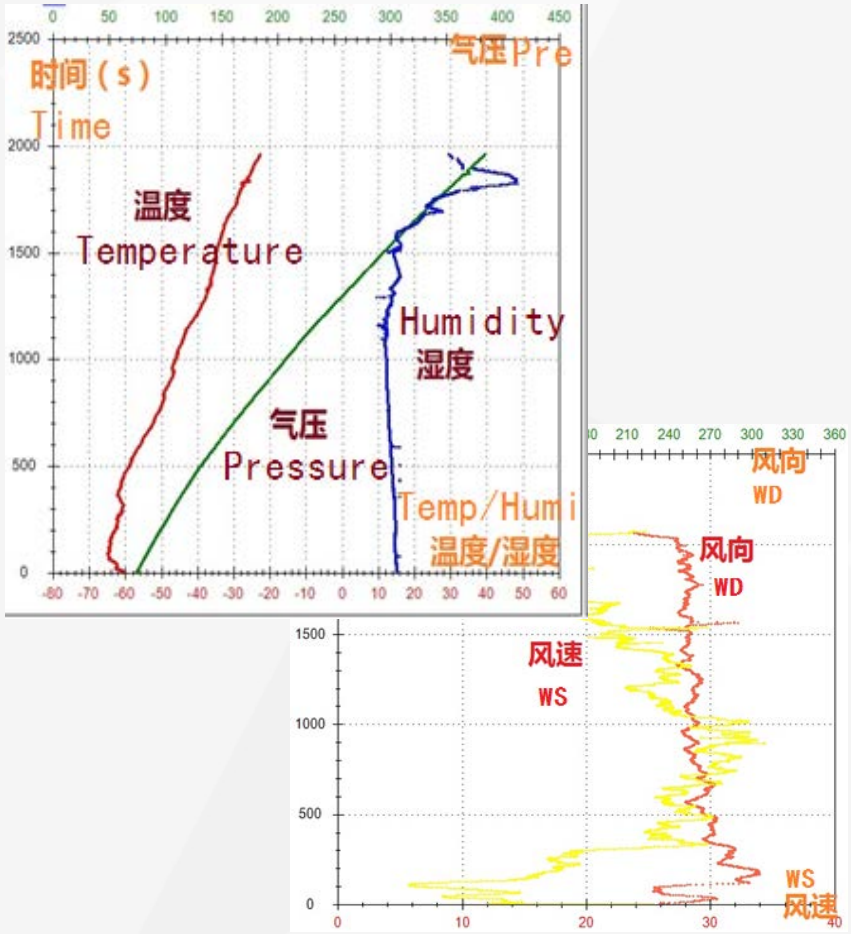


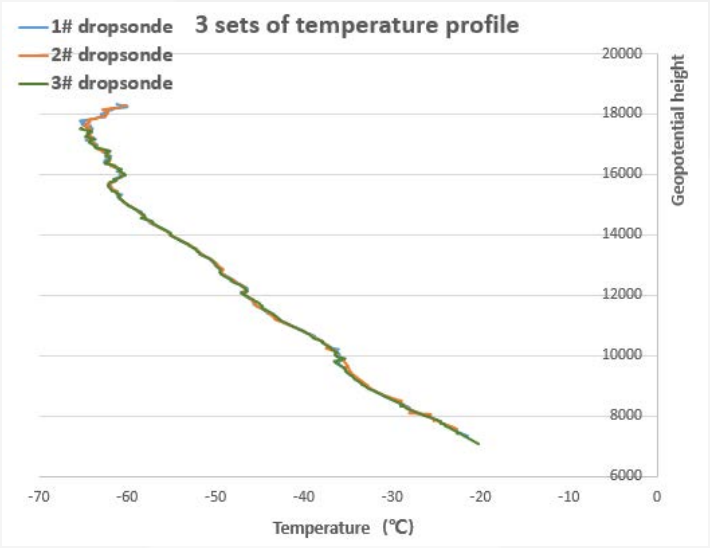
Our Works on HAPs

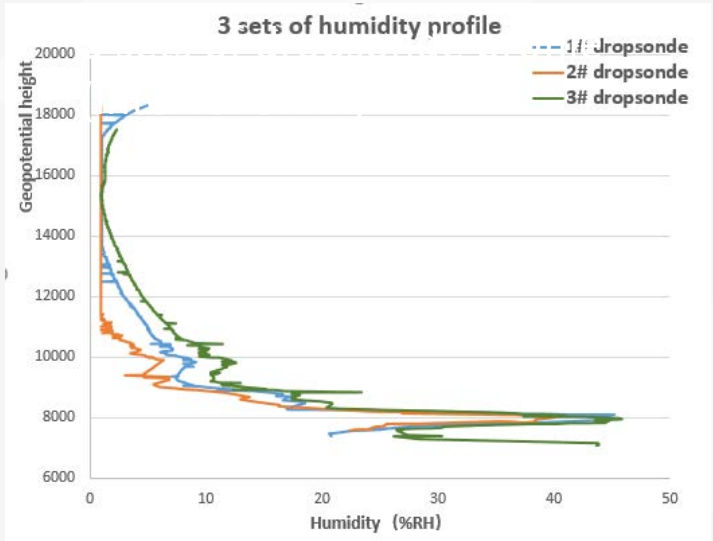


Our Works on HAPs





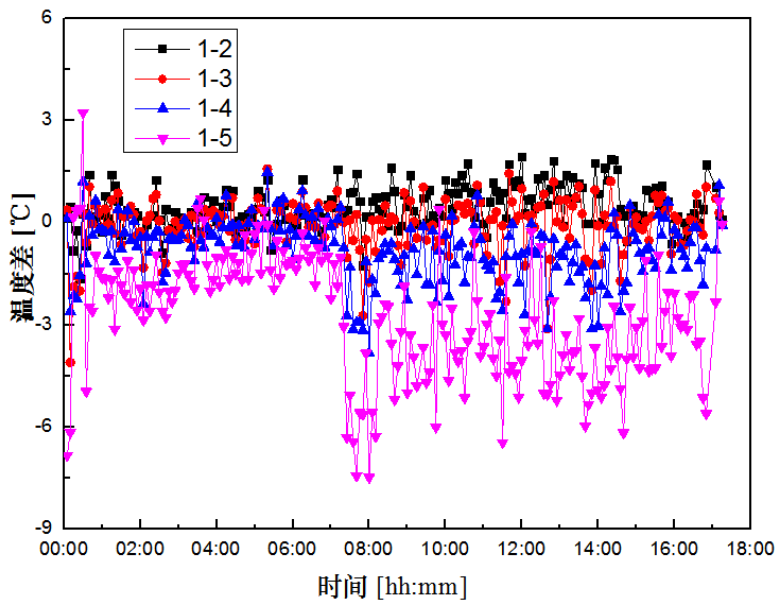




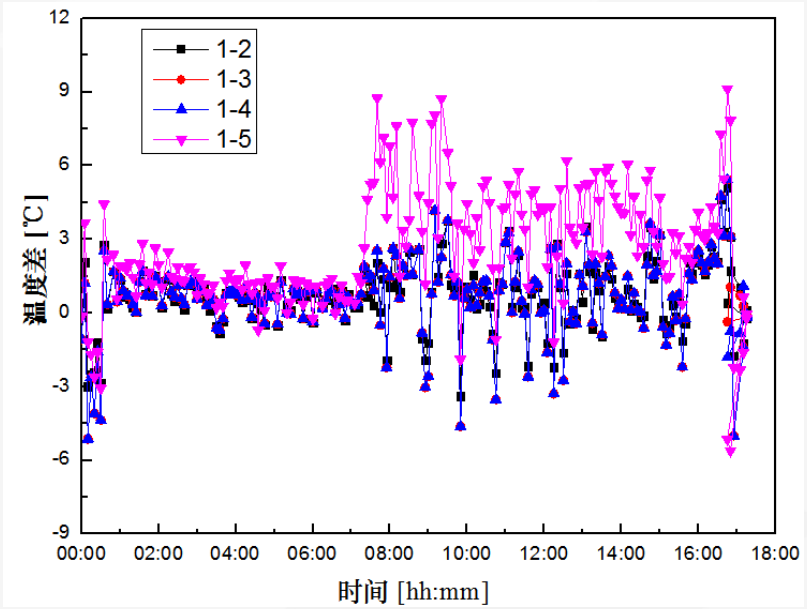
Drop moment: starting altitude is 18.5km

e.g TPU profile and wind profile

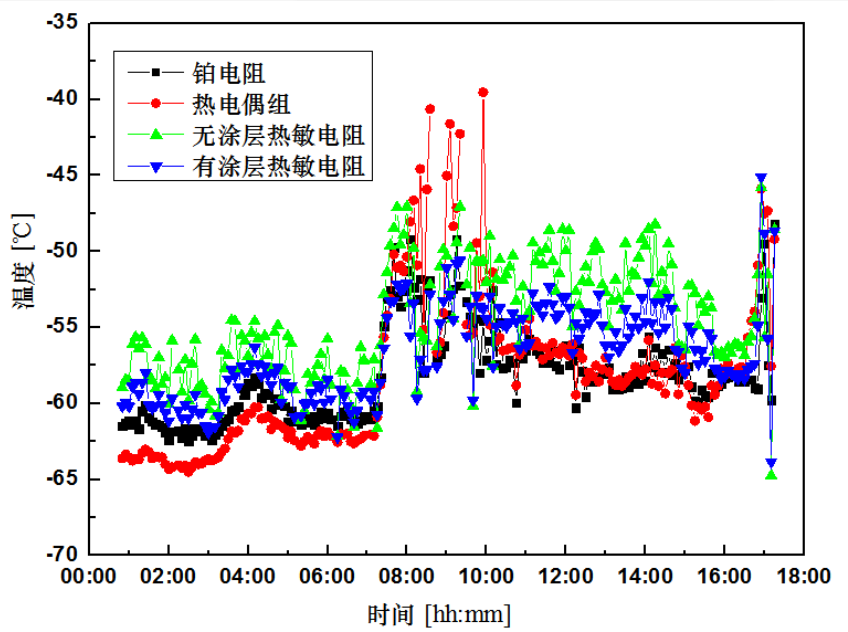
Our Works on HAPs



Comparison of temperature observation data for uncoated thermistors



Comparison of temperature observation data with coating thermistor



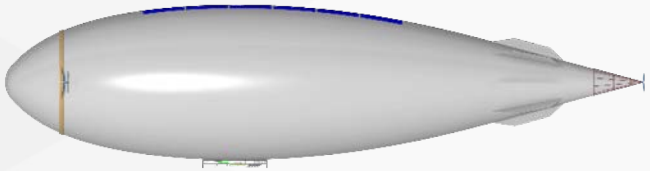
Comparison of observation data of various types of temperature sensors

The continuous observation time is 18 hours, the residence height is 18.5km, the air pressure is 70hPa, and the temperature is -60 degrees

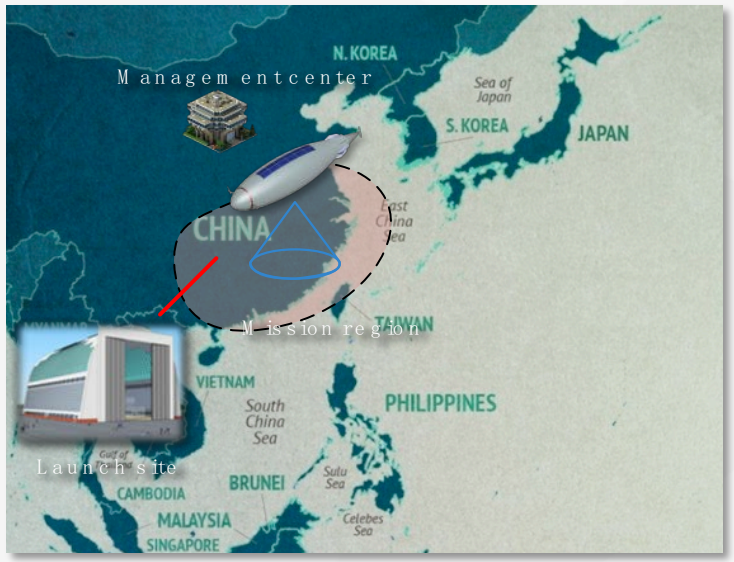
Pressure Resistance Test on the ground

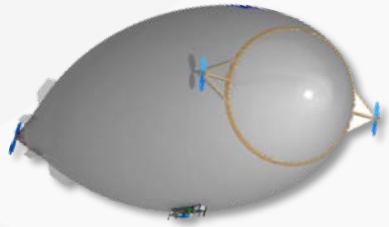
Characteristics of HAPs

Flight profile



Mission phase: 18km~21km
Maximum air velocity: 22m/s
Mode: Station keeping
Cruise in specific region
planned trajectories





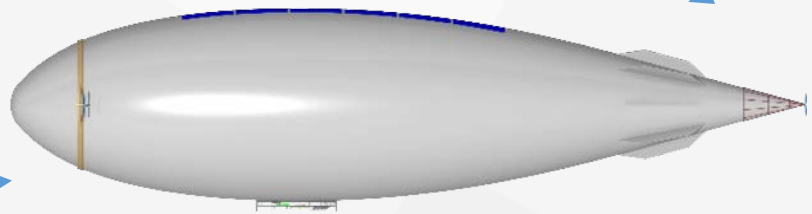
Descent phase: about 2 hours
Trajectory with wind profile

Ascent phase: Departure with fine weather windows
vertical velocity: 3m/s~8m/s

Characteristics of HAPs

Communications

Communication vehicle



Communication satellite

Communication Ground Station

Controller Center

Characteristics of HAPs

Communications

Stratospheric
Backbone Network

Communication
Ground Station

Controller Center

Service area

Characteristics of HAPs

Operations

On-board automation:

- detection of environment(wind and temperature around HAP)
- navigation and control algorithm(trajectory optimization and follow planned trajectory)

Management of HAPs by Controller Center:

- Plan the trajectories or station keeping area
- Observe status of HAPs and take emergency management

From UTM to High Altitude Operations

Ascent and Descent phases

Similarities:

Requirement of ATC permission and safety area

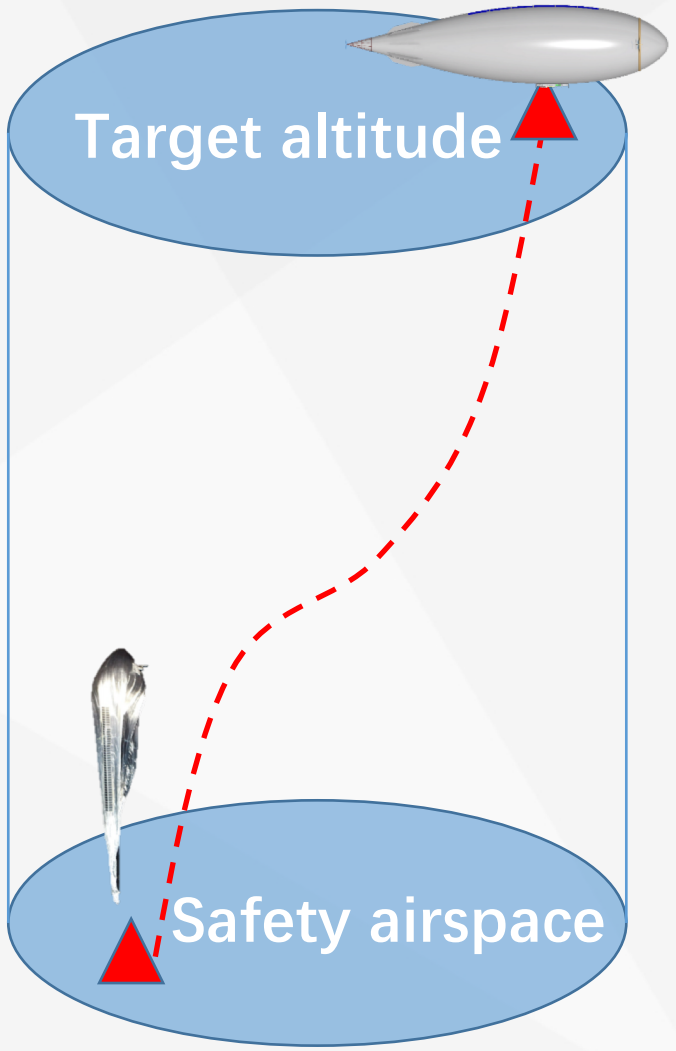
Maintaining separation with other aircrafts below

Differences:

On-board automatic control

No-visual flight control

Low velocity and huge volume



From UTM to High Altitude Operations

Mission phases

Similarities:

Share position and velocity with other aircrafts

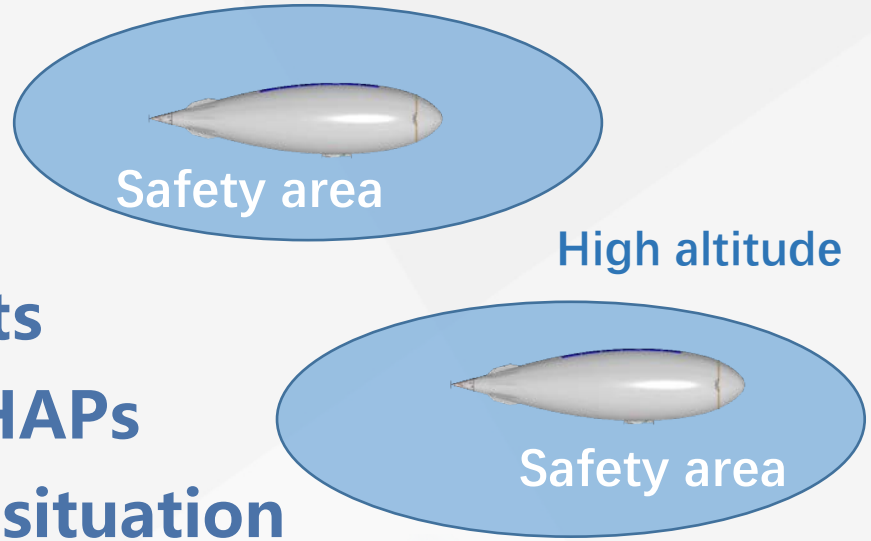
Keep proper segregated airspace with other HAPs

Interfaces with ATM and UTM for emergency situation

Differences:

Long duration of flight

Above the other tropospheric aircrafts



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