

# STRATOBUS™ OPERATION ECHO WORKSHOP 2

/// EUROCONTROL – Brussels - 20/04/2022

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THALES ALENIA SPACE INTERNAL

# A SOLUTION BETWEEN THE UAV AND SATELLITE

TO COMPLEMENT AN EXISTING OR CREATE AN INDEPENDENT SYSTEM



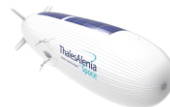
Global & non-intrusive  
Very low vulnerability  
Low OPEX



Low permanence (revisit time in hours)  
High CAPEX



**Permanence**  
**Can embark high performance Payloads**  
**Multi mission**  
**Maintainable & Upgradable**  
**Low OPEX/hours ratio (operational)**



Regional coverage  
Middle class resilience



Capacity of projection  
Can embark high performance Payloads  
Multi mission



Low permanence (hours)  
Regional coverage  
Low resilience  
High OPEX/hours ratio (operational)

# STRATOBUS™ SOLUTION

Taking advantage of all the benefits and specificities of High Altitude Platform System, Stratobus™ has the persistence of a satellite with the flexibility of a UAV

- ✓ Highly automated, it can ensure persistent flights up to a whole year (best zone of operation is intra-tropics)
- ✓ Located at 19 km altitude (62,000 feet) to avoid:
  - / Clouds and strong winds (jet-streams)
  - / Regular air traffic below 13 km
- ✓ Can oversee ground activities:
  - / At extended range (up to 500 km)
  - / Accurately (10 cm class)
- ✓ Can host high performance radar, optical and telecom payloads, thanks to its capacity of 250 kg and 5 kW
- ✓ Suitable for local or regional footprints with permanent operation
- ✓ Lifespan is 10 years with a yearly maintenance (in-depth maintenance after 5 years)



# STRATOBUS™: DESIGNED TO BE THE OPTIMAL SOLUTION

## 4x rear tails with actuators

- ✓ Control
- ✓ Stability

## 4x electrical engines

- ✓ Moving
- ✓ Stationarity

## Solar array

- ✓ Autonomy
- ✓ Daytime operation

## Avionics modules

- ✓ Flight management
- ✓ Automatic pilot

## 2x power storage gondolas

- ✓ Night Operation

## Payload gondolas

- ✓ Steady, Stable and quiet
- ✓ Temperature & pressure control
- ✓ Easy integration

## Deployable mooring lines

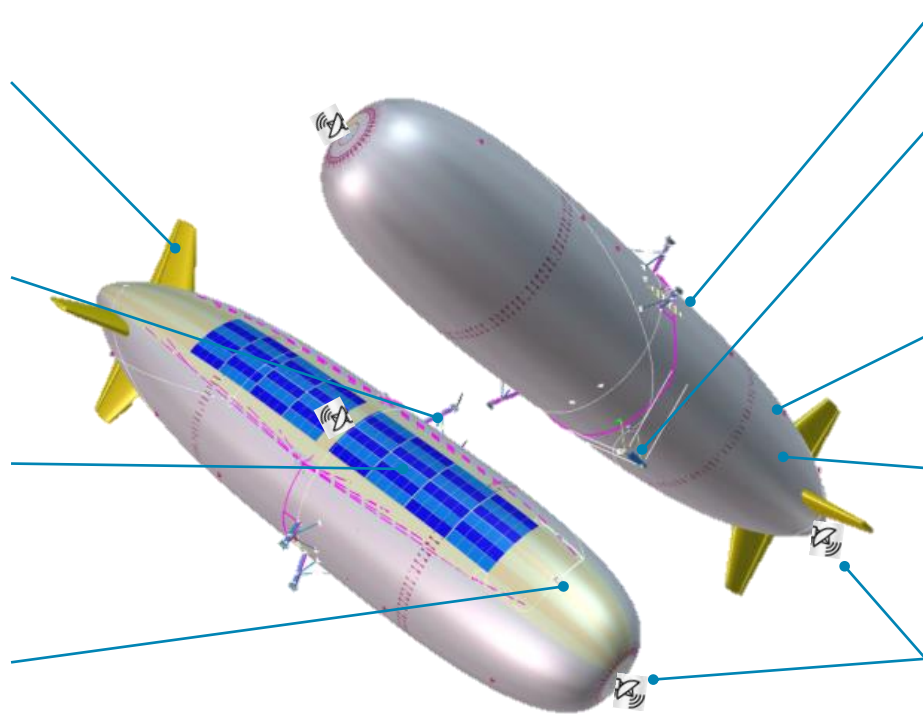
- ✓ Landing capture

## Envelope filled with over-pressurized Helium

- ✓ Long time in the air (1 year)
- ✓ High resistance

## Ground communication

- ✓ Line-of-sight
- ✓ Beyond Line-of-Sight



140m long / diameter 32m

# STRATOBUS™ HOW TO USE IT?

/// Remotely controlled in direct link (LOS) and through a satellite (BLOS)

/// Mission and Platform links are segregated (for safety reasons)

## Platform control

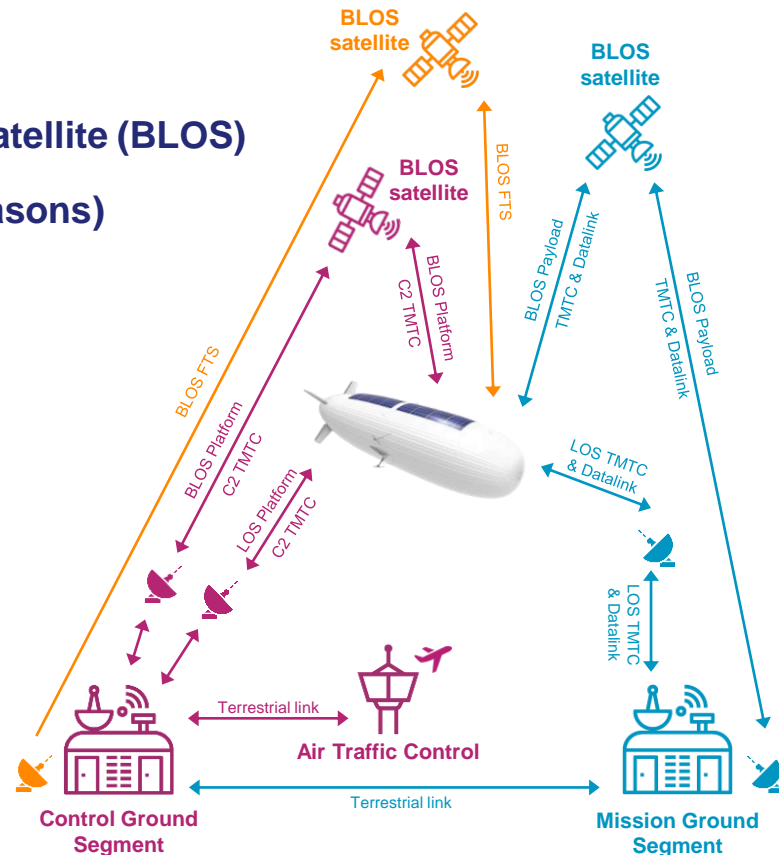
- Using frequency bands allowed by authorities with worldwide coverage

## Payload control and Data Mission

- For civil or military mission
- NATO bands can be used for military missions

## Flight Termination System (FTS)

- Independent on-board safety device used to destroy the platform in the event of a total loss of control



\*LOS: Line Of Sight – BLOS: Beyond LOS

# STRATOBUS™ APPLICATIONS



## Defense

ISR\*  
Military telecom  
Airborne connectivity  
Electronic Warfare  
Early warning



## Surveillance

Land/maritime  
Piracy  
Borders  
Oil & critical infra  
Smuggling  
Illegal fishing



## Urban/Environmental

Pollution  
Weather  
Fire management  
Cities and suburbs  
Disaster Relief



## Navigation

Local augmentation of  
GNSS\*\* for  
Availability  
Accuracy



## Telecommunication

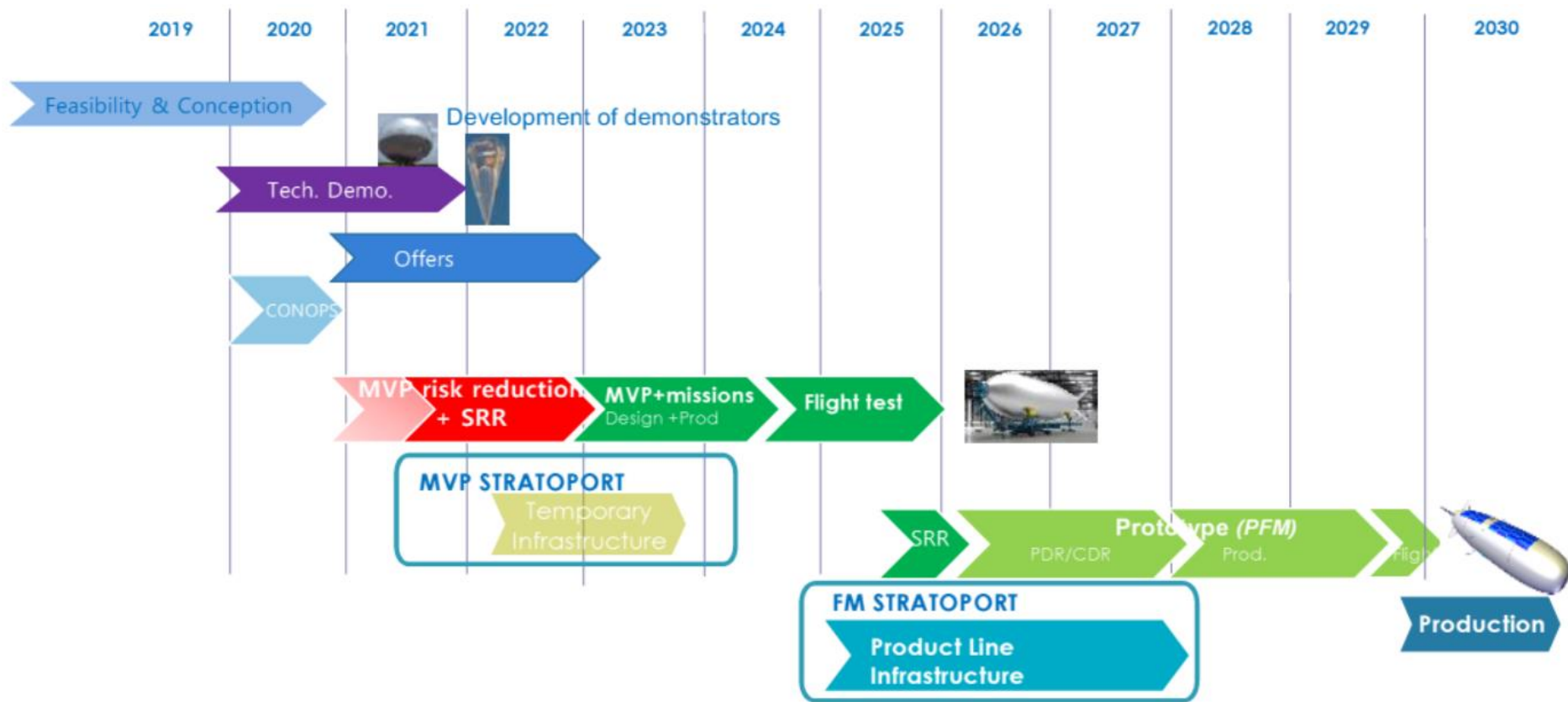
Cellular 5G/6G  
Internet  
Backhauling  
Broadcasting

\* Identification, Surveillance and Recognition

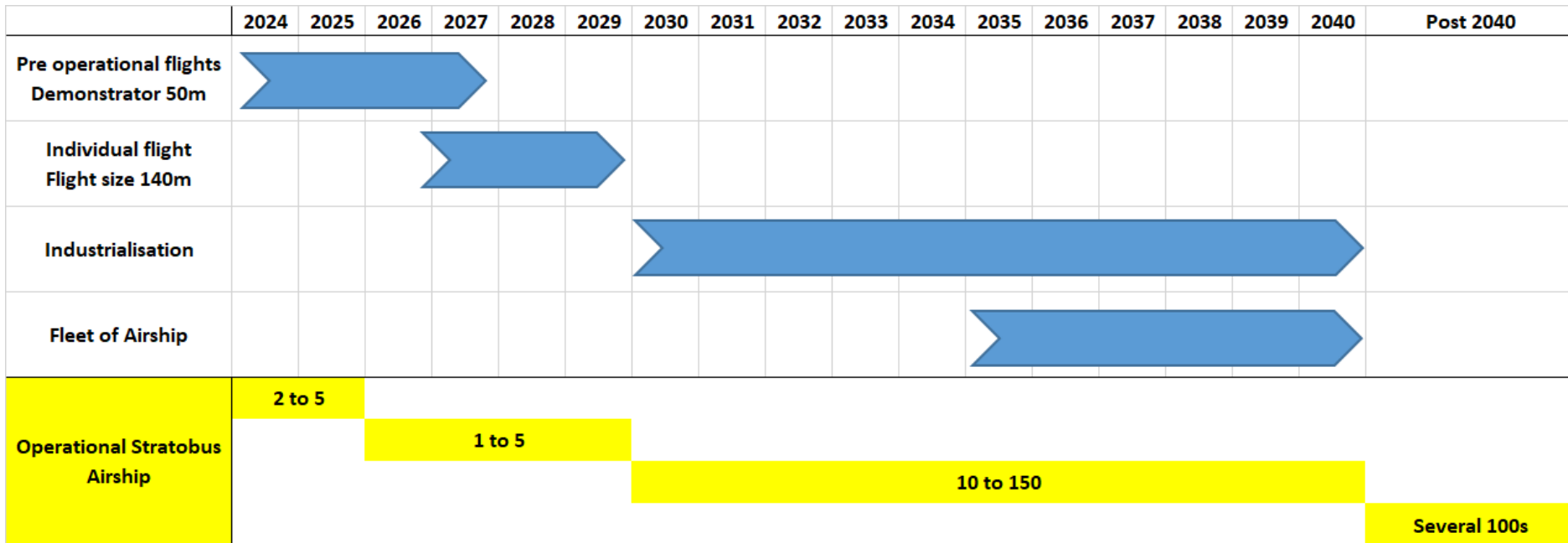
\*\* Global Navigation Satellite System



# GLOBAL ROADMAP



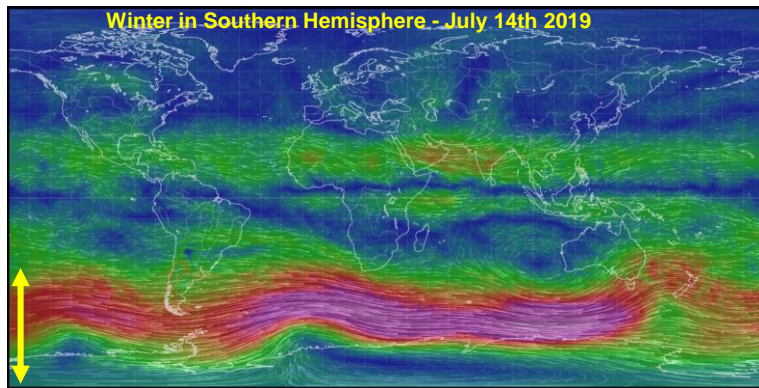
# HOW MANY STRATOBUS™ AND WHEN ?





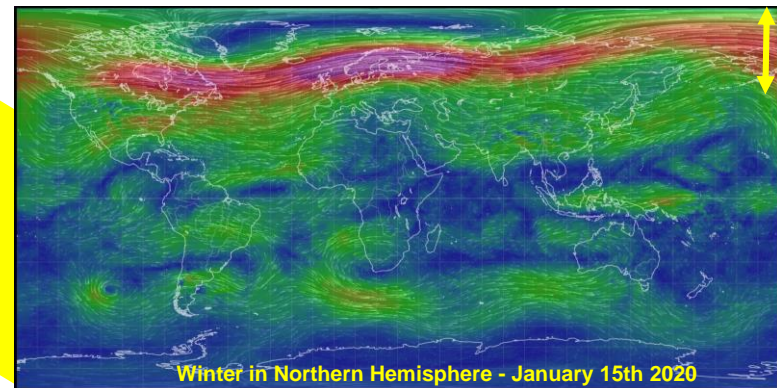
# WHERE AND WHEN TO FLY IN STRATOSPHERE DURING THE YEAR ?

/// Wind speed @ 70hPa - Lower Stratosphere (~17.5km)



Courtesy Earth.nullschool.net

Fly zone  
(latitude)  
for solar  
powered  
HAPS



Courtesy Earth.nullschool.net

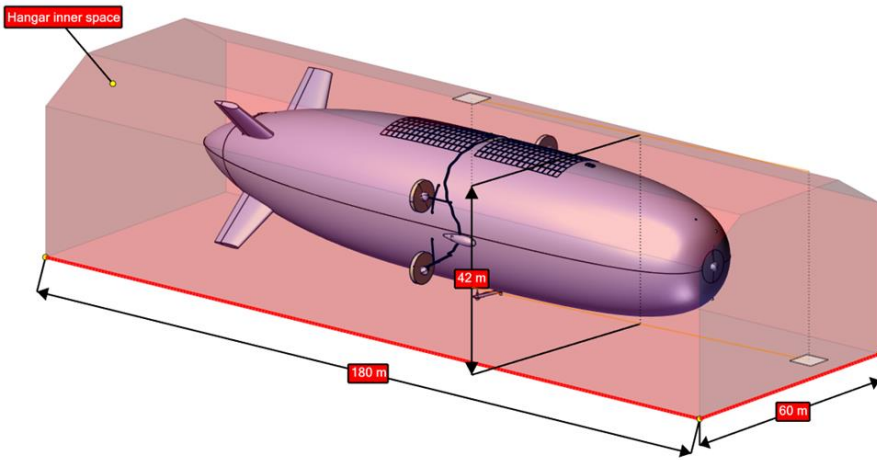
No Fly  
zone

/// High latitude cannot be operated in Winter season due to combination of:

- High wind speed
- Short day duration to charge batteries for night flight

➔ Latitude range limitation versus seasons

# INTEGRATION OF A 140M AIRSHIP REQUEST LARGE FACILITY



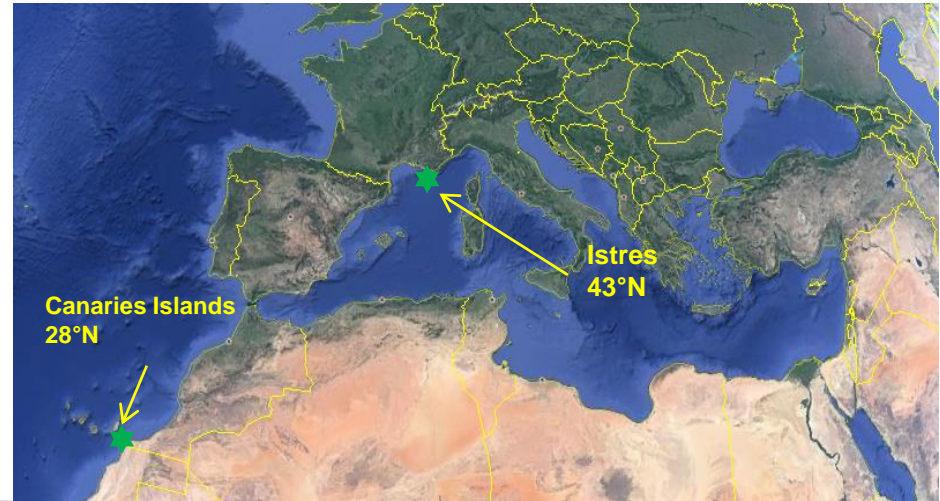
## Hangar inner size

- L.180m x l.60m x h.42m

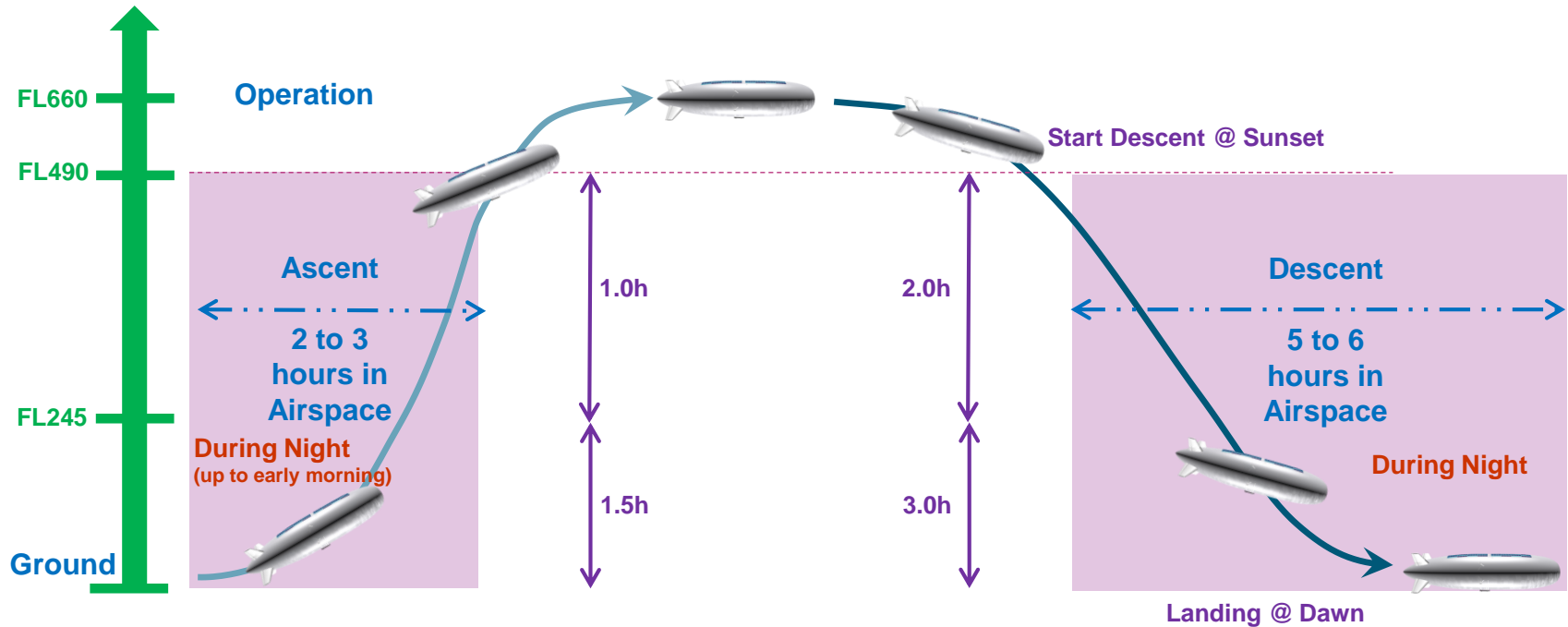
The necessary large infrastructure induces that Stratobus™ airbase will be in a limited specific location

Limited number of infrastructure induces long transfer in stratosphere to reach operation area

- Several 1000s km of transit



# CROSSING AIRSPACE - FLIGHT PROFILE

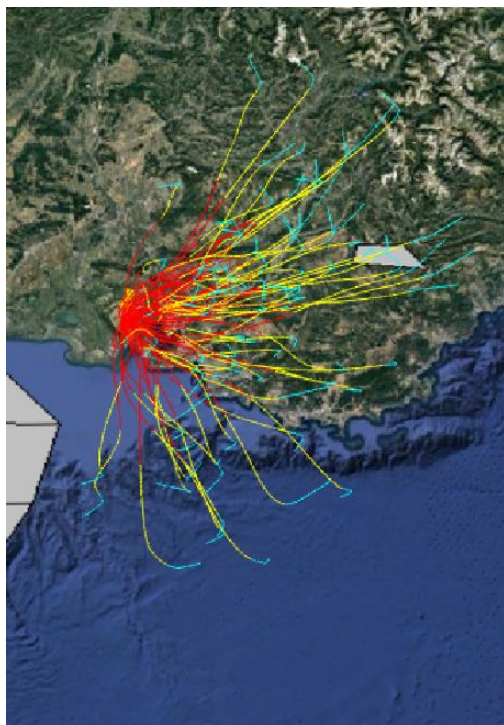


# ASCENT & DESCENT FROM FRANCE - ISTRES

Ground – FL245 → [0 ; 7400]m

FL245 – FL490 → [7400 ; 14900]m

> FL490 → > 14900m



Ascent trajectory elongation of  
150km to 250km

Descent trajectory elongation of  
400km to 500km

/// Large trajectory volume

➔ Requesting segregated airspace has no  
sense

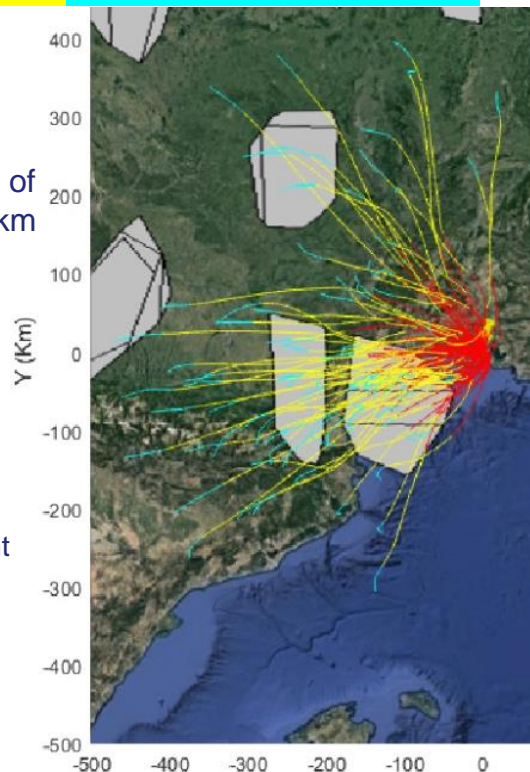
/// Airship airspeed is very low (<20m/s  
in troposphere)

➔ Airship could be assimilated as a fixed point  
in the flow of airplanes

➔ Tactical separation, in cooperation  
with ANSP

X (Km)  
-50 0 50 100 150

Grey polygon corresponds to segregated airspace for military operation and flight tests



Y (Km)  
400  
300  
200  
100  
0  
-100  
-200  
-300  
-400  
-500

X (Km)  
-500 -400 -300 -200 -100 0

Date: 21/04/2022

Ref: Not referenced

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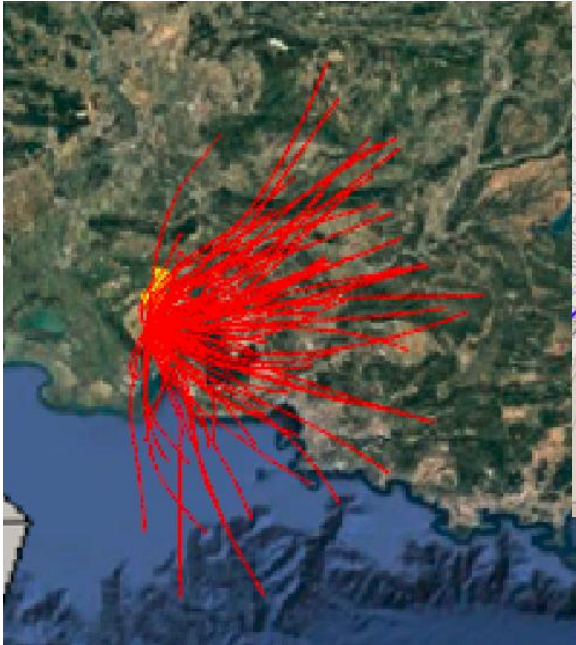
ThalesAlenia  
Space



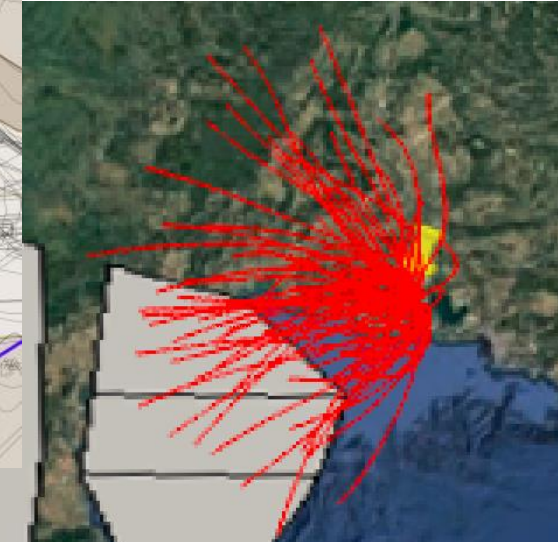
# STRATOBUS™ ASCENT & DESCENT [0 ; 8]AM – 18/07/2019

/// Lower level – Ground to FL245

Ascent → 1.5h



Descent → 3h

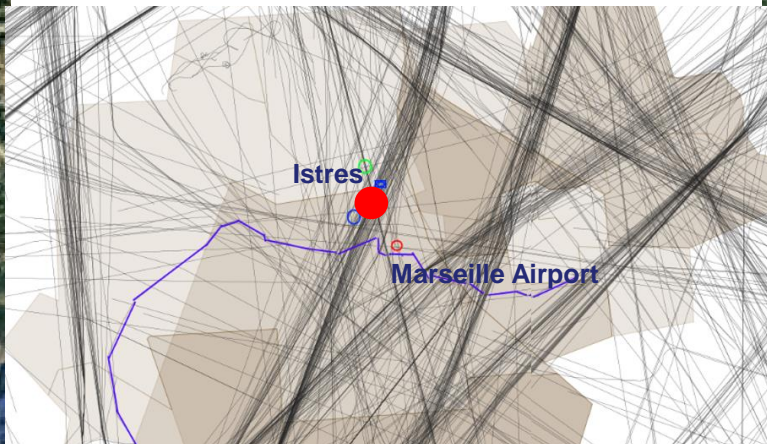
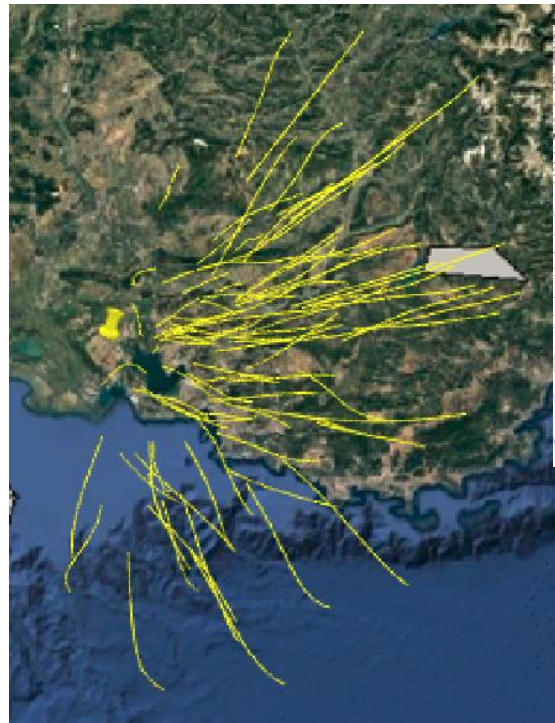


*Grey polygon corresponds to segregated airspace for military operation and flight tests*

# STRATOBUS™ ASCENT & DESCENT [0 ; 8]AM – 18/07/2019

///Upper level – FL245 to FL490

Ascent → 1h



Descent → 2h



*Grey polygon corresponds to segregated airspace for military operation and flight tests*

# STRATOBUS™ IN HIGHER AIRSPACE

## /// Our missions → Focused on Ground spot

- / Station keeping at a dedicated location → Cylinder of few km diameter
- / Pattern trajectory to cover a dedicated area (as for SAR\* or ISR\* mission)
- **Stable localization of the vehicle is mission key point**

## /// Our Vehicle

- / Low airspeed in higher airspace < 30m/s
- / Low maneuverability
- / Fixed altitude, driven by buoyancy → variation < 300m
- **Low level of adaptability**
- **On-board Sense and Avoid System will not be efficient**

## /// Our expectation from Higher Airspace Traffic Management

- / Mission Station keeping volume requirement should be defined as sanctuary
- / Conflict forecasting shall be the essence, to provide enough time for our slow vehicle to react
- Permanent tactical separation ?
- / Pattern trajectory volume shall be shared to prevent conflict – 24h / 48h / 72h

SAR\*: Search And Rescue

ISR\*: Identification, Surveillance and Recognition



# WHAT STRATOBUS™ WOULD NEED TO OPERATE ?

## /// Lower and Upper Airspace → Tactical separation in cooperation with local ASNP

- / Crossing lower airspace < FL245 in early morning before Airport start of operation, for both Ascent & Descent
- / Crossing upper airspace [ FL245 ; FL450 ] at Ascent at the beginning of daily operation, before full traffic
- / Crossing upper airspace [ FL245 ; FL450 ] at Descent during the night

## /// Higher Airspace

- / Mission Station keeping volume requirement should be defined as sanctuary
- / Conflict forecasting shall be the essence, to provide enough time for our slow vehicle to react
- / Pattern trajectory volume shall be shared to prevent conflict – 24h / 48h / 72h