# Operations above FL600
# French perspective

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# LARGE EXPERIENCE ON SPECIAL FLIGHTS & OPERATIONS


Supersonic
Concorde (Daily)

(routine possible mostly with certified aircraft)

Quaterly

Rafale in interception flight (Hourly)

Launches from Kourou CSG
ARIANE, SOYOUZ, VEGA
(monthly)

- Concorde supersonic aircraft
- Stratospheric balloons and gliders
- Rocket launches

- Civil and military hourly cooperation
- Guidance to the innovative projects

# EXAMPLES OF FL600+ PROJECTS

## SUBORBITAL AIRCRAFT SYSTEMS (LOCAL, A-TO-A)

**'SpacePlane'** Airbus

**'VSH : Véhicule Suborbital Habité'** Dassault Aviation

**'VEHRA'** Suborbital Reusable Launcher Family
Dassault Aviation

## HIGH ALTITUDE PSEUDO-SATELLITE (HAPS)

**CNES,** the French Space Agency
leader in Stratospheric balloons
Ops since 1962


**'Stratobus'** Thales Alenia Space

**'Zephyr'** Airbus

## AIR-LAUNCH SYSTEMS


**'DANEO'**, a dedicated micro-satellites airborne launcher
Dassault Aviation

**'ALTAIR'**, '*Air Launch space Transportation using an Automated aircraft and an Innovative Rocket'.*
European H2020 project coordinated by
ONERA, the French Aerospace Lab
+ 8 partners in Europe

# FROM TRIALS TO MORE ROUTINE OPS?

ANSP will have to face a very large diversity of FL600+ projects and contexts:

- **very diverse** in terms of *technology readiness levels, concepts of operations, manoeuvrability, reliability and safety levels, certified or not, (Air)Craft, manned/unmanned, fully or less automated, or piloted, various speeds (slow balloons and gliders vs hypersonic rocket-powered vehicles) …*

**How to accomodate such a diversity?**

Key enablers to make it possible ?

- differentiation between the very diverse FL600+ Ops, in particular differentiate the Space Operations *(incl. launch, re-entry),* from other higher airspace Ops
- regulation & certification for the (air)craft, operation, crew licensing ..
- joint mission preparation and contractual arrangements
- In the longer term, dynamic management of airspace adapted to the systems' *performance, reliability, safety, manoeuvrability, predictability and flight profile*
- position reporting and surveillance
- live communication with pilot/commander

# FOCUS ON ‘ALTAIR’ CONOPS

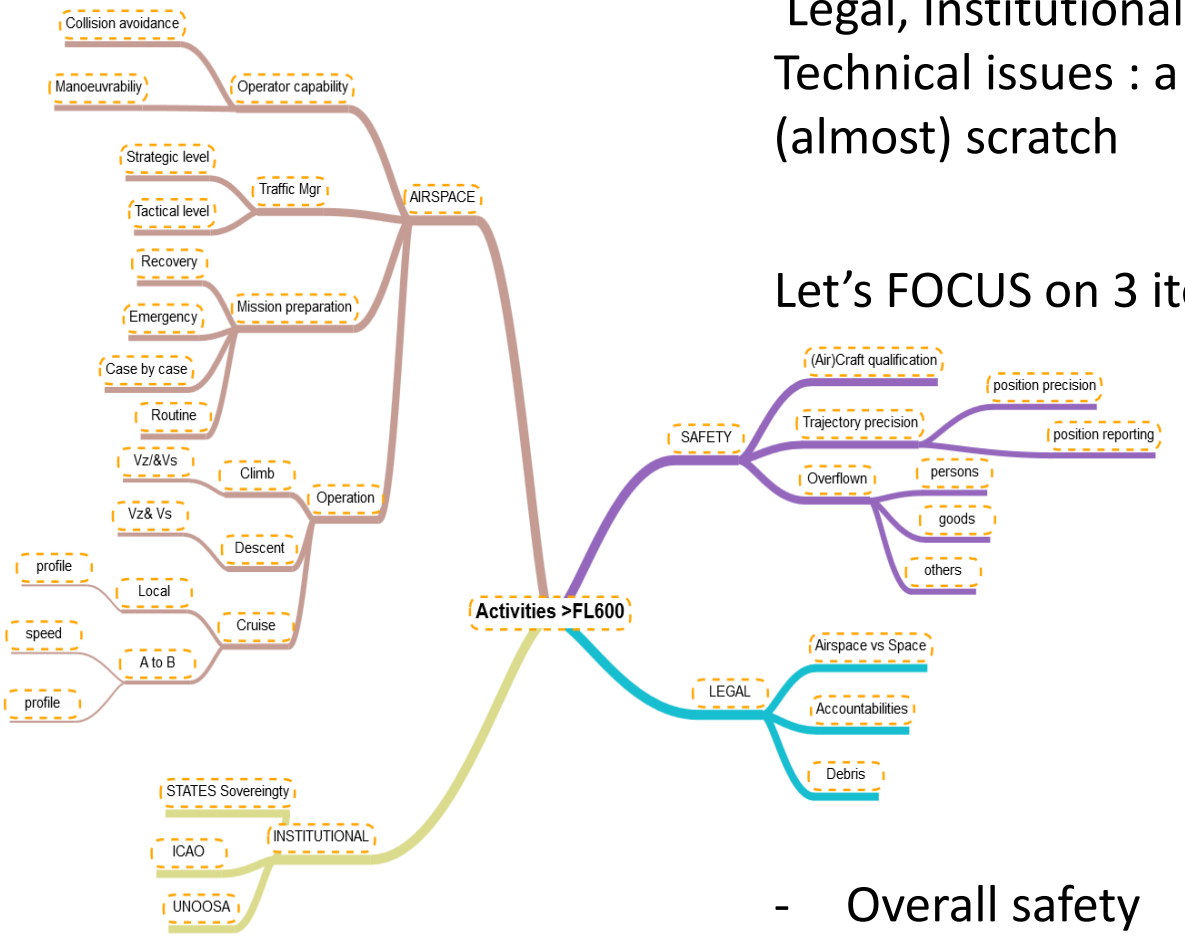
**Payload**
Weight : 150 kg
Reference orbit : SSO @ 600 km

**Launcher**
2 main stages with hybrid propulsion
1 orbital module with H2O green propulsion
GLOW : 26.6 tons
Length : 18.4 m

**Separation point**
Altitude : 12 km/ FL 360
Speed : Mach 0.65
Flight path angle : 20°

**Reusable Automated Carrier**
MTOW : 64.5 tons
Wingspan : 55 m
Length : 42 m

# PREPARING THE BASICS FOR THE HIGHER (AIR)SPACE



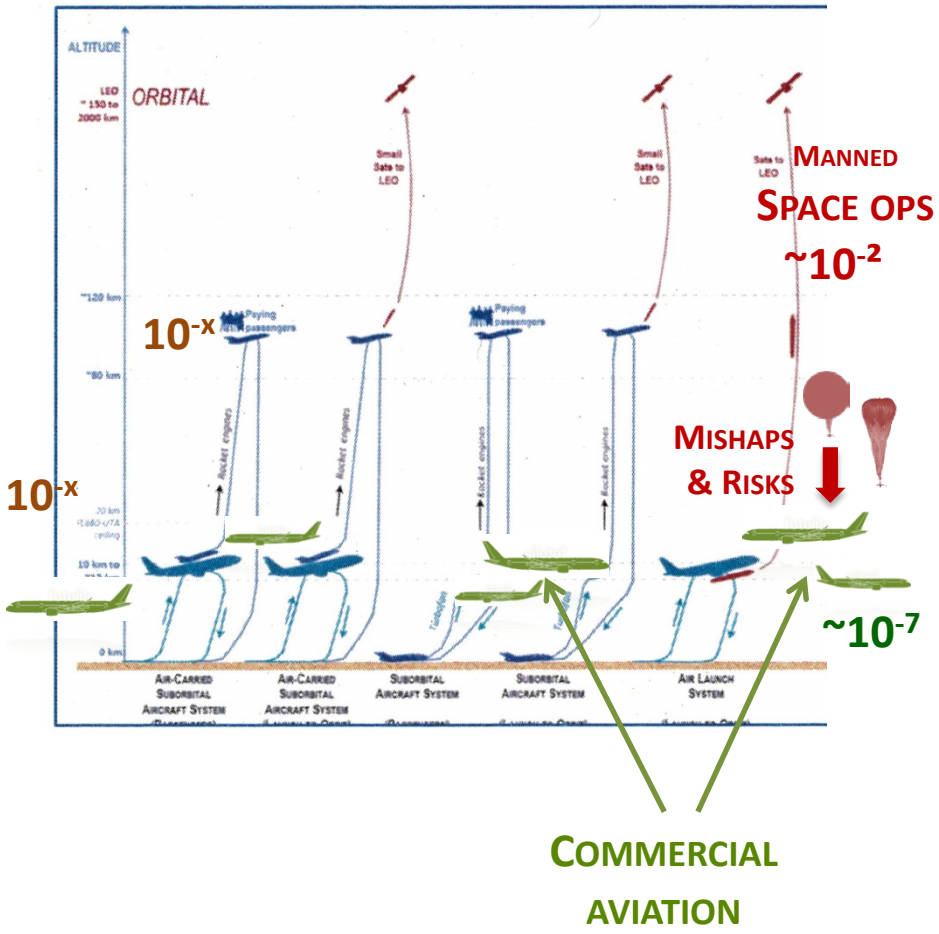

Legal, Institutional, Operational and Technical issues : a mind map from (almost) scratch

Let's FOCUS on 3 items:

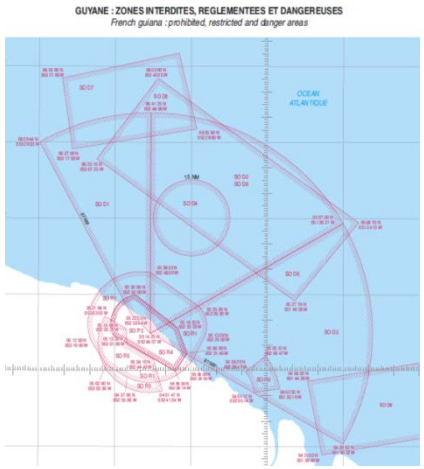
- Overall safety
- Integration with other traffic
- Airspace management

# 1 -MAINTAIN A HIGH LEVEL OF SAFETY FOR ALL USERS AND THIRD PARTIES EVERYWHERE

- Certification standard of the (air)craft related to the risk and public acceptance
- Protection of commercial air transport is part of the overall safety assessment
- SORA *(risk assessment method for drones),* could sound interesting for future HATM
- When paying passengers onboard, an acceptable level of safety (ALOS) should be defined for the certified suborbital vehicle or system, and for the operation.

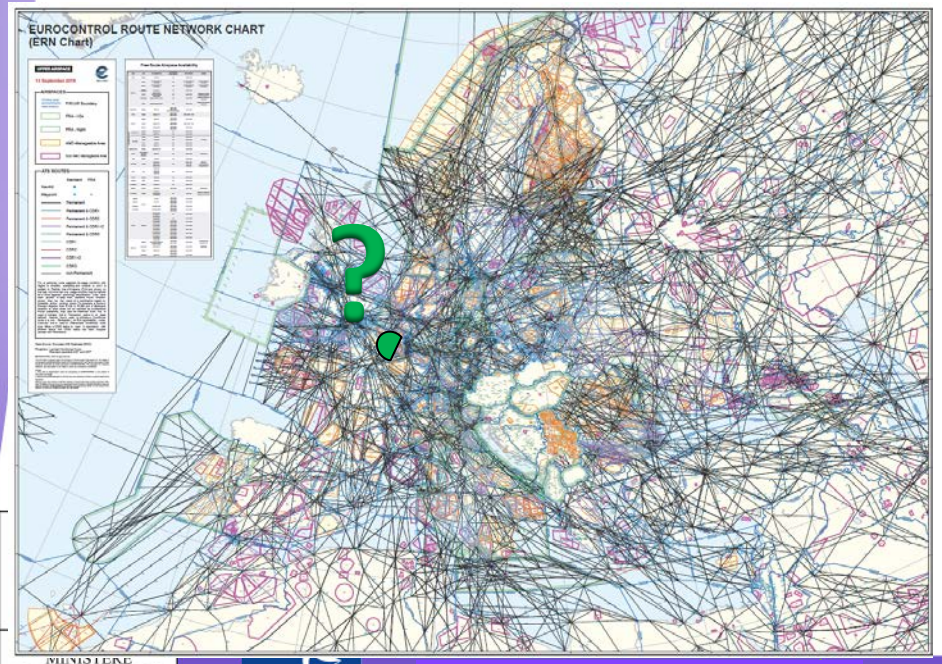


# 2- INSERTION WITH OTHER TRAFFIC

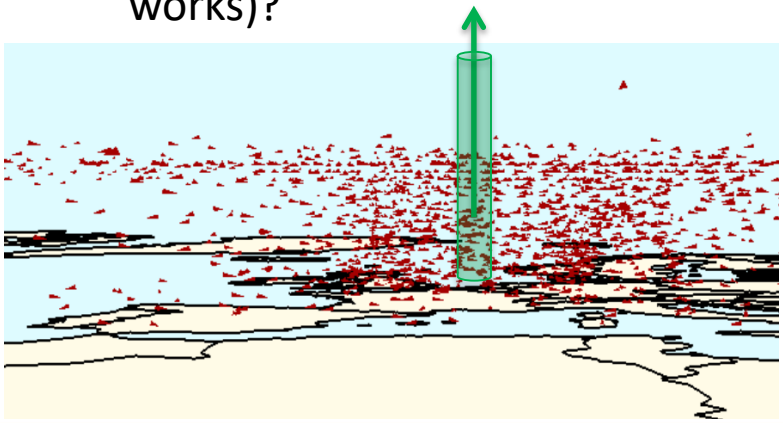



- Kourou Space Center (CSG) airspace designed purposely for each type of space operations
- derived from LOS* rules and application of FUA procedures : Impact zone assessment, mission preparation, airspace allocation and live coordination

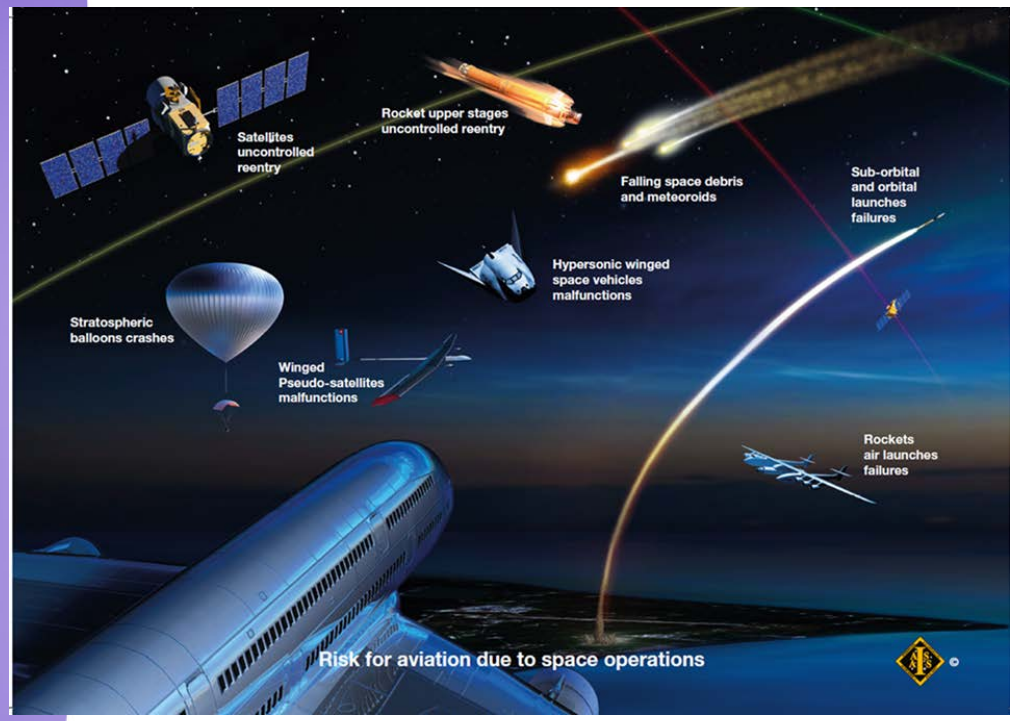
* loi des opérations spatiales 2008




- New tools for free routes airspaces (FRA) context : traffic avoidance, deconfliction, separation standards (cf SASP works)?



# 3 - AIRSPACE MANAGEMENT




Source : IAASS

- Airspace is “open” by nature with International, European and National rules (e.g. ICAO, UNOOSA, EU, EASA…)
- Its management is given by delegation of a public service, with an associated business model
- Under the Chicago Convention, each State has complete and exclusive sovereignty over the airspace above its territory. Defence, security and police Ops also take place in airspace
- The efficient use of airspace will shape the Airspace design and management (ASM)

# CONCLUSIONS

Once mature, reliable and safe as acceptable, very diverse new entrants are legitimate to pioneer the higher Airspace. It is important to differentiate between the diverse higher airspace operations, especially the requirements for space operations.

To be accepted into airspace, 'FL600+ new entrants' will need to show safety, reliability, predictability and also accommodate with:

- legacy airspace users,
- airspace management under FL600,
- each State's complete and exclusive sovereignty over the airspace above its Territory.

Other potential FL600+ Ops issues : *Legal issues, liability, insurance, export-control, environmental issues, risks for third parties, etc.*

France, largest ANSP in Europe, with a strong and innovative aerospace Industry, welcomes the development of FL600+ new entrants

# THANK YOU