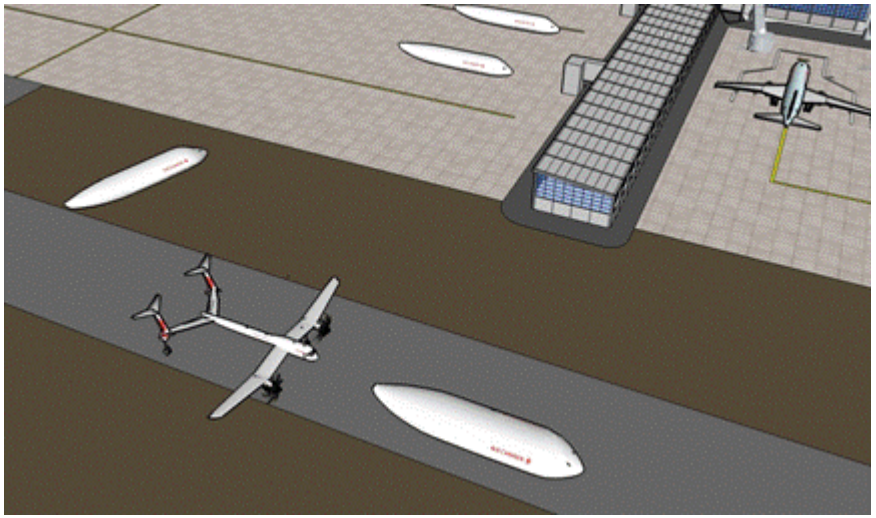

# Project description for TRL2
# Dec. 2013

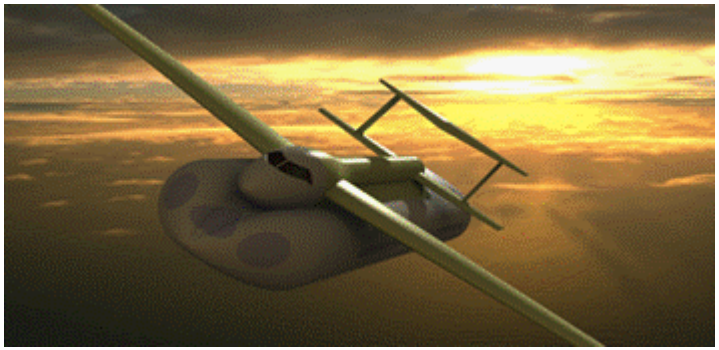
# Project origin


A bee and its pollen basket



Goal : reduce by 50% cost of flight hour

# Bee-Plane orientations for TRL2

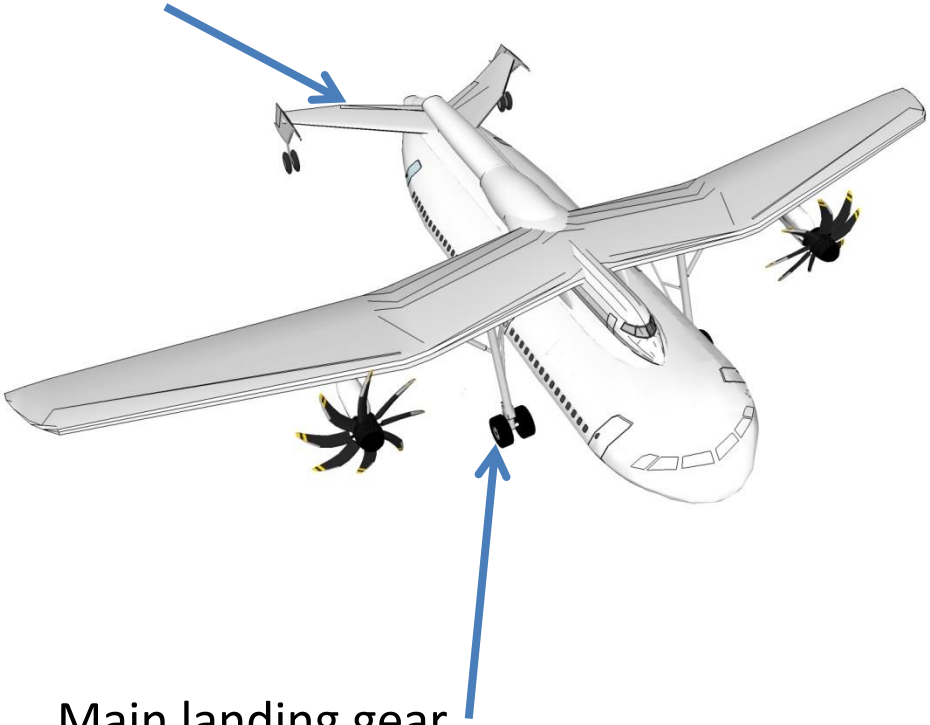


Detachable fuselage
Size of an Airbus A321
200/220 PAX
Overall load 100 T
Multi usage baskets

Engines : 2*TP400 + 1 central Sam146
Rear landing gear twin taildragger
Reverse U Tail

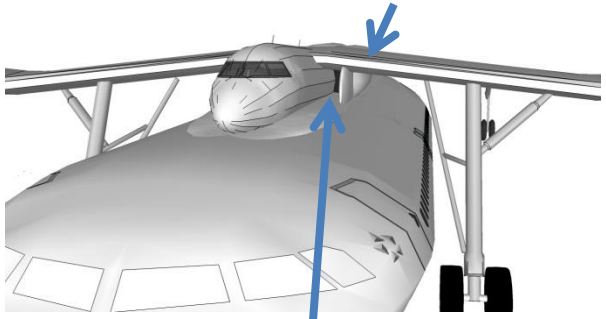
# Updated configuration

Tail : upside down U shape



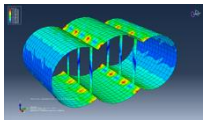
Main landing gear

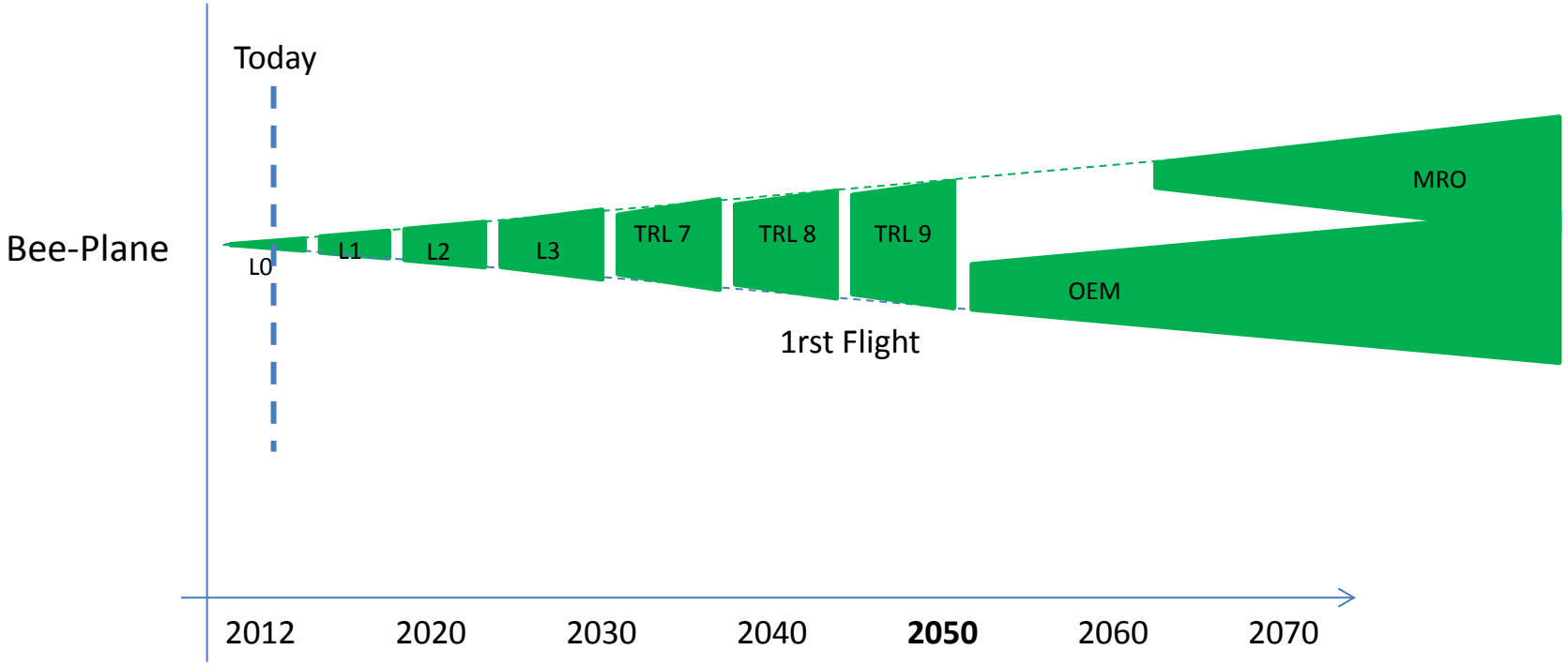
High main wing



Air inlet for central turbofan

# Projet 2050 vision



# Bee-Plane – Future markets

Airbus


Nearly 20 000 aircraft to be delivered in 20 years

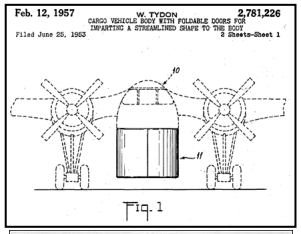
Boeing

Nasa

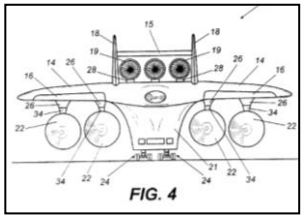
10% of market represents 160 Md$

# Bee-Plane - State of the art

Fairchild XC-120 (US)
Years 1950s




Large flying Wing

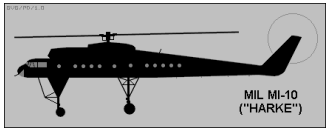



Clip Air (CH)

Helicopter

Skycrane (US)


Mil Mi-10 (RU)




White Knight Two (US)
Load 16t

Configurable Air transport (US)

# Bee-Plane™ Technology review

Fairchild XC-120
Pack Plane (1950)

&

Noise
reduction

Electronic
wiring

Carbon
body

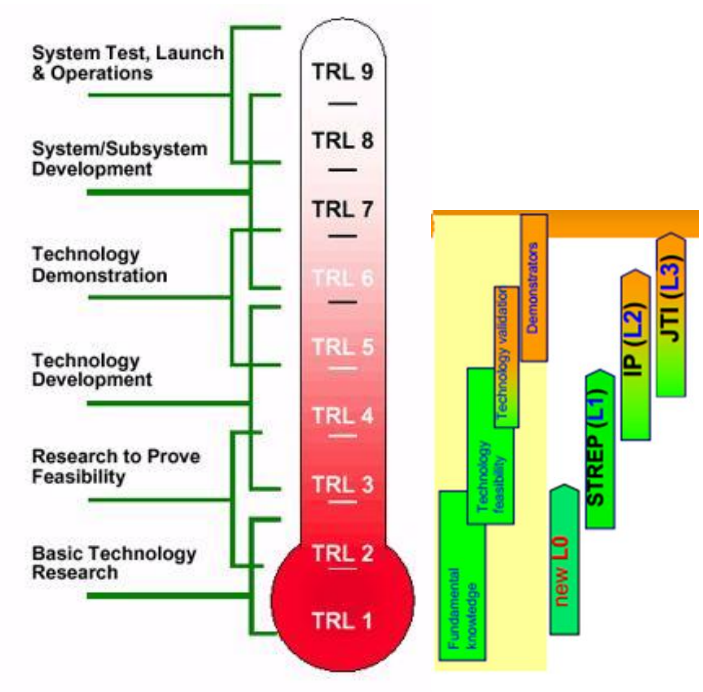
Turboprop
engine (TP400)

=

Double
body

# Vocabulary

- « TRLs » for technical readiness level
- « Levels » for public fundings
  - Level L0 : 1m€ (public funding ~600k€)
  - Level L1 : 5m€ (public funding ~3m€)




| Technology Readiness Level (TRL) - European Space Agency | | |
|---|---|---|
| TRL | Description | Years |
| TRL 9 | Actual system "Flight proven" through successful mission operations | |
| TRL 8 | Actual system completed and "Flight qualified" through test and demonstration (ground or space) | |
| TRL 7 | System prototype demonstration in a space environment | |
| TRL 6 | System/subsystem model or prototype demonstration in a relevant environment (ground or space) | |
| TRL 5 | Component and/or breadboard validation in relevant environment | |
| TRL 4 | Component and/or breadboard validation in laboratory environment | |
| TRL 3 | Analytical & experimental critical function and/or characteristic proof-of-concept | |
| TRL 2 | Technology concept and/or application formulated | 2013/2015 |
| TRL 1 | Basic principles observed and reported | 2012/2013 |

# Main studies

Accoustic

Variable inlet casing

Downward horizontal rear wing

Collaborative project

Landing gear

Engines

Numerical mock-up

loading system

Flight stability

Aerodynamic shape

Fastening system

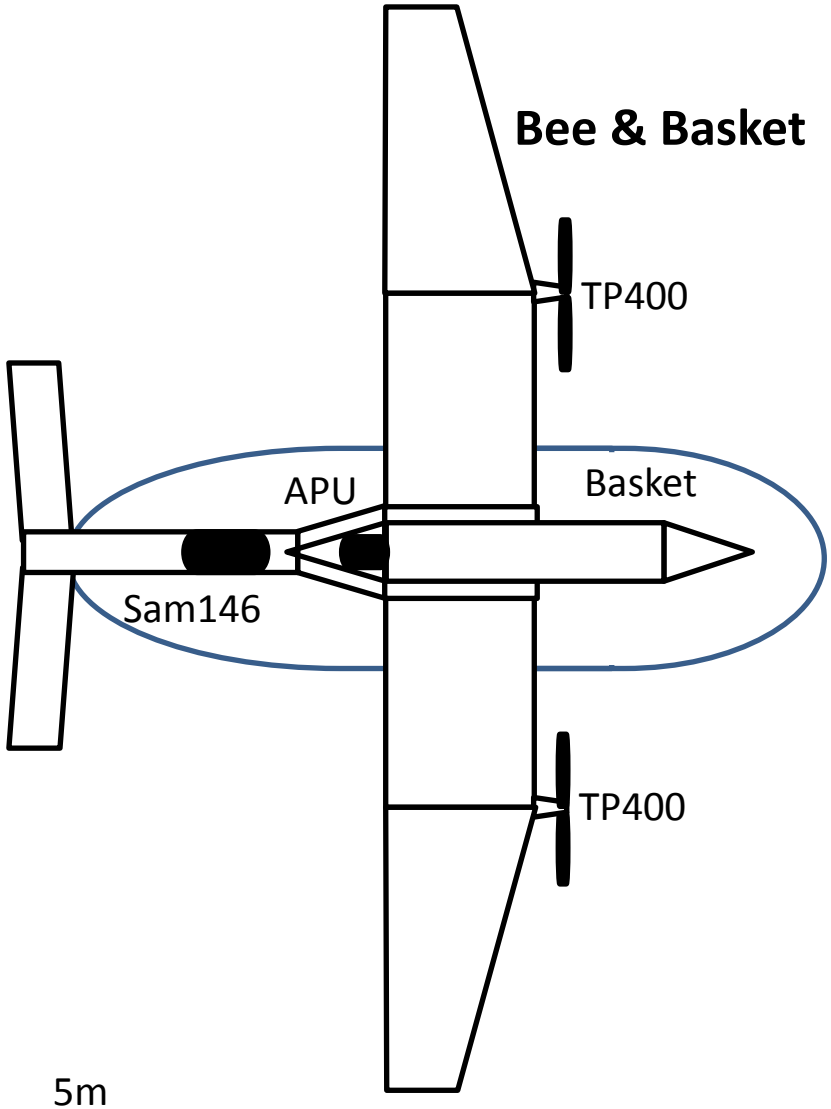
Wings

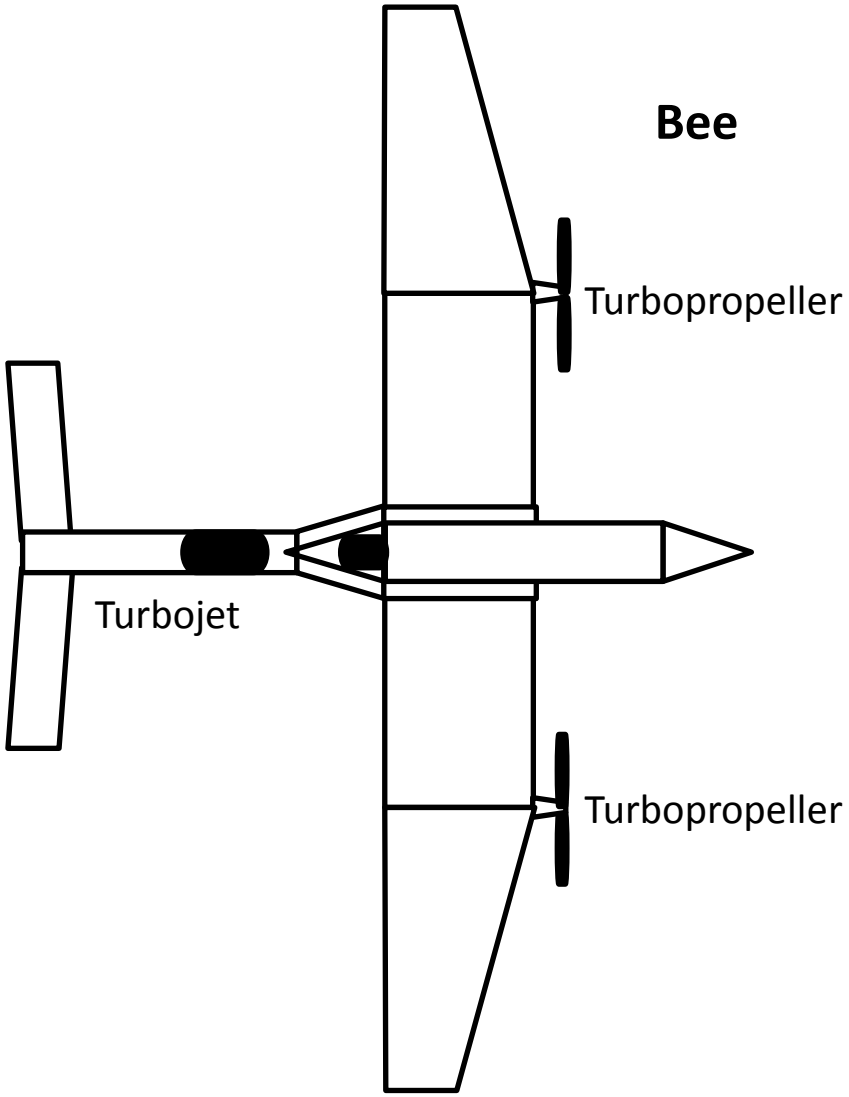
Logistic

Costs

Certification


# Bee-Plane – technical description

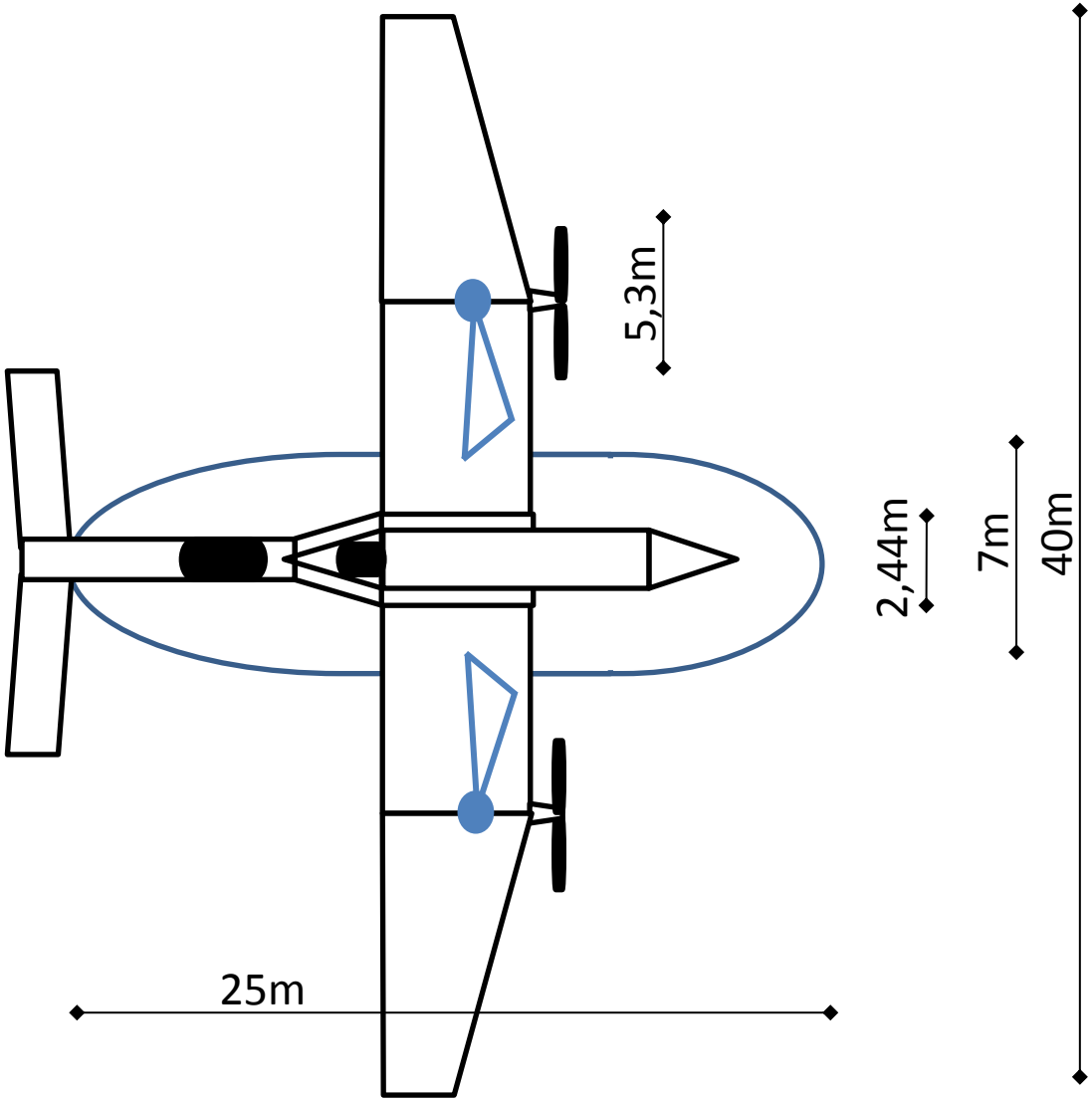


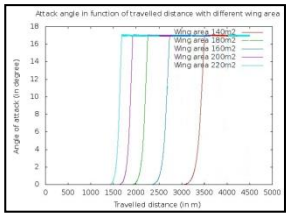



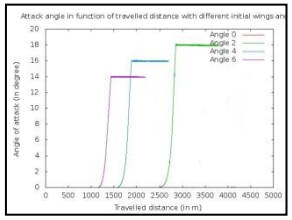



Bee-Plane TRL2 Description - Revision 5-4 – Dec. 11, 2013

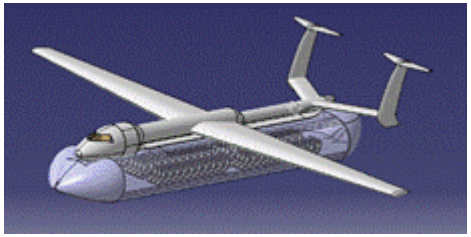
# Bee-Plane



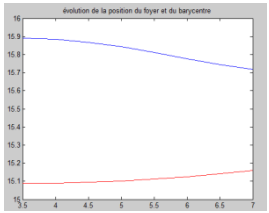




Thrust Analysis - INSA Rouen 2013



Shape and structure - Estaca 2012

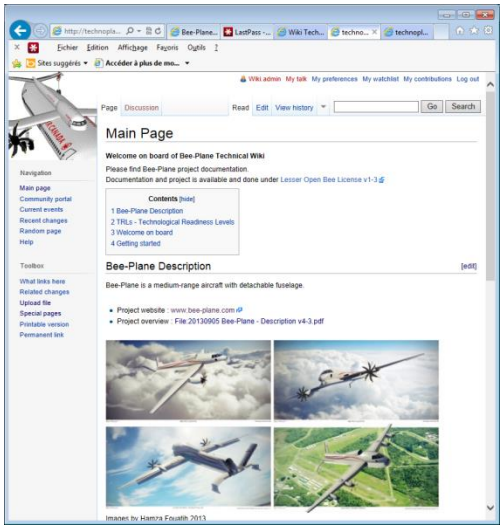



Aero parameters - Centrale Paris 2013

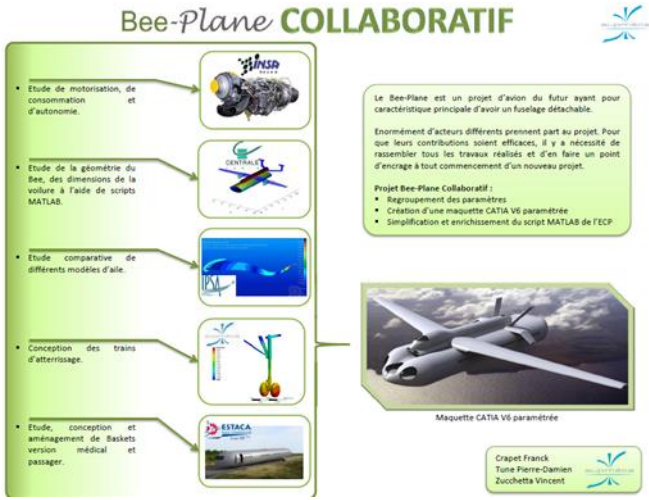
www.bee-plane.com

# Bee-Plane Collaborative project

Lesser Open Bee License 1-3



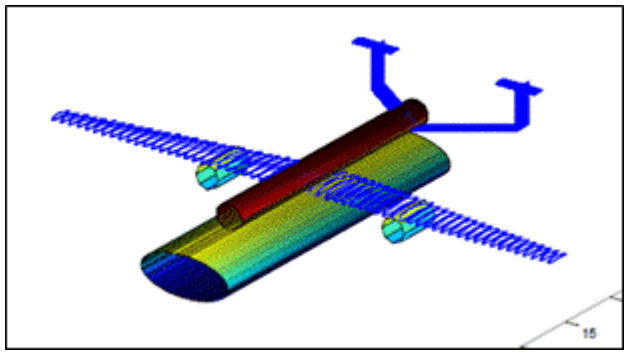

Technical wiki and coordination
Technoplane SAS



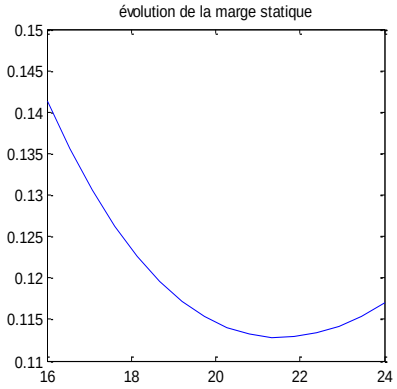

Project wrap-up - Supmeca 2013

http://technoplane.hd.free.fr/MediaWiki/

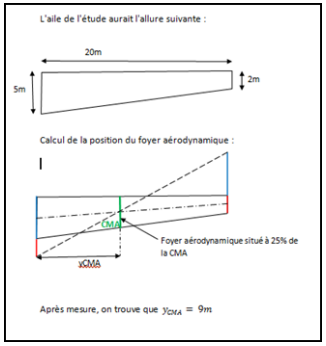
# Flight stability



Centrale Paris 2013



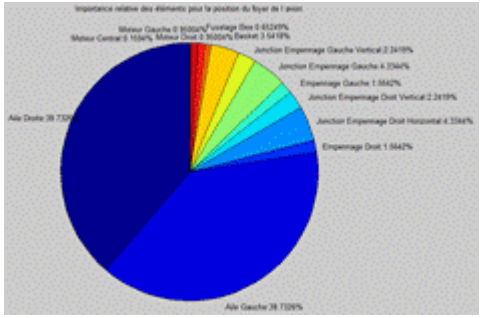

Centrale Paris 2013




Estaca 2012

| Paramètre | Valeur |
|---|---|
| Longueur des ailes | 21 m |
| Corde à la base | 5,3 m |
| Angle de dièdre | 17 ° |
| Incidence | 2,3 ° |
| Rapport des cordes | 0,4 |
| Longueur des empennages | 5 m |
| Corde à la base | 3,5 m |
| Angle de dièdre | 25 ° |
| Incidence | 0 ° |

Hamza Fouatih 2013

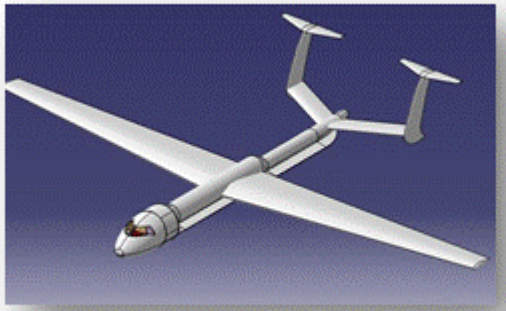


Centrale Paris 2013

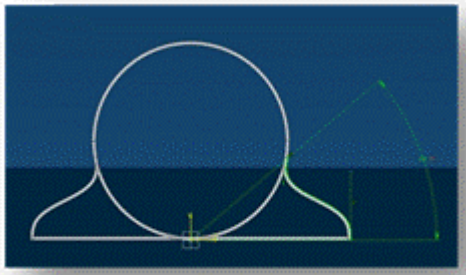
# Bee numerical mock-up

Parametric numerical mock-up - Supmeca 2013

Numerical mock-up - Estaca & Supmeca 2013



Numerical mock-up - Estaca 2013

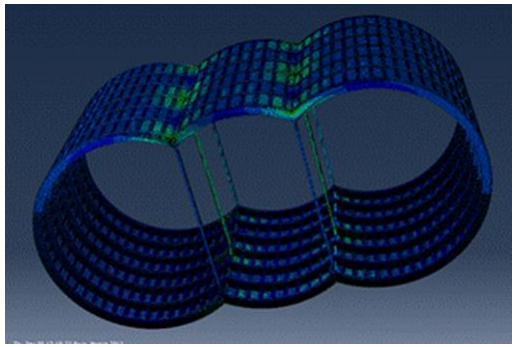


Supmeca 2013

Hamza Fouatih 2013

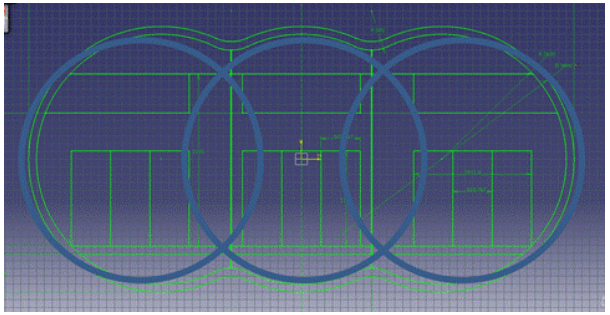
Hamza Fouatih 2013

# Baskets layout

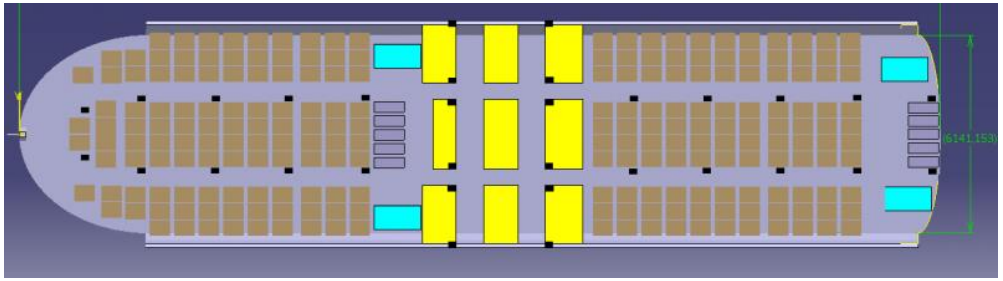


Structural analysis - Estaca 2013

Numerical mock-up - Estaca 2013



Estaca 2013

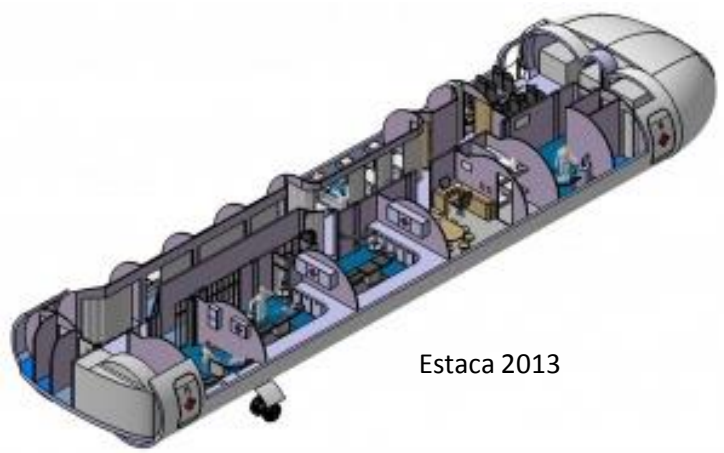


Cabin lay out - Estaca 2013

PAX rows 3+3+3 seats

1 main central passagers door on each side

# Hospital Basket



Estaca 2013

Estaca 2013

Estaca 2013

Estaca 2013

# Water Bomber

# Bee noze and cockpit

Supmeca 2013

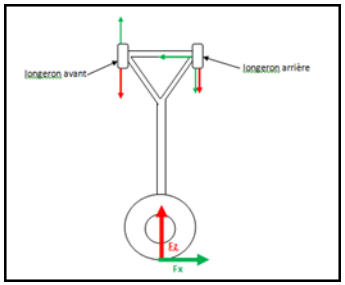
Hamza Fouatih 2013

Hamza Fouatih 2013

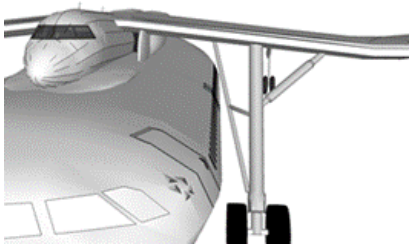

Hamza Fouatih 2013

2 pilots (1 behind each other) or 1 pilot, or none
Glass to check loading and unloading operations

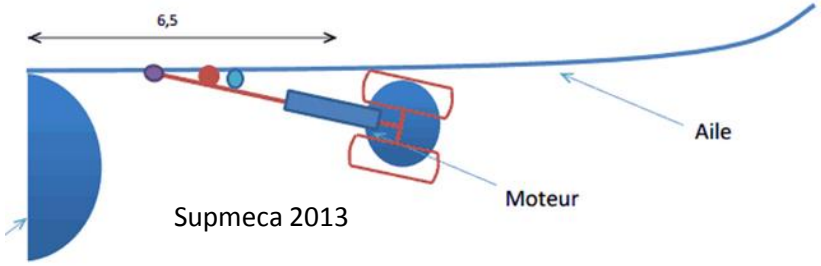
# Main landing gear



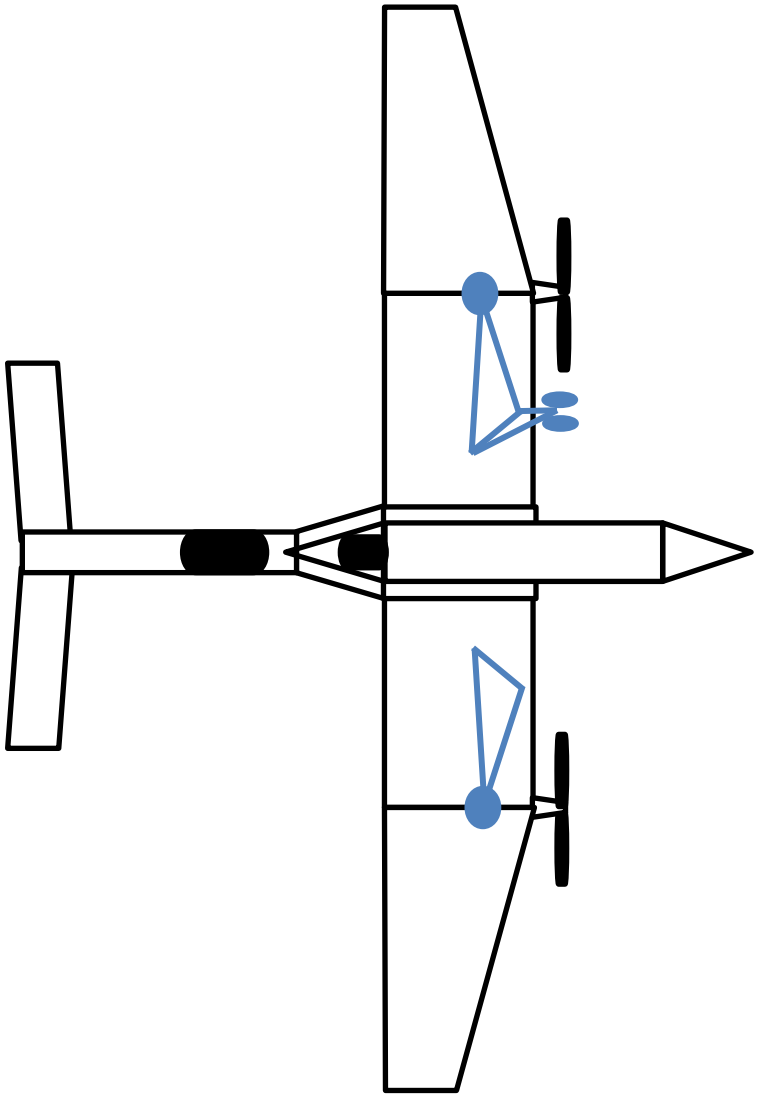

Estaca 2013



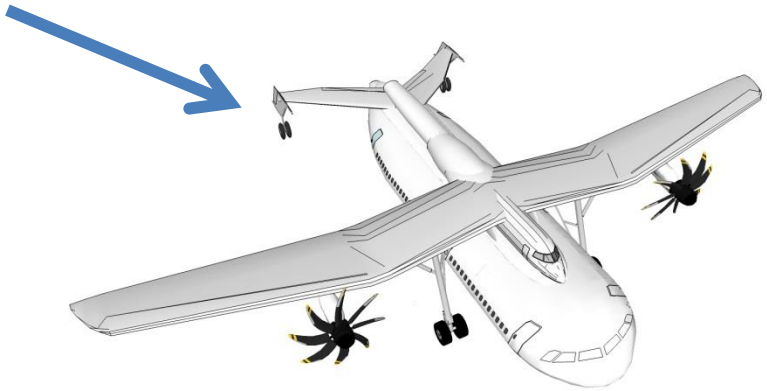
Hamza Fouatih 2013

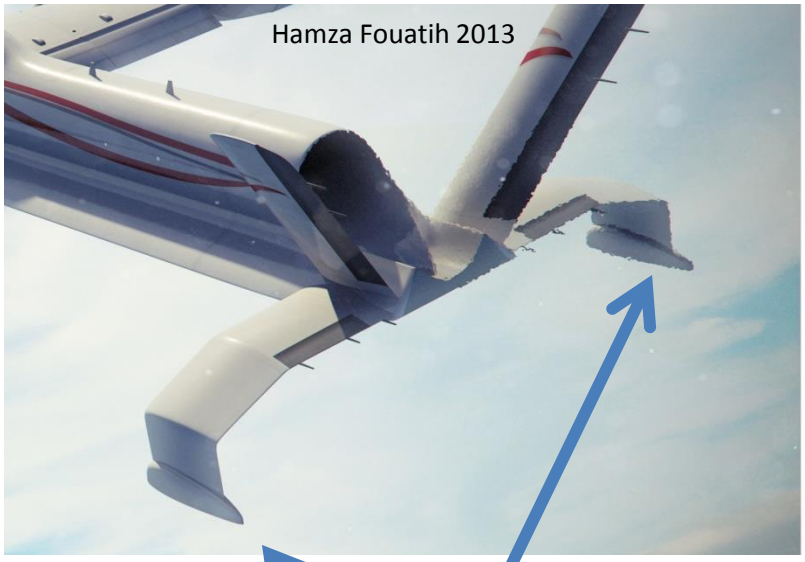



Supmeca 2013



# Rear twin taildragger landing gear

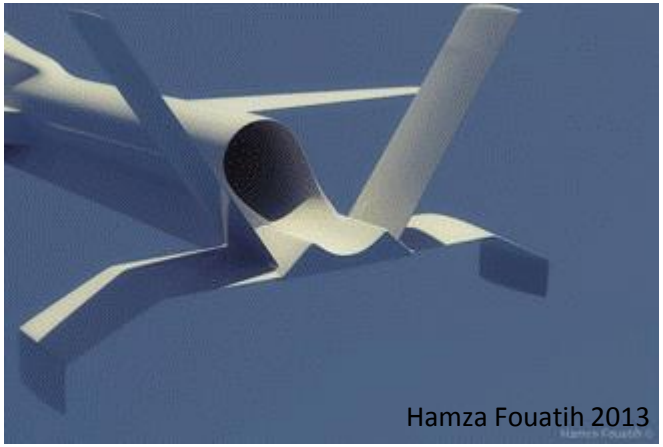




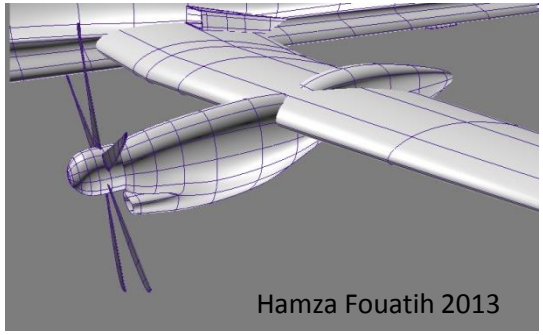

Rear landing gears

# Accoustic studies


Engines noize modelization



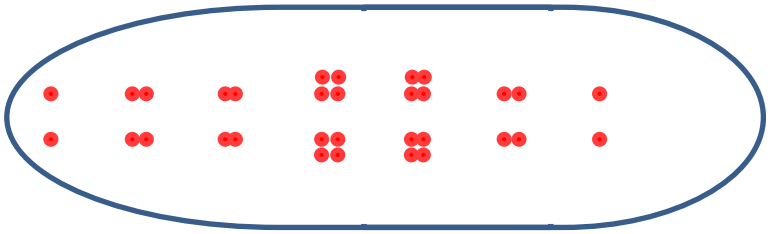

Exhaust and V tail

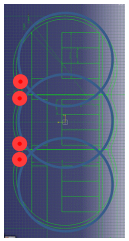


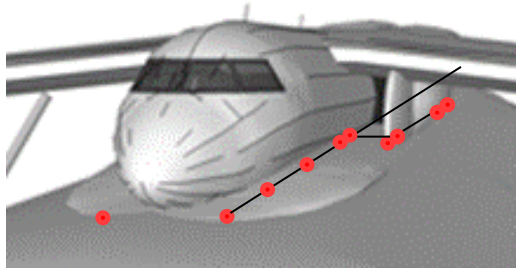

Engines & Fuselage interactions


Engines configurations

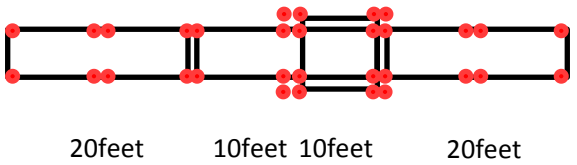
# Iso attach System



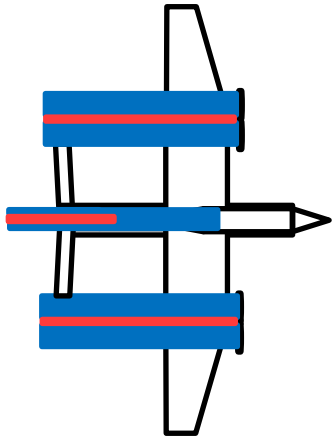


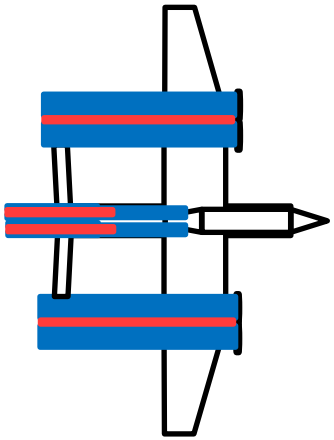


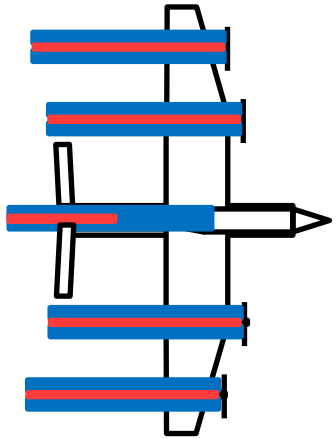




# Engines configurations







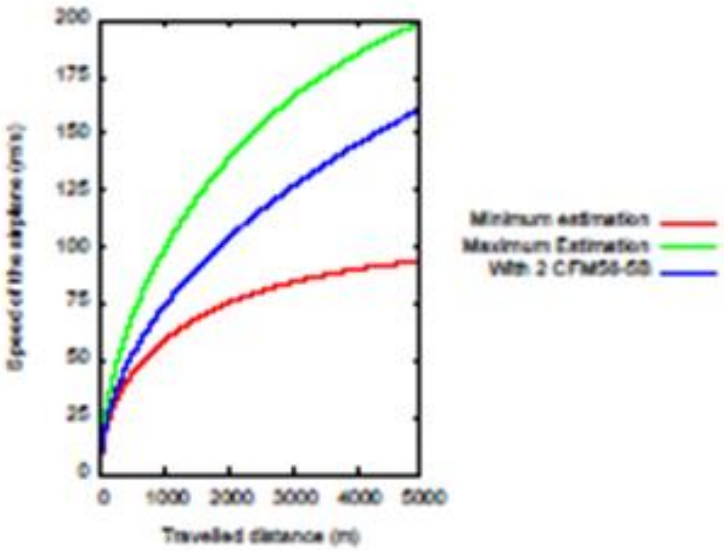
2 Turboprop TP400
1 central turbofan Sam146

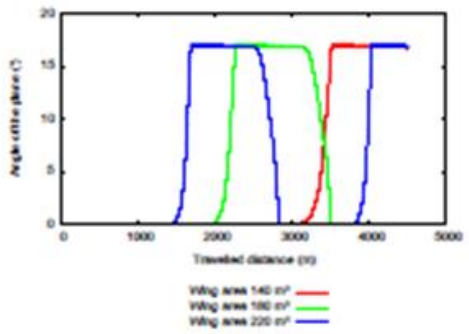
2 Turboprop TP400
2 central turbofan Silvercrest

4 Turboprop Allison T56-A-15 (C-130)
1 central turbofan Sam146

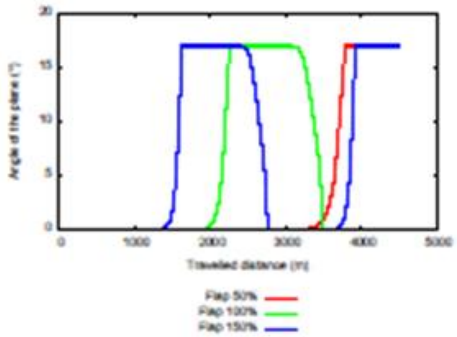
# Engines choice / wings configuration

INSA 2013

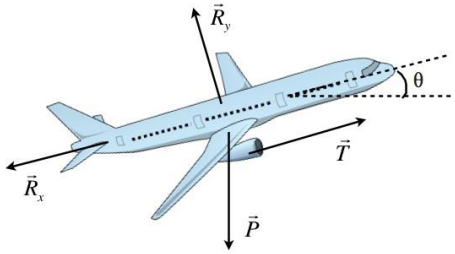


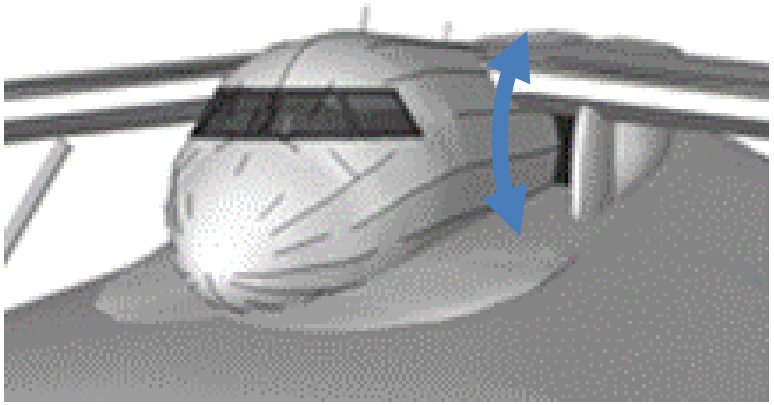

*Results V.2: Angle of the plane with a flap that add 100% of the lift coefficient and an initial wing angle of 3°*




*Results V.1: Angle of the plane with a wing area of 180 m² and an initial wing angle of 3°*



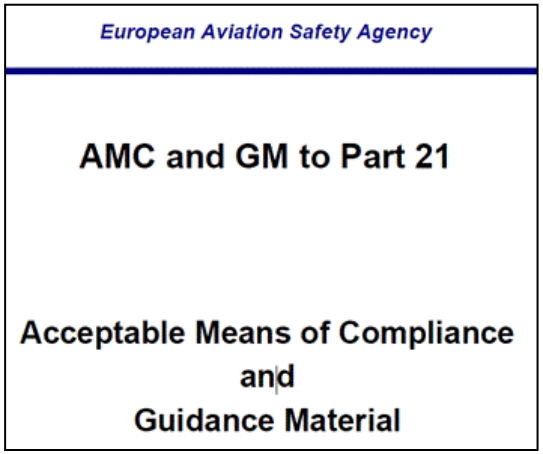
# Air inlet casing for central turbofan



Variable inlet casing ?
closed during cruise flight
and empty flight

# Certification

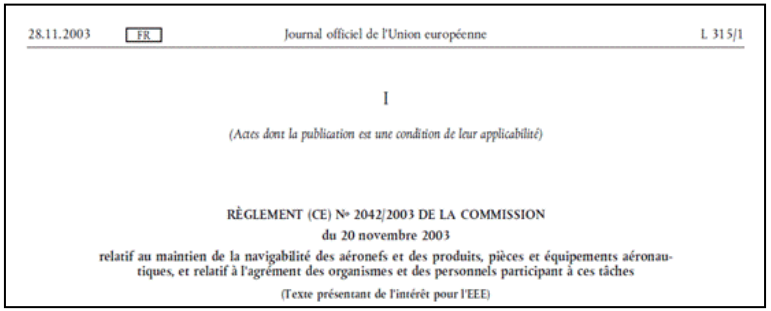
Part 21


European Aviation Safety Agency

AMC and GM to Part 21

Acceptable Means of Compliance
and
Guidance Material

Part 145


28.11.2003 FR Journal officiel de l'Union européenne L 315/1

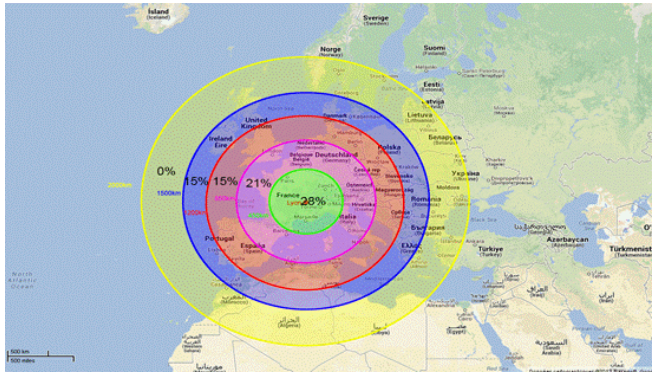
I

(Actes dont la publication est une condition de leur applicabilité)

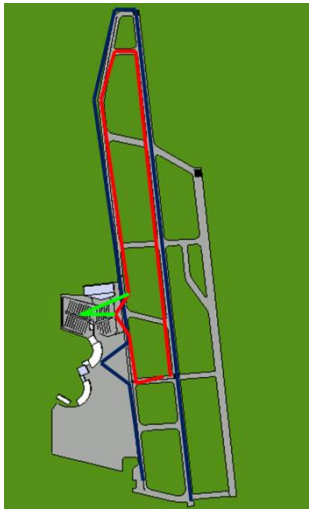
RÈGLEMENT (CE) N° 2042/2003 DE LA COMMISSION
du 20 novembre 2003
relatif au maintien de la navigabilité des aéronefs et des produits, pièces et équipements aéronautiques, et relatif à l'agrément des organismes et des personnels participant à ces tâches
(Texte présentant de l'intérêt pour l'EEE)

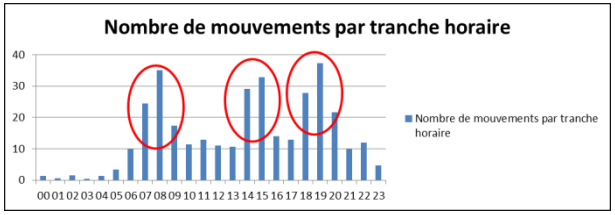
# Economical impact

## Airlines

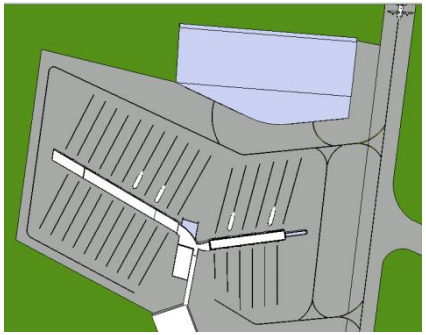



Supméca 2013






## Airports



Supméca 2013

# Project partners

Institution & financial partners :

Coordinator : TechnoPlane

Universities : CENTRALE PARIS, ESTACA ÉCOLE D'INGÉNIEURS, supméca, IFMA INSTITUT FRANÇAIS DE MÉCANIQUE AVANCÉE, INSA ROUEN, TRINITY COLLEGE DUBLIN, EM NORMANDIE, IPSA L'EXPERTISE AÉRONAUTIQUE

Design:

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