APPLICATIONS of the ENGINEERING in the AERONAUTICS

PRESENTED BY:
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AIRBUS

EADS

Date of foundation: July 10, 2000

Foundation companies: Aerospatiale Matra SA
CASA (Construcciones Aeronáuticas SA)
DaimlerChrysler Aerospace AG

Gerhard Schröder | José María Aznar | Lionel Jospin

The heads of government in 2000 confirm the extension of EADS to integrate the three bounding partners

EADS today is the second-largest group in the global aerospace and defence industry, with a unique range of products and services

A Global Leader

EADS
European Aeronautic Defence and Space Company

AIRBUS Commercial Aircraft

No.1

Helicopters

No.1

Commercial Launch Vehicles

No.1

Missile Systems

No.2

Satellites

No.3

Mil.Transport Aircraft

No.3

Military Aircraft

No.4

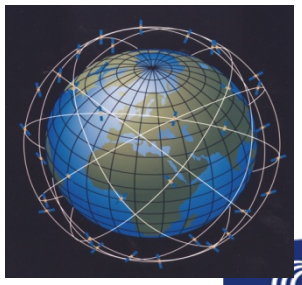
EADS Structure (more than 100.000 employees)

Airbus

Defence and security

Eurocopter

Astrium



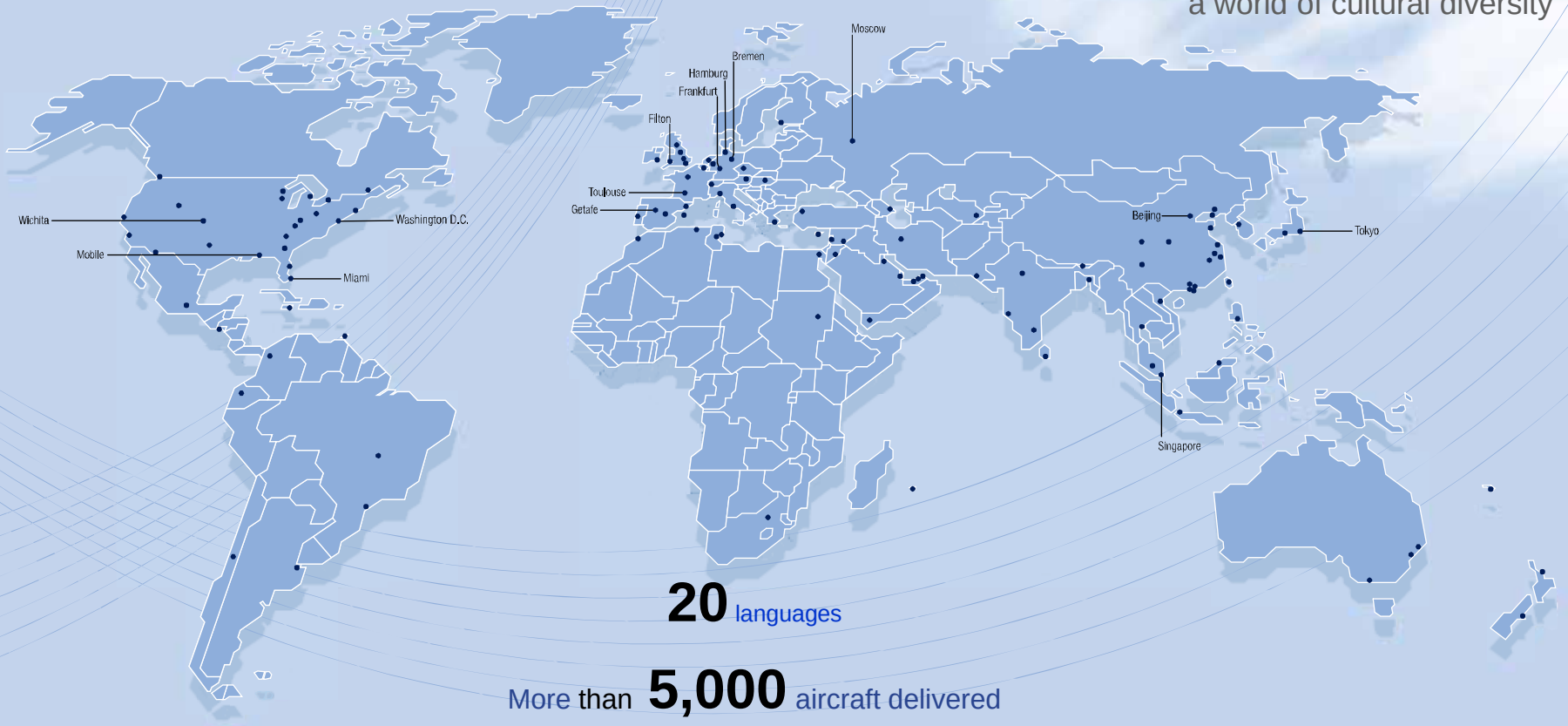
Military Transport

Welcome to Airbus

AIRBUS Global Presence 2007

Gross market share: 51 %

a world of cultural diversity



20 languages

More than **5,000** aircraft delivered

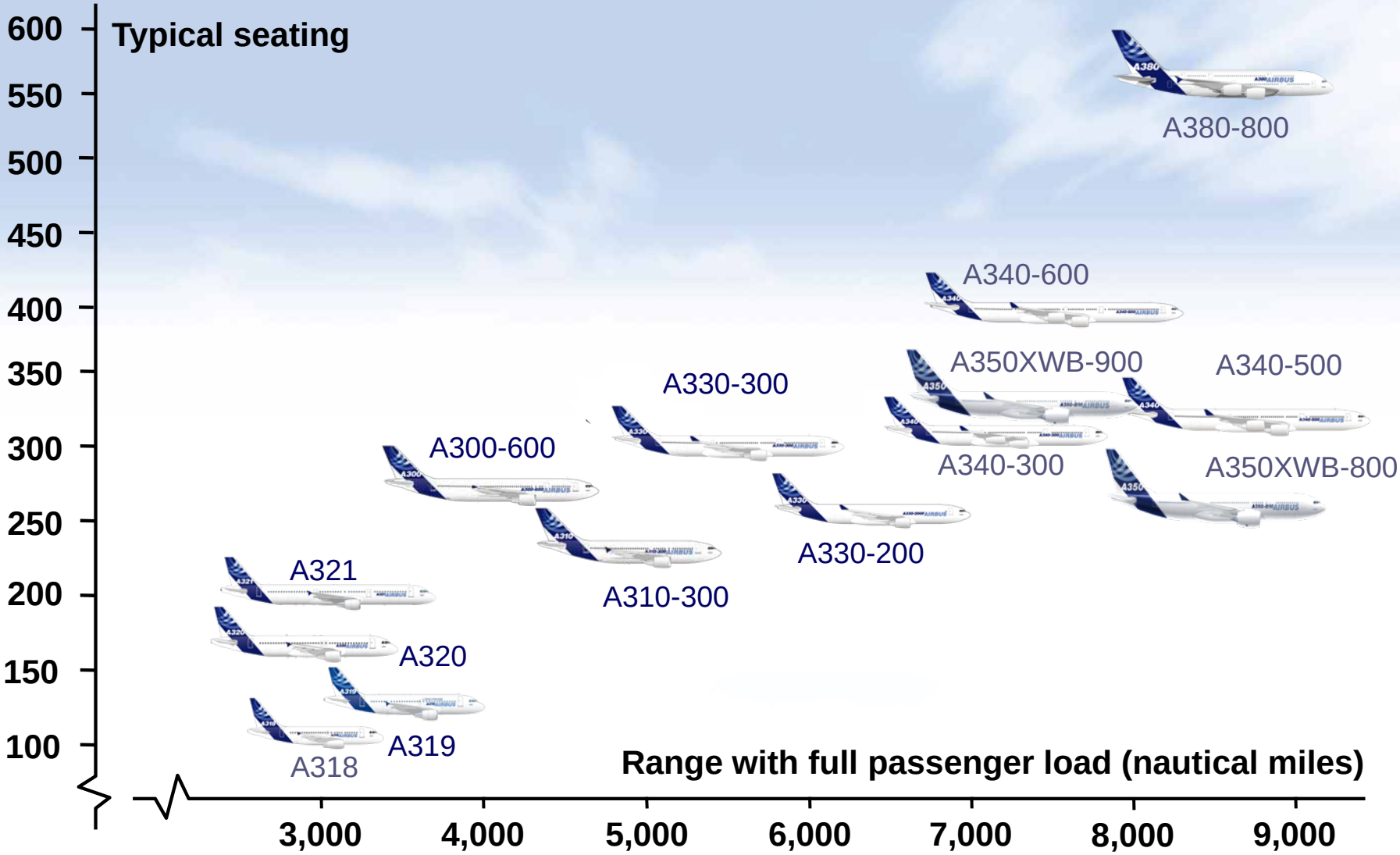
57,000 employees (Airbus Spain 3000 employees)

297 customers

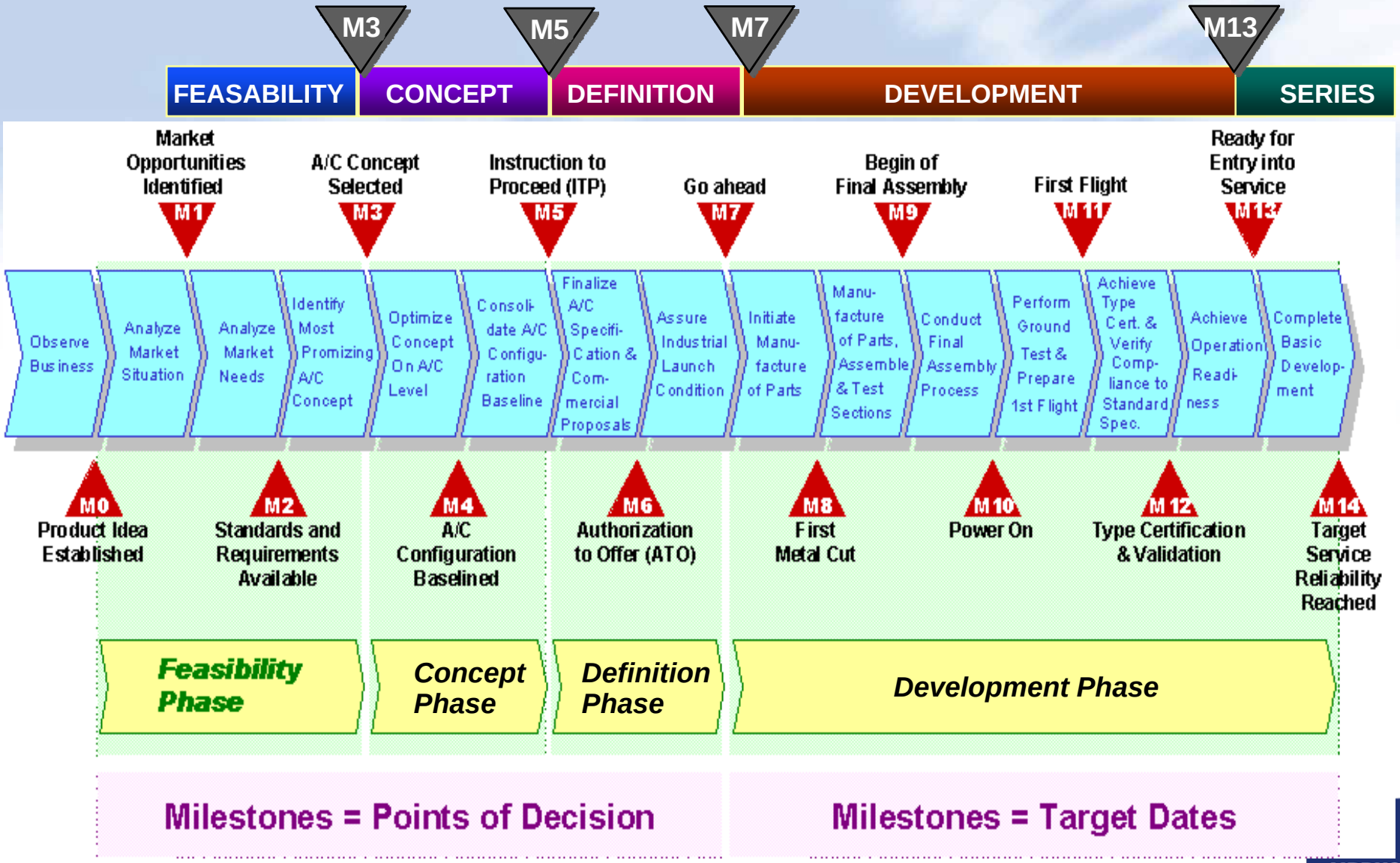
more than **88** nationalities

EVERY 3 SECONDS AN AIRBUS AIRCRAFT TAKES OFF OR LANDS SOMEWHERE IN THE WORLD

Airbus 2007 – Current Programmes



DEVELOP NEW AIRCRAFT PROCESS MILESTONES PLANIFICATION



AIRCRAFT DEVELOPMENT

I. STRUCTURE

II. SYSTEMS

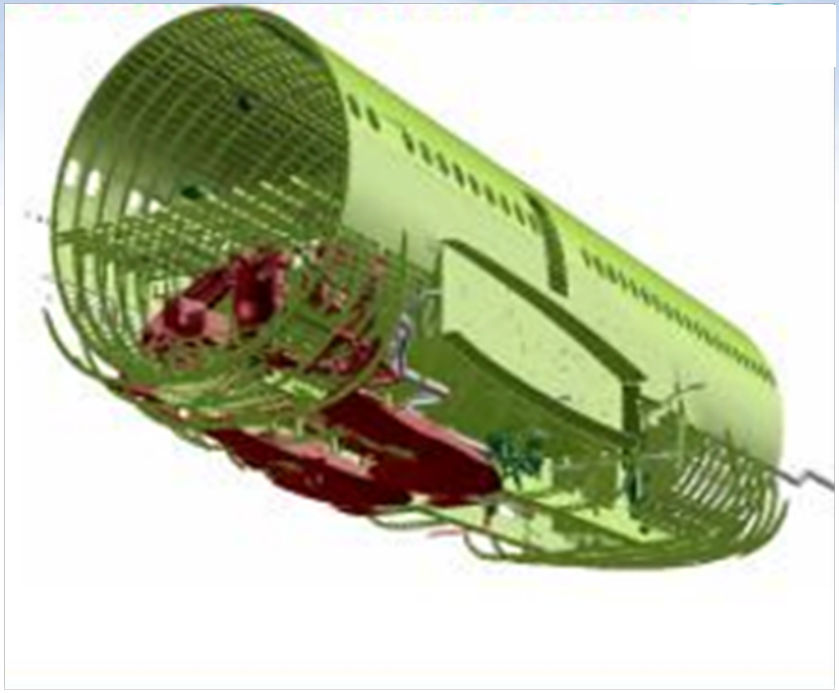
III. CABIN CONFIGURATION

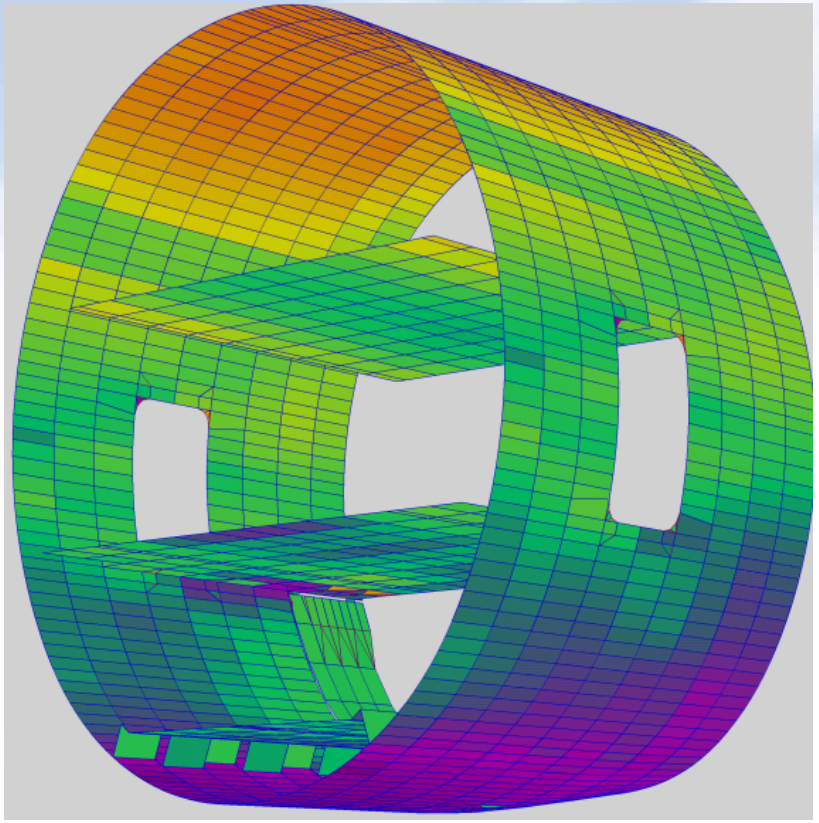
IV. POWER PLANT

In the development of an aircraft the following points have a high importance for the design:

- Materials selection (metallic and non metallic).
- Industrial Manufacturing – Assembly.
- Weight.
- Costing.
- Harmonization and standardization (mechanics, systems, electrics).
- Technical issues: Corrosion prevention, lightning protection,…
- Technical and customer requirements.
- Testing.
- Resources (work sharing).

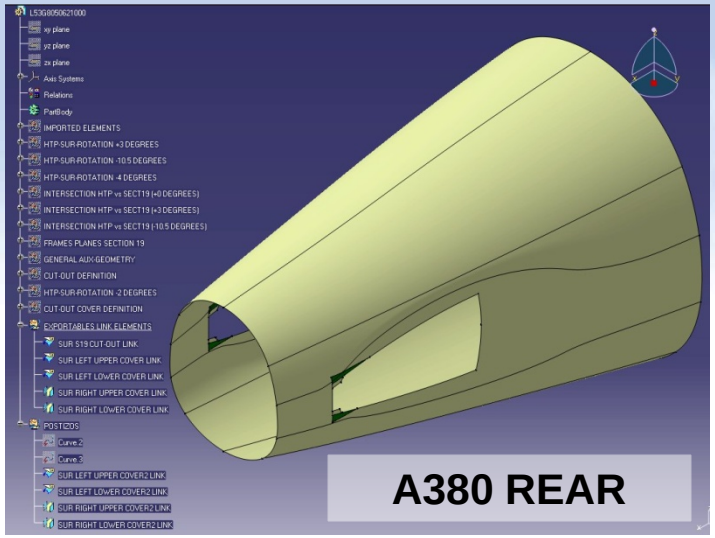
STRUCTURE

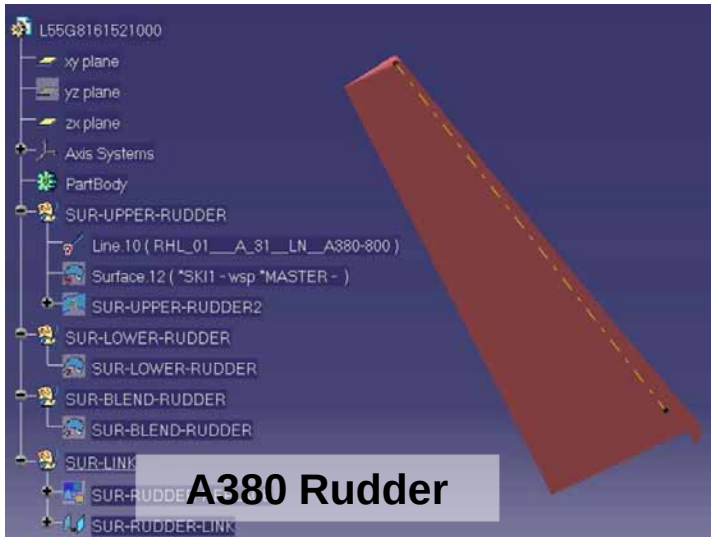


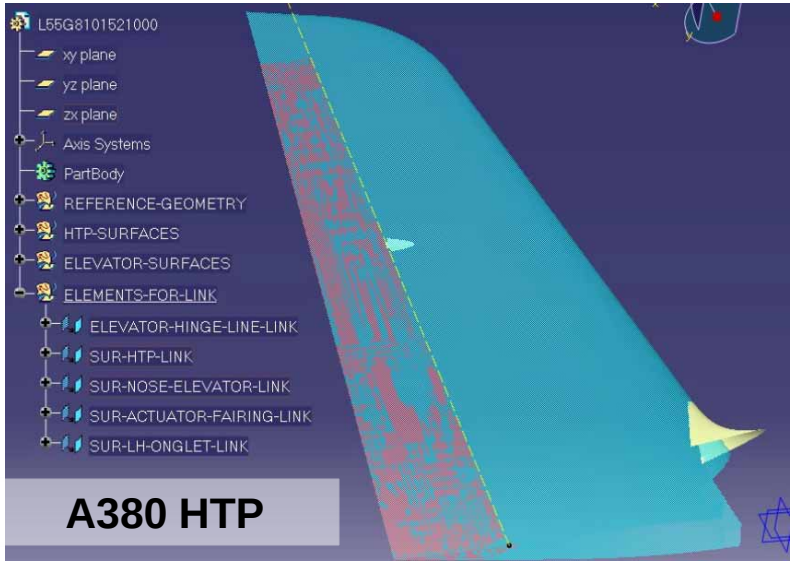


AERODYNAMIC SURFACES

Aerodynamic shape of the A/C for getting flight and performances requirements (lift, drag, noise, speed, etc.)

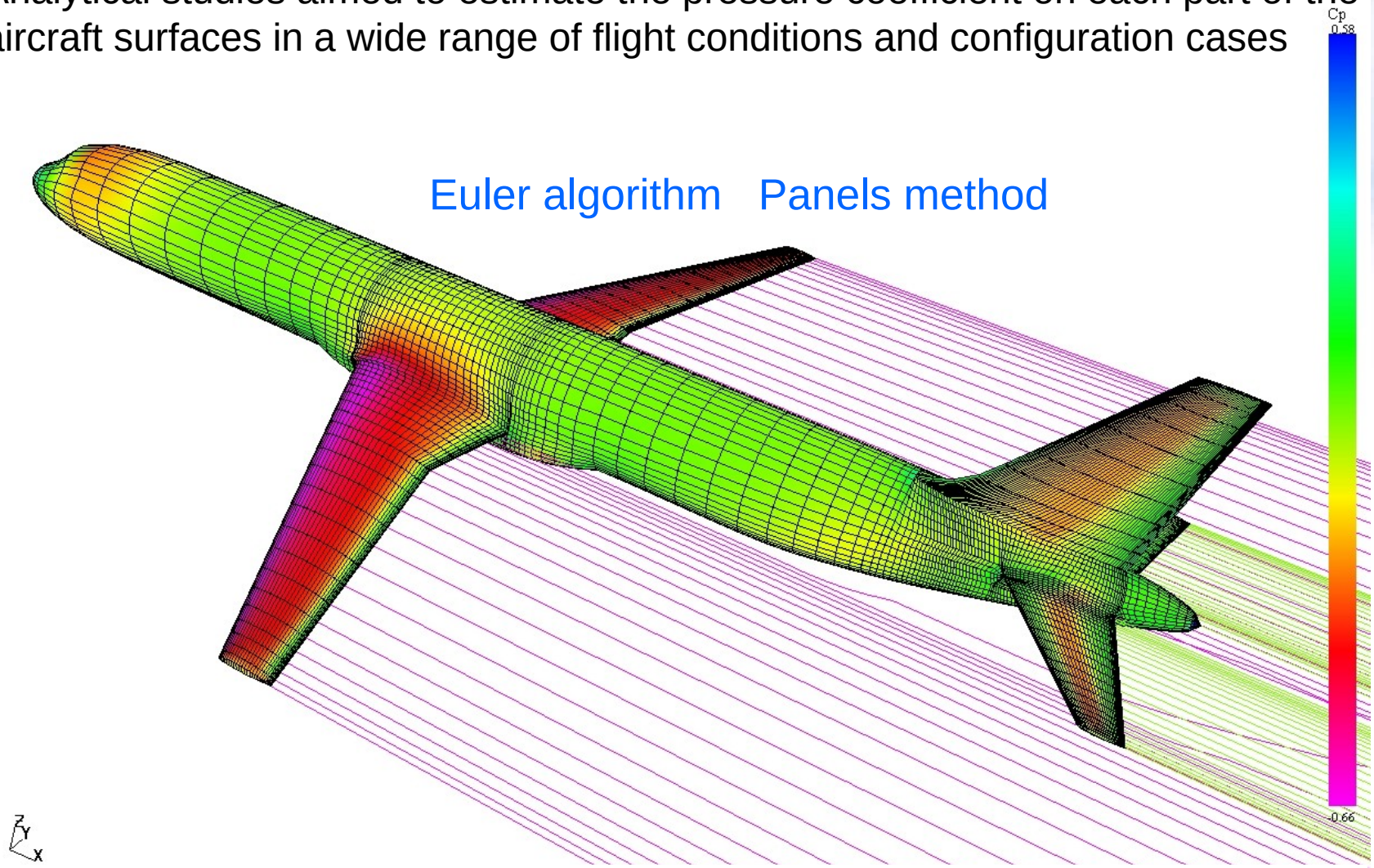






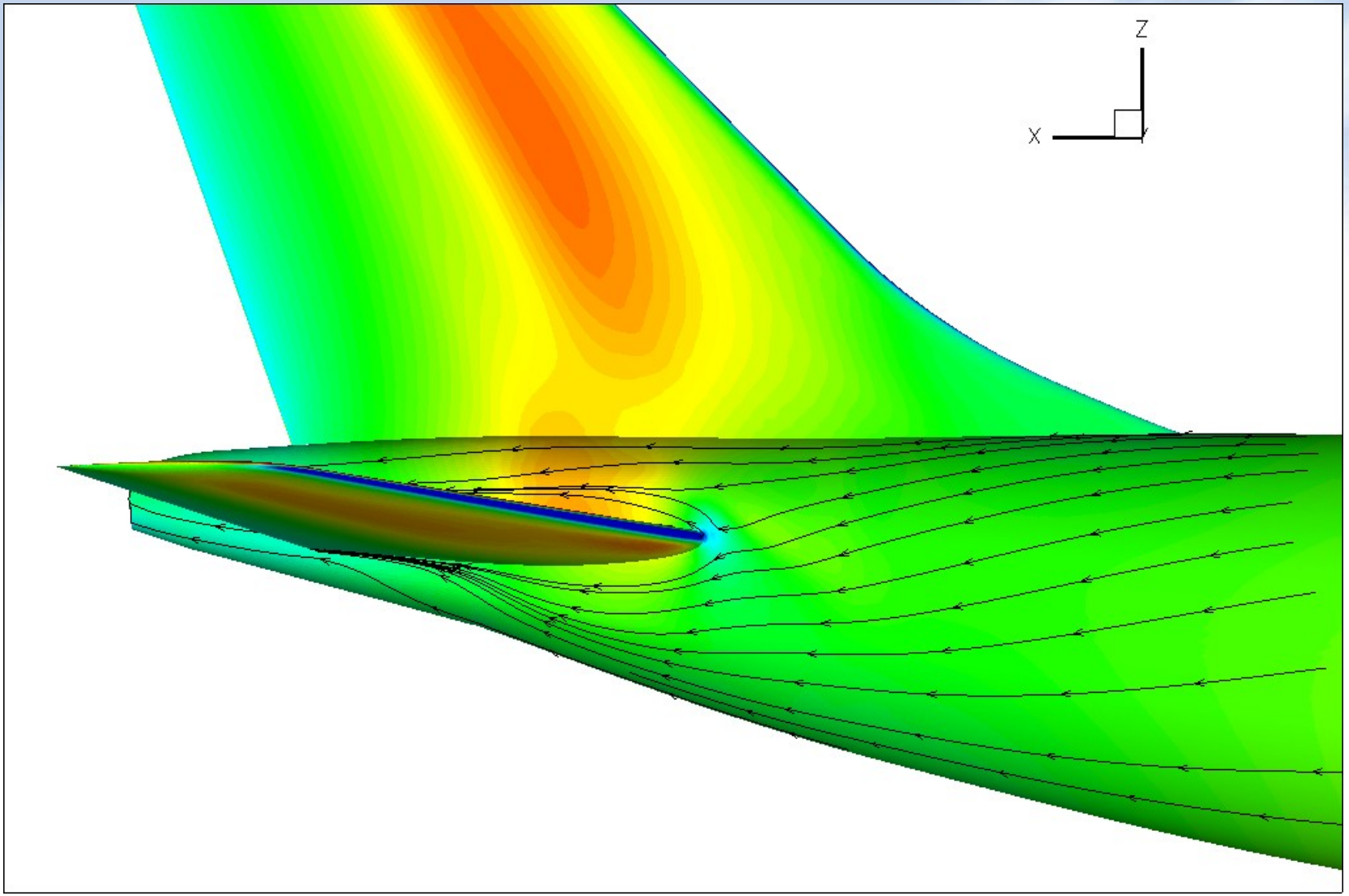
PRESSURES DISTRIBUTION

Analytical studies aimed to estimate the pressure coefficient on each part of the aircraft surfaces in a wide range of flight conditions and configuration cases



PRESSURES DISTRIBUTION

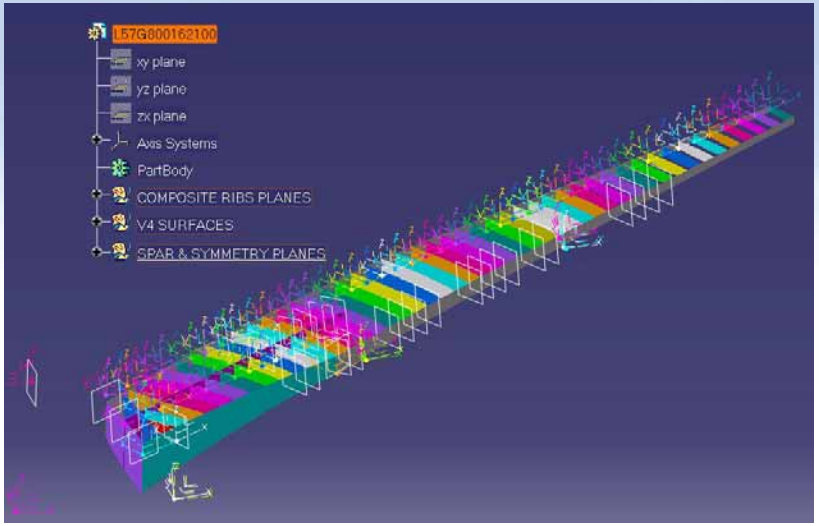
RANS (Reynolds Averaged Navier-Stokes) Method



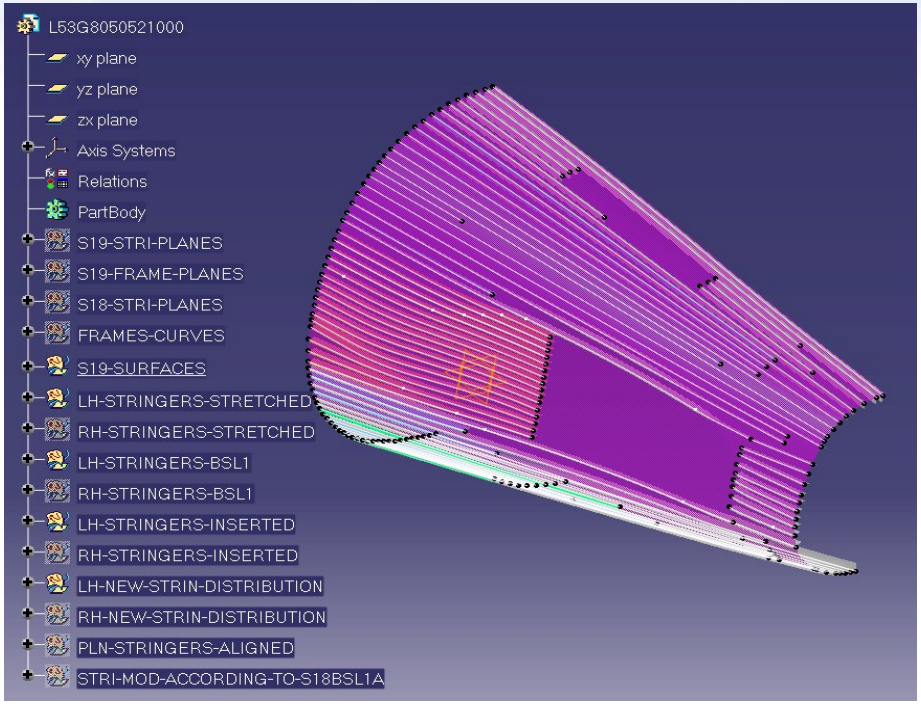
STRUCTURAL ARRANGEMENT

Geometrical references of aircraft external and internal shapes, and the major co-ordinate systems and datum lines

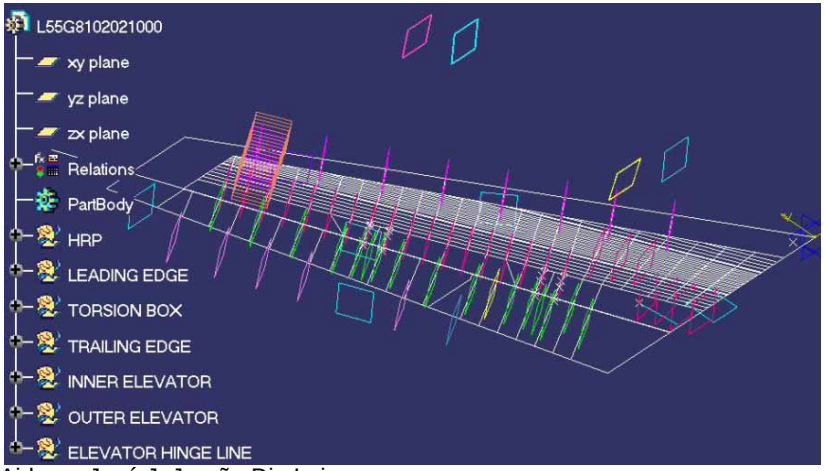
A380 Wing



A380 Section 19



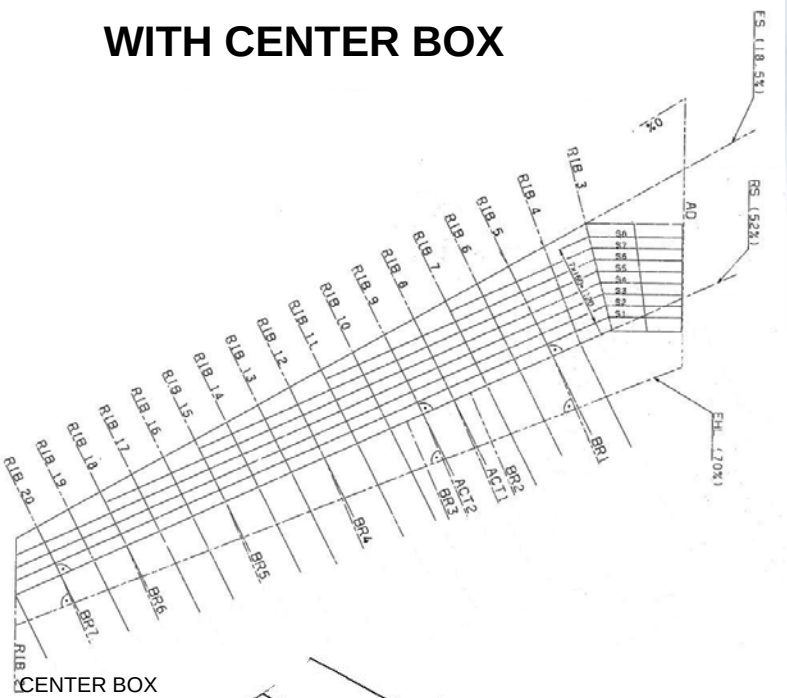
A380 HTP



DESIGN STUDIES AND ALTERNATIVES

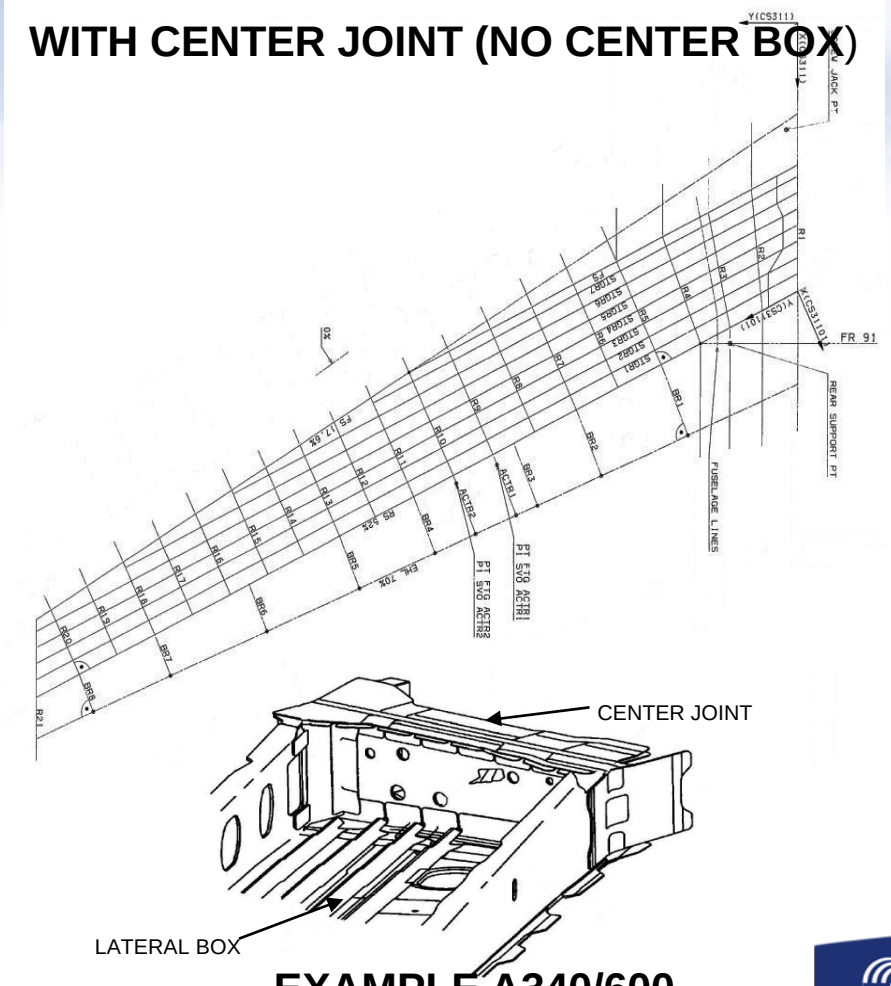
Different possibilities of a technical solution to be evaluated by the involved departments that meet one or several requirements which aim at defining the optimised solution at the lower cost in the shortest time.

WITH CENTER BOX



EXAMPLE A330/340

WITH CENTER JOINT (NO CENTER BOX)

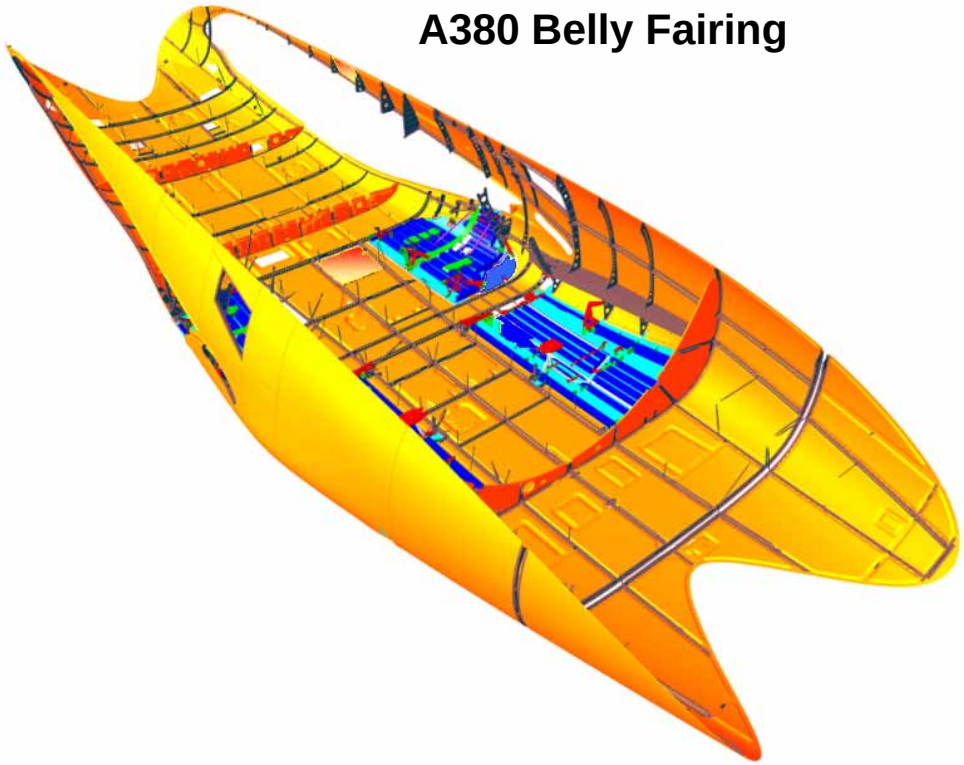


EXAMPLE A340/600

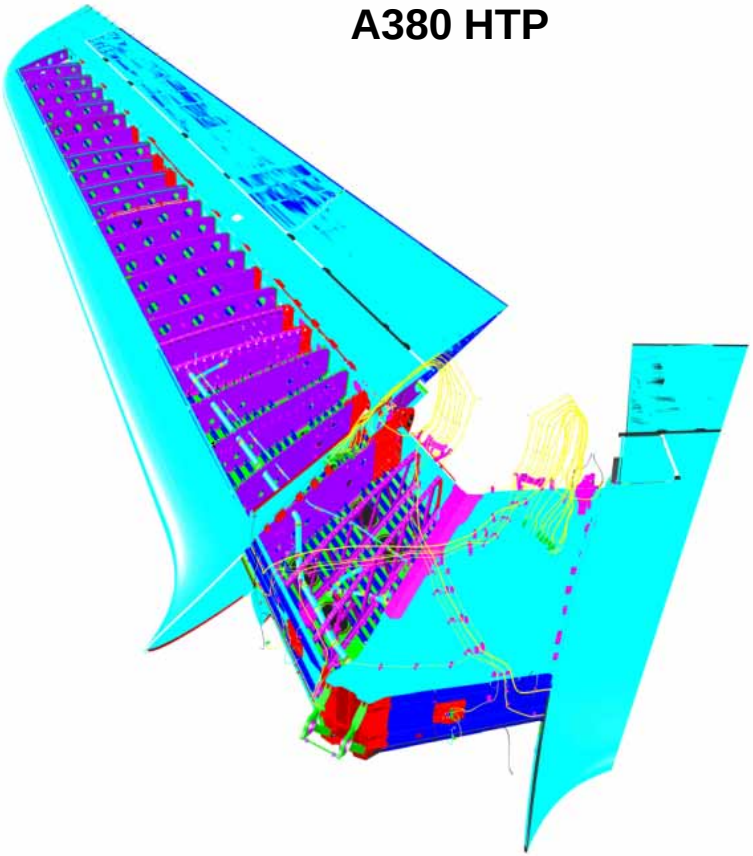
SPACE ALLOCATION MOCK-UP

Simplified envelope volumes for structure and system parts (including installation) allowing to allocate space between structures and systems and to validate structure and systems architectures

A380 Belly Fairing

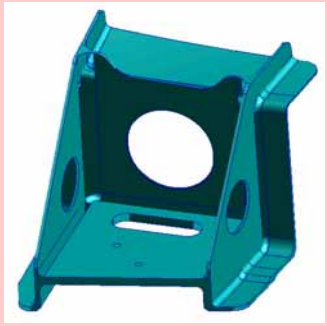


A380 HTP



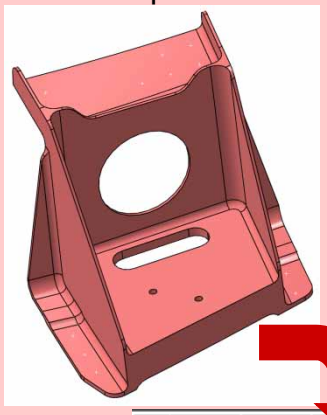
DESIGN - STRESS Design loop (Metallic or CFRP parts)

DESIGN

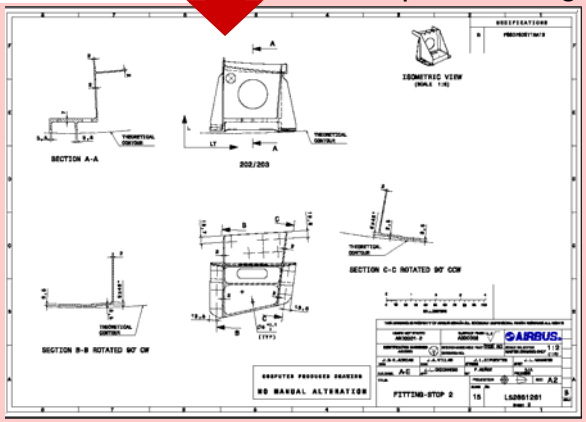


Design concept

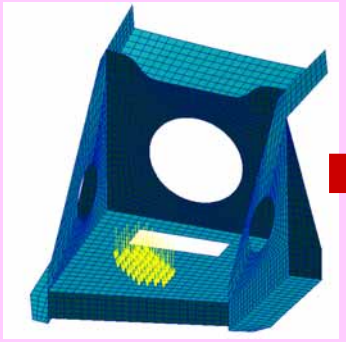
Definitive part



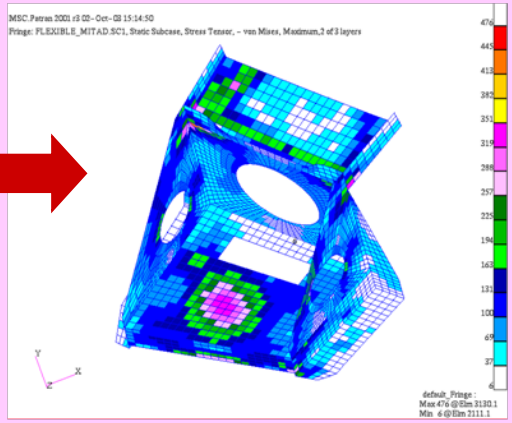
Official part drawing



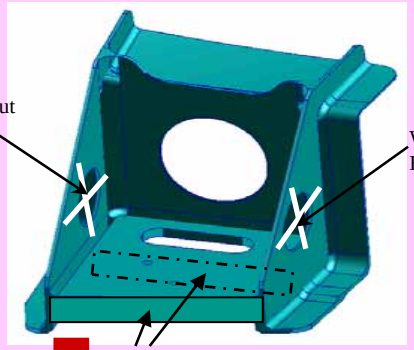
STRESS



FEM with loads



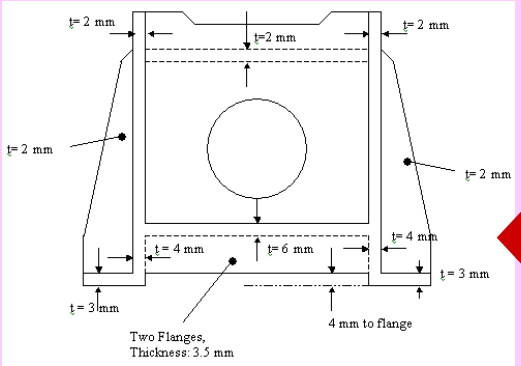
Stress results



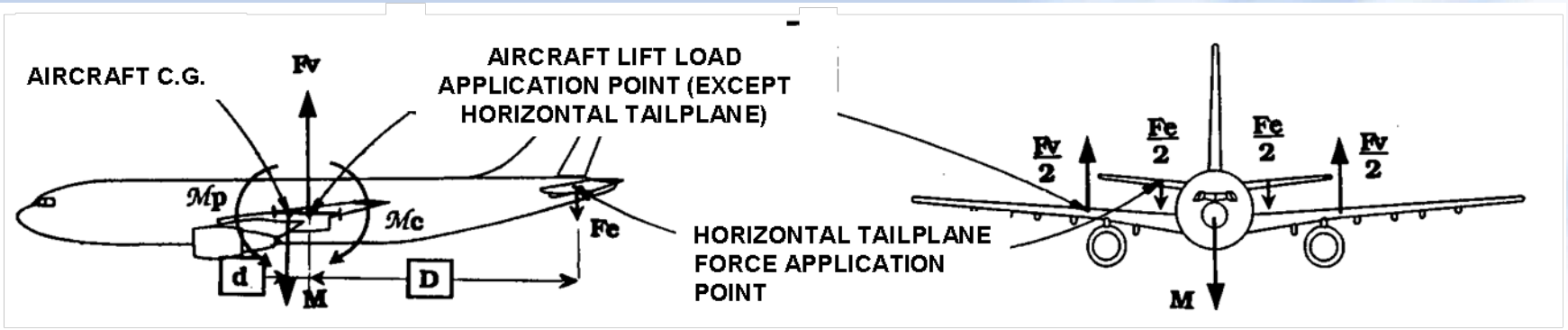
Two new Flanges:
thickness = 3.5 mm

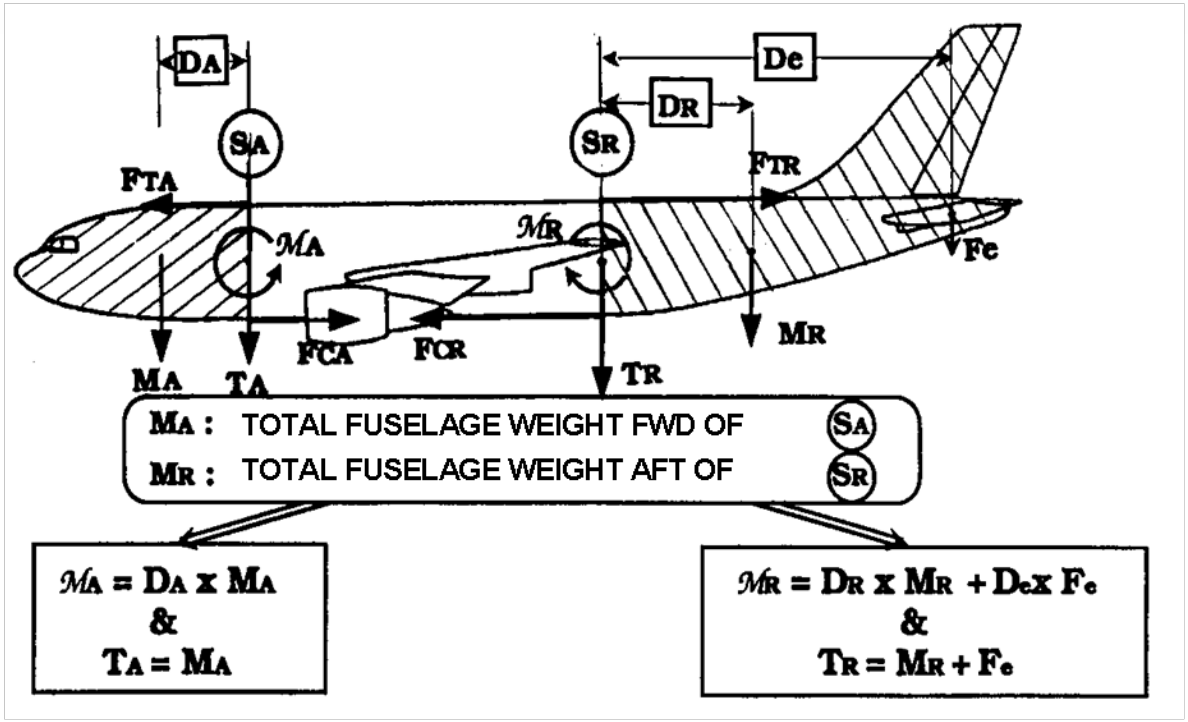
New proposal

New dimensioning



GENERAL AIRCRAFT BALANCE

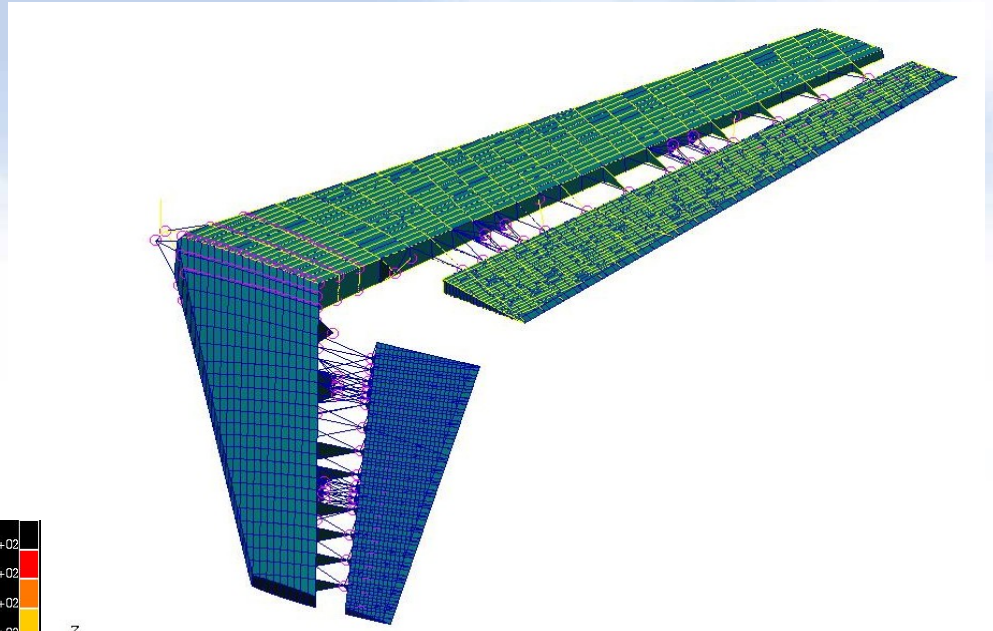


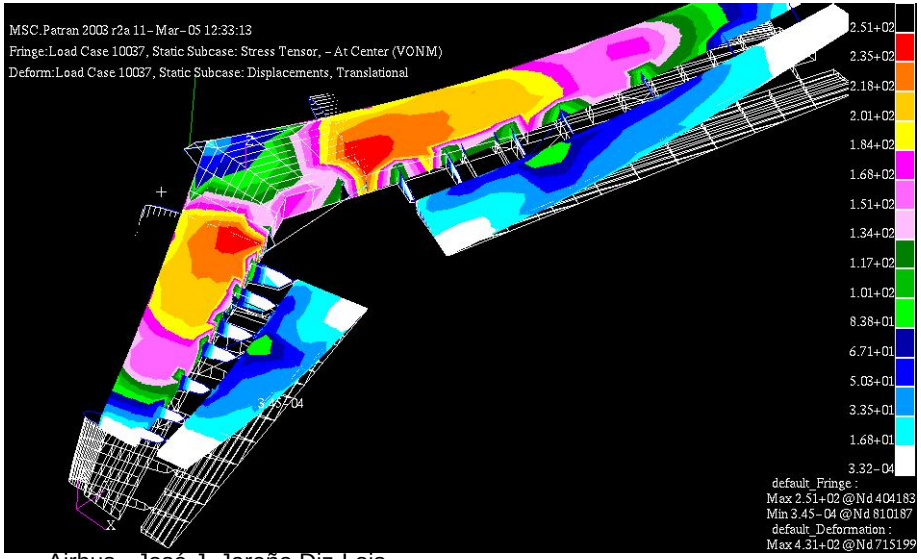


FEM AND STRESS ANALISYS

Model of one A/C component simulating its geometry, materials properties, types of attachment, constraints, etc

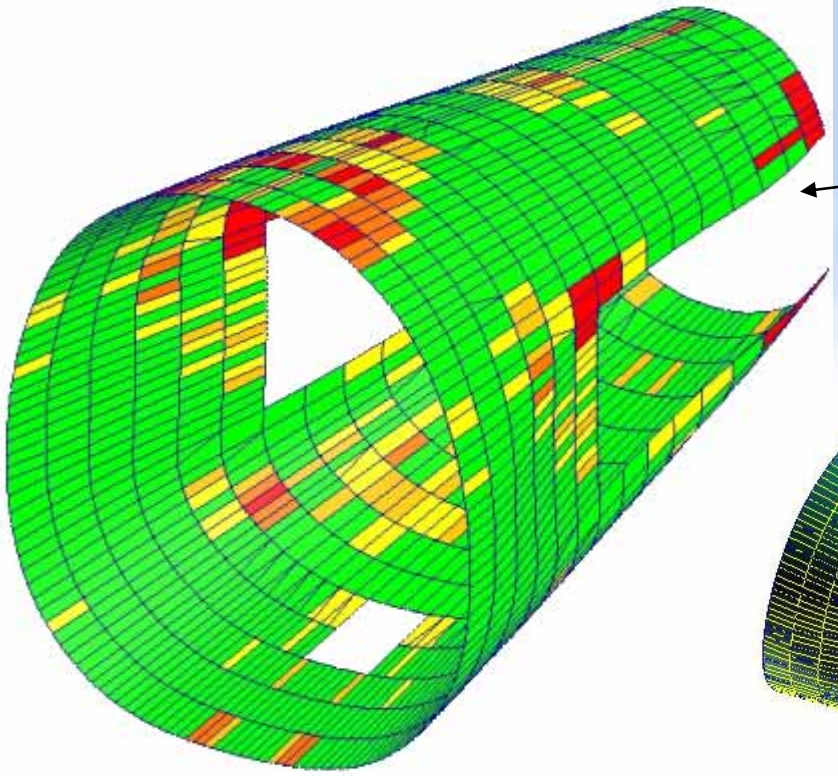
TYPICAL HTP PRELIMINARY FEM



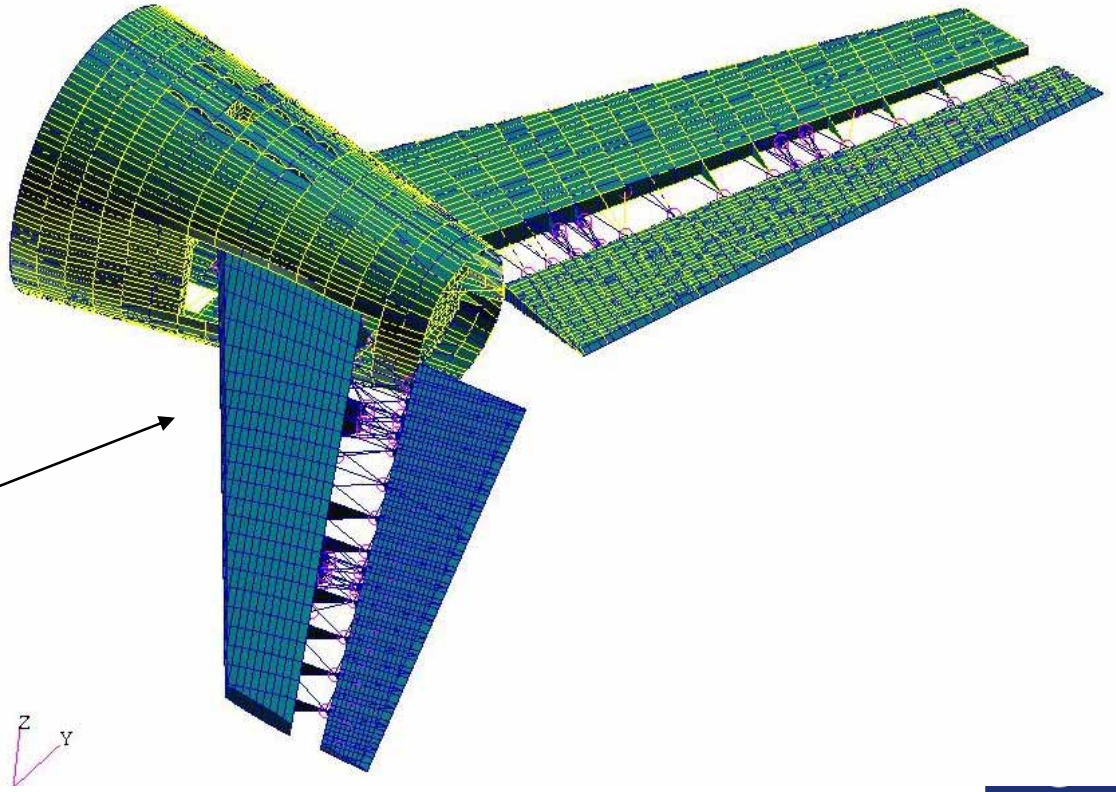


HTP STRESS ANALISYS FEM

FEM AND STRESS ANALISYS



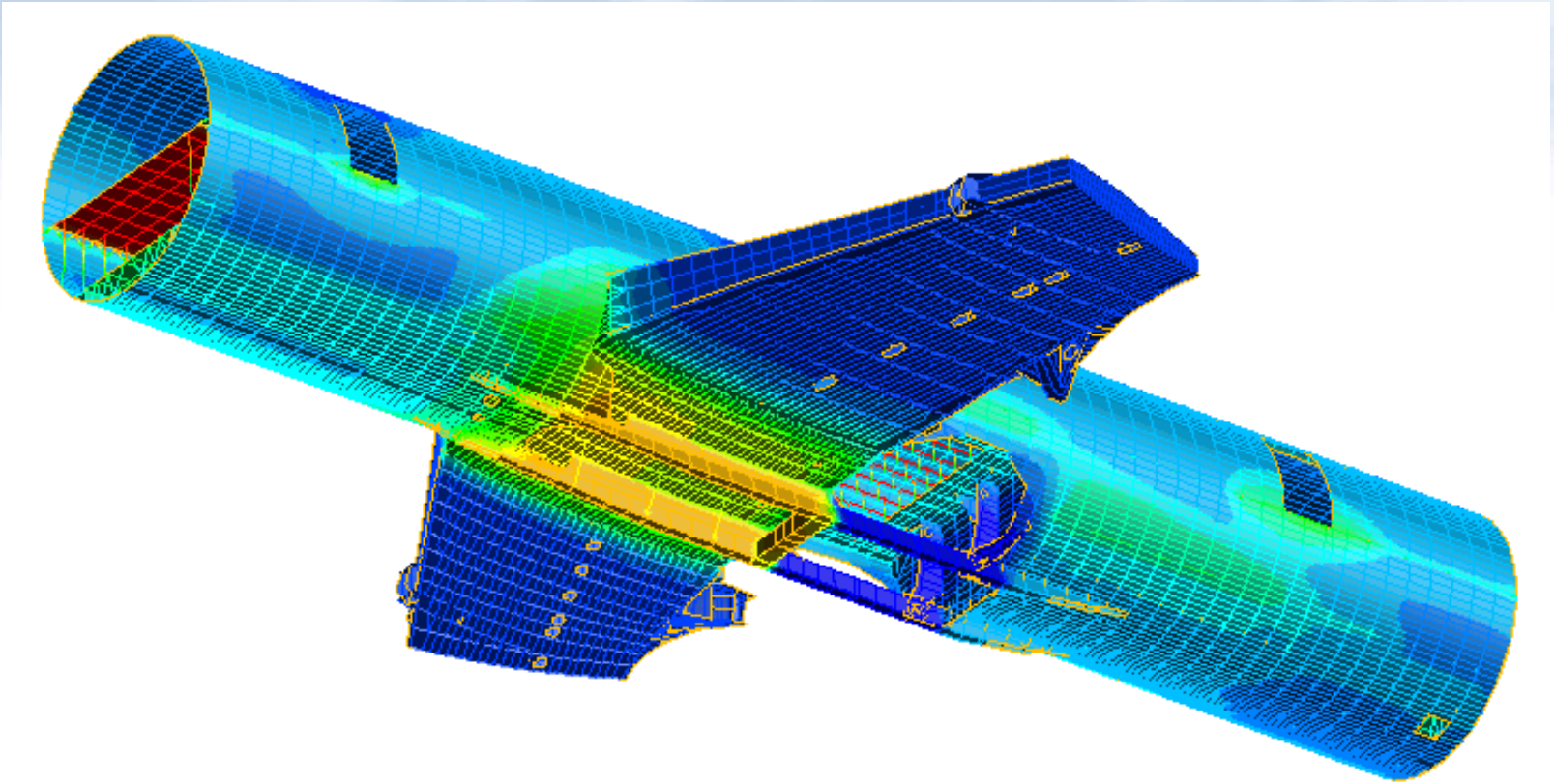
PRELIMINARY RESERVE FACTOR ANALYSIS (IMPACT OF A NEW LOAD LOOP)



SECTION 19 AND HTP FEM

FEM AND STRESS ANALISYS

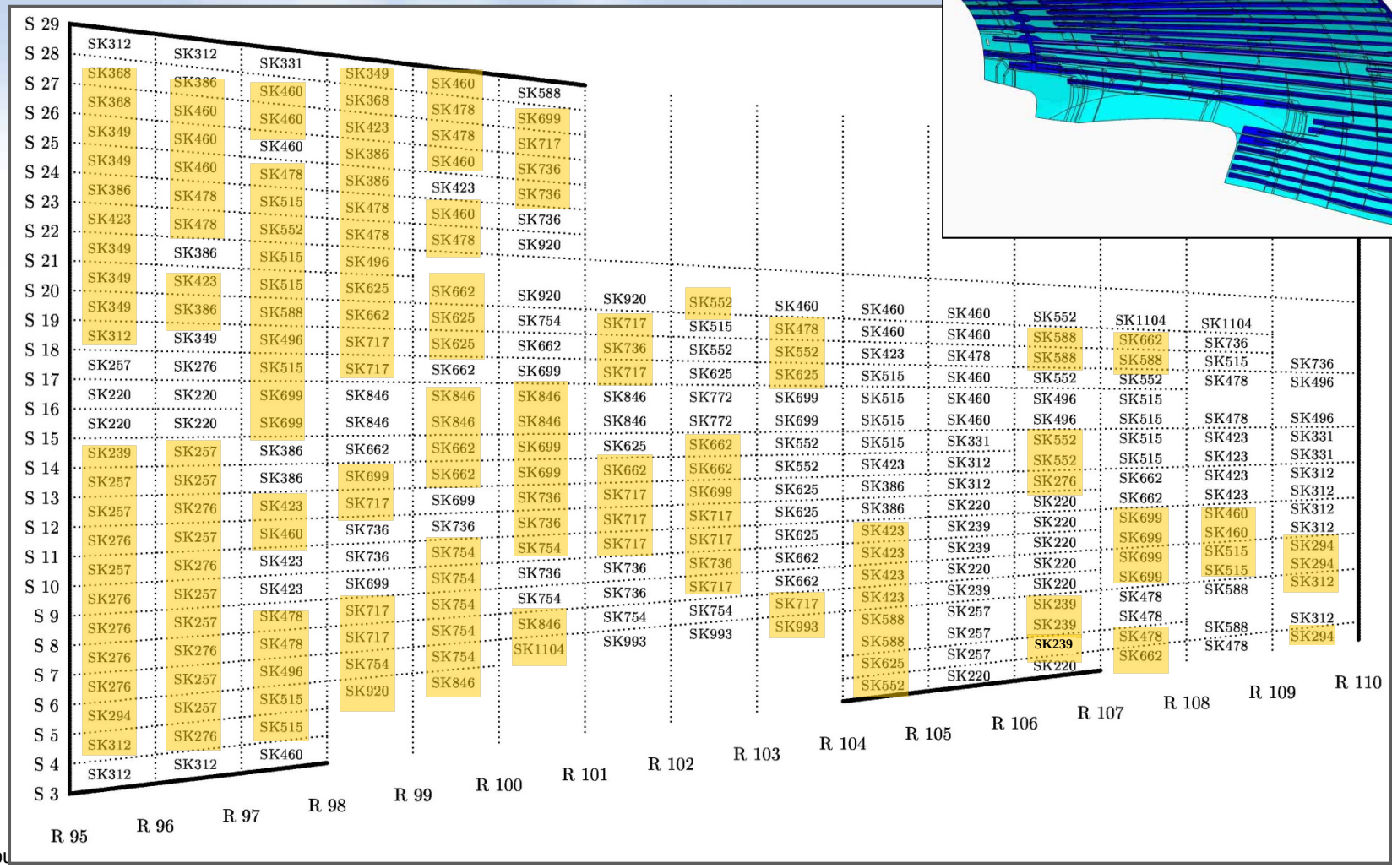
WING BOX BODY FEM



PRELIMINARY SIZING (A380 Example)

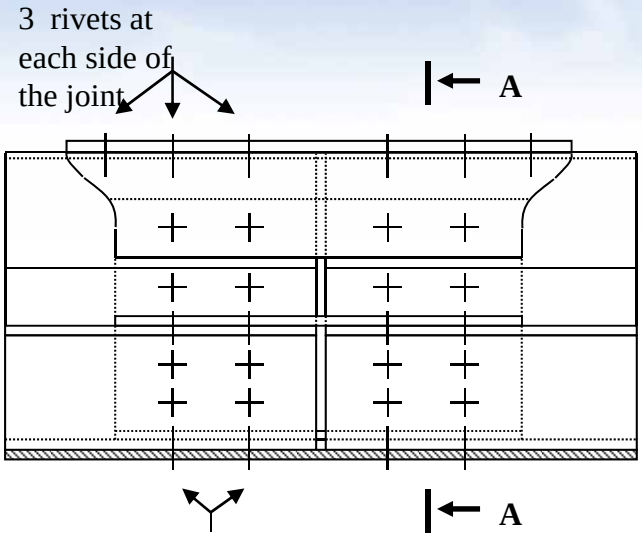
Section 19 Lateral Upper panel thickness distribution

Baseline providing minimum data (basic dimensions and thickness) to start production of 3D models

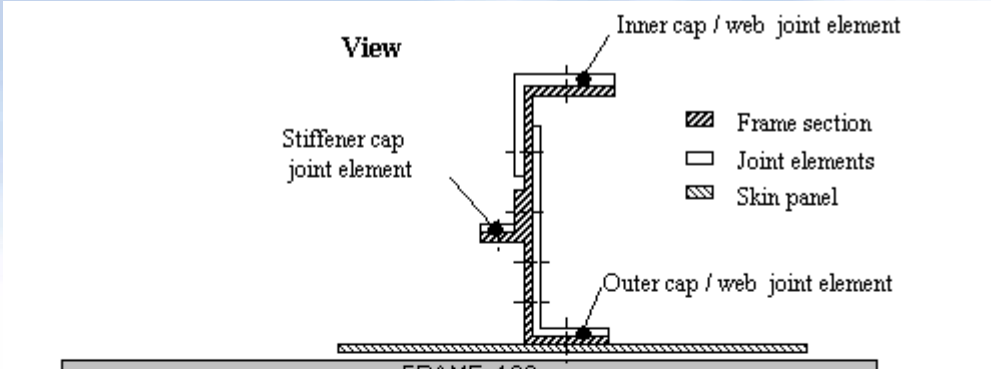


PRELIMINARY SIZING (A380 Example)

Section 19 metallic frames joint



2 columns of rivets at each side of the joint



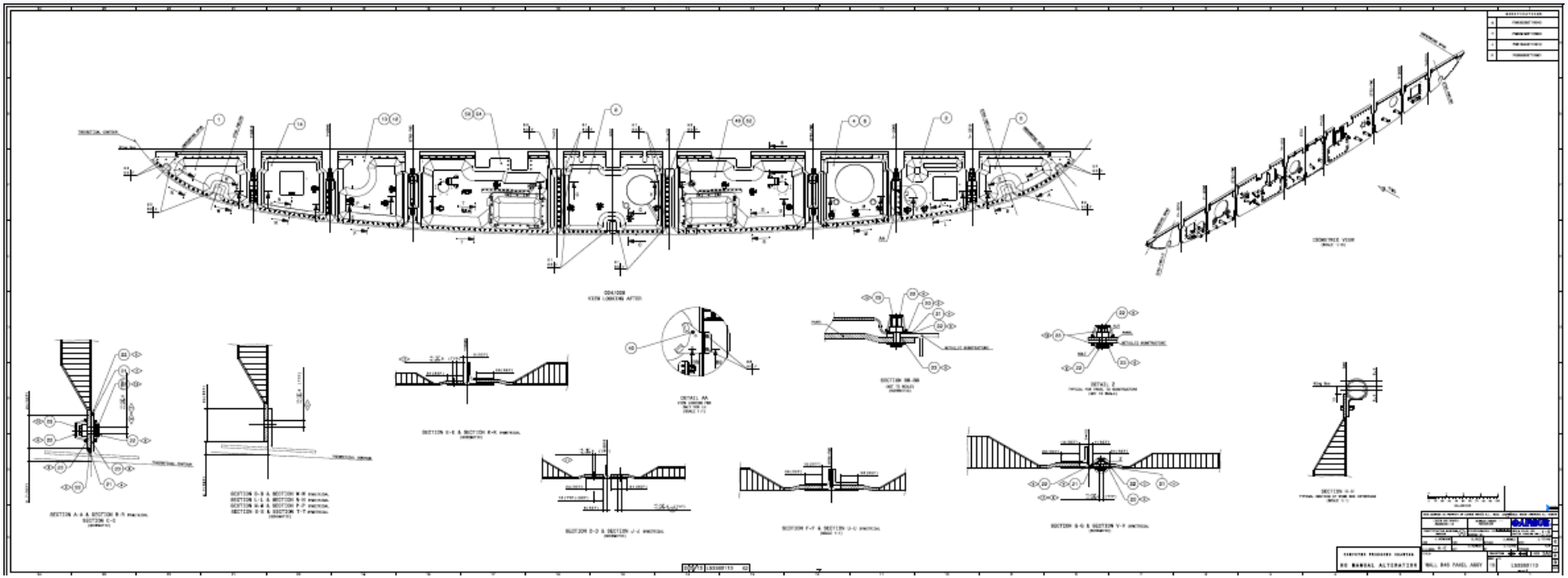
FRAME 109		
SPLIT SECTION 4		
	D (mm)	
Outer cap / web joint element		
Stiffener cap joint element		
Inner cap / web joint element	Inner Cap joint	
	D (mm)	
	Web joint	
	D (mm)	
	Outer cap skin joint	
	D (mm)	

FRAME 109	
SPLIT SECTION 4	
	t (mm)
Outer cap / web joint element	
Stiffener cap joint element	
Inner cap / web joint element	

DESIGN PRINCIPLES

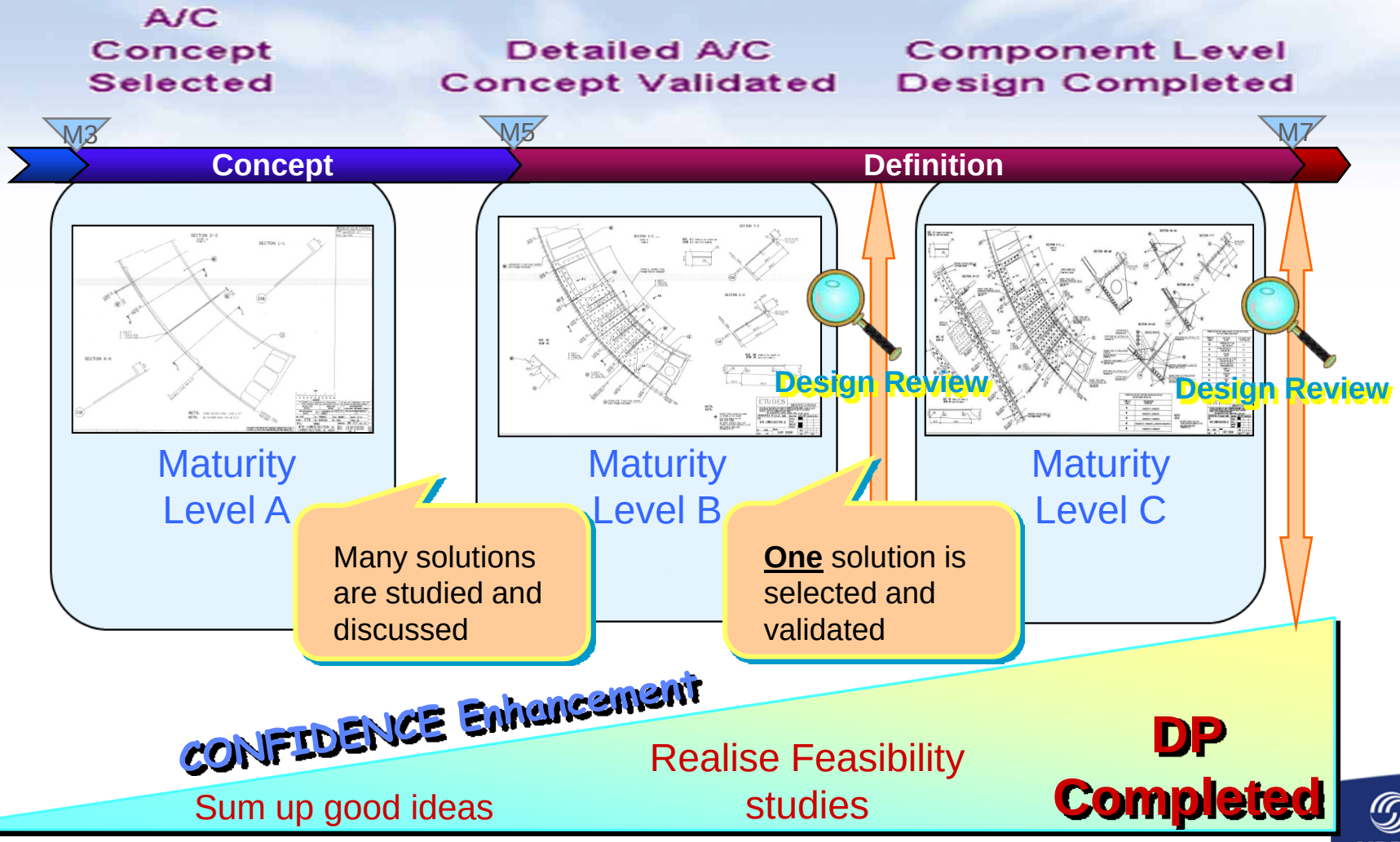
Technical solutions to the A/C that meets the applicable requirements.

It presents **detailed** information in order to demonstrate that the design fulfil all the requirements (stress, production, economy, reparability, supportability,…) and to enable the validation of the design by all the stake holders through a maturity process

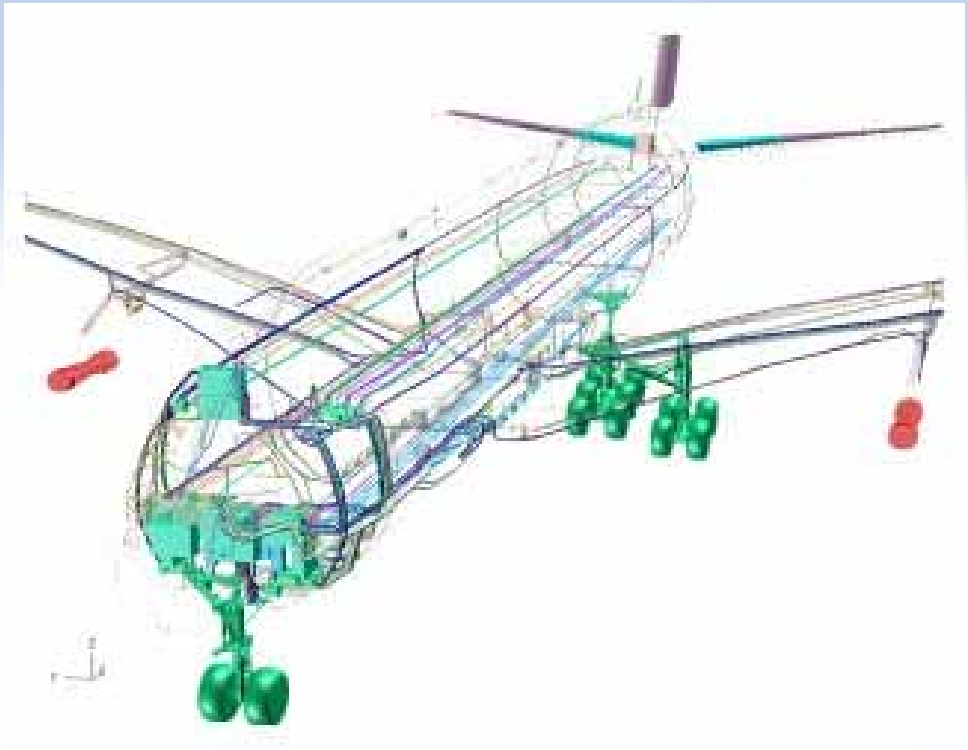


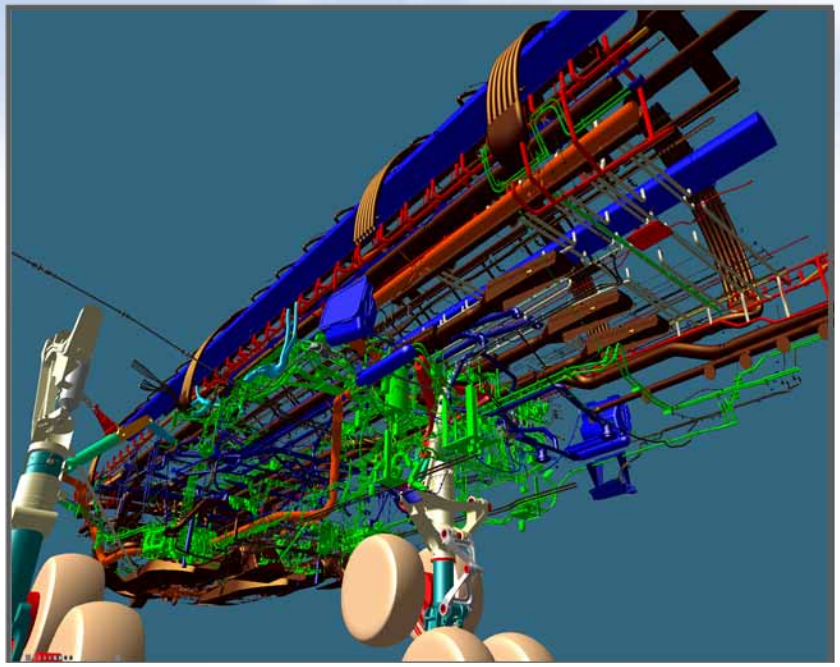
DESIGN PRINCIPLES (Maturity levels A, B, C)

Maturities provide information about the progress status (real and planned) of a definition, and consequently about the level of confidence in the proposed solution.



SYSTEMS & EQUIPMENTS





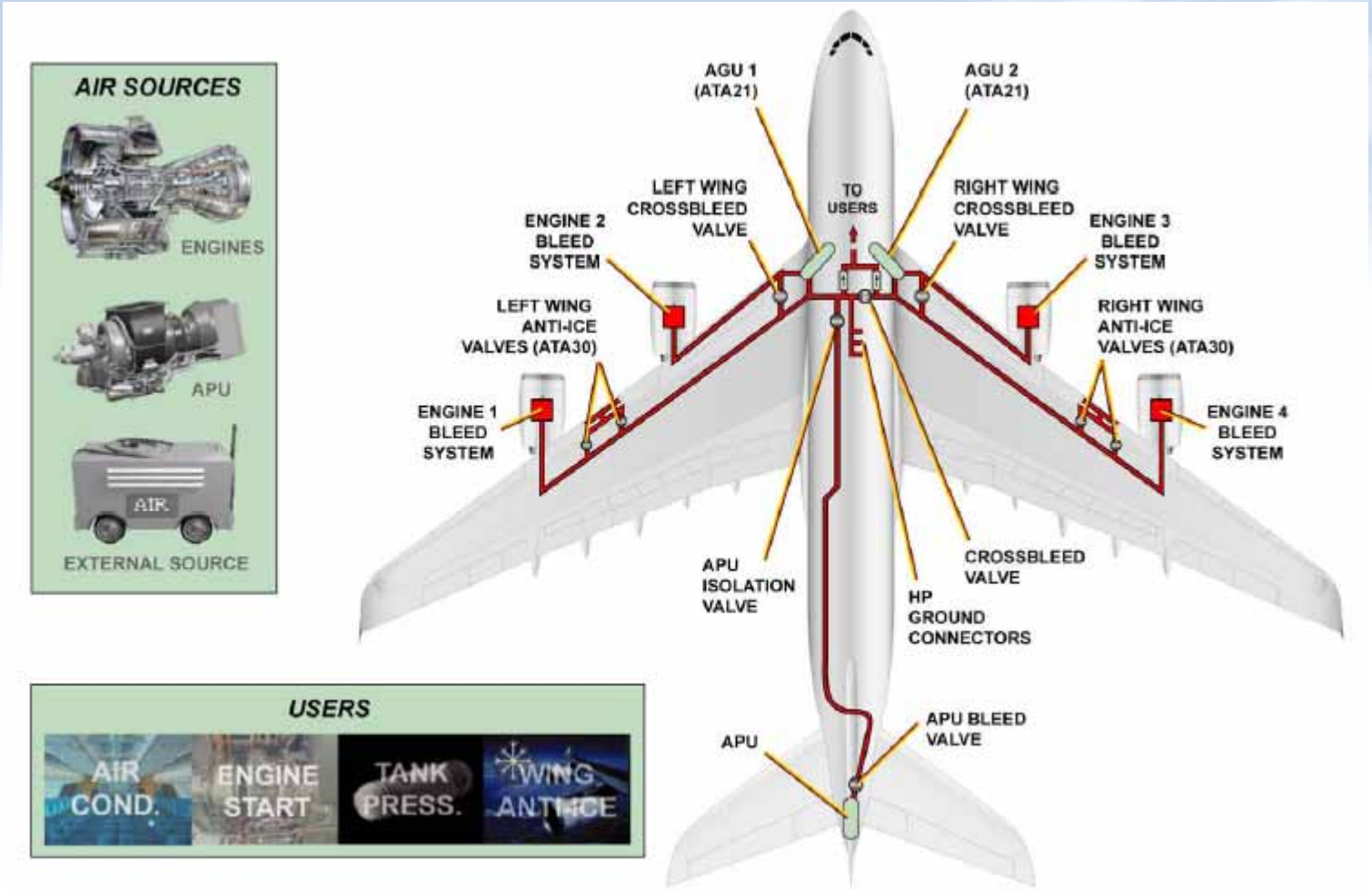
SYSTEMS and EQUIPMENT LAY-OUT DEFINITION

Location of systems components on the structure, like fuel, water, hydraulic, mechanical commands (rods, cables, etc.), electrical harnesses, etc. The attachment of those components to structure (brackets) is also part of Systems Lay-out.

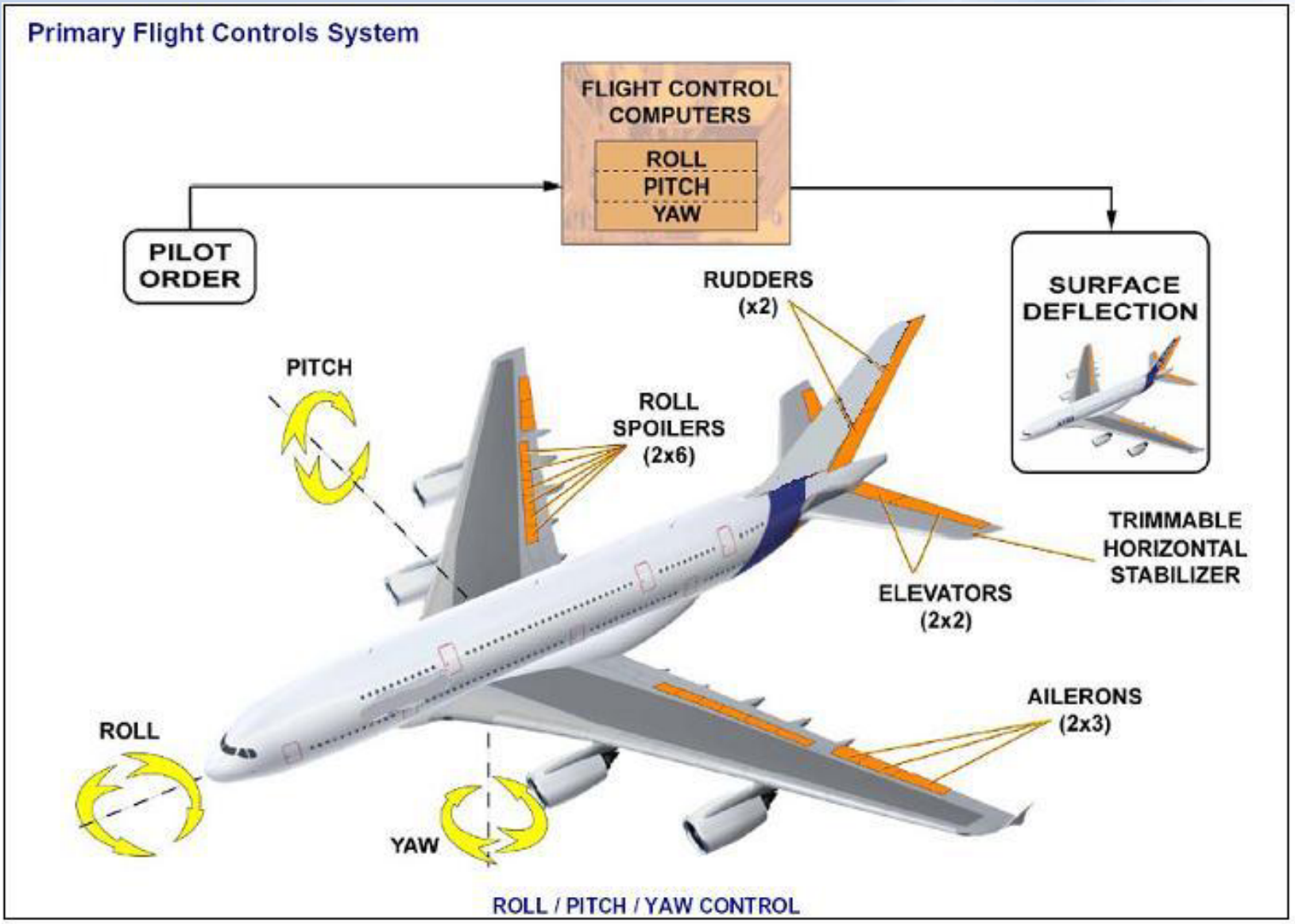
ATA 21. AIR CONDITIONING/VENTILATION
ATA 25. SUPPLEMENTAL COOLING
ATA 27. FLIGHT CONTROLS
ATA 28. FUEL
ATA 29. HYDRAULICS
ATA 32. LANDING GEARS
ATA 33. LIGHTS
ATA 36. BLEED
ATA 38. WATER & WASTE
ATA 49 AUXILIARY POWER UNIT
ATA 25 & 38. DRAINAGE
ATA 92. ELECTRICS
.....

Location of equipments on the structure, like landing gears, electronic bays, electric/hydraulic/pneumatic equipments, actuators, etc. The linking elements between them are part of the Systems Installation

BLEED AIR


AIR SOURCES
ENGINES
APU
AIR
EXTERNAL SOURCE
USERS
AIR COND.
ENGINE START
TANK PRESS.
WING ANTI-ICE
AGU 1 (ATA21)
AGU 2 (ATA21)
LEFT WING CROSSBLEED VALVE
TO USERS
RIGHT WING CROSSBLEED VALVE
ENGINE 2 BLEED SYSTEM
ENGINE 3 BLEED SYSTEM
LEFT WING ANTI-ICE VALVES (ATA30)
RIGHT WING ANTI-ICE VALVES (ATA30)
ENGINE 1 BLEED SYSTEM
ENGINE 4 BLEED SYSTEM
APU ISOLATION VALVE
CROSSBLEED VALVE
HP GROUND CONNECTORS
APU
APU BLEED VALVE

FLIGHT CONTROLS



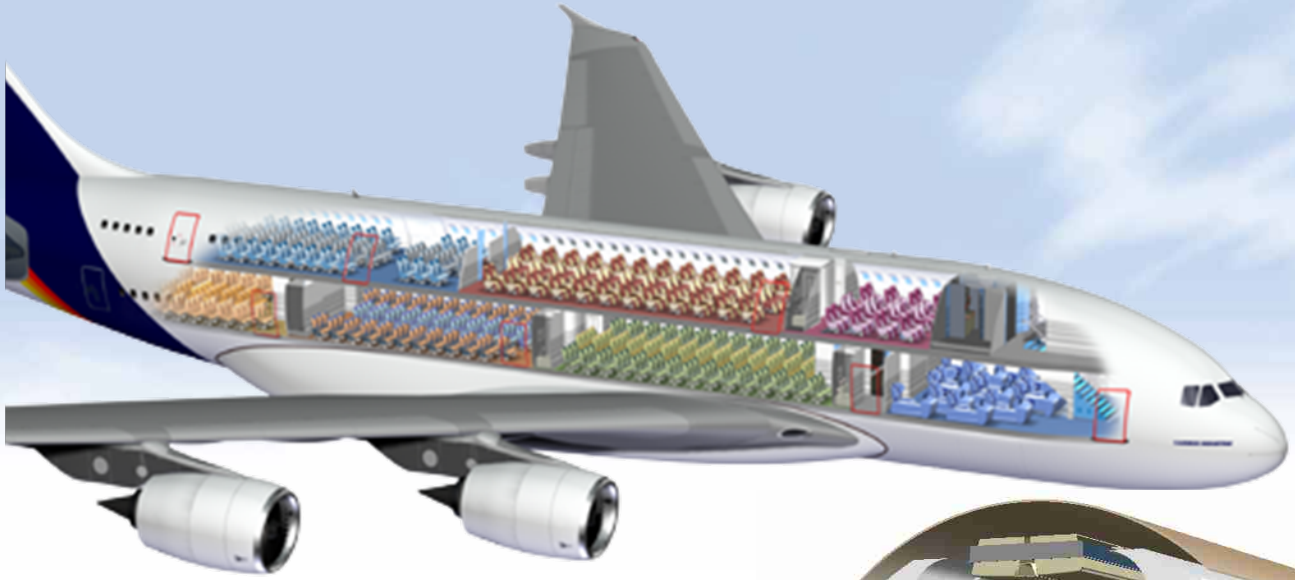
LANDING GEAR

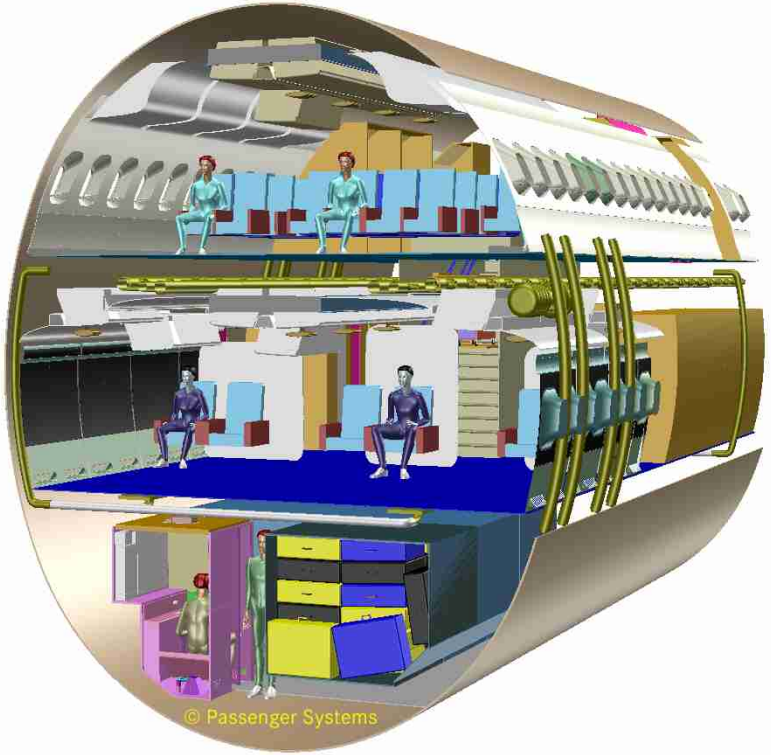
Nose landing gear

Body landing gear

Wing landing gear

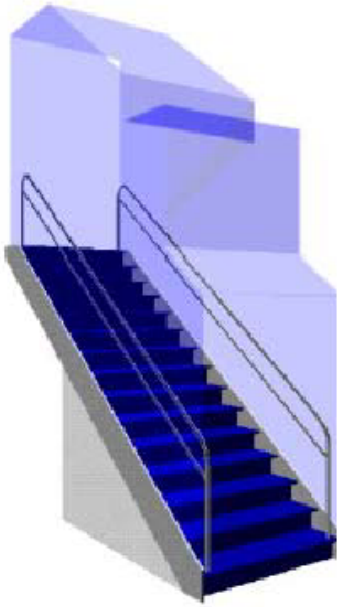
CABIN CONFIGURATION

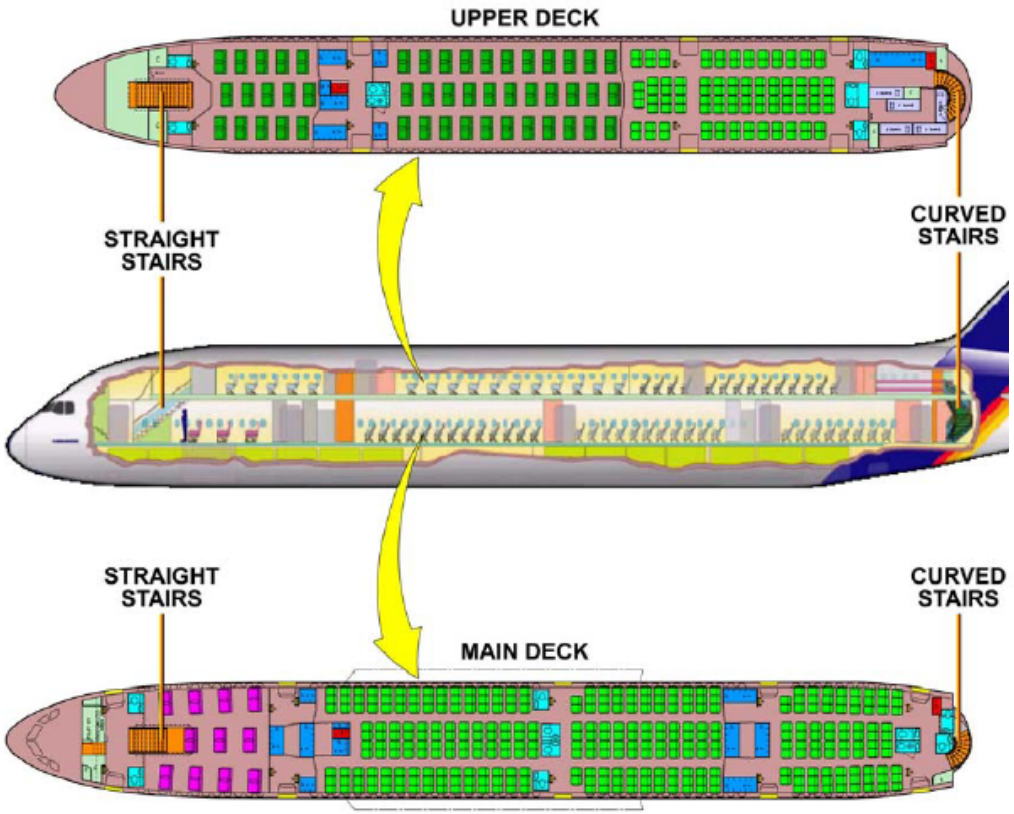




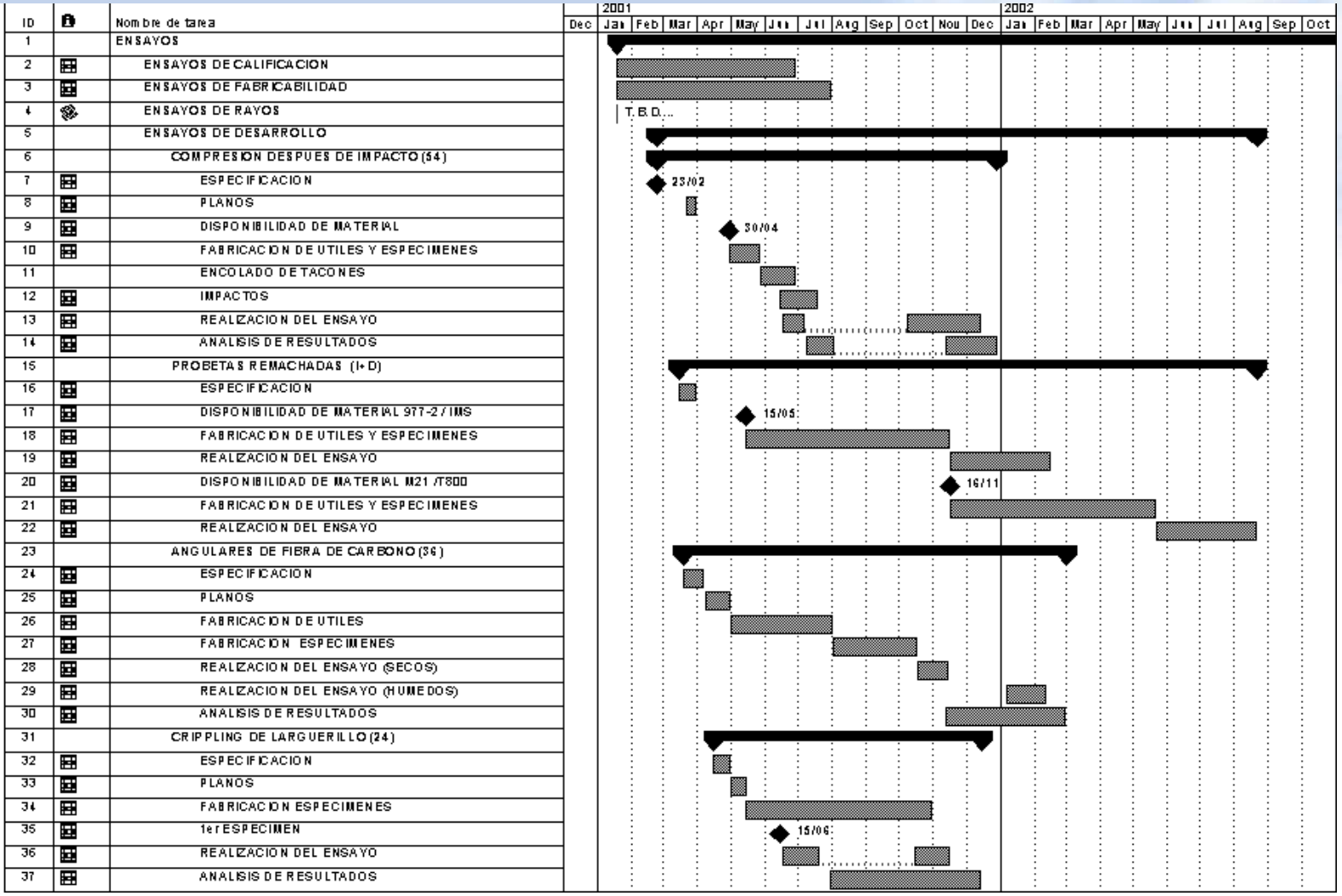
CABIN CONFIGURATION

Passenger Compartment





TEST PLANNING



ID	Nombre de tarea
1	ENSAYOS
2	ENSAYOS DE CALIFICACION
3	ENSAYOS DE FABRICABILIDAD
4	ENSAYOS DE RAYOS
5	ENSAYOS DE DESARROLLO
6	COMPRESION DESPUES DE IMPACTO (54)
7	ESPECIFICACION
8	PLANOS
9	DISPONIBILIDAD DE MATERIAL
10	FABRICACION DE UTILES Y ESPECIMENES
11	ENCOLADO DE TACONES
12	IMPACTOS
13	REALIZACION DEL ENSAYO
14	ANALISIS DE RESULTADOS
15	PROBETAS REMACHADAS (I+D)
16	ESPECIFICACION
17	DISPONIBILIDAD DE MATERIAL 977-2 / IMS
18	FABRICACION DE UTILES Y ESPECIMENES
19	REALIZACION DEL ENSAYO
20	DISPONIBILIDAD DE MATERIAL M21 /T800
21	FABRICACION DE UTILES Y ESPECIMENES
22	REALIZACION DEL ENSAYO
23	ANGULARES DE FIBRA DE CARBONO (36)
24	ESPECIFICACION
25	PLANOS
26	FABRICACION DE UTILES
27	FABRICACION ESPECIMENES
28	REALIZACION DEL ENSAYO (SECOS)
29	REALIZACION DEL ENSAYO (HUMEDOS)
30	ANALISIS DE RESULTADOS
31	CRIPPLING DE LARGUERILLO (24)
32	ESPECIFICACION
33	PLANOS
34	FABRICACION ESPECIMENES
35	1er ESPECIMEN
36	REALIZACION DEL ENSAYO
37	ANALISIS DE RESULTADOS

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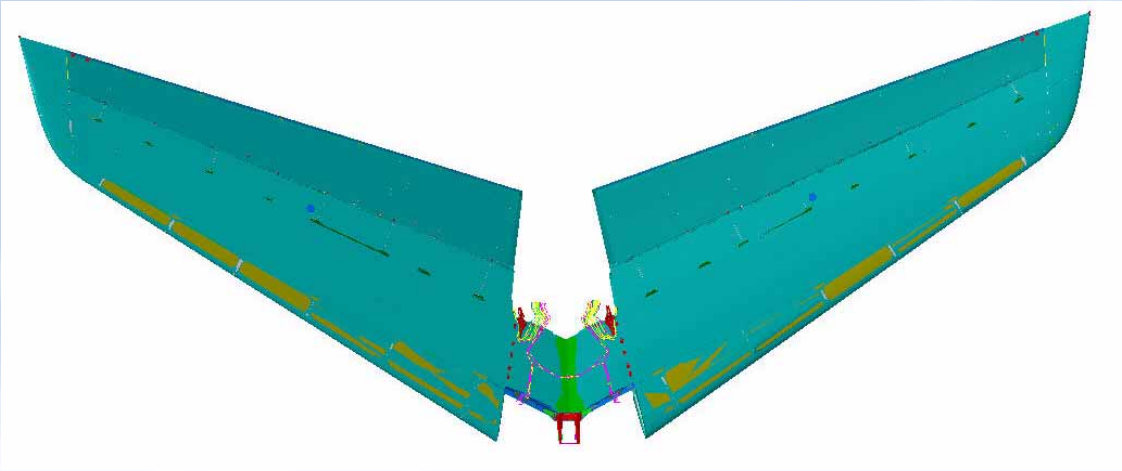
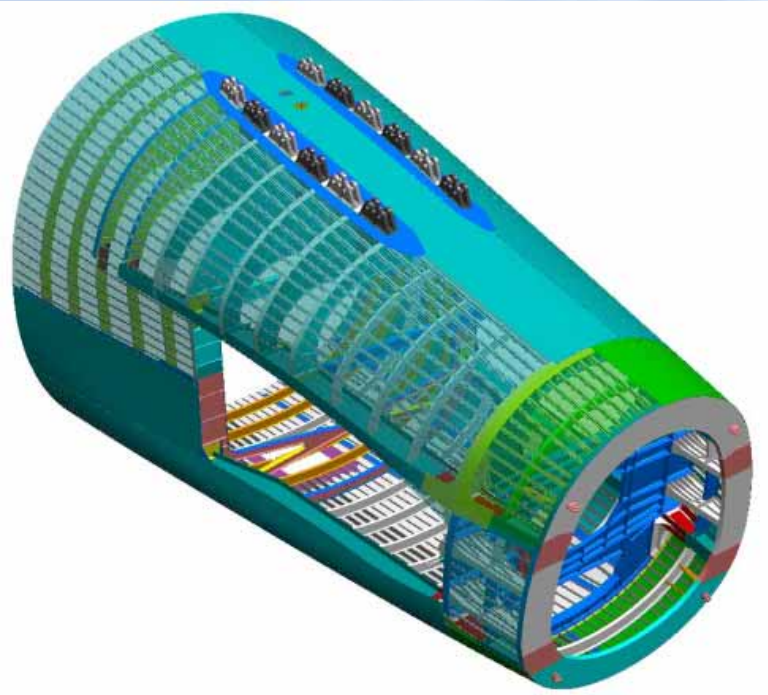
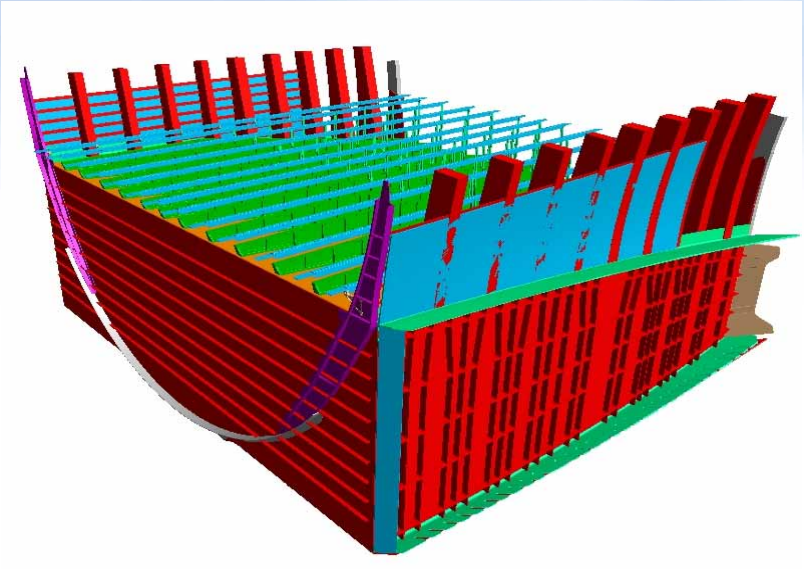


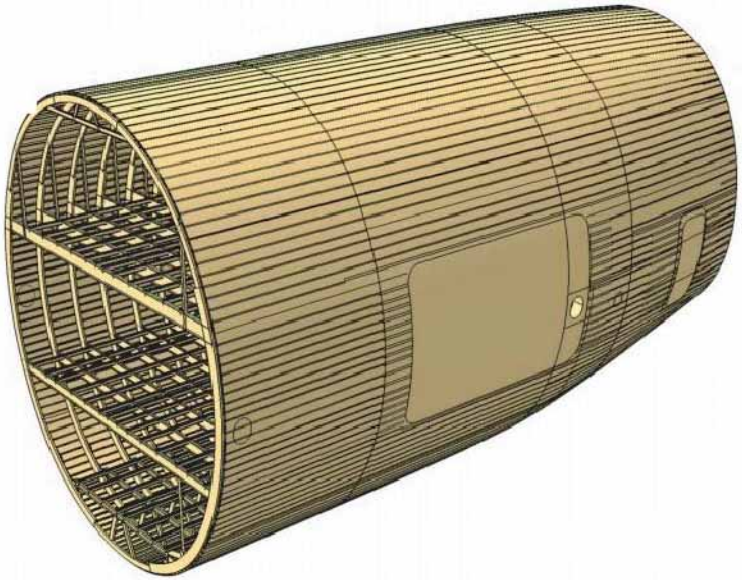
S19 A380



WING BOX BODY A380



S18 A380



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Thank you

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