Dassault Systèmes

Aerospace & Defense Overview and Strategy

Le Bourget,
June 20th, 2011

Agenda

1 Key Facts and Data for A&D

2 Dassault Systèmes Strategy

A&D INDUSTRY

Market Figures

Automotive	
Aerospace	Airframe OEMS / Aero Suppliers / Propulsion / Missiles & Drones / Space Systems/ Defense
Ship	Ships Builders/ Yacht Styling/ Craftsmanship/ Marine Equipment/ Machinery Suppliers
Industrial	Fab Metal Products/ Industrial Machinery/ Mobile Equipment/ Industrial Equipment
High-Tech	Consumer Electronics/ Enterprise Systems/ Telco Equipments/ Specialized Electronics/ Technology Suppliers/ Contract Manufact. /Semiconductors
Consumer Goods	Furniture/ Home & Garden/ Leisure &/ Personal Goods/ Apparel & Jewelry
CPG	Food & Beverage/ Tobacco/ Cosmetic & Healthcare/ Household Products
Life Sciences	Pharmaceuticals/ Biotechnologies/ Medical Devices & Equipments
Energy	Energy/ Utilities/ Oil & Gas/ Process/ Chemical
Construction	Architecture/ Construction/ Civil Engineering/ Maintenance
Business Services	Banking & Insurance/ Retail & Wholesales/ Media & Entertainment/ Telcos/ Utilities/ Travel & Transportation/ Education/ Government

2 $B

Estimated " comprehensive" PLM revenue for 2010

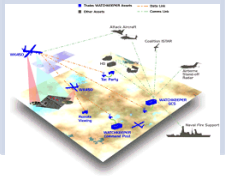
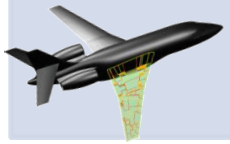
1.7 $B
« mainstream »

0.3 $B
« extended »

1st

PLM Market opportunity for Technology & Process Innovation

Mega Trends and impacts on A&D

Environmental issues	Geopolitical change	Defense & Security	Space Industry	Technology	Programs
					

INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

Mega Trends and impacts on A&D

Regulation Issues

Environmental regulations compliancy:

- 50% Carbon emission reduction in 2020
- 80% NOx emission reduction in 2020
- 50% Noise reduction in 2020

REACH for raw materials, Cleansky Regulations…

Lifecycle cost analysis

Impact of each operation on environment

Dismantling : 6000 planes within 15 years

Needs for New Embedded solutions to manage Product development :
From Smart Engineering to Smart Manufacturing and Support/

Global Sustainment ! (Airbus 3 billions USD, LM 5 billions USD)

INDUSTRY
KNOWLEDGE . PROCESS . VALUE

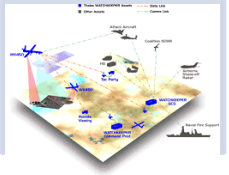
DASSAULT SYSTEMES

Mega Trends and impacts on A&D

Environmental issues

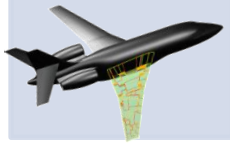
World new paradigms

Defense & Security



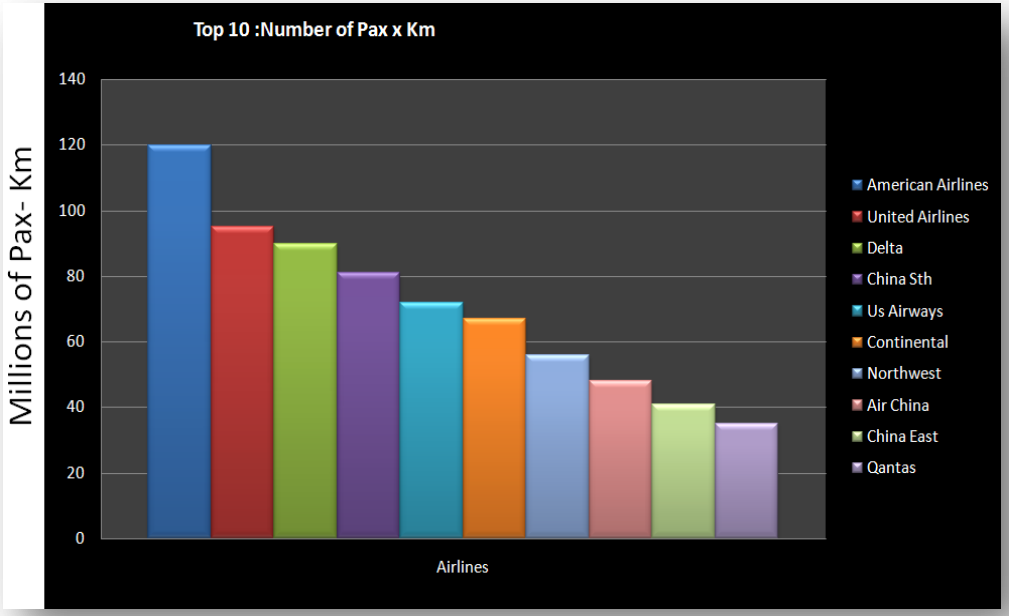
Space Industry

Technology



Programs

- 2,5 pax in 2010, 16 billions Pax in 2050 (sourceIATA).
- BRIC is heavily involved in Aerospace Race.
- Strong Development of Asian traffic (+ 7%)



- A&D industry is getting older (need to attract and to capitalize)
- 22% of A&D population in USA is close to retirement
- China wants to be in the Top 5.
- Russia needs to develop Manufacturing capacities
- India has a strong potential for regional transportation (400 airports)
- Raw Materials and Energy challenges
- Regional regulations for Aeronautic
- Suppliers in developping countries (costs, IP).
- 1605 known programs in the World (Including Sub System programs)

INDUSTRY KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

Mega Trends and impacts on A&D

•52 new ongoing aircraft programs (Fighters, UAV, Transport, Helicopters)

• Cost reduction for new program as well as three cornered working mode (Armies, DOD and the contractors) make program management critical for defense

• More than 2800 sources of information on a program and **61% of US military program are delayed**

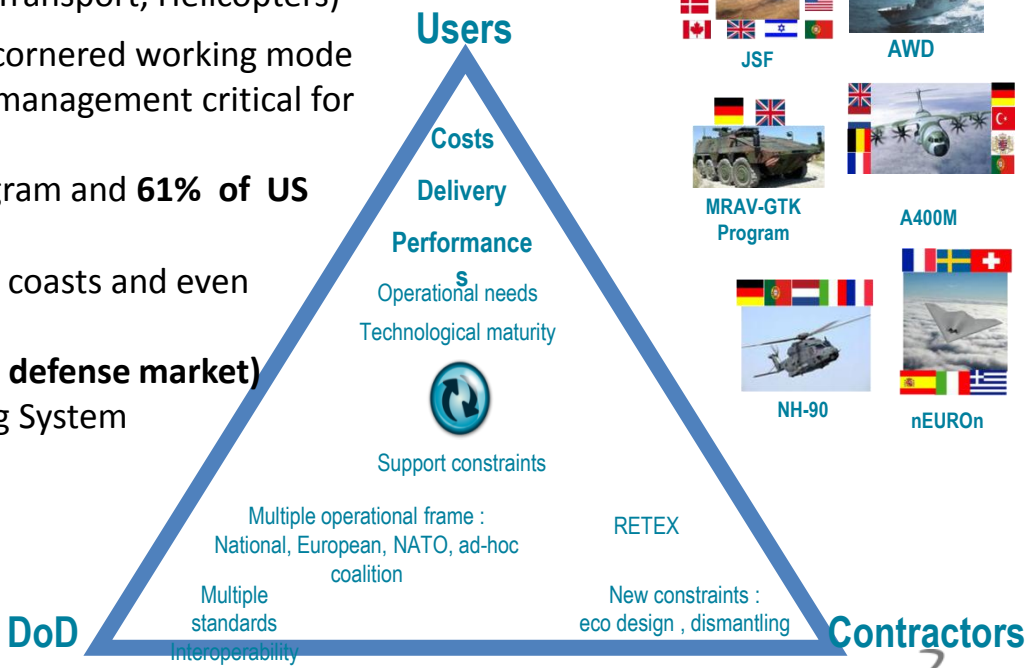
• Security is the upcoming topic ; securing borders, coasts and even country from potential threat

• National Security business : **2.6 trillion $ (2 times defense market)**

• Defense players did not anticipate new actors (Big System Integrators) running for this business

•Money spent on Games for military training: **4B$**

•Need to accelerate the development cycle.



INDUSTRY KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

Mega Trends and impacts on A&D

3 worlds :

-Historical companies with a traditional approach (leaders, mainly public)
-Younger companies with a traditional approach (followers, mainly public)
-NewSpace companies with a new approach (outsiders, private)

•Only Russia has human transportation capacities.

•Investments on Earth Observations, Communication Satellites, Environment Studies

•International Collaborations : programs, studies, development

•China is a key player : maturity for launch systems, payload, reliability.

•India and brazil are developing their own industry

•New market for Space tourism : next step is Sub Orbital flight.

•Private Space, mainly in USA : new development paradigms

•Need for embedded knowledge in tools, simulation (no undo button in space).

INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

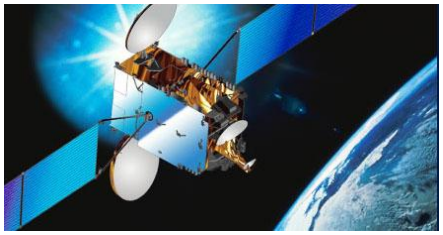
Satellite - Revenues

SPACE Segmentation

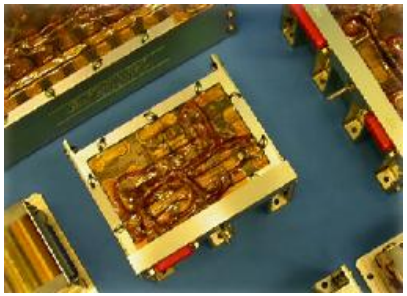
Today…

Space Infrastructure

Satellites



Equipment



Space Exploration

Launch Vehicles

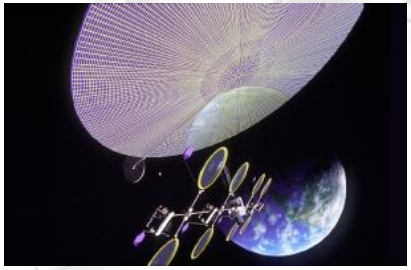
Engines

Ground Systems

Space Transportation

and in the Future…

Solar Power Stations



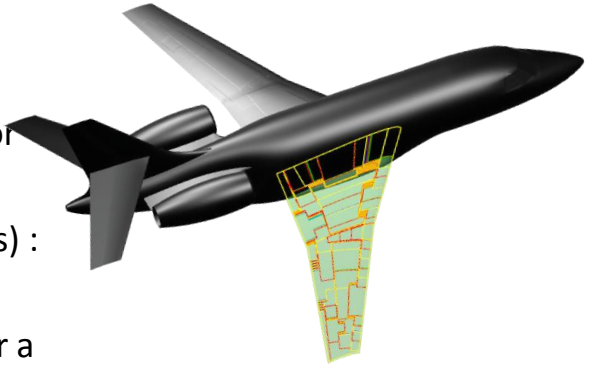
Single-stage-to-orbit

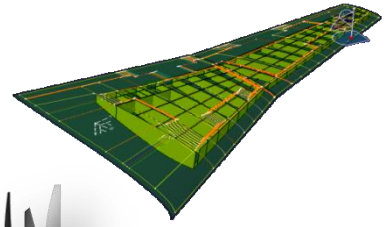
Space Manufacturing

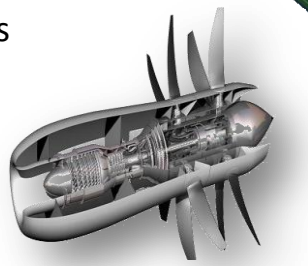
10

Mega Trends and impacts on A&D

- Carbon planes, to reduce weight : need to cover all steps, from Engineering to Manufacturing, Simulation, and Support & Services
- From classic fuselage and wings to flying wings or rhomboedric wings : Needs for new Simulation opportunities, non linear (SIMULIA).
- Electrical Airplane (avoid Fuel Consumption during taxiing phases, Hybrid planes) : More Systems in the Planes.
- Reduce Consumption = reduce speed too ; propellers are coming back (need for a third player, Embraer?)
- New propulsion systems : Open Rotor technology; 100.000 new engines for the next 20 years to be build with Eco Compliancy.
- New opportunities as Tilt Rotor Helicopters for local transportation. Helicopters market is still under development (China)
- Clean Technologies for manufacturing : measure Manufacturing Impacts





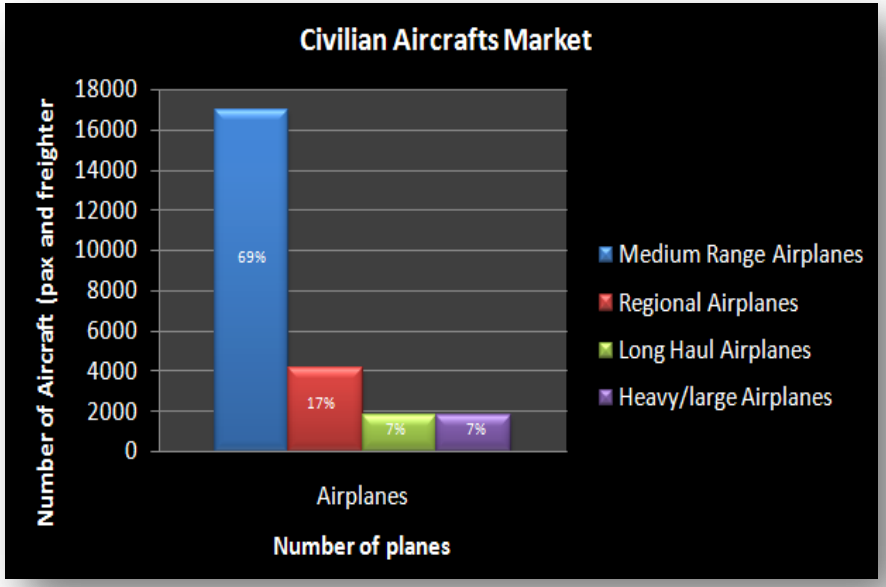


INDUSTRY KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

Mega Trends and impacts on A&D

- Boeing's forecast for the next 20 years is 33.500 planes For 4.000 milliards de dollars
- No more a « duopole » in the Medium range class : Bombardier (C- series), Comac (C919), Irkut (MC 21)…
- Update on A320, A320 Neo (15% less fuel consumption), No announcement on 737, (potentiel impact of the 787).
- Late programs : B777 (55 months) but 900 sold as of today, A 380 (20 months) 48 sold, 787 (44 months) 800 orders.



- On the 787 program, 43 main suppliers for Boeing, managing 70% of the engineering and production.
- Tier 1 are managing large Ecosystems.
- Because of international Programs, IP control and Export Management are key.
- From Financial Management to Engineering Management…
- A320 cost is around 85 to 100 millions USD
- Large opportunities in China for Helicopters and Business jet.
- Calculate Return on Investments and Return on Planet.

INDUSTRY KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

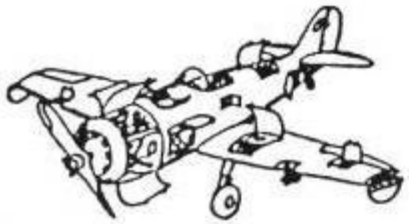
Agenda

1. Key Facts and Data for A&D
2. Dassault Systèmes Action plan 2011-2021

INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

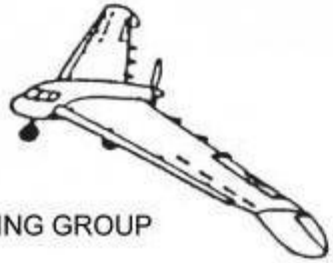
A complex world



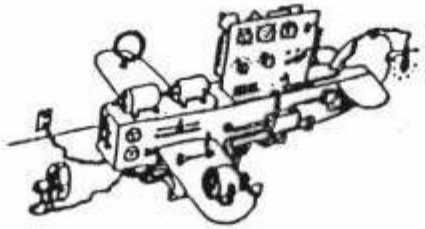
SERVICE GROUP

EQUIPMENT GROUP

ARMAMENT GROUP



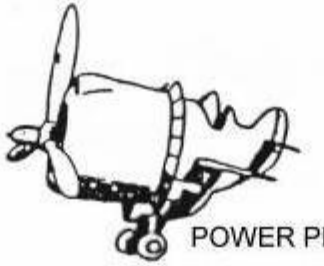
WING GROUP



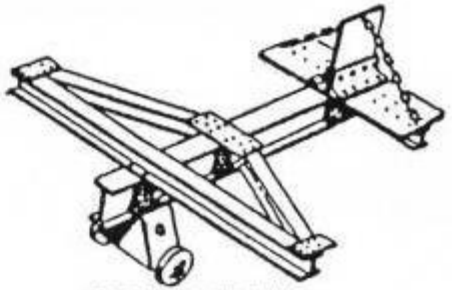
ELECTRICAL GROUP

AERODYNAMICS GROUP

EMPENNAGE GROUP



POWER PLANT GROUP



STRESS GROUP

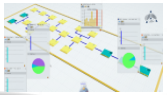
INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

AeroSpace & Defense : Holistic Overview

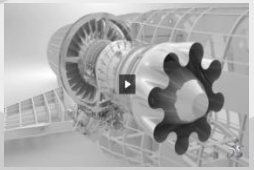
Life like Simulation and Training Experience

Global Sustainment



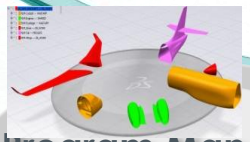
Production Operation Intelligence

ULTIMATE INTEGRATION EXPERIENCE



IP Management And Export Control

Manage and Value Innovation Chain



Program Management

Digital Aircraft System

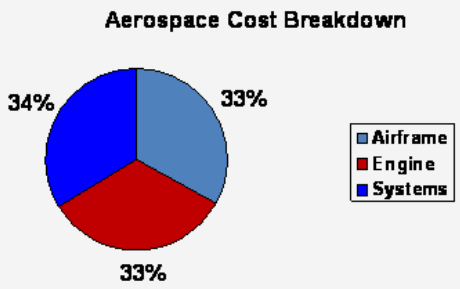
INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

System Engineering Challenges

System Complexity

Increasing functional product complexity

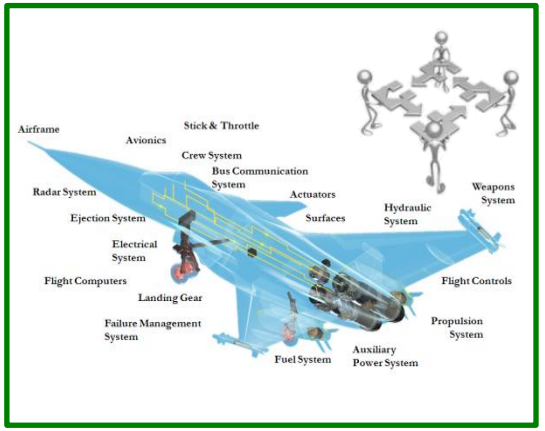


Requirements

More than 40% project failures due to lack in requirements management and traceability

Source: VDC

System Interoperability



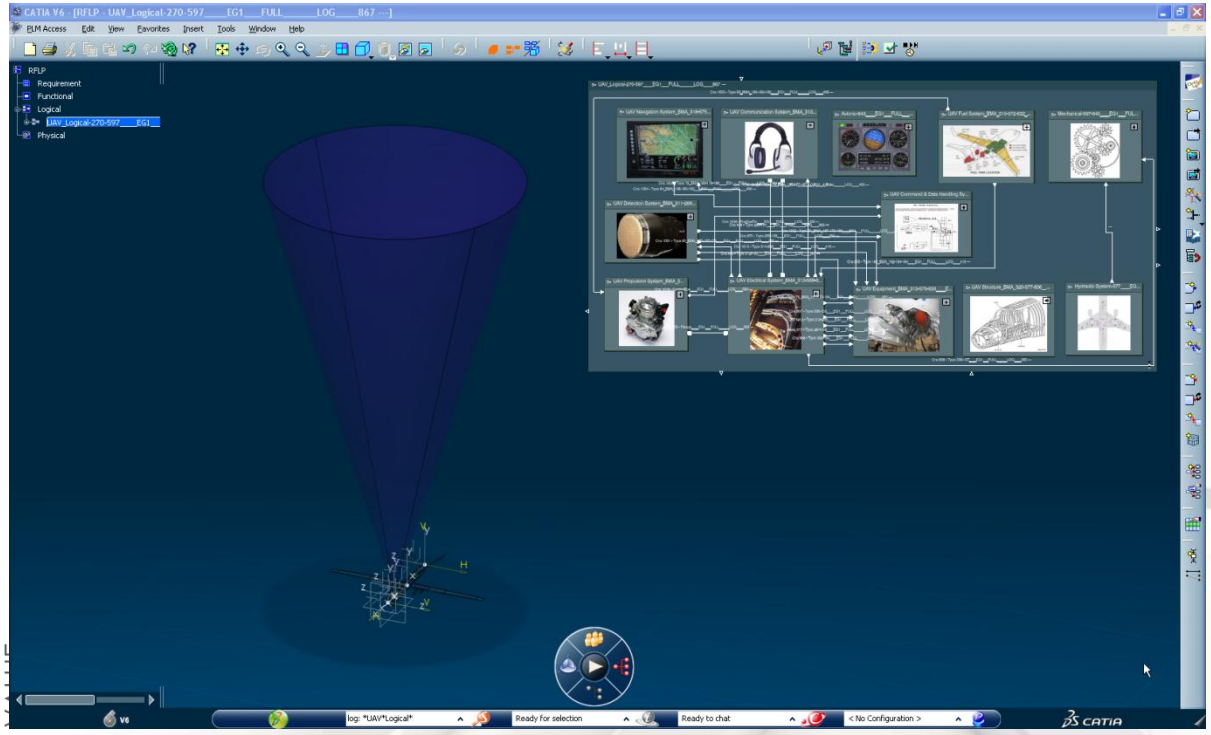
~80% of the aircraft development cost is fixed at the early stage of the design

Source: INCOSE, VDC

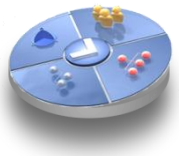
System Industry Challenges

Question : ratio between number of Airframe Engineers compare to number of Systems Engineers?

Answer : from 1 to 12…

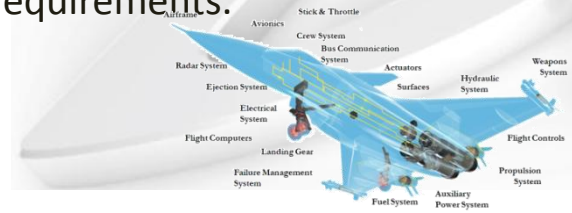


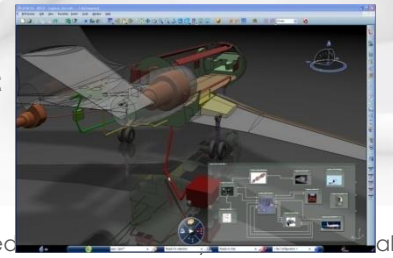
Embedded Systems for
- Piloting
- Behaviors
- Integrated modular Avionic
- Software
- Security/Safety…

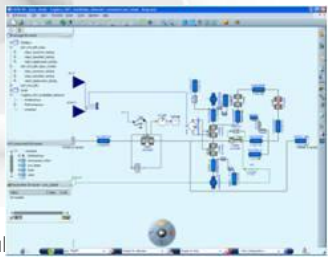


Routed Systems for
- Electrical
- Fluidic
- Hydraulic…

V6 (PLM System) id the Unique Platform of integration for Engineering, System Engineering and requirements.







System Engineering Development

Continuous effort since 2003
- Internal and External
- Under Customer directions

Released in V6
- Infrastructure
- Base Engineering Tools
- Consistent Data Model

PLM V6 Systems

…

Systems of Systems Initiative

Geensoft Strategic Partnership

O2M Mechatronics Project

V6 System Product Deliveries

MODELISAR Project (Autosar-Modelica and HIL Integration)

EUROSYSLIB Project (Modelica Libraries)

Acquisition of Arboost (Safety Engineering)

Acquisition of Dynasim (Modelica Compiler)

Modelica selected as DS strategic system language

Announce of CATIA Systems

Acquisition of ATHIS (Synchronous Statecharts)

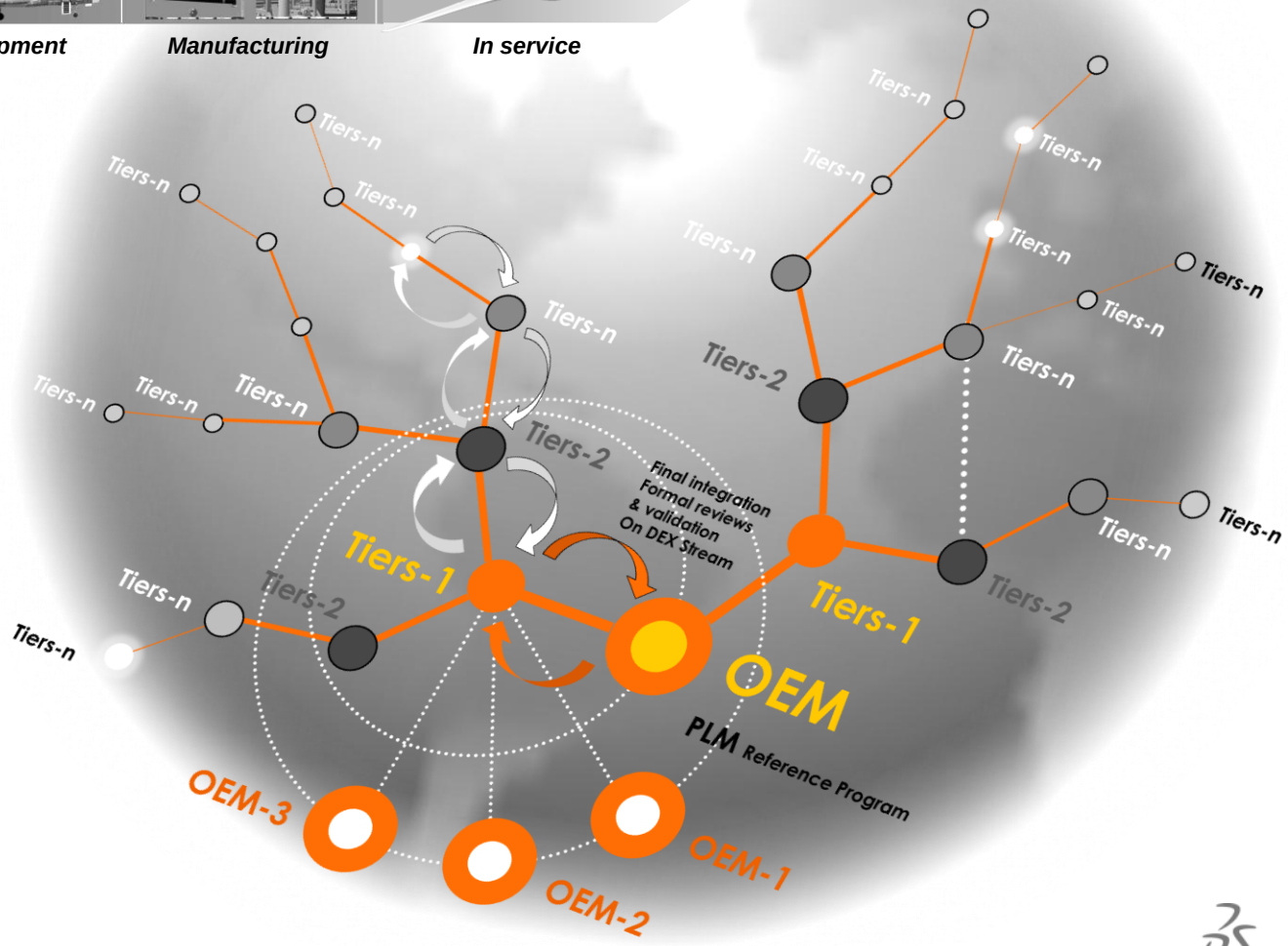
PLM HUB 2.0 Solution – Challenges

BOEING « We did one mistake with the 787 Program, we did look at the Tier 1 only… problems and quality issues came from behind this point…. »

Today

Globalization of responsibilities for program management

Aerospace economic model is redefining roles and responsibilities

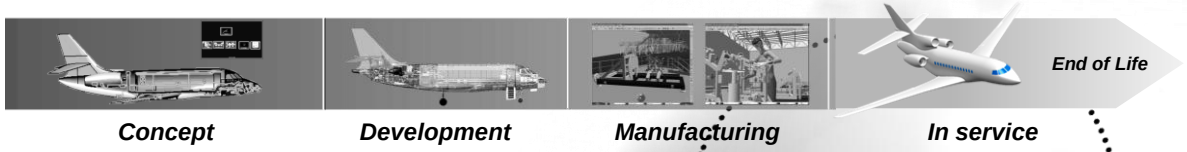


INDUSTRY KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

PLM HUB 2.0 Solution – Challenges

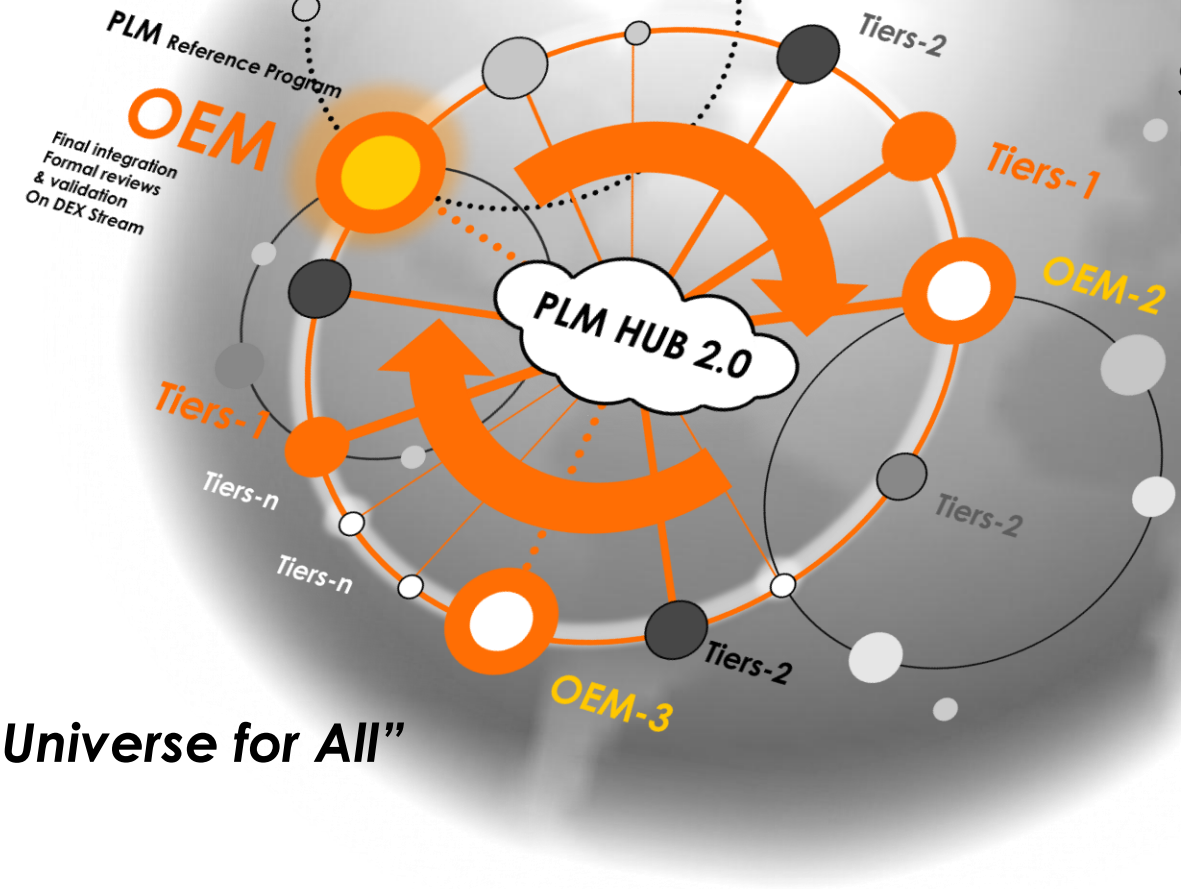
From Private Virtual Plateau (OEM-Tier 1) ➔ **To HUB Collaboration Platform** (OEM – ALL)
Supporting each actor of each community, but also the overall efficiency of the Community



Tomorrow

Globalization of responsibilities for program management

Aerospace economic model is redefining roles and responsibilities



Connect, Share, Design, Simulate, Produce Experience

"PLM Virtual Universe for All"

INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

Collaboration Platform

Boostaerospace : HUB PLM 2.0 to support A&D ecosystem

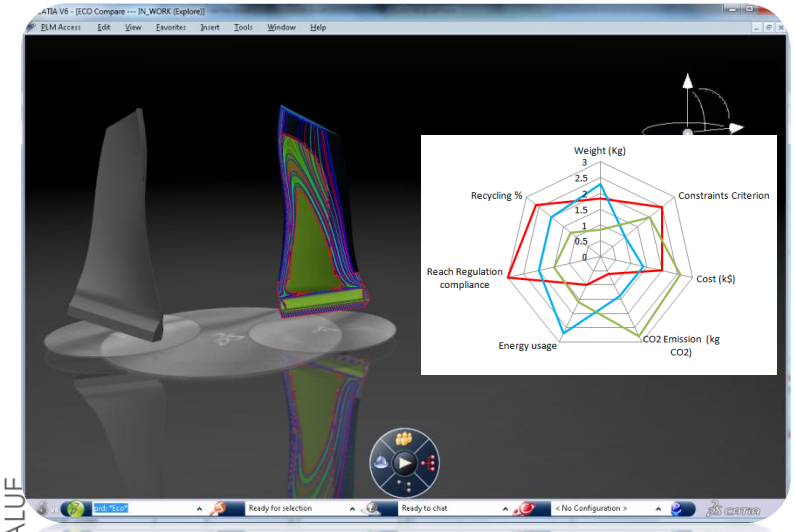
INDUSTRY KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES

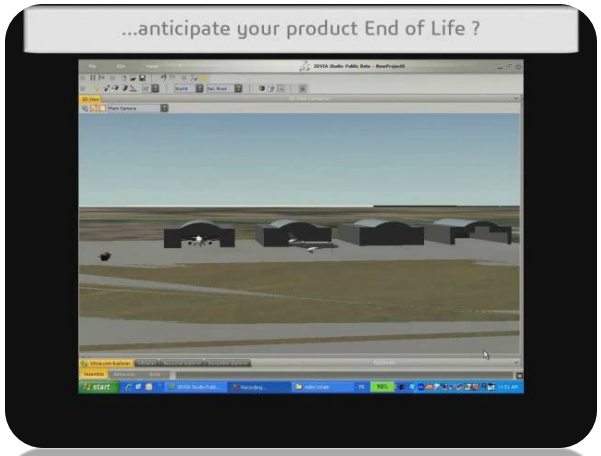
Global Sustainment – EcoSustainable Design

- Taking **« pure » design decision**
  - Product compliance to regulation
  - Criterias available from the **early phasis** of the product design (based on experience)
  - **Shared** with an eco-system
  - Exchange with the supply chain

- Econological criterias **refinement** while engineering the manufacturing



- Anticipate the product's **end-of-life**




Reach


Costs


Energy

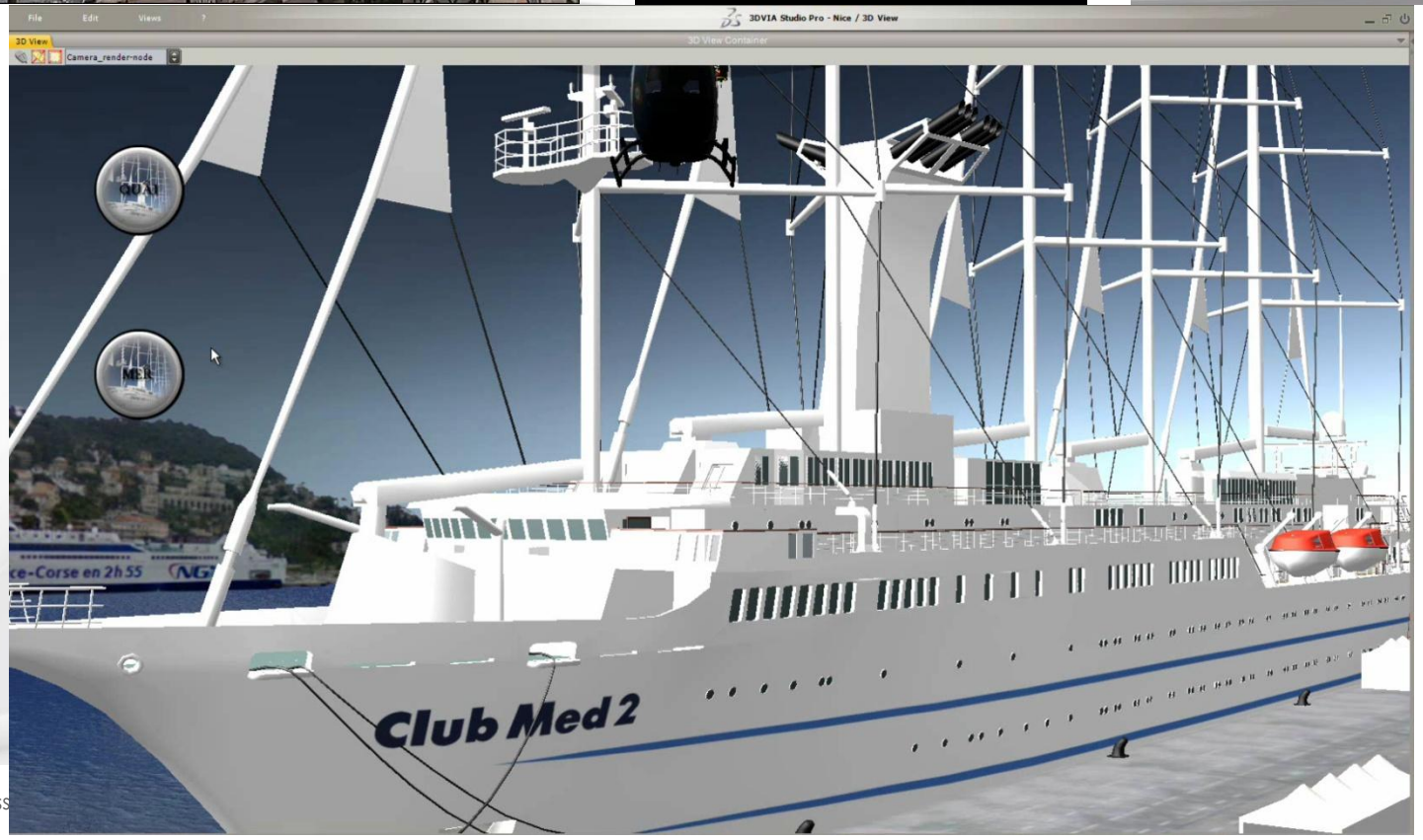

CO_2

INDUSTRY KNOWLEDGE . PROCESS . VALUE

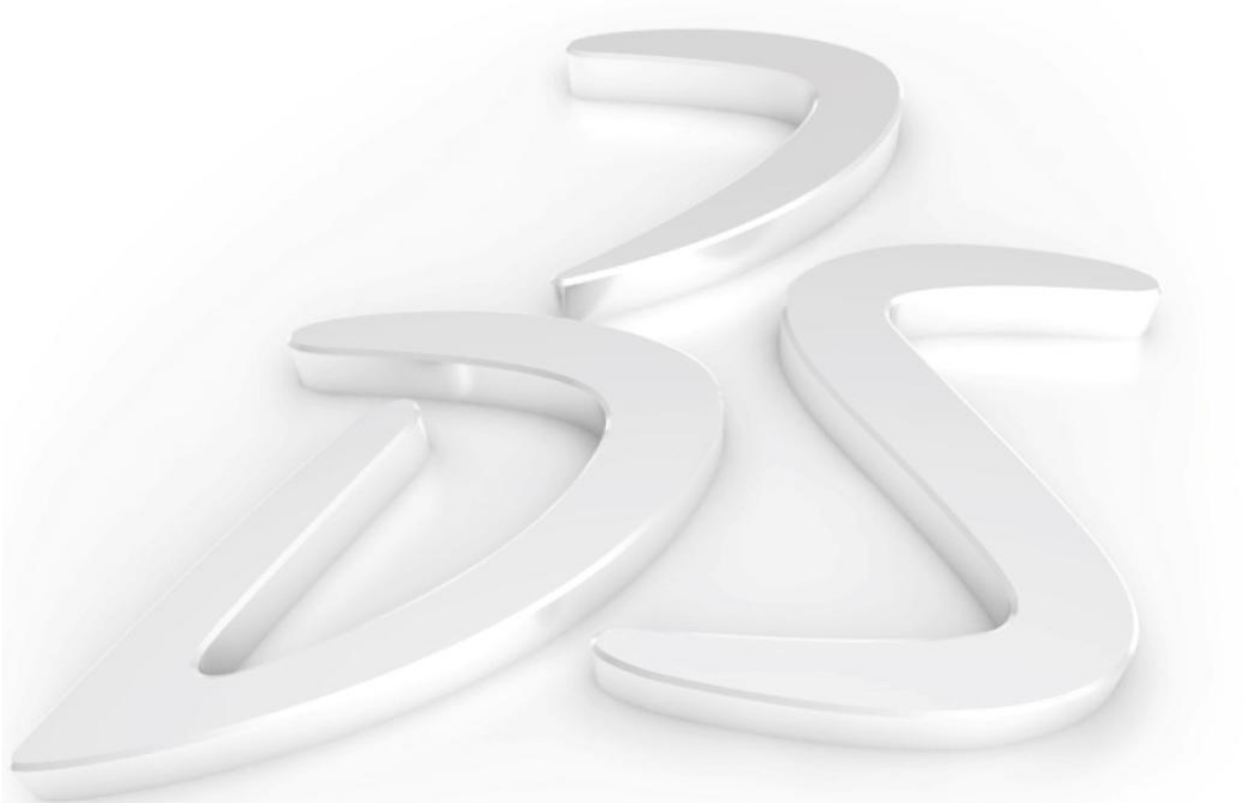
DASSAULT SYSTEMES

3D & Virtual Universes.

Virtual Universe for Training and Decision Support Application



Thank your for your attention.



INDUSTRY
KNOWLEDGE . PROCESS . VALUE

DASSAULT SYSTEMES