

# ***A short history of CATIA & Dassault Systemes***



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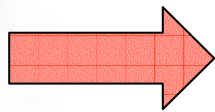
# 3 periods from the origin to now

- 1- The roots: from 1967 to 1981
- 2- The start-up: from 1981 to 1995
- 3- The maturity: from 1995 to nowadays

# 1- The roots: from 1967 to 1981

## In the 60's...

- **Critical requirements in the airplane industry:**
  - ✈ Aerodynamics through theoretical computation
  - ✈ Stress analysis through theoretical computation
  - ✈ Numerical Control Machining of « sculpted » parts
- **First generation of computers and graphic terminals**



Development of software to define shape of airplanes started at Dassault Aviation in 1967

# 1- The roots: from 1967 to 1981

## in the 70's...

- Creation of a CAD/CAM team at Dassault Aviation:

- ✈ To develop master geometry software
- ✈ To create the outer shape of the airplane
- ✈ To deliver external shape data to design & manufacturing

- Acquisition in 1975 of CADAM (from Lockheed) for drafting

Step by step all new airplanes are electronically defined:

External shapes in 3D (curves, surfaces, volumes)

Internal parts in 2D drafting

# 1- The roots: from 1967 to 1981

The first airplanes with external shapes 100% digital

(1969-1972)

Alphajet



Mercure

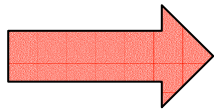


Curves defined & smoothed interactively  
Surfaces defined & exploited in batch

# 1- The roots: from 1967 to 1981

## 1977: start of the CATIA development (« CATI »)

- ✚ From 10 years experience in 3D mathematics
- ✚ Taking into account CADAM interactive user's interface



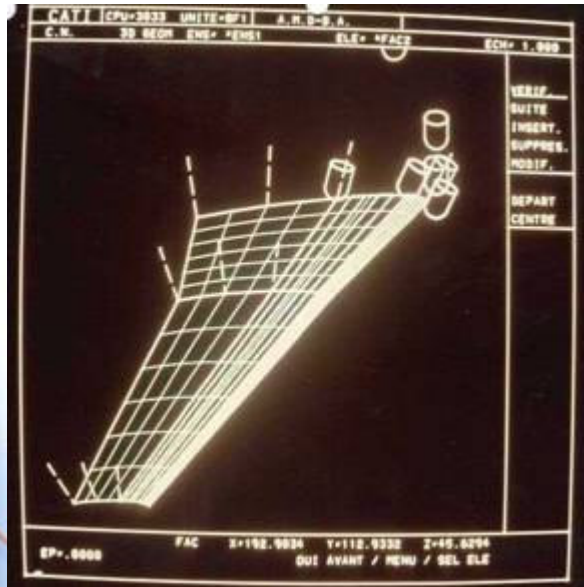
To integrate better 3D and CADAM

To reduce design/manufacturing cycle time by 4

To allow deployment within Dassault Aviation



## 1- The roots: from 1967 to 1981



## The first application of CATI



## 1- The roots: from 1967 to 1981

**CATI becomes highly visible  
at Dassault Aviation...**



Mr Marcel Dassault  
with Dominique Calmels (left)  
and Francis Bernard (right)

(November 1980)





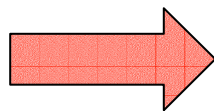
## 2- The start-up: from 1980 to 1995

### ➤ Early 1981: Decision to create a new business with CATIA

- ✎ Creation of Dassault Systemes
  - ↳ Move the CAD/CAM team in Dassault Systemes
  - ↳ Activity: to develop CATIA for all industries
- ✎ Alliance with IBM
  - ↳ To sell and to support CATIA worldwide



The first logo:  
3D, Interactive



Dassault Systemes starts with 15 people  
IBM sells CADAM for 2D & CATIA for 3D

## 2- The start-up: from 1980 to 1995

We start the public story...

Motivation, CAD/CAM skills,  
Support of Dassault Group & IBM,

...but no knowledge of IT business!



**DASSAULT** is developing today the new  
**CAD/CAM** system of the future

**its processing structure integrates these four main functions.**

**display definition of shapes**

The image of objects which are modeled on the computer are synthesized on the scope. Thousands of parts, the virtual shape of which is stored and processed electronically.

On the scope, the operator gives the part its desired shape by guiding the computer through a simple and highly accurate interactive dialogue. He becomes a sculptor of modern times whose computer system immediately changes his thought into a visual image.

**analysis of objects**

The computer, a wonderful calculation system, in which the visual image of the object is created, simulates the way it will perform. Although this object is still conceptual, its weight, volume, stress resistance and aerodynamic reaction exist as data already stored in the computer memory. Thus, any technical defects can be detected and repaired on its computer representation.

**industrial process**

Finally, all of the orders developed on the computer are carried out through a numerical control machine-tool. The virtual thing which has been conceived by Man and synthesized on the scope then becomes reality, reproducing the thought with an absolutely exact fidelity.

The four screenshots show the following:

- 3D MECHANICAL DESIGN:** A 3D wireframe model of a mechanical part with various features like holes and fillets.
- SECTION CUTS:** A 3D wireframe model of a mechanical part with a section cut through it, showing internal features.
- COMPLEX ENCLOSURE:** A 3D wireframe model of a complex mechanical enclosure with multiple openings and internal structures.
- COMPLEX FILLET:** A 3D wireframe model of a mechanical part with a complex fillet applied to its edges.

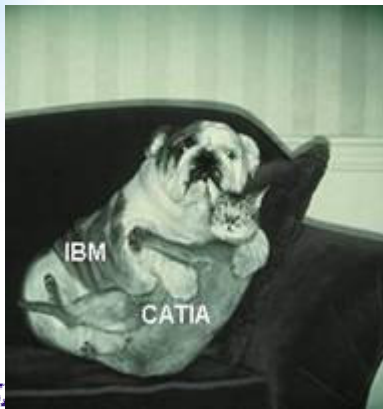
## 1- The roots in the 70's

# CATIA VERSION 1.0...



## 2- The start-up: from 1980 to 1995

**November 1981:**  
DS/IBM announce  
CATIA Version 1.0



**DS**  
DASS  
SYSTEMES



**Computer-Graphics  
Aided  
Three-dimensional  
Interactive  
Application**

- System 370, 43XX, 303X
- MVS and VS1
- 3-D Design
  - Wire-frame
  - Surfaces
  - Solids
- 3-D Analysis
- 3-D Database
- Kinematics
- Multi-Axis NC
- Multi-User Program

Dassault  
Systemes



## 2- The start-up: from 1980 to 1995

### Computer Graphics Aided Three-Dimensional Interactive Application (CATIA®).



CATIA is a highly interactive, high function 3D geometry system for computer-aided design and manufacturing. Developed by Dassault Systèmes, Paris, France, the CATIA system is the result of more than ten years of Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) development in the areas of complex shape definition and numerical control (NC) machining.

CATIA uses the IBM 3250 Graphics Display as its high function interactive workstation. All the 3250 hardware features are fully supported (for example, multiple intensity levels, line types, and blinking) thus providing superior human factors.

CATIA permits direct construction of 3D objects. Additional facilities provide for viewing manipulating, and

analysing these objects. Machining instructions to drive an NC tool are automatically produced by the system.

CATIA provides a special interface for passing design data to and from the Computer Augmented Design and Manufacturing (CADAM®) System. The integration of these two major systems encompasses the entire design process from

The data-base system contains both the precise geometric definition and the corresponding graphical representation of the data.

3D components may be generated from collections of subcomponents.

Any view of a 3D object from any angle can be generated automatically.

Changes in any view automatically change all the views of the 3D object.

English or metric dimensions may be used.

A comprehensive set of analysis functions computes lengths, areas, and volumes.

The kinematics function allows 3D motion studies and interference

### Computer Graphics Augmented Design and Manufacturing (CADAM®).



CADAM provides an interactive graphics system for use by designers and draughtsmen in computer-aided design and manufacturing. CADAM is IBM's principal engineering graphics product and was developed by the Lockheed Corporation. It is the result of more than fifteen years of continuous effort and has been proven in large-scale production use at many IBM customers.

These companies use the CADAM system in the design and manufacture of high-technology products from design conception through manufacturing. The benefits have included:

- ☐ Increased productivity
- ☐ Shorter time from design through manufacture

- ☐ Lower costs
- ☐ Better designs
- ☐ Greater accuracy
- ☐ Improved engineering change control
- ☐ Higher standardisation of designs

The CADAM system uses a central design data base for storing and retrieving drawings created by designers and draughtsmen. This design data base enables users in both design and manufacturing to share geometric and alphanumeric data. It facilitates the timely and accurate communication of design information between design and manufacturing and is an important part of CADAM's design data base.

CADAM® is a trademark of CADAM Inc.

#### HIGHLIGHTS

The CADAM system is highly interactive and user oriented. Procedures at the graphics displays (IBM 3250s) use construction techniques familiar to the conventionally trained draughtsmen. Geometric construction is based on descriptive geometry.

CADAM system model. Replication of details or standard symbols is possible. A user may construct a detail, such as a fastener or bracket, only once, and then replicate and locate it as necessary.

Transformations assist the draughtsman in the development of oblique and isometric views.

3D surface geometry capability aids users in the design and visualisation of 3D surfaces. A user may construct ruled surfaces, bi-cubic surfaces, surfaces of revolution, and 3D splines.

With the aid of 3D mesh generation facilities, designers may construct finite element models for structural analysis, heat-transfer analysis, and similar applications.

With the attribute facility, any part of an engineering drawing (single geometric element or permanent group) can be assigned user defined attributes (weight, price, description, etc.). This data can be used for input to user programs to generate bills of material, purchase orders, wiring instructions, and so on.

Designers can get better designs because they can test more design possibilities.

Design changes are rapidly incorporated into drawings. Sub-assemblies can be rapidly incorporated into many drawings.

The data base is interdisciplinary, enabling a user to make the geometry of a part available to other users.

NC part programming is based on accurate design geometry held in the data base. Improved accuracy reduces the timespan for verifying NC tapes, reduces tool tries, and reduces scrap.

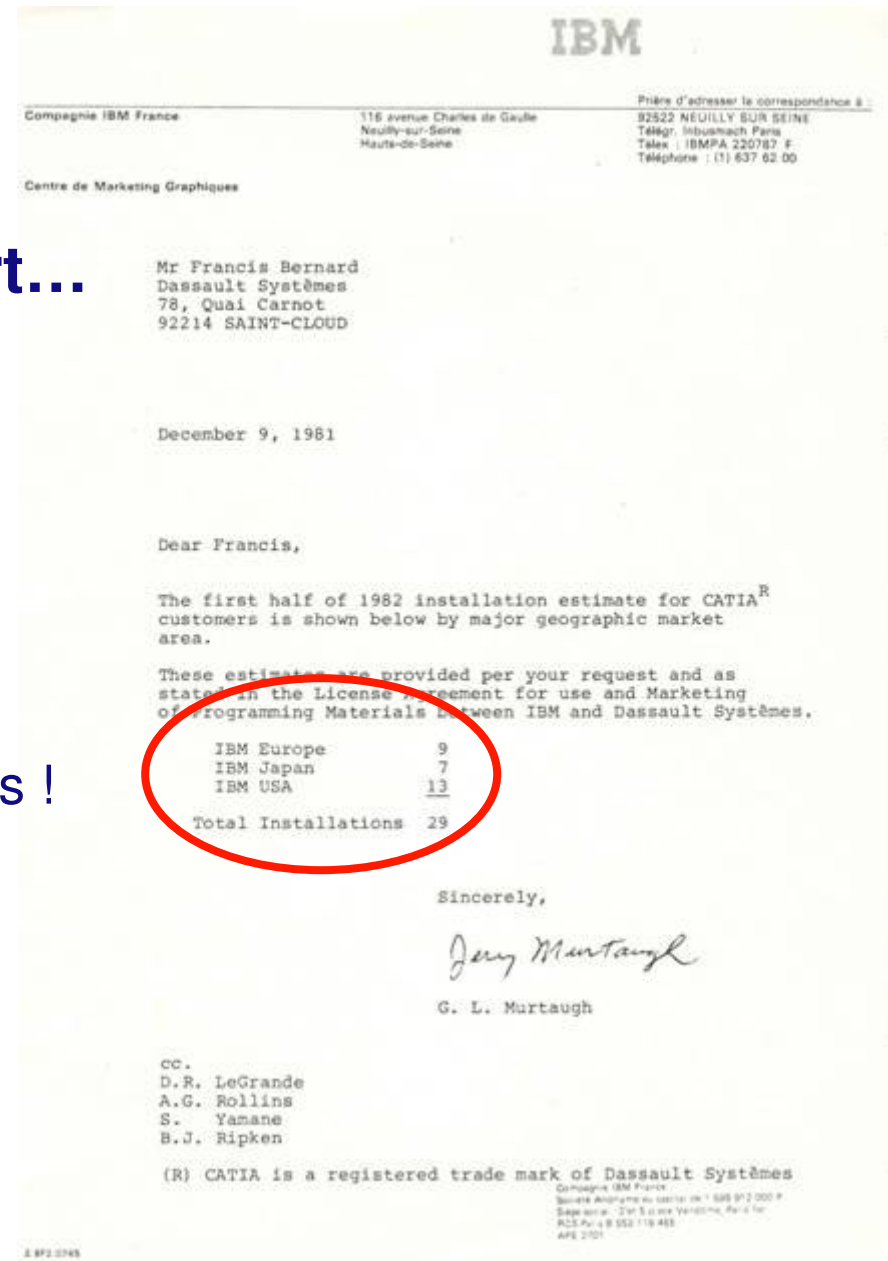
CADAM system configurations may include TP-attached IBM 3250s



## 2- The start-up: from 1980 to 1995

1981/82: a very slow start...

1H 82 Sales target: 29 customers !



## 2- The start-up: from 1980 to 1995

### 1981/82: the first customers....

Dassault Aviation (Airplane, France)

Grumman (Airplane, USA)

SNECMA (Jet Engine, France)

Daimler-Benz (Automotive, Germany)

BMW (Automotive, Germany)

Honda (Automotive, Japan)

....

## 2- The start-up: from 1980 to 1995

1982: we start generating attention...



## 2- The start-up: from 1980 to 1995

### 1984: the major payers...

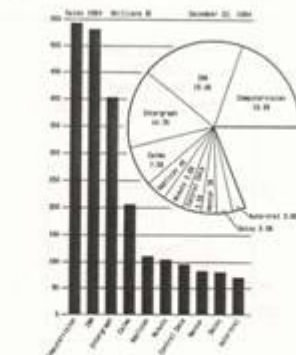
CV, IBM, Intergraph,  
Calma, Applicon, Mcauto,...

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#### CAD/CAM, CAE INDUSTRY GROWTH REACHES 50 PERCENT IN 1984 AS REVENUES TOP \$2.7 BILLION

CAD/CAM, CAE had another record-breaking year in 1984. With revenues of U.S. vendors estimated at more than \$2.7 billion, annual growth has skyrocketed to 50 percent -- up from 40 percent in 1983, and 28 percent in 1982, says a new survey of CAD/CAM, CAE systems and vendors published by Daratech, Inc., a Cambridge, Mass. research firm. This high growth, most of it in the first half of the year, follows the introduction, late in 1983, of a generation of more powerful,

1984 CAD/CAM INDUSTRY ESTIMATED REVENUES



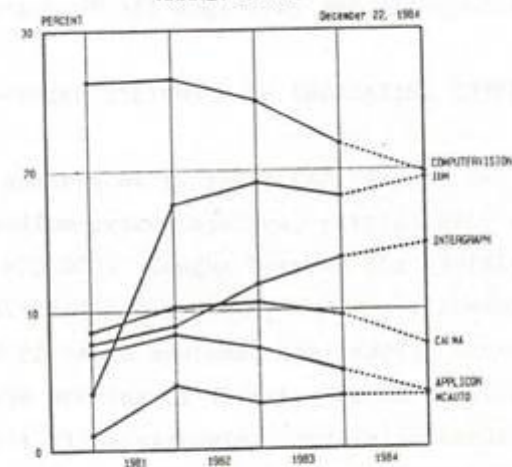
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Ref: WP38(11) 12/20/84

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CAD/CAM, CAE INDUSTRY  
ESTIMATED  
MARKET SHARE



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(MORE)

1/4/84

## 2- The start-up: from 1980 to 1995

**1985: we have 400 customers...**

**200 people in Paris**



A few top executives of Dassault Systems

standing, left to right:  
F. Bernard, Executive Vice President  
D. Calmels, Technical Director  
P. Forstner, Marketing and Technical Support Department Manager  
P. Ritzky, Training Department Manager

January 1985

## Creation of DS America

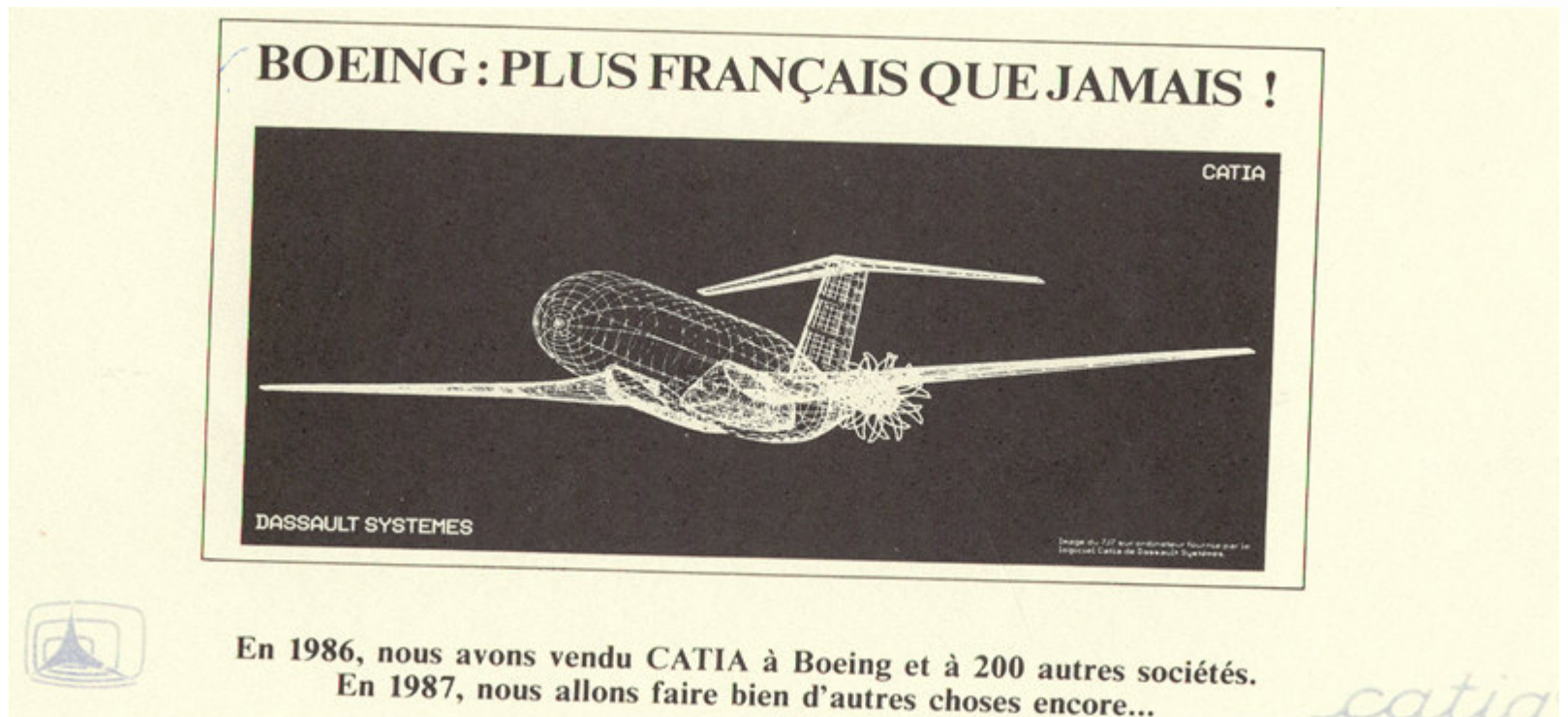


**With CADAM/CATIA,  
IBM becomes Nb 1**



## 2- The start-up: from 1980 to 1995

**1986: Boeing selects CATIA and publishes it !**



Half-page in all major French newspapers

« Boeing more French than ever ! »



## 2- The start-up: from 1980 to 1995

July 1987:  
we are very visible...

### SAMPLE Computer Aided Design report®

Vol. 7, No. 7, July 1987

#### CATIA RISING STAR OF IBM



There's a major battle looming in the high priced CAD/CAM world between Lockheed Corporation's CADAM subsidiary and Dassault Systems, a division of Dassault Aircraft of France. The prize will be leadership of IBM's CAD/CAM software.

IBM is virtually unchallenged CAD/CAM systems -- those with 25 to 200 single central processor. Control Data about one tenth of IBM's business. The totals roughly a billion dollars and acc four-billion-dollar-CAD/CAM industry.

Big CAD/CAM systems are popular of the major airframe assemblers -- North Dynamics, Boeing, and Rockwell -- use IBM Boeing's Commercial Airplane Company chu "turnkey" CAD systems to run CAD/CAM app mainframes. (Boeing had used the IBM Sy engineering analysis and commercial appl General Motors is also a major IBM custc purchased to run its data processing aff

Unlike other CAD/CAM vendors, programmers writing millions of lines of IBM markets CAD software developed by ot basis. IBM's marketing consists of sell giant sales force (20,000 strong in the provides sales support, such as demo jcc and technical specialists of every strip prints and distributes sales literature, research to determine what customers wan that its software vendors should make.

IBM fosters competition between suppliers. Today IBM's most popular CAD CADAM. Only a small minority of mainfra many of these are CADAM users too. Howe is growing rapidly while CADAM users in population growth. Furthermore CATIA is CADAM's expense, a fact which has CADAM wounded elephants. Wounded elephants ca the behind-the-scenes battle between the now warming up.

It doesn't matter to IBM what the battle. IBM will win either way and That's because competition produces exce stay competitive, another software house

Will CATIA surpass CADAM to b CAD/CAM line? To find out, we sent a re

Today Dassault Systems boasts some of the brightest technical management in the CAD/CAM business. French engineers are generally better educated in mathematics than Americans, and these mathematical skills helped the company develop clean, well structured programs. Dassault posted young technical managers to America where they worked in IBM offices. They learned to listen to customers and to translate their desires into features for CATIA.

Dassault's management seems to have a long term vision about where their product is headed, and they share this vision with customers. Unlike IBM, which operates in secret, Dassault announces product plans at users meetings a year in advance of delivery. This gives Dassault a chance to get valuable feedback before final programming details are cast in concrete.

Overall Dassault's management is open, honest (at least by the standards of the CAD/CAM business), and professional. When Dassault's programmers can't do something or don't want to do it, they generally explain why. Sometimes they'll admit that it will take time to deliver additional functions they know are needed. This professional attitude serves Dassault well in the long run. Because Dassault is open and reasonable, customers don't develop unrealistic expectations of CATIA. Without unrealistic expectations, there are fewer disappointments.

Growth is the biggest challenge faced by Dassault. Dassault Systems has grown from about 45 employees in 1981 to 320 today. If CATIA really takes off, the head count could grow to 600. Such growth might overtax Dassault's very bright young management team.

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## 2- The start-up: from 1980 to 1995

And we start competing against CADAM...

### Can CADAM Fight Back?

Can CADAM Inc. counter Dassault's offensive? Of course it can. CADAM is moving, albeit slowly, to address customer complaints and forestall defections. Kevin Clayton, a project engineer supporting CADAM users at Harnischfeger, a heavy equipment builder, says CADAM release 20.1.2 was very clean and ready to go into production without testing and debugging. He also says CADAM has improved operators manuals and illustrations.

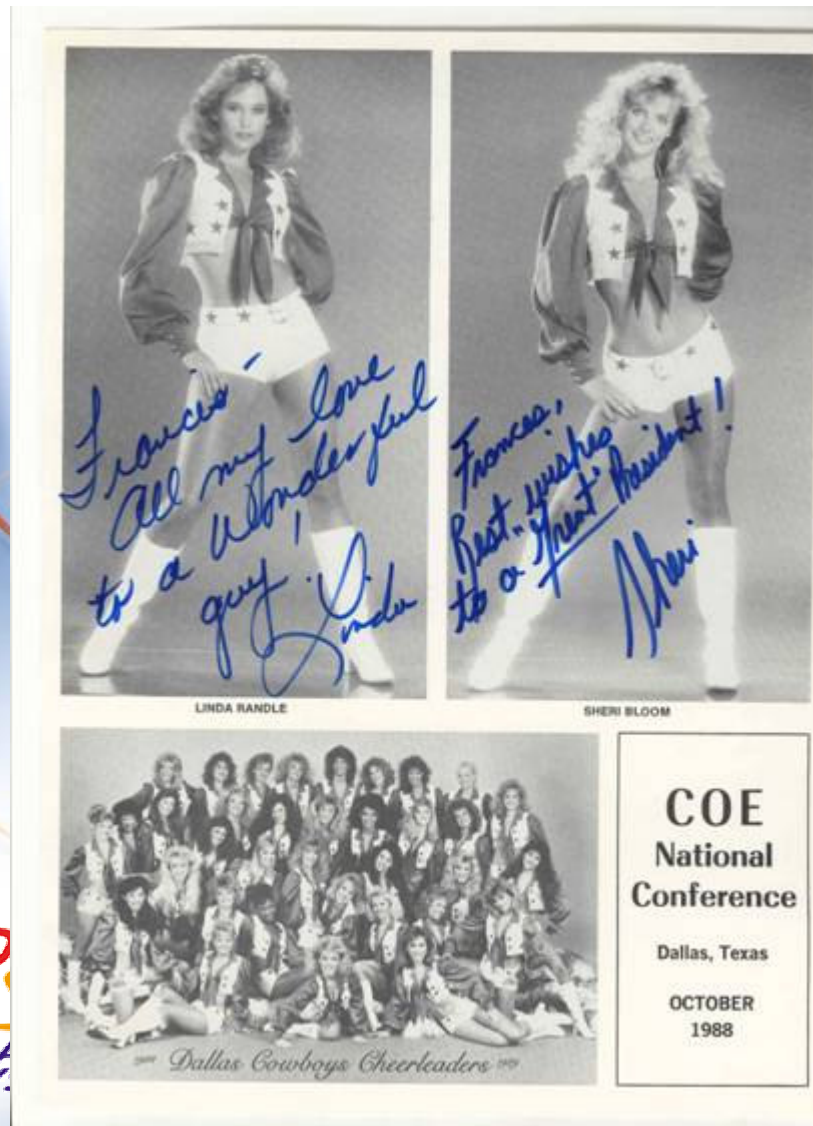
CADAM is trying to promote its own solid modeler and three-dimensional surface design package as an alternative to CATIA. If CADAM can match Dassault's reliability, efficiency, and function, it can certainly keep customers from switching. Despite the

COMPUTER AIDED DESIGN REPORT

JULY 1987 9

## 2- The start-up: from 1980 to 1995

A lot of work...  
and a lot of fun...



## 2- The start-up: from 1980 to 1995

**1991...10th anniversary:**

**1000 people**

**Subsidiaries in USA, Japan**

**2500 customers** (40% Auto, 30% Aero, 30% others)

**Software and service partners**

**IBM Strategic Partner**

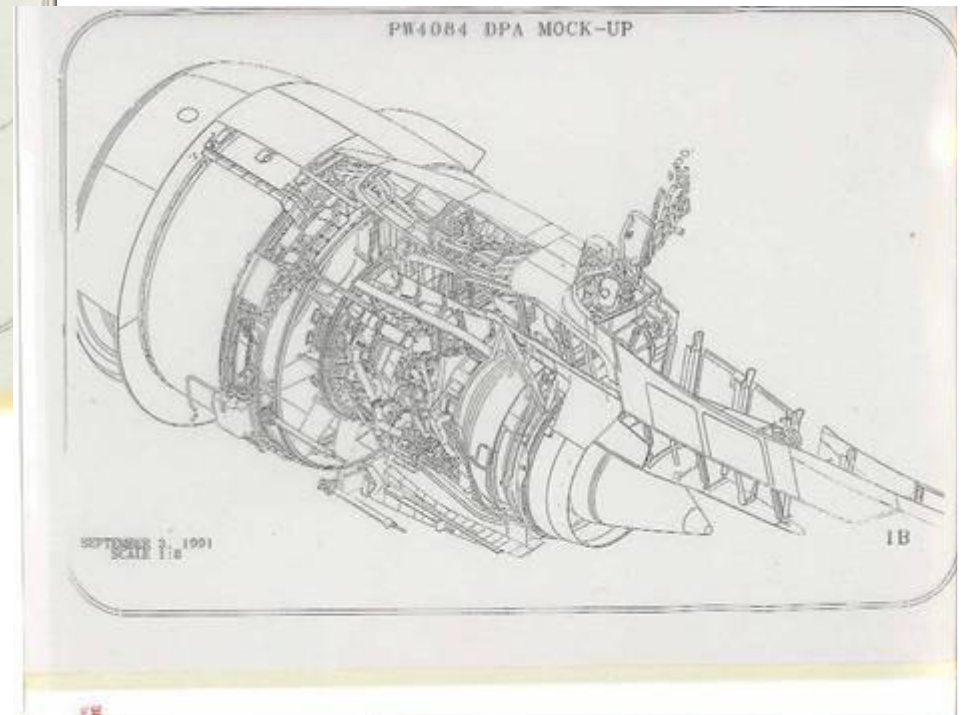
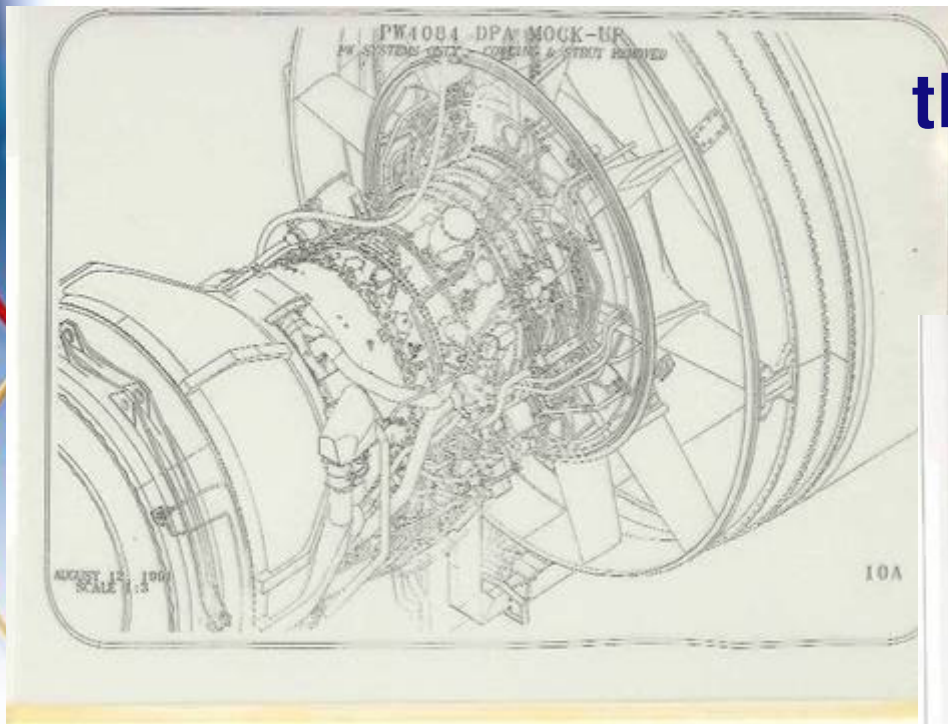
**CADAM acquisition**





## 2- The start-up: from 1980 to 1995

**1991: on Version 3  
the first Digital Mock-Ups..**



## 2- The start-up: from 1980 to 1995

### The solution evolution...

- **1981: Version 1 (5-8 products)**
  - ✚ Host MVS
  - ✚ Shape design, NC, ...
- **1984: Version 2 (10 products)**
  - ✚ Host MVS, VM
  - ✚ Drafting, ...
- **1988: Version 3 (18-25 products)**
  - ✚ Host/IBM Workstation
  - ✚ Data management (CDM), ...
- **1993: Version 4 (30-100+ products)**
  - ✚ Host/ UNIX Workstations (IBM, HP, SUN, SGI)
  - ✚ Exact solids, Parametric design,...

## 2- The start-up: from 1980 to 1995

Problems don't come only from customers...



**15 January, 1994:**  
An earthquake destroys  
our offices in California

## **2- The start-up: from 1980 to 1995**

### **Where are we in 1995 ?**

- **Version 4 in production at all major sites**
- **Market segment focus (from task to process-driven)**
- **Addressing all markets (Auto, Aero, F&A, Consumers goods, Shipbuilding, Plant design)**
- **Shift in IBM/DS relationship: Hardware independence**
- **8000 customers**

### 3- The maturity: from 1995 to nowadays

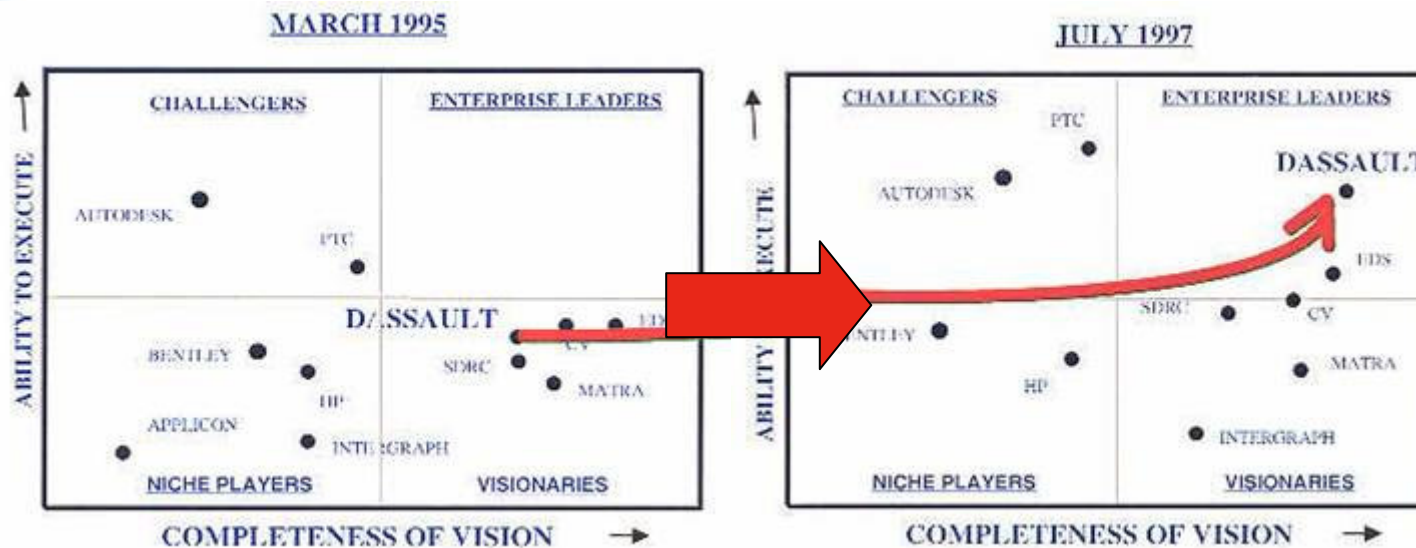
- 1996: Dassault Systemes on the stock market (Nasdaq, ...)



(new logo)

- 1997:

- Acquisition of Solidworks: to address the Design-Centric market
- Acquisition of Deneb: to address Manufacturing → DELMIA
- Disclose of CNEXT → CATIA V5






Source: Gartner Group



### 3- The maturity: from 1995 to nowadays

1998:

#### CATIA Version 5

-  *A complete re-write of CATIA*
-  *UNIX, Windows platforms*
-  *An architecture to support PLM*

#### Acquisition of IBM PDM assets

-  *Creation of ENOVIA*

### 3- The maturity: from 1995 to nowadays

#### 1999:

- ✚ Acquisition of Matra Datavision lab (Euclid)
- ✚ Acquisition of SmartTeam
  - ✚ *To complement ENOVIA in the PDM arena*

#### 2000:

- ✚ Consolidation in DELMIA of Deneb, Safework & EAI-DELTA
  - ✚ *A complete Manufacturing solution (robotics, ergonomics, process planning,...)*
- ✚ Acquisition of SPATIAL
  - ✚ *3D Software components*

### 3- The maturity: from 1995 to nowadays

2001:

- Acquisition of Structural Research & Analysis Corp (SRAC)
  - To complement CATIA Analysis solutions



(new logo)

2002:

- Acquisition of Knowledge Technologies International (KTI)
  - To accelerate knowledge engineering developments
- Win of Toyota Motor Corporation
  - Confirms the leadership of PLM V5 solution
- Creation of a joint venture with Geometric Software Solutions
  - The first off-shore development lab in India



# CONCLUSION

## An incredible success story...

- 1- A long-term vision
- 2- Strong management & professionals to execute
- 3- A customer-driven culture
- 4- A partnership-driven culture
- 5- and a lot of work...
- 6- and some luck...

More a human story...

than business & technology !





[www.3ds.com](http://www.3ds.com)