HOW MDA SATELLITE SYSTEMS INCREASES REUSE USING GEOMETRIC SEARCH

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GLOBAL PRODUCT DATA INTEROPERABILITY
SUMMIT
2014

ELYSIUM Parker NORTHROP GRUMMAN BOEING

Outline

- Context
- About MDA
- Why use 3DPartFinder?
- How MDA uses 3DPartFinder
  - Reuse of complete part
  - Partial reuse of a part
  - Reuse of the concepts of a complex part
- Return on investment
- MDA conclusion
- The new generation of 3DPartFinder tools
  - Analytics
  - 3DPartFinder for everyone

Context

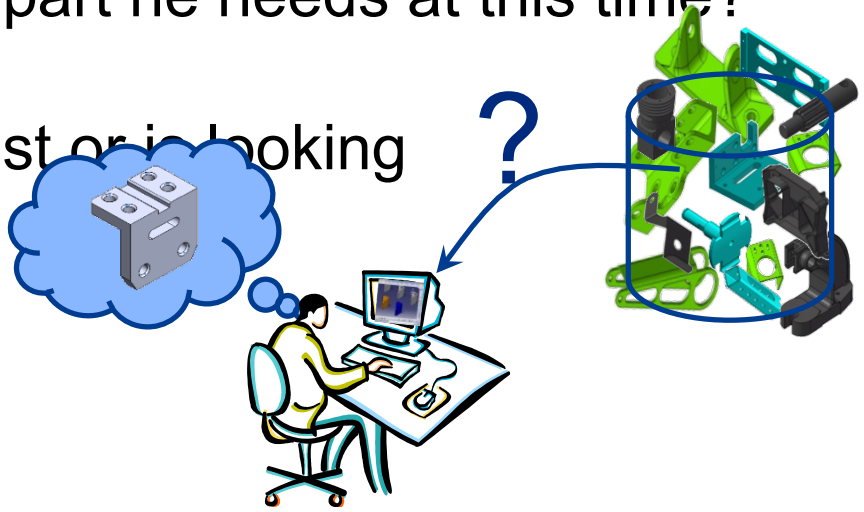
- Most companies seek to:
  - Reuse parts and information from previous projects
  - Avoid recreating existing parts
  - Keep time and money to innovate

- But the question is :

"How can a designer find the part he needs at this time?"

or

"Does such a part already exist or is looking for it a waste of time?"



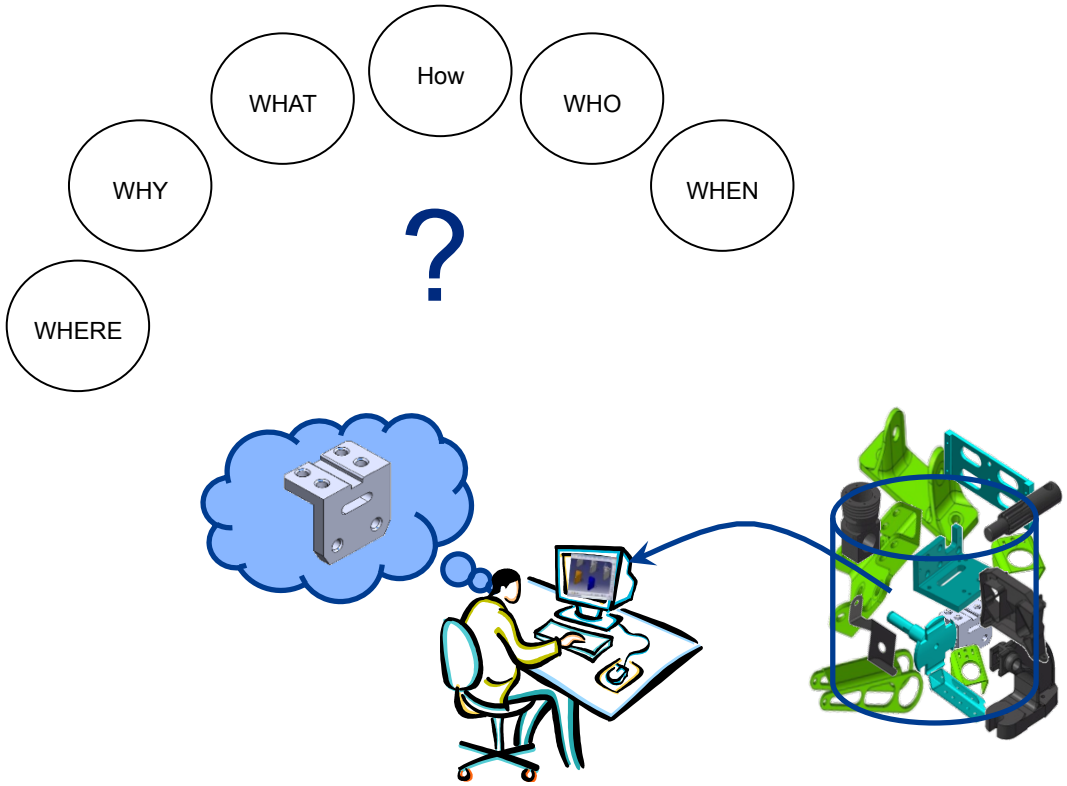
Context

- New tools exist to help solve the problem!
  - "Two classes of Search and Discovery Solution software tools can improve accessibility – semantic and geometric:
  - Semantic search – uses algorithms that assess the meanings and relationships within text to search and discover product data scattered throughout the enterprise
  - Geometric search – uses a mathematical representation of a part to seek and find parts with identical or similar shapes"

Dick Bourque posted on Engineering.com (Dec 2013)

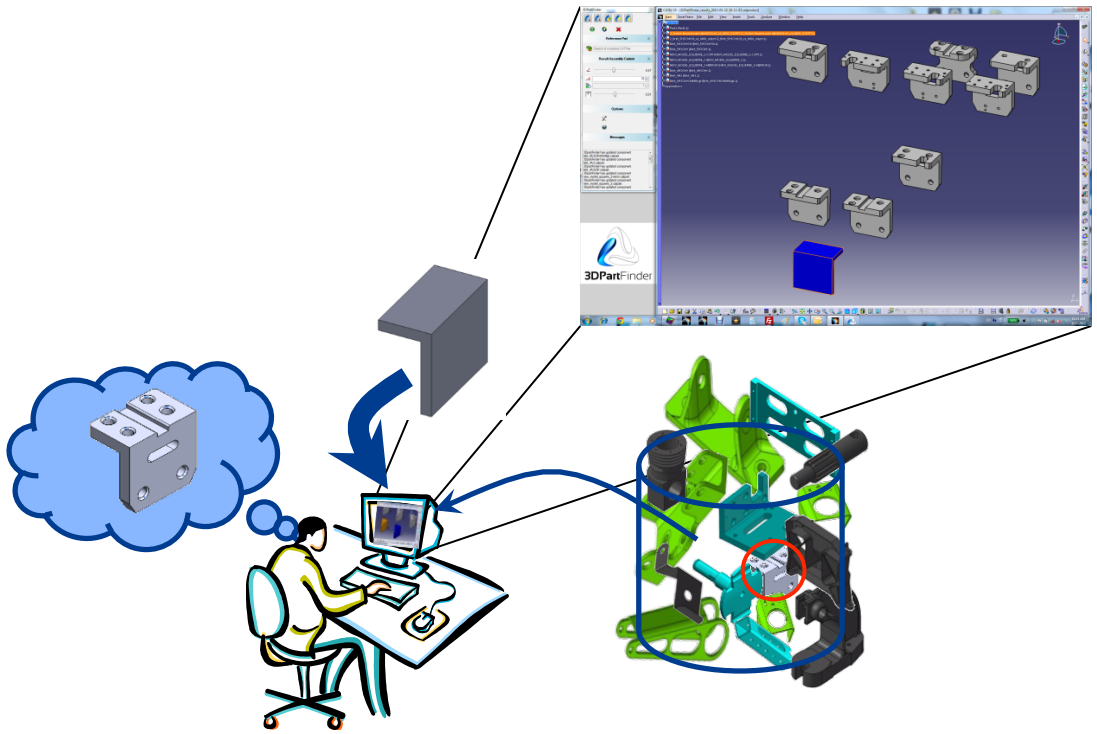
Context

- Semantic search:



Context

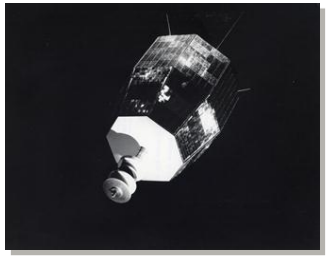
- 3D Geometric search:
  That's *"How MDA Satellite Systems increase reuse"*



About MDA

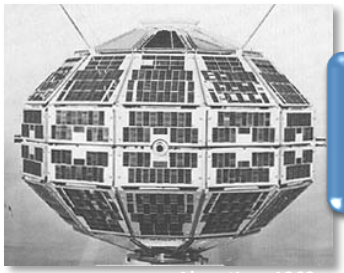
Global Product Data Interoperability Summit | **2014**

Space systems and sub-systems provider for 50 years



RCA Limited
Govt & Commercial Systems Division
1928

Spar Aerospace Limited
1977



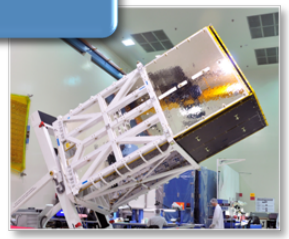
Northern Telecom Satellite Division

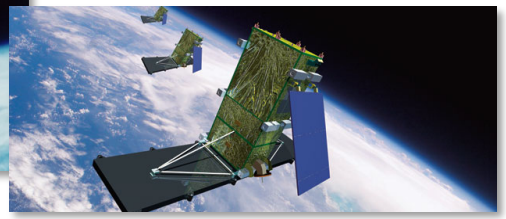
1977

EMS Technologies Inc.

1999

2005





Why use 3DPartFinder?

- Telecommunication Technologies evolve very rapidly in the Field of Satellites. Ours clients aware of market growth, require more and more in shorter timelines!
- Designing a piece requires an average of 20 to 30 hours of work.
  - Engineering
  - Purchase
  - Documentation
  - Archiving
  - Approval
  - Etc.
- The reuse of parts and associated documentation then allows us to be more competitive.

Why use 3DPartFinder?

- With more than 20 years of heritage in 3D parts it is sometimes difficult to find the necessary information only with alphanumeric search tools.

- Geometric search allows a more efficient search through past projects and to get relevant results!

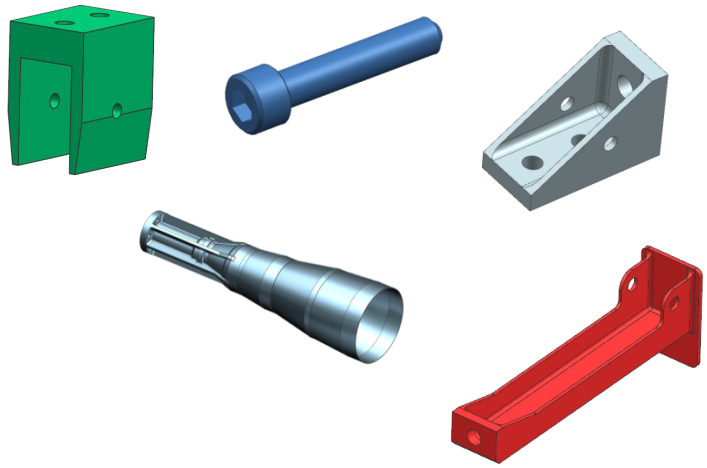
3DPartFinder

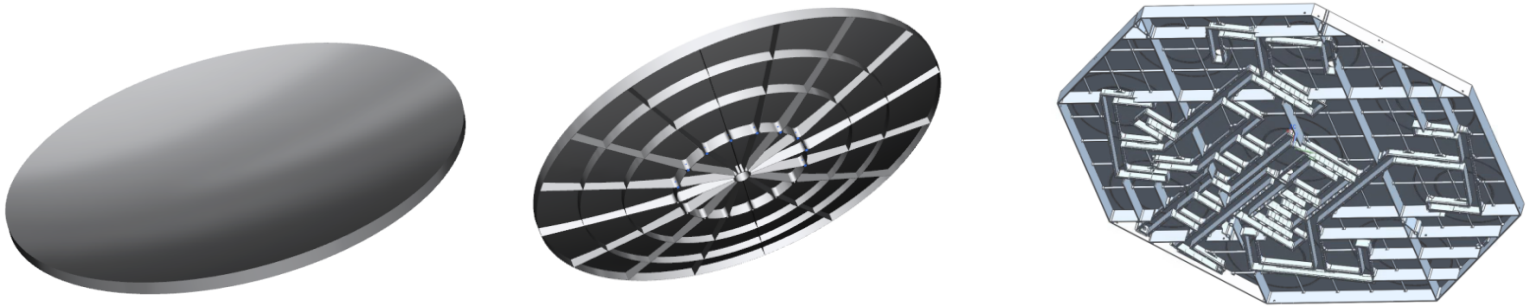
How MDA uses 3DPartFinder?

- A partnership between 3DSemantix and MDA has enabled us to develop 3DPartFinder for NX CAD system and Teamcenter PLM.
  - 3DSemantix adapted the 3DPartFinder tools for NX and Teamcenter
  - MDA participated in testing and debugging, providing comments and suggestions to improve the tool
- Since the implementation, MDA is very satisfied with the results.
- However, works remains to be done in order to change mentalities and to instil the philosophy of parts re-use. The 3DPartFinder is the ideal tool to achieve it!

Typical use of 3DPartFinder

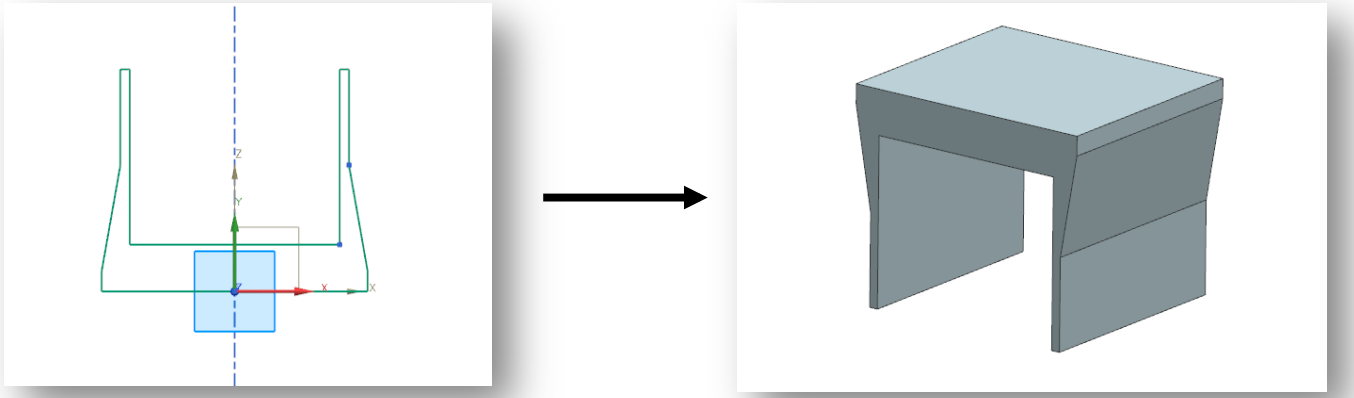
- Geometric search allows to:
  - Reuse complete parts
    - Simple parts
    - Catalog and standard parts
  - Reuse parts partially
    - Simple parts with changes
    - Complex parts with minor changes
  - Reuse concepts of complex parts
    - Very complex parts needing several modifications
    - Parts used as examples to design new parts
    - Find concepts to generate ideas





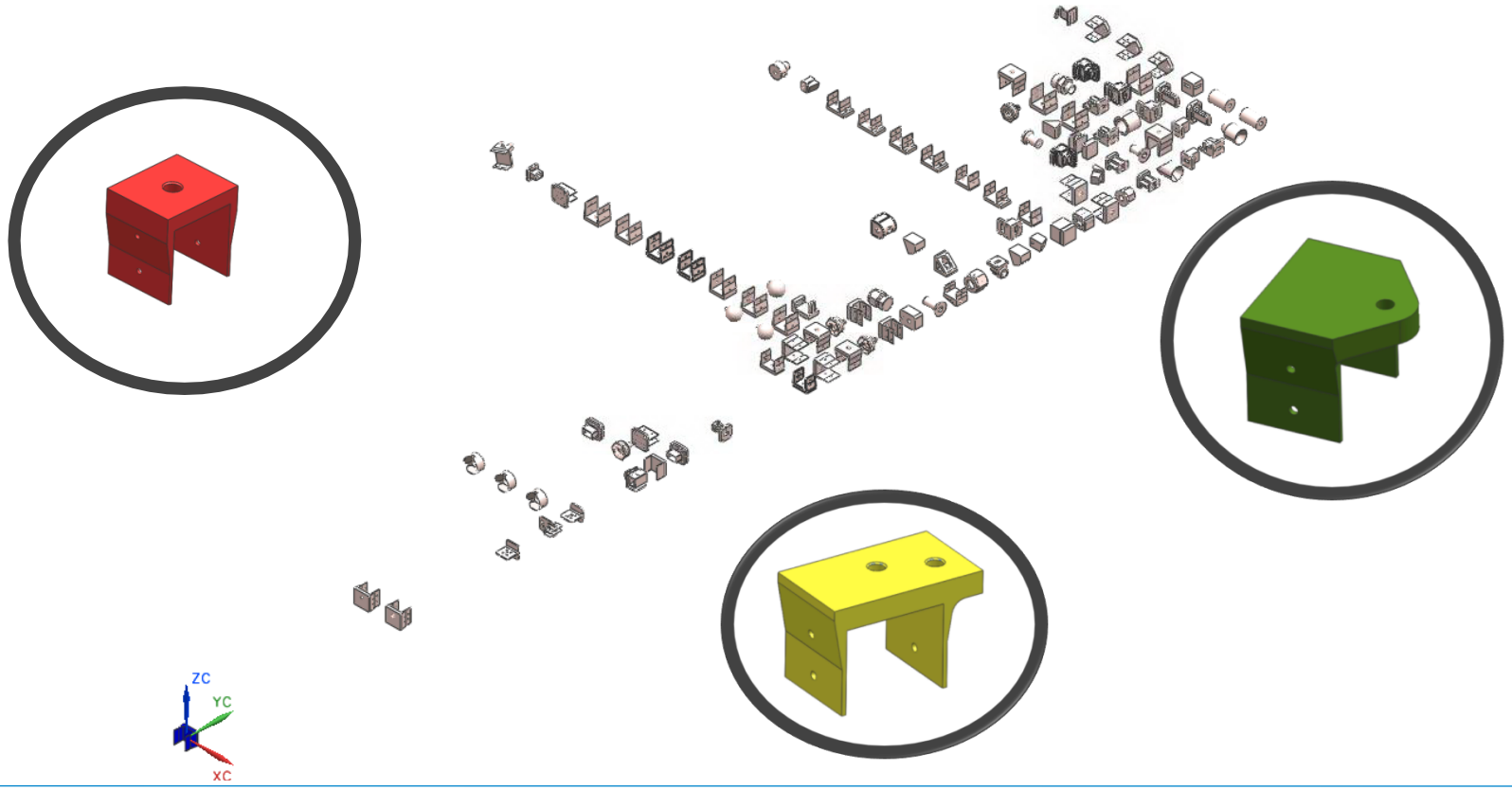
Reuse of complete part

- U-shape clip
  - MDA uses several types of clip to make the mechanical link between composite and metallic parts.
  - A Visual Database (thumbnails) can be easily created in order to have rapid access to a large amount of similar parts.
  - The Base sketch of that part is well known by the designers. A simple extrusion of this sketch gives us a solid, which can be used to initiate a 3D search



Reuse of complete part

- U-shape clip
  - Results provided by the 3DPartFinder are diverse and give an idea of the range of possibilities related to this design

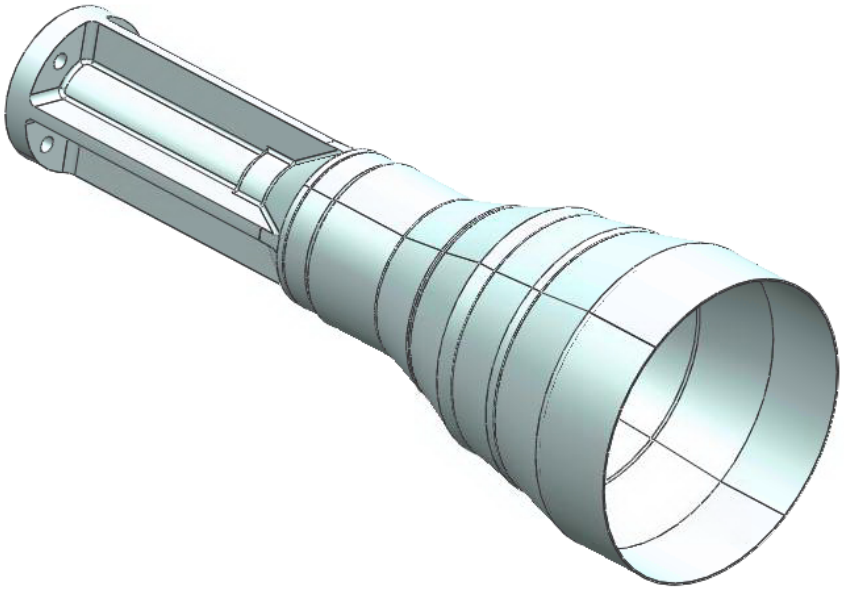


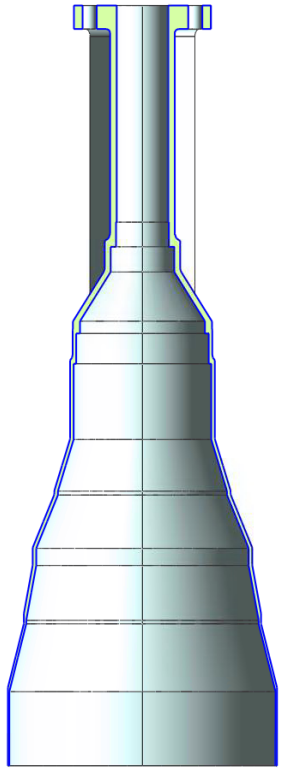
Reuse of complete part

- U-shape clip (Conclusion)
  - Once the part is found, it remains only to include it in our CAD assembly and parts list
    - No drawing needs be done
    - No submission is required
    - No structural analysis is necessary (or at least a reduced analysis)
    - No approval is required, since the used part has already followed the approval cycle
    - No additional document needs to be produced.

Partial reuse of a part

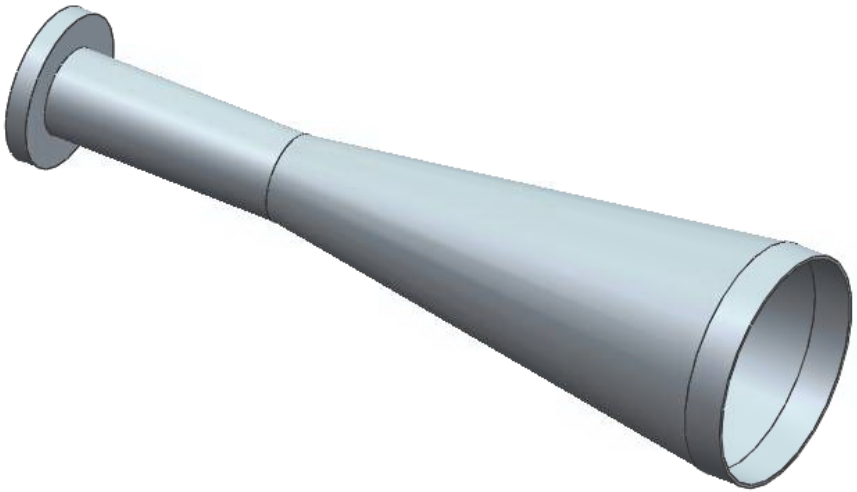
- Horn
  - Part used to capture and emit waves. Used on satellite antennas.
  - The internal geometry is relatively simple, but unique for each project.





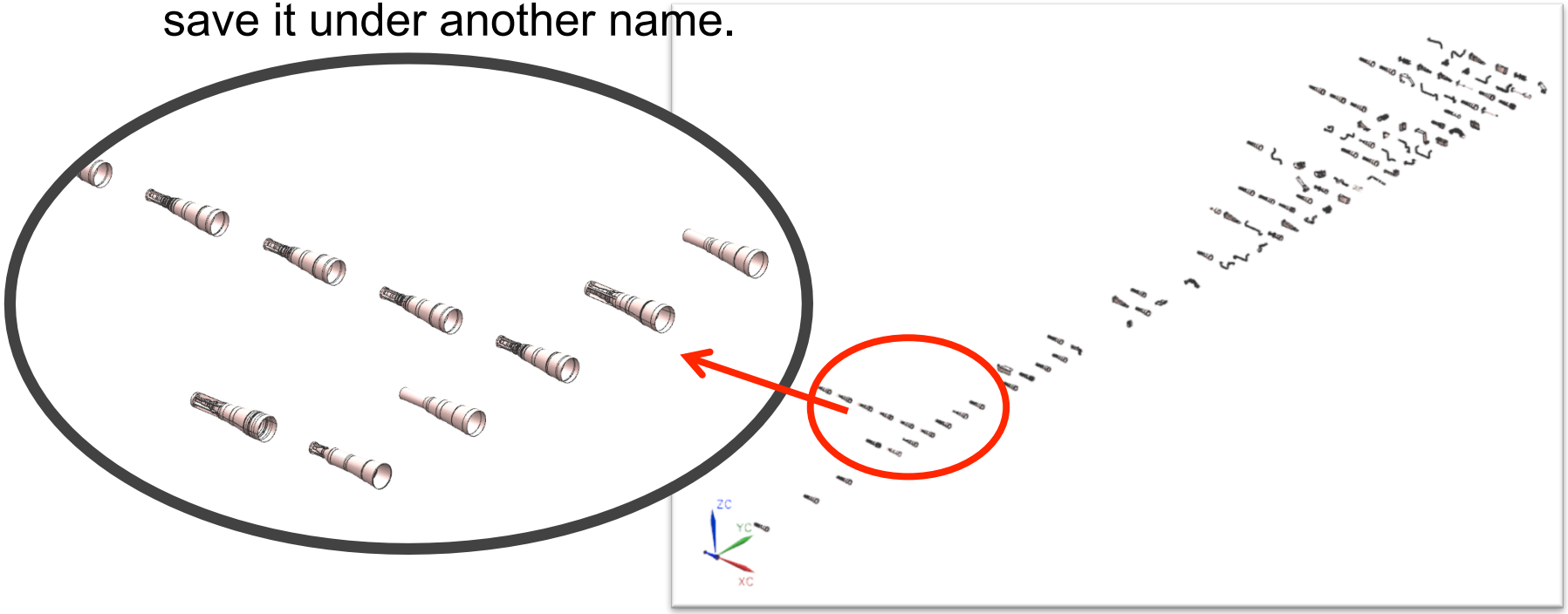
Partial reuse of a part

- Horn
  - With approximate dimensions, a search can be conducted to find similar parts
  - The objective is to define a rough shape using a few simple CAD functions (Revolution, Extrusion, …)



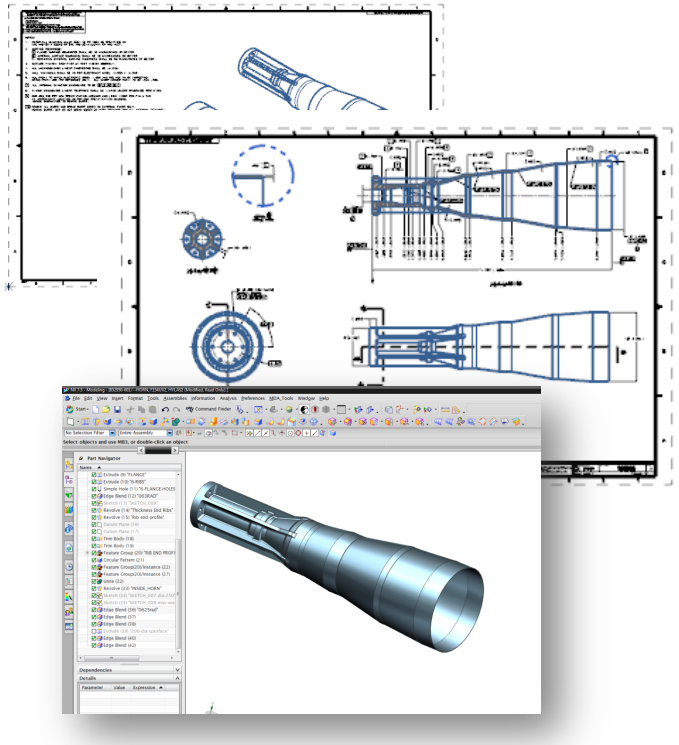
Partial reuse of a part

- Horn
  - From a 100 similar parts return.
  - 20 to 25 of them meet the needs of the designer.
  - Directly from the result, the designer can choose the right part and save it under another name.



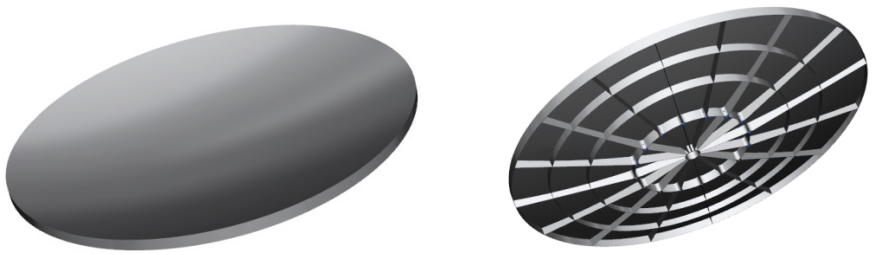
Partial reuse of a part

- Horn (conclusion)
  - An existing part found in the result is used to start a new design in the CAD system
  - Modifying values of parameterized functions of the CAD system allows user to obtain the desired part
  - Due to associativity, we rapidly obtain all the documents:
    - 2D drawings
    - Assembly drawings
    - Manufacturing and assembly Procedures
    - Etc.
  - Part approval is much faster
    - Geometry based on past projects
    - Documentation reused
    - Structural and thermal analysis exists
    - Etc.



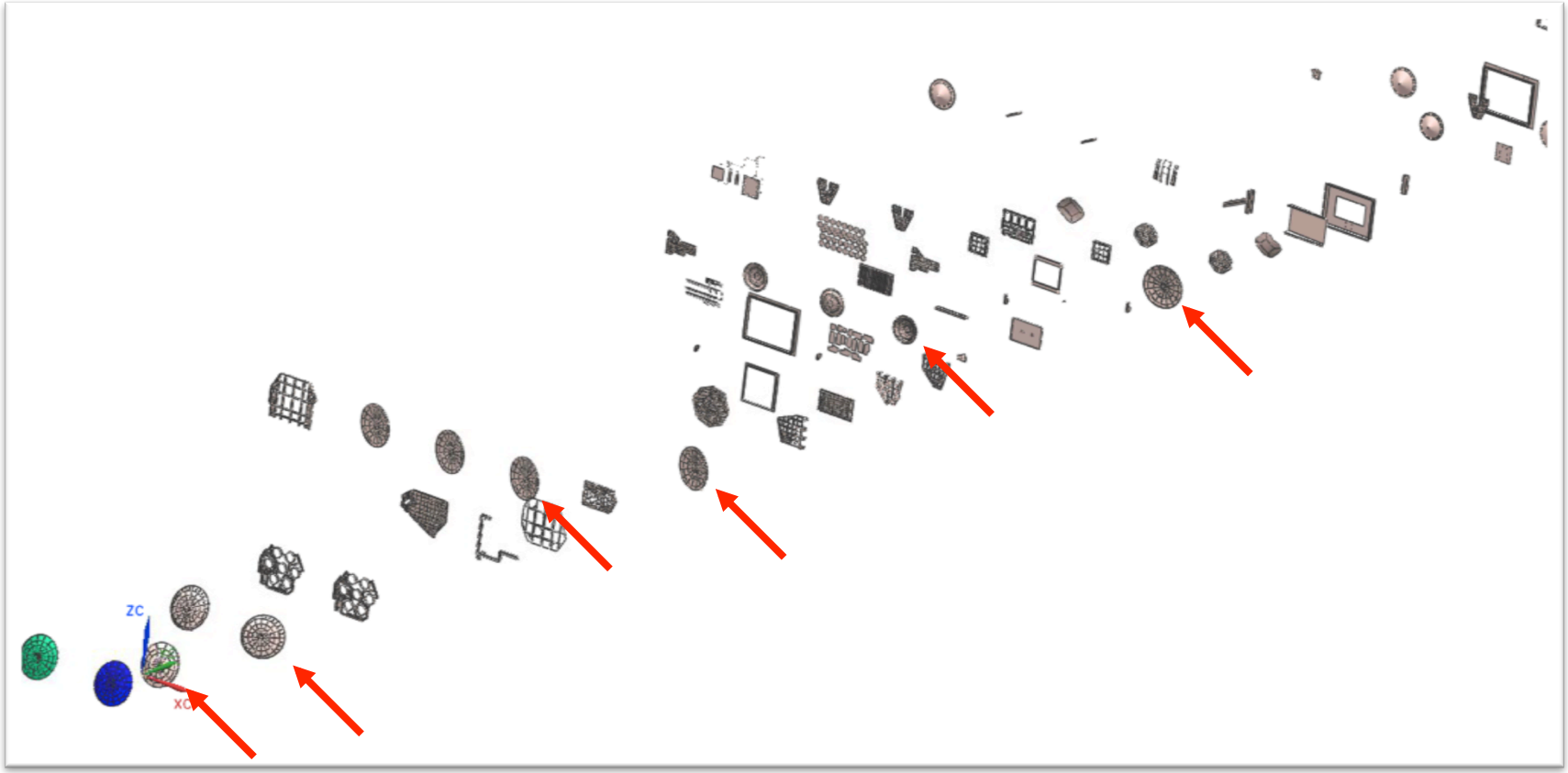
Reuse of the concepts of a complex part

- Reflector
  - Sometimes a new part is so different from the existing parts that it cannot be copied and modified
  - We use the tool to find similar parts, in order to base our design on these examples
    - Find new concepts through inheritance
    - Find who has worked on a similar part in order to ask advice, recommendations, prices, difficulties, problems, etc.
    - A designer can use examples to generate the 3D model and 2D drawings. Subsequently, it will be much easier to get them approved.



Reuse of the concepts of a complex part

- Reflector
  - In less than a minute, we get 6 reflectors that are similar, from 6 other previous projects.



Reuse of the concepts of a complex part

- Reflector (conclusion)
  - The complexity of the reflector does not allow user to reuse a reflector from a previous project, since it is created from points clouds.
  - However, some indirect costs are saved:
    - Reduction of modeling time (use of the same concepts, thicknesses, materials, etc.)
    - Reduction of time on structural analysis
    - Reduction of time of verification done by the approvers (since they can compare it to other reflectors from previous projects)
    - From a purchase perspective, the tool allows user to find comparisons in the analysis of the submissions
    - Lessons learned from past projects help avoid the recurrence of some problems!

Return on investment

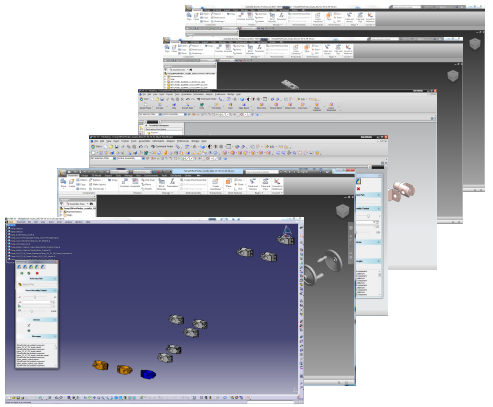
- The analysis of the return on investment depends on a multitude of criteria, each specific to your company. Here are a few used by MDA :
  - 80% savings in time when the complete part is reused
  - 40% savings in time when a part is partially reused
  - 15% savings in time when design is based on existing parts
  - 68% of the designers will use 3DPartFinder. However, there will be a percentage growth before reaching this value (learning curve)

MDA Conclusion

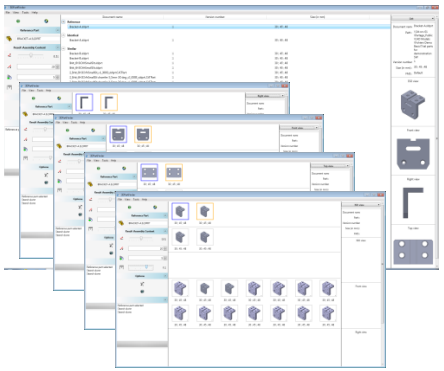
- MDA continue to re-enforce the parts reuse philosophy
- Employees with less experience use 3DPartFinder to learn from existing parts
- Employees are more efficient
- Information transfer between designers is improved
- It is too early to evaluate the global economic impact but it will be done soon
- User are satisfied and their recommendations are treated by 3DSemantix and implemented in new releases.

New generation of 3DPartFinder tools!

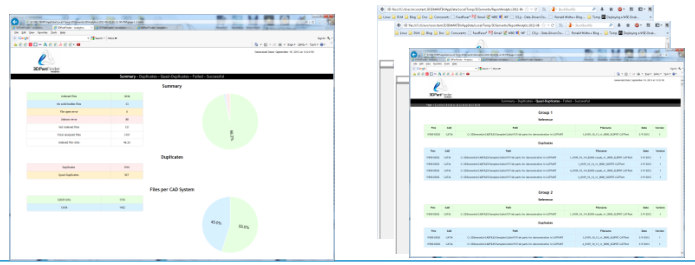
- 3DPartFinder for CAD Systems
  - CATIA
  - NX
  - PTC Pro-E & Creo
  - Autodesk Inventor
  - SolidWorks
  - Solid Edge



- 3DPartFinder for All Users
  - For Non-CAD Users
  - High accuracy search in all CAD formats and systems. Supports different PLM
  - Improved interoperability and decisions



- 3DPartFinder Analytics
  - Diagnostic and Status
  - Duplicate parts and Nearby parts (quasi-duplicates)
  - Multi-CAD formats and PLM supports



Thank you for your attention!

Questions?

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