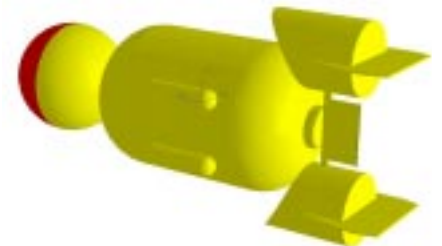


CAX-IF



Larry McKee  
June 28, 2000



## Participants -- Round 3J (ended March 2000)

**AutoDesk<sup>1</sup>**

**debis**

**UG Solutions**

**PTC**

**Matra<sup>3</sup>**

**ITI/CADDS<sup>5</sup>**

**Bentley**

**Dassault Systemes<sup>2</sup>**

**ITI/SDRC**

**STEP Tools Inc.**

**Theorem Solutions<sup>4</sup>**

**Alias|Wavefront**

1 -- AutoDesk tested MDT and Inventor

2 -- Dassault tested AP203+ and AP214 for Colors

3 -- Matra tested AP203+ and AP214 for Val. Props.

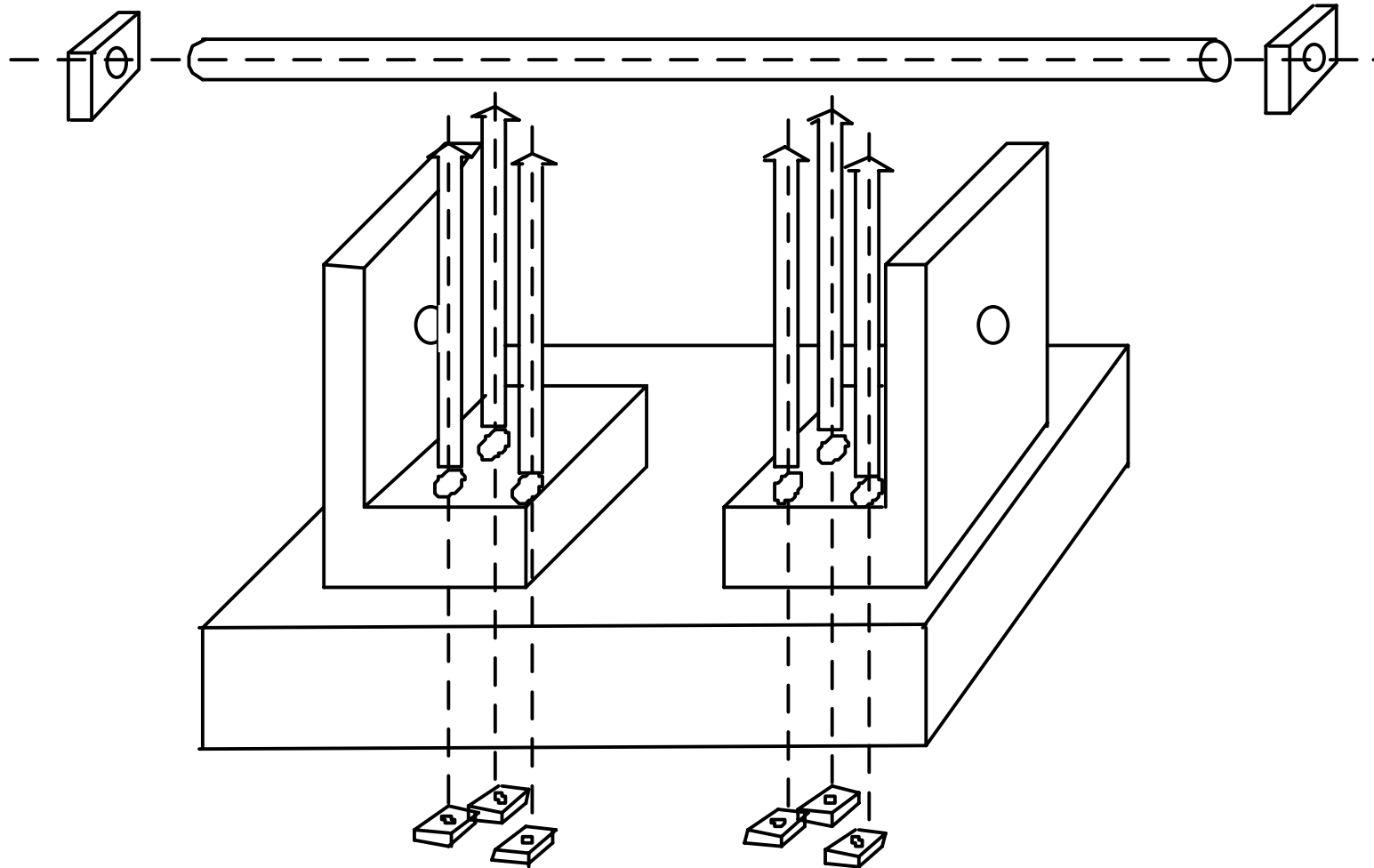
4 -- Theorem tested AP203+ and AP214 for Val. Props.

5 -- ITI/CADDS informally tested Colors (no stats. submitted)

## Scope of Round 3J

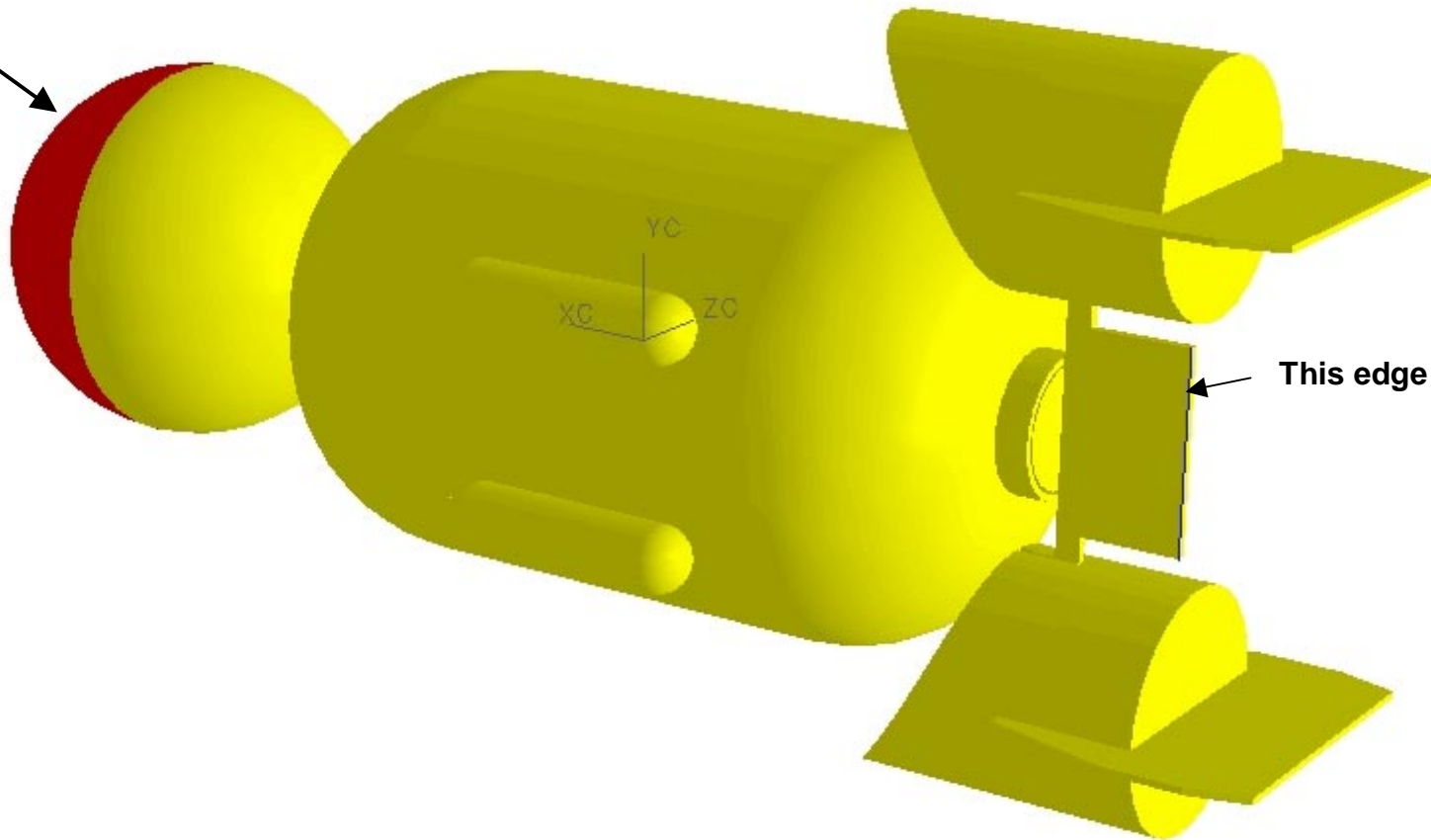
- **Validation Properties**
  - *Area*
  - *Volume*
  - *Centroid*
- **Colors**
  - *Overriding Edge Color*
  - *Overriding Face Color*
  - *Solid Color*
- **3D Text Annotation**
- **Drawing Views**
- **Features (Round Hole and Threaded Hole)**
- **Production Models**

# Solid Assembly for Validation Properties



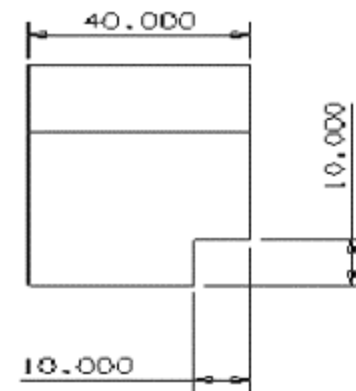
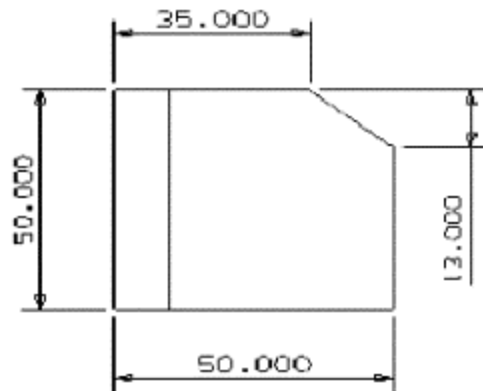
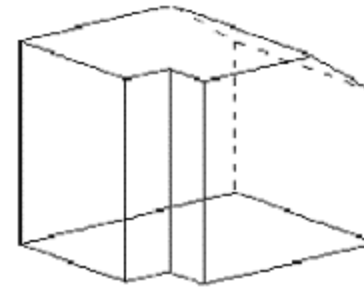
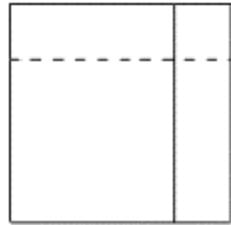
# Colors and 3D Text Annotation Test Case: Spaceship

Outer face of Head\_Front is coloured red

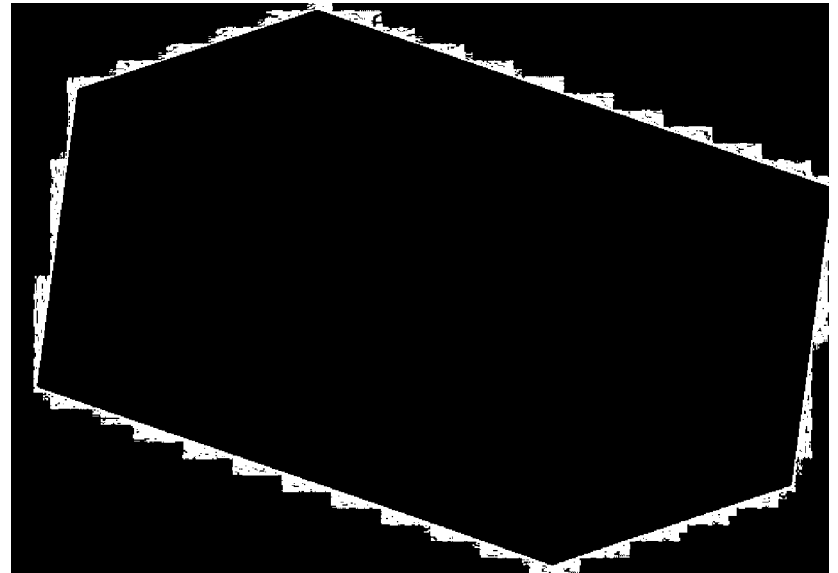
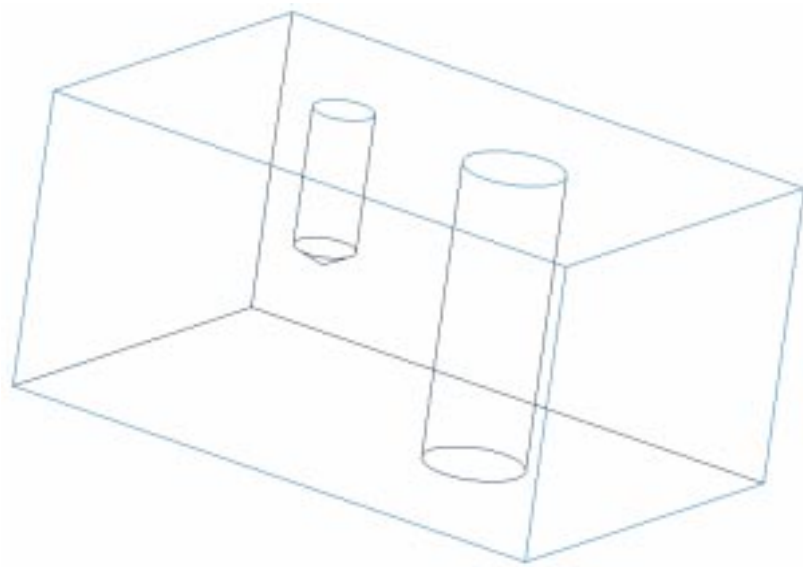


This edge is blue

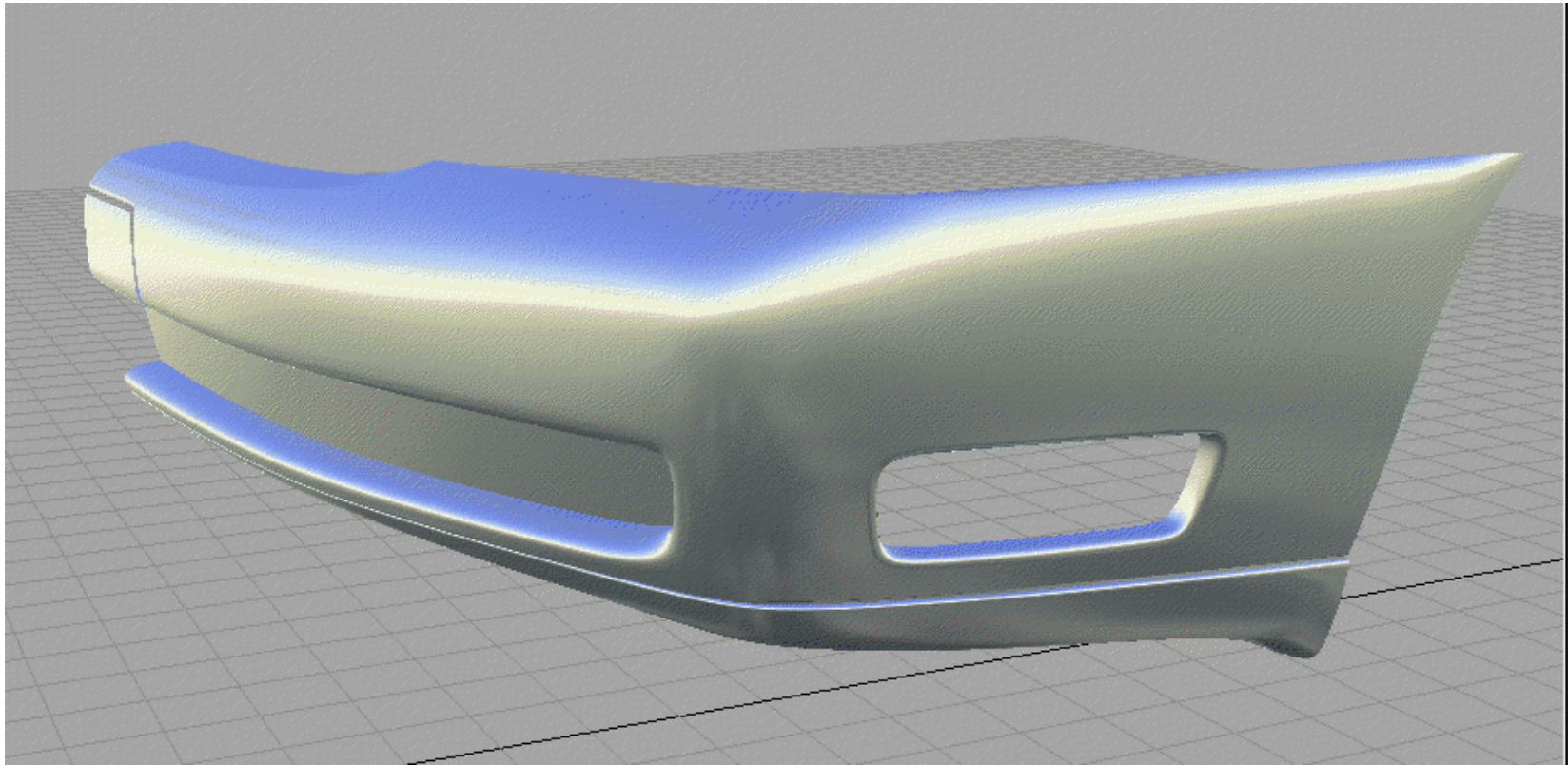
## Drawing View Test Case



## Features (Threaded and Round Hole)

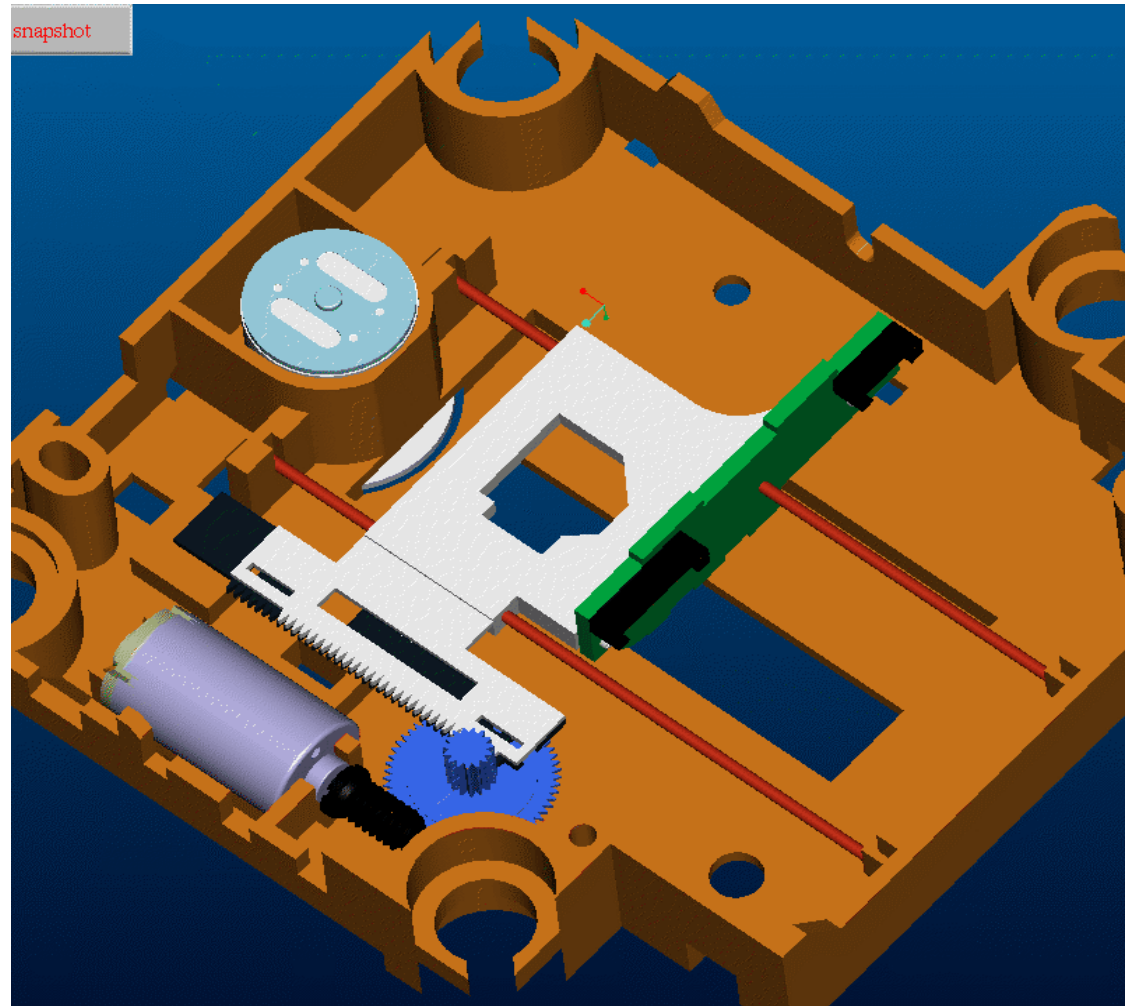


# Production Test Case Alias|Wavefront -- Surface model

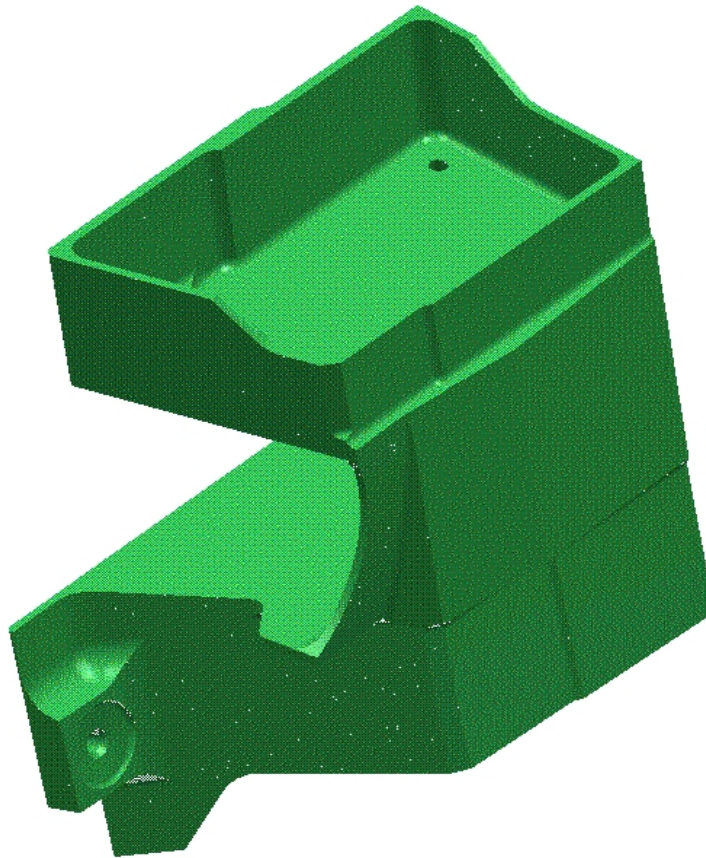




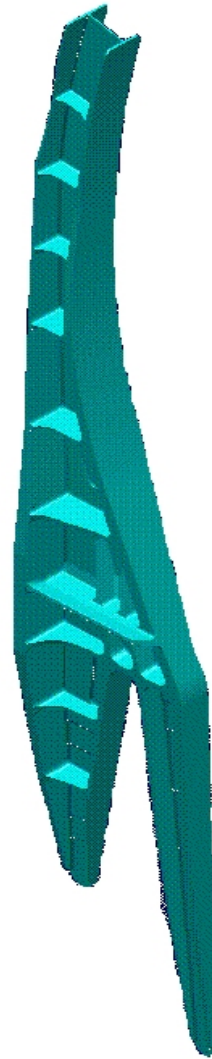
## Production Test Case PTC/ProE -- Chassis



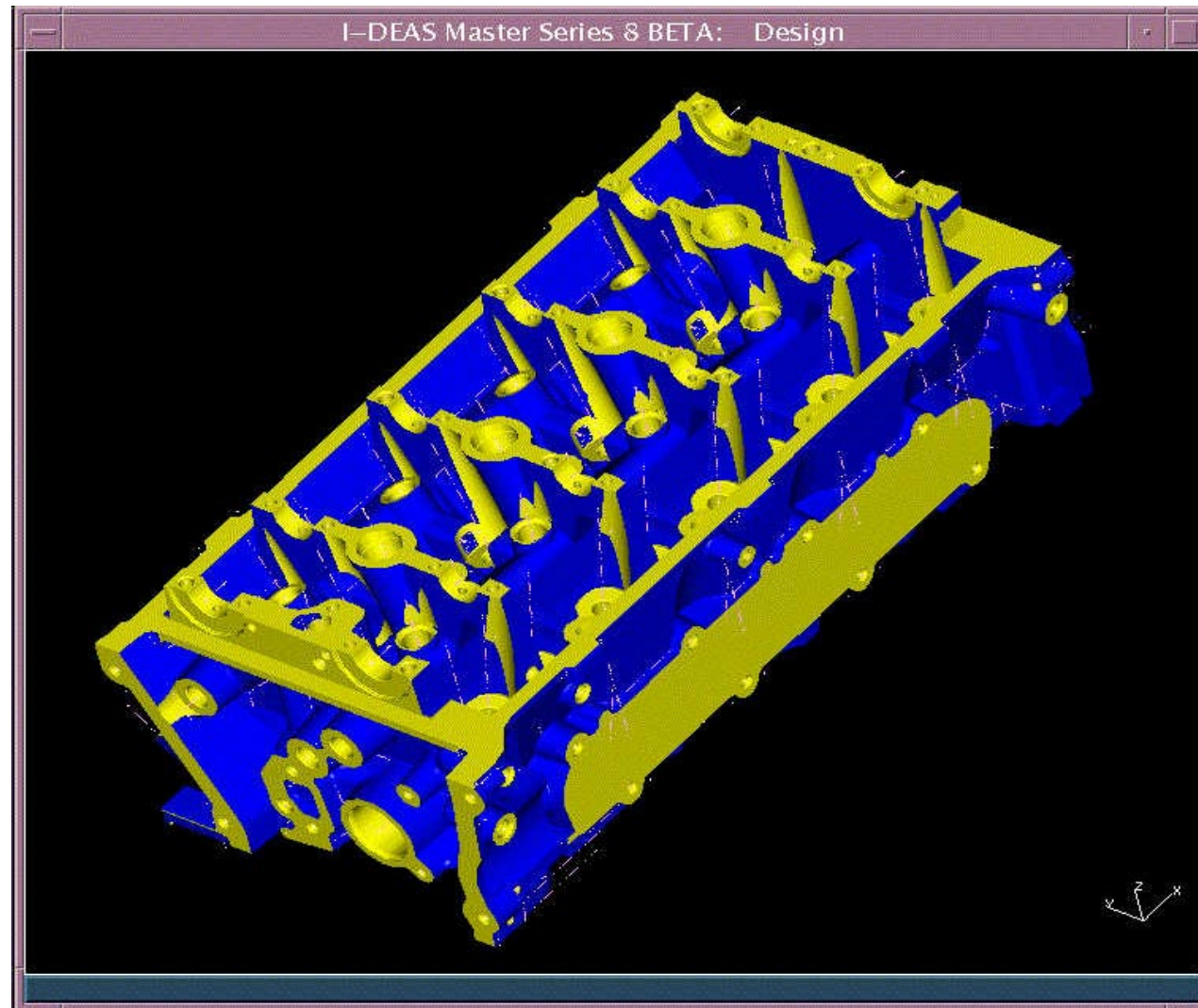
## Production Test Case CATIA -- Boeing Part



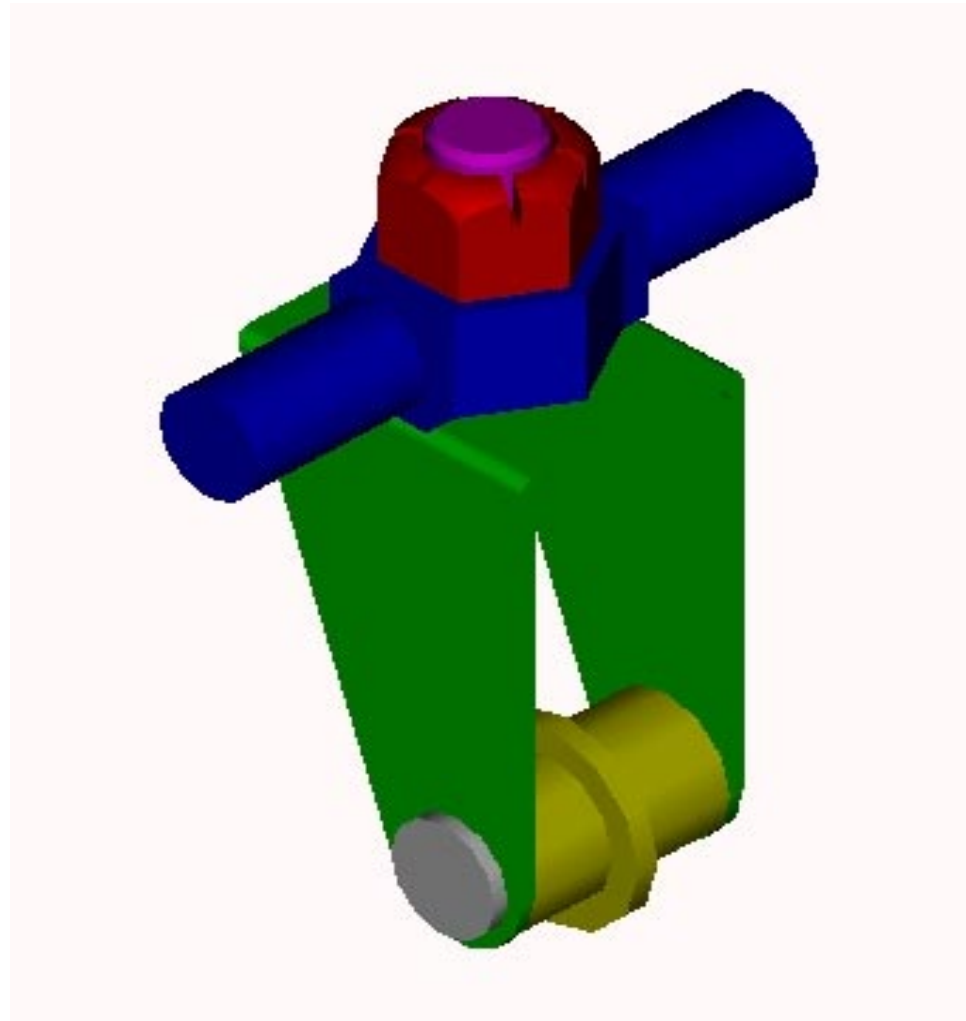
## Production Test Case CATIA -- Boeing Part



# Production Test Case SDRC/I-DEAS -- FORD cylinder head

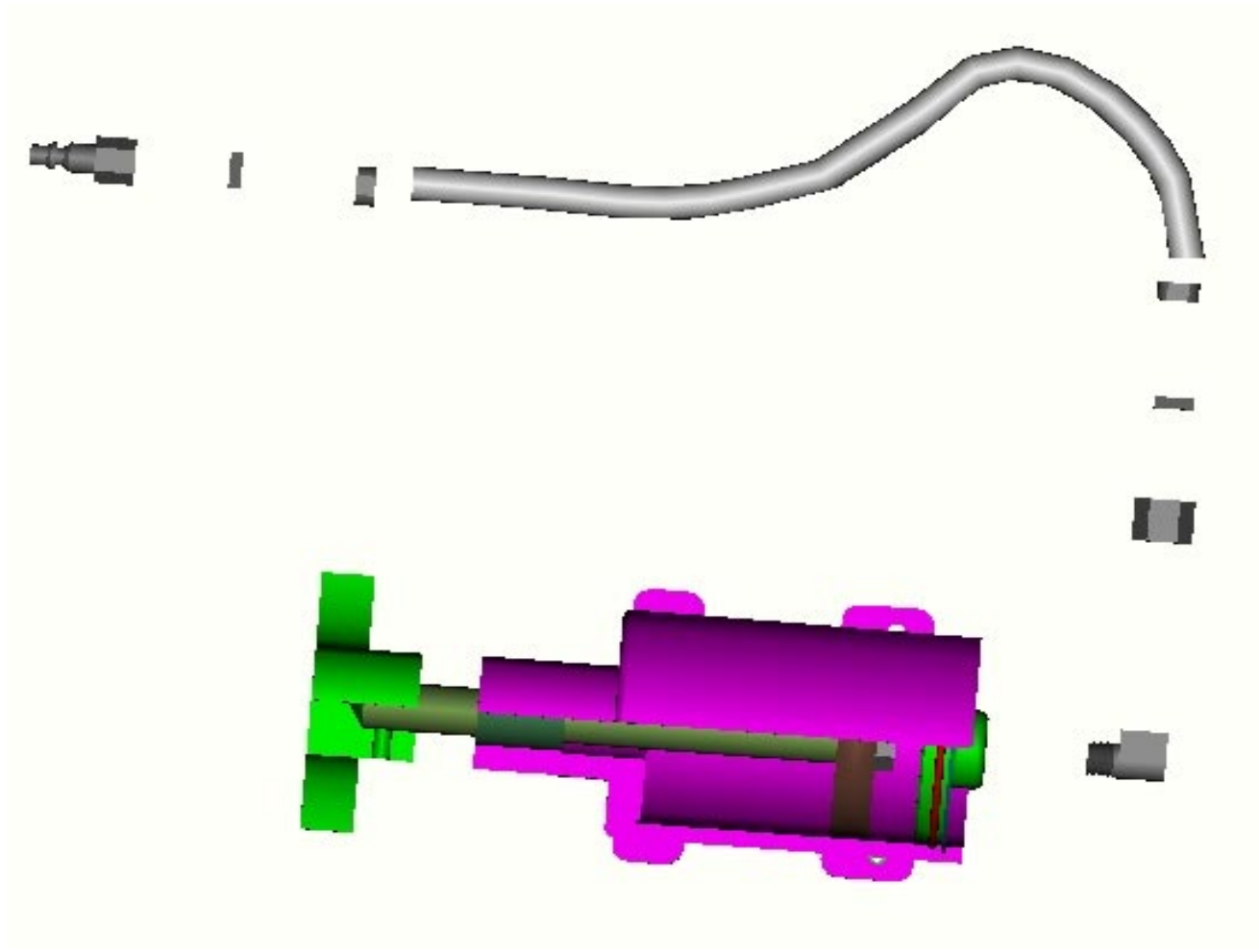


# Production Test Case AutoDesk/AutoCAD -- Pulley Assembly

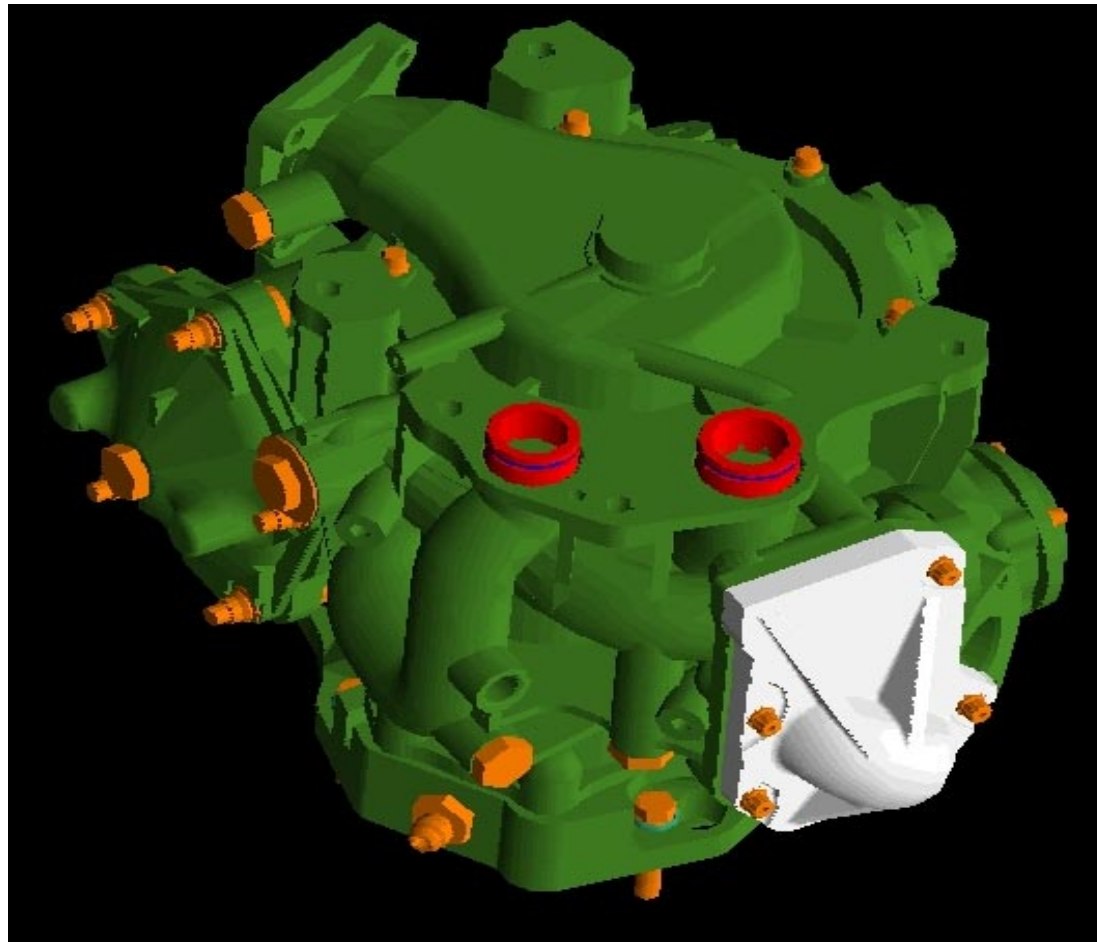




# Production Test Case AutoDesk/AutoCAD -- Air Cylinder Assembly



# Production Test Case UGSolutions/UG -- P&W Compressor Assembly



## Highlights of Round 3J

- 15% increase in CAX participation (12 to 14)
- 9 vendors tested Validation Properties
- All vendors tested Colors (5th time)
- 2.5 vendors played in the 3D Text Annotation arena
- 1 vendor pre-processed 'Features' testcase
- 3 vendors participated in 'Drafting'
- 3 vendors informally tested Drafting Dimensions test case
- All vendors processed the 8 production models



## Who Did What in Round 3J?

	STI	PTC	Catia	Bentley	AutoCAD	Inventor	UG	SDRC	Theorem	Alibre	debis	Alias
Validation Properties	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	No	No
Production Models	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Associative Text	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No
Drafting	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No
Colors	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
Features	No	No	No	No	No	No	No	No	No	No	Yes	No

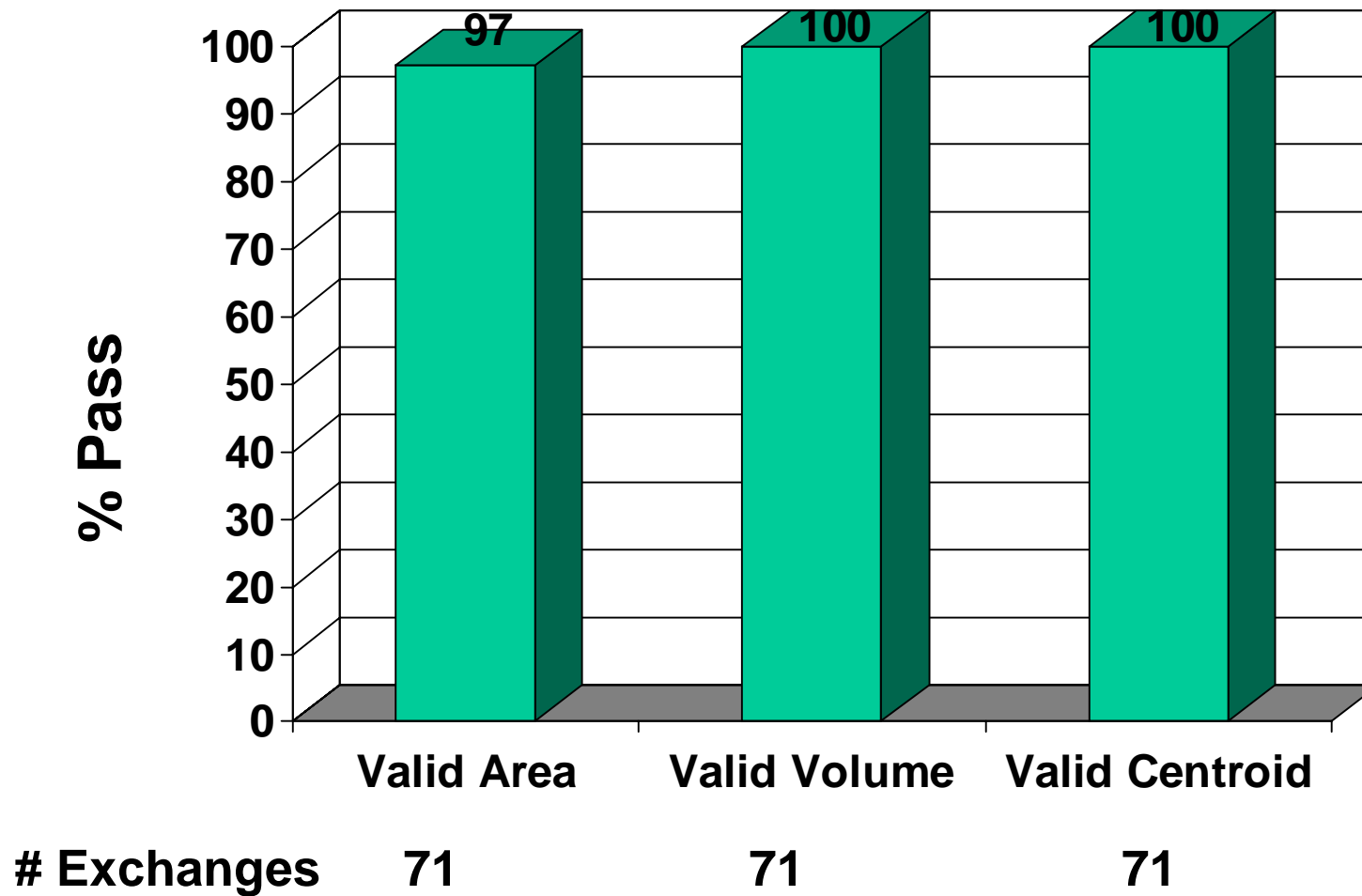


Denotes participant signed up for something, but didn't implement

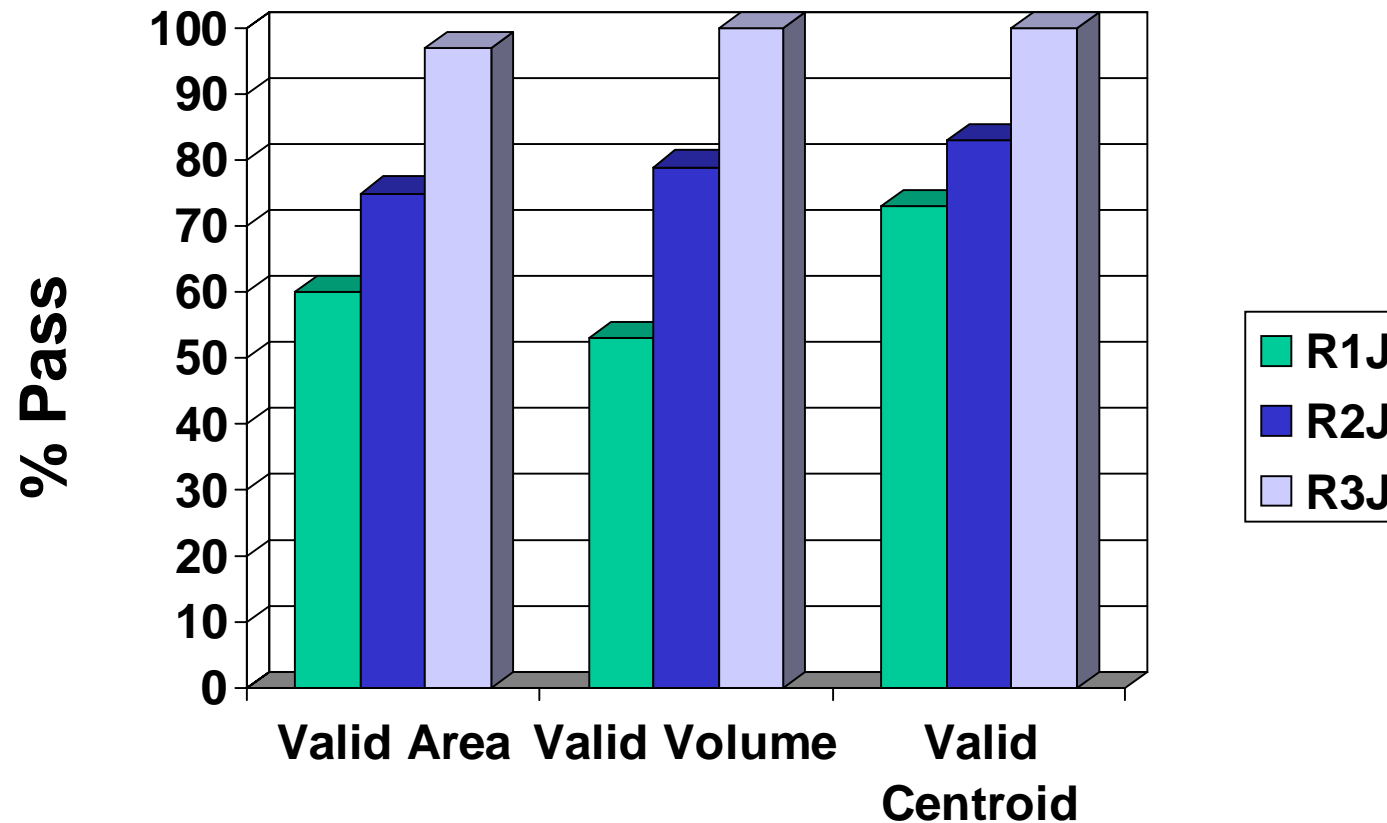
# CAX-IF Round 3J -- Solid Assembly Results Summary

- Tested Validation Properties
  - *Area*
  - *Volume*
  - *Centroid*
- 22% increase in Vendor Participation (7 to 9)
- Instantiated values in STEP files used to “validate” model
- Round 2J issue resolution follow-up directly correlated to Round 3J improved Validation Properties results

## Results for Solid Assembly Validation Properties



## Comparative Results for Validation Properties



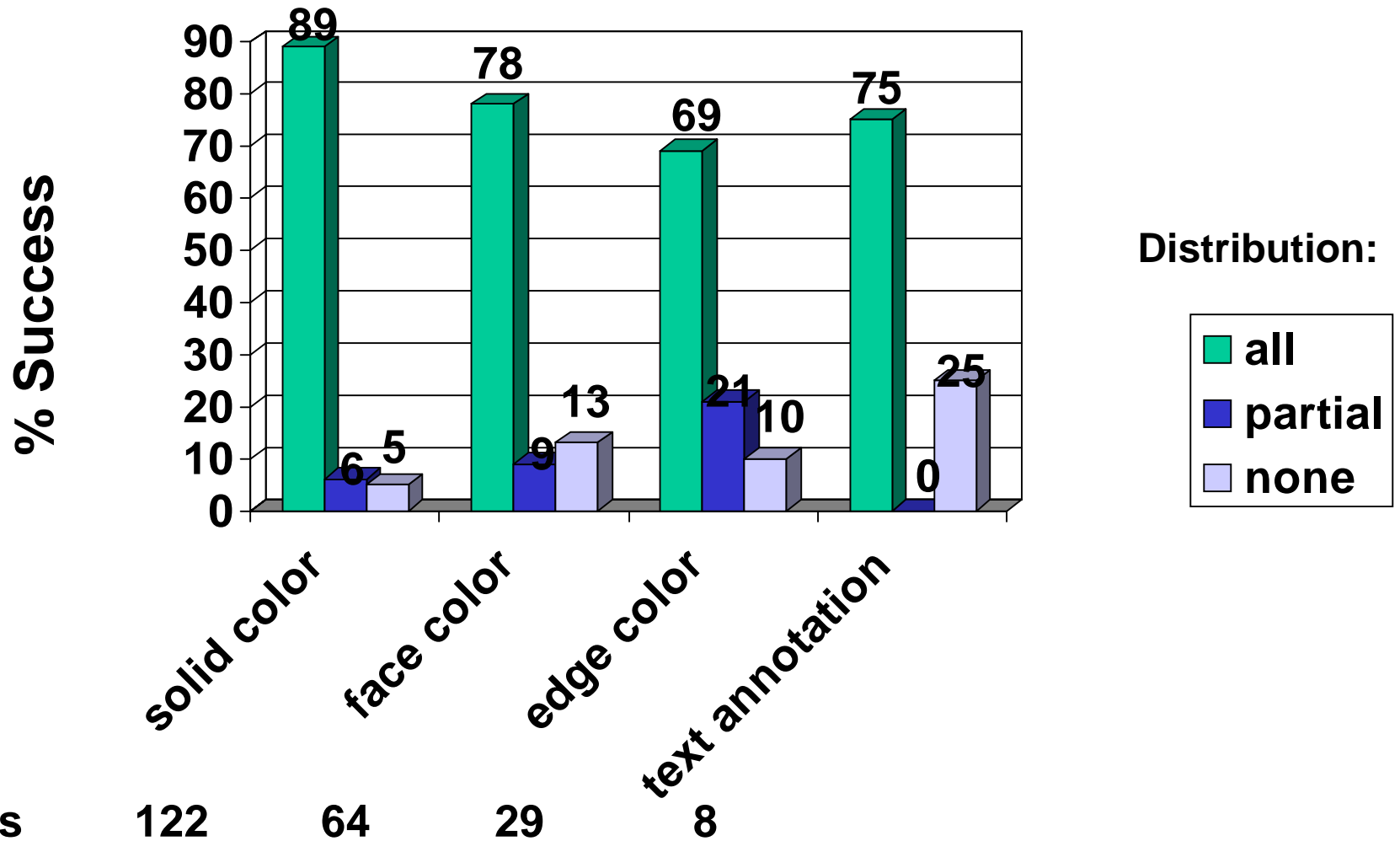
## Round 3J -- Solid Assembly Recommendations

- Validation properties: move on to “more complex geometry”
  - Use “space ship” model in Round 4J
  - Use in production models

## Round 3J -- Spaceship Results Summary

- **Colors**
  - *Solid Color*
  - *Overriding Edge color*
  - *Overriding Face color*
- **3D Text Annotation**
- **Increased success in geometry exchange compared with Round 1J**
- **Several Color issues need resolution**
- **Submitted screenshots improved issue identification**
- **3 vendors tested 3D Text Annotation in Round 3J compared to 2 in Round 2J**

## Results for Spaceship Colors and Text Annotation



# Exchanges

122

64

29

8

## Round 3J -- Spaceship Recommendations

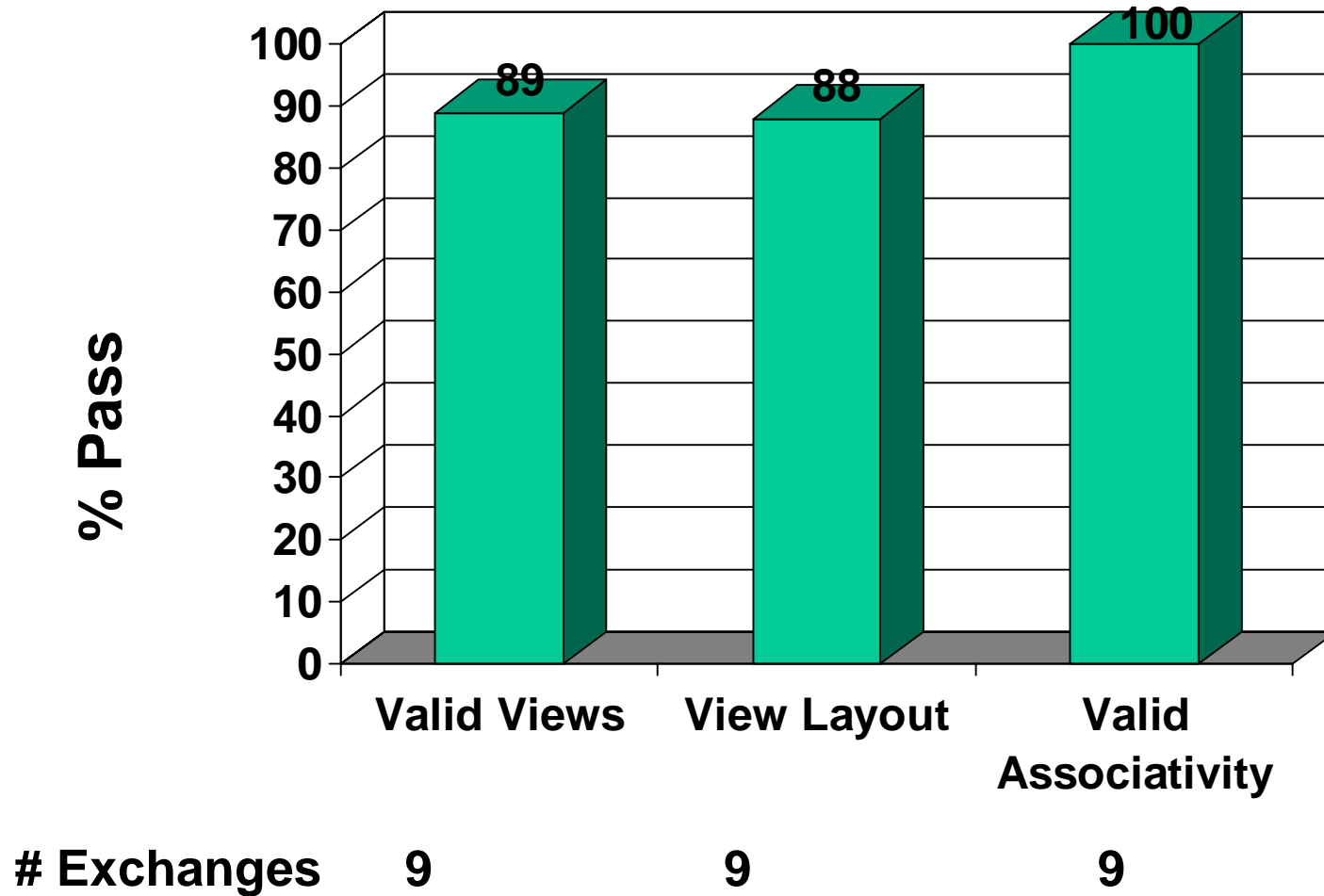
- Retest in Round 4J with Validation Properties to further improve geometry exchange
- Colors and 3D Text Annotation will also be included to sort out existing issues
- Screenshots to be included again for testing parity purposes



## Round 3J -- Drafting Results Summary

- Drafting
  - *Presentation of views*
- Vendor participation slowly increasing (2 in Round 1J, 1 in Round 2J, 3 in Round 3J, and 5 in Round 4J)
- Participants informally tested the Round 2J model including Dimensions in addition

## Results for Drafting Model



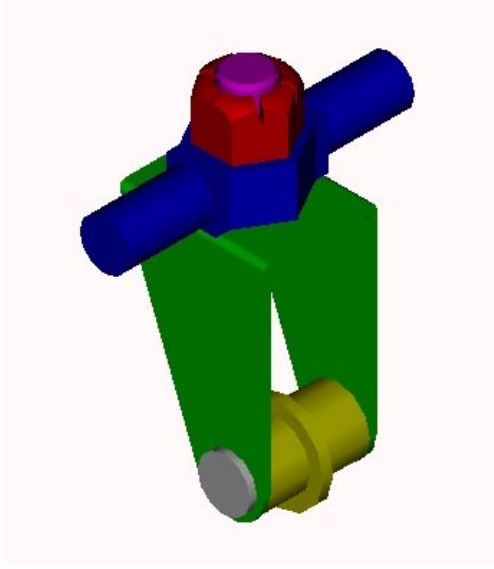
## Round 3J -- Drafting Recommendations

- Formally test the D2 model (presentation of views plus dimensions) in Round 4J
- Possible inclusion of dimensional tolerances

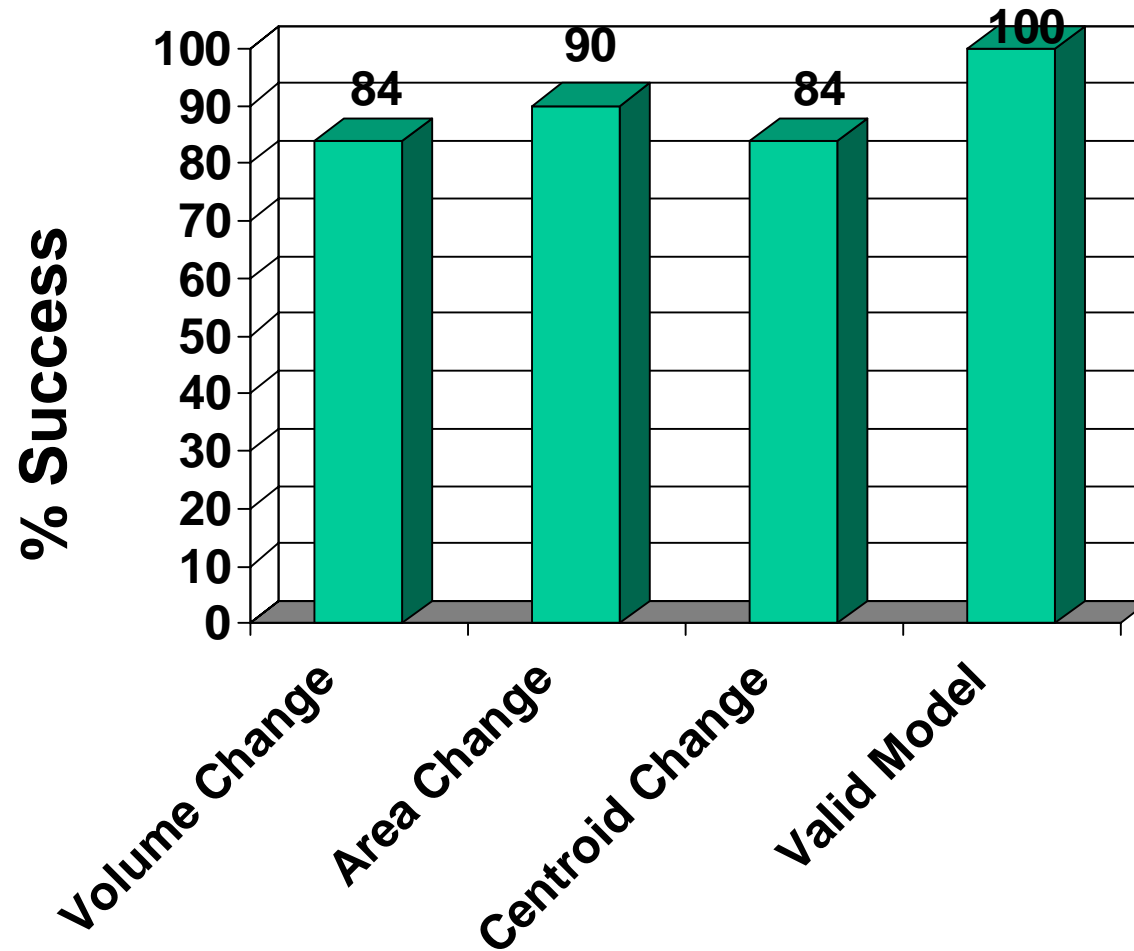
# CAX-IF Round 3J -- Production Models Results Summary

- First successful attempt at testing “real world” models
  - *87 exchanges*
  - *28 issues identified*
- Normal “growing pains” encountered with use of real data
  - *Model quality*
  - *Model placement*
  - *Model validity*

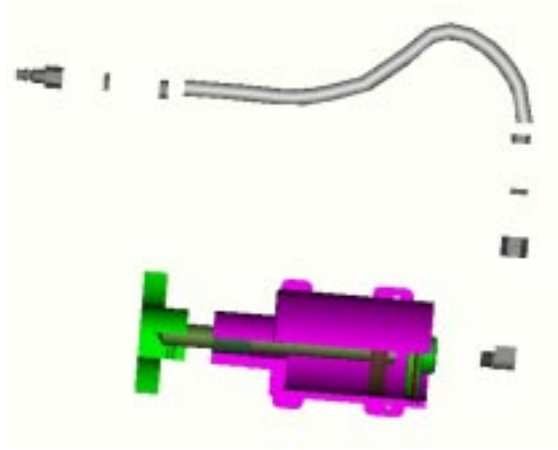
## Results for Production Model 'ac'



From Autodesk

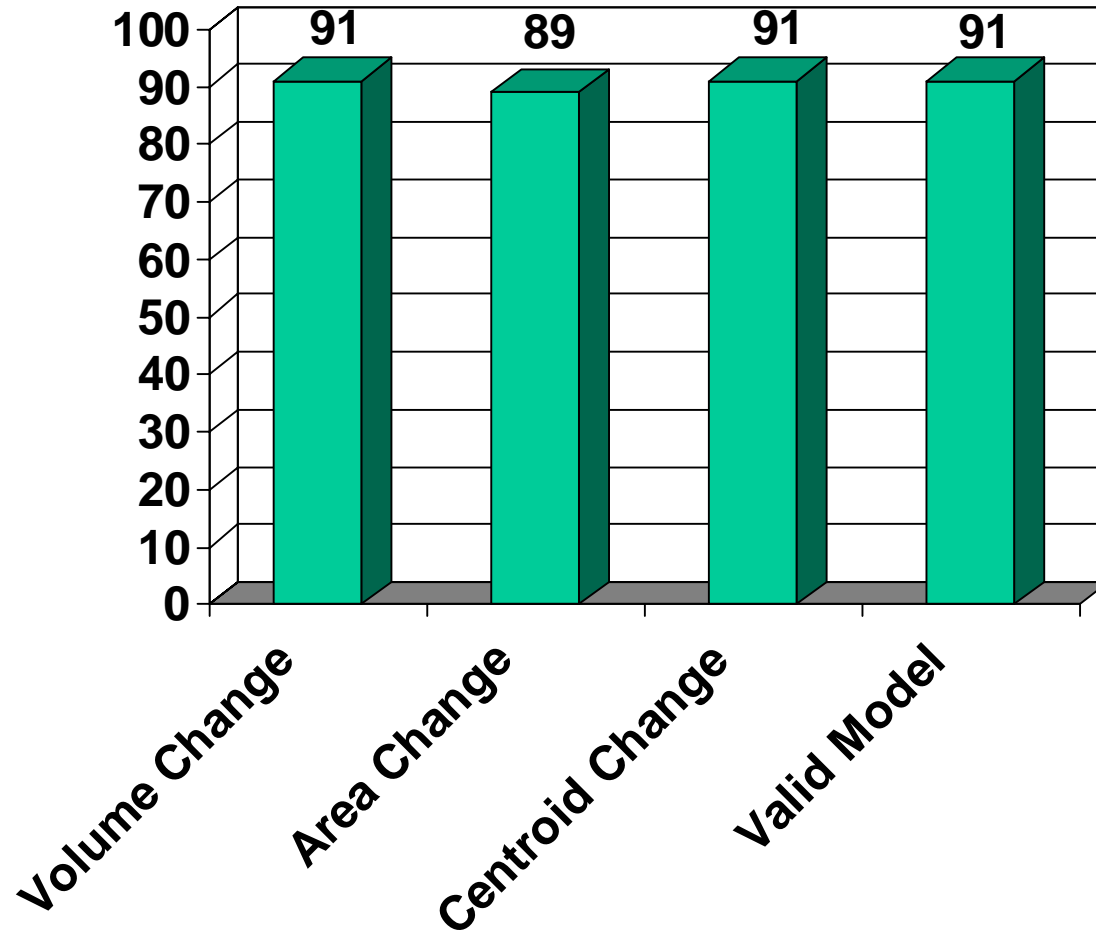


## Results for Production Model 'ac2'



From Autodesk

% Success

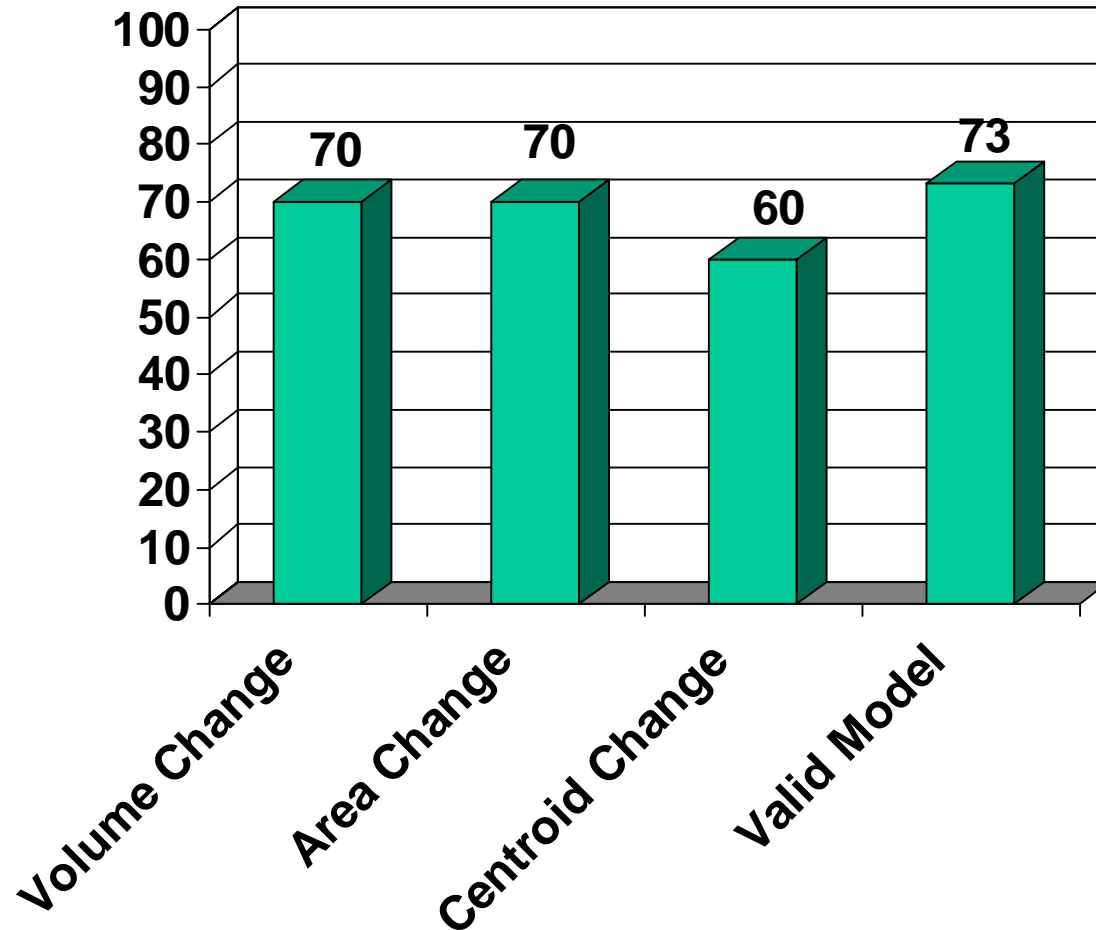


## Results for Production Model 'ct'



From CATIA/Boeing

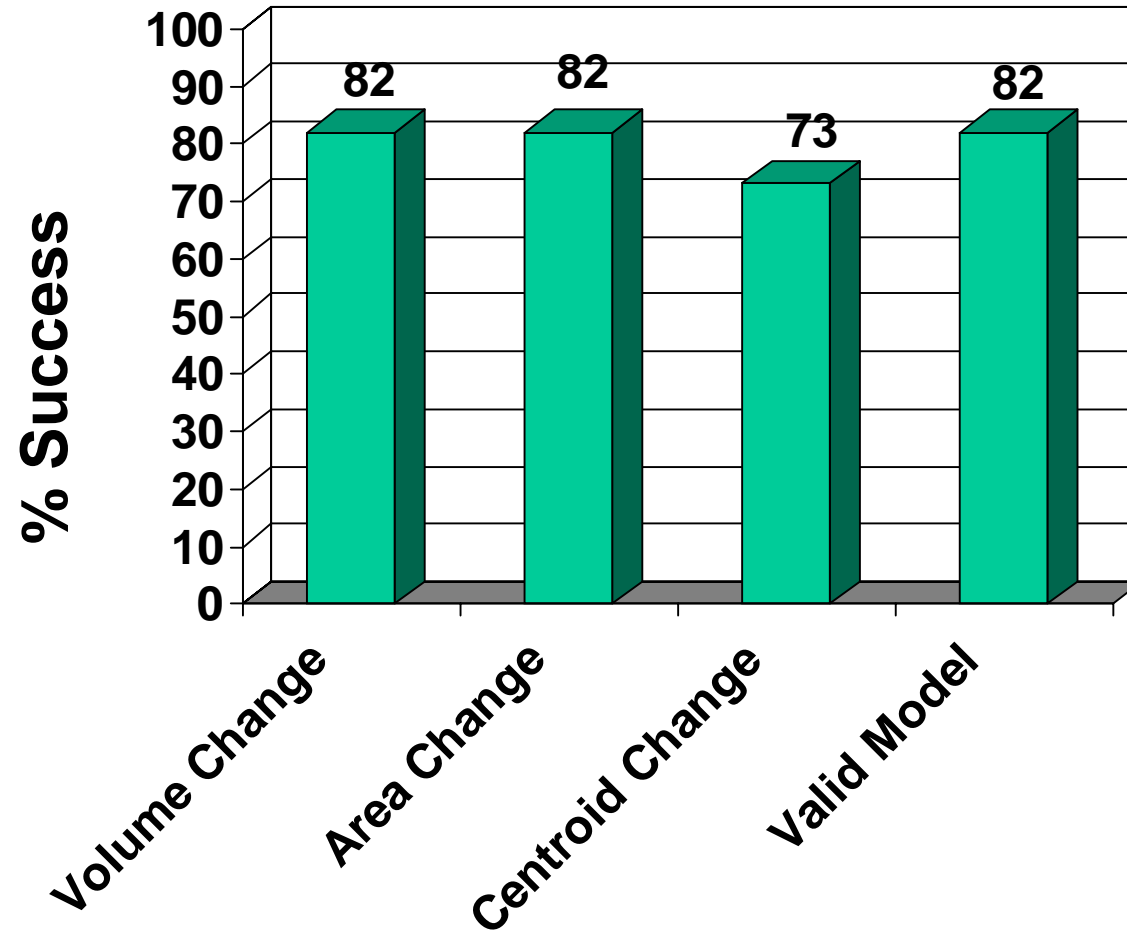
% Success



## Results for Production Model 'ct2'

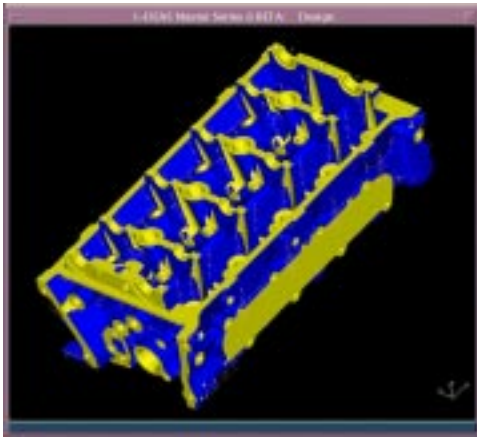


From CATIA/Boeing

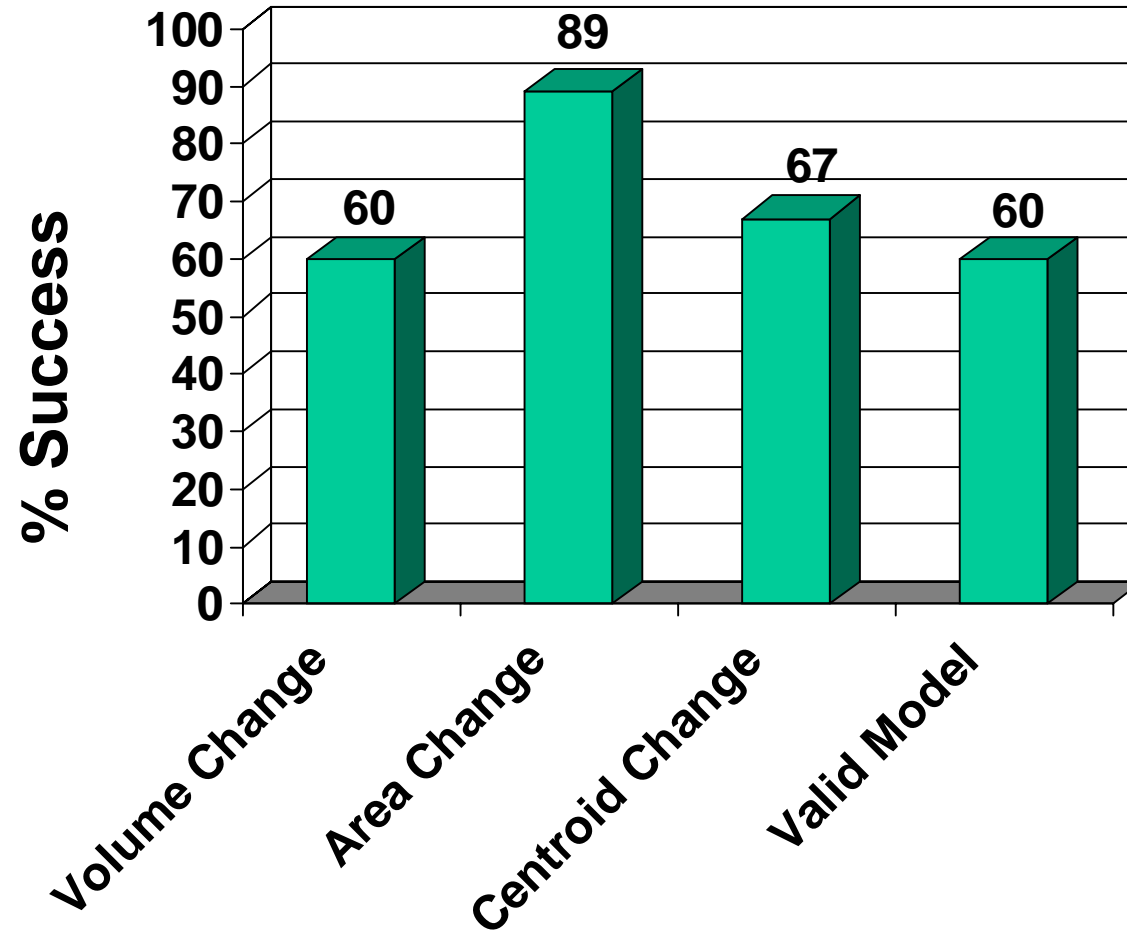




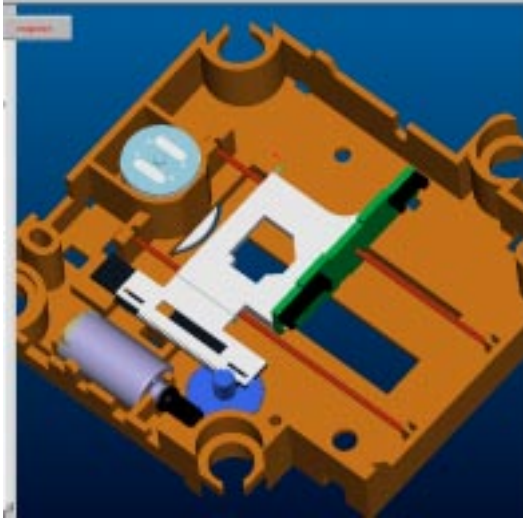
## Results for Production Model'id'



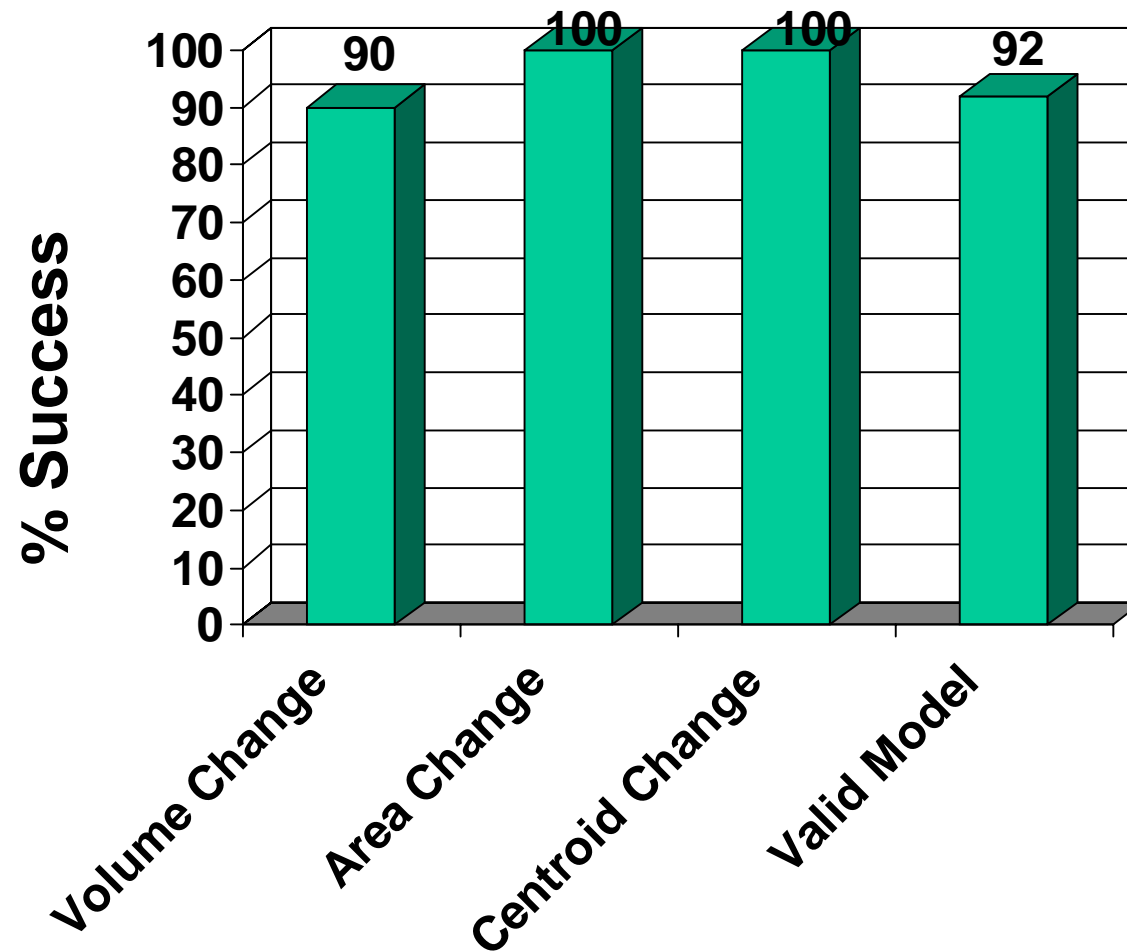
From I-DEAS/Ford



## Results for Production Model 'pe'



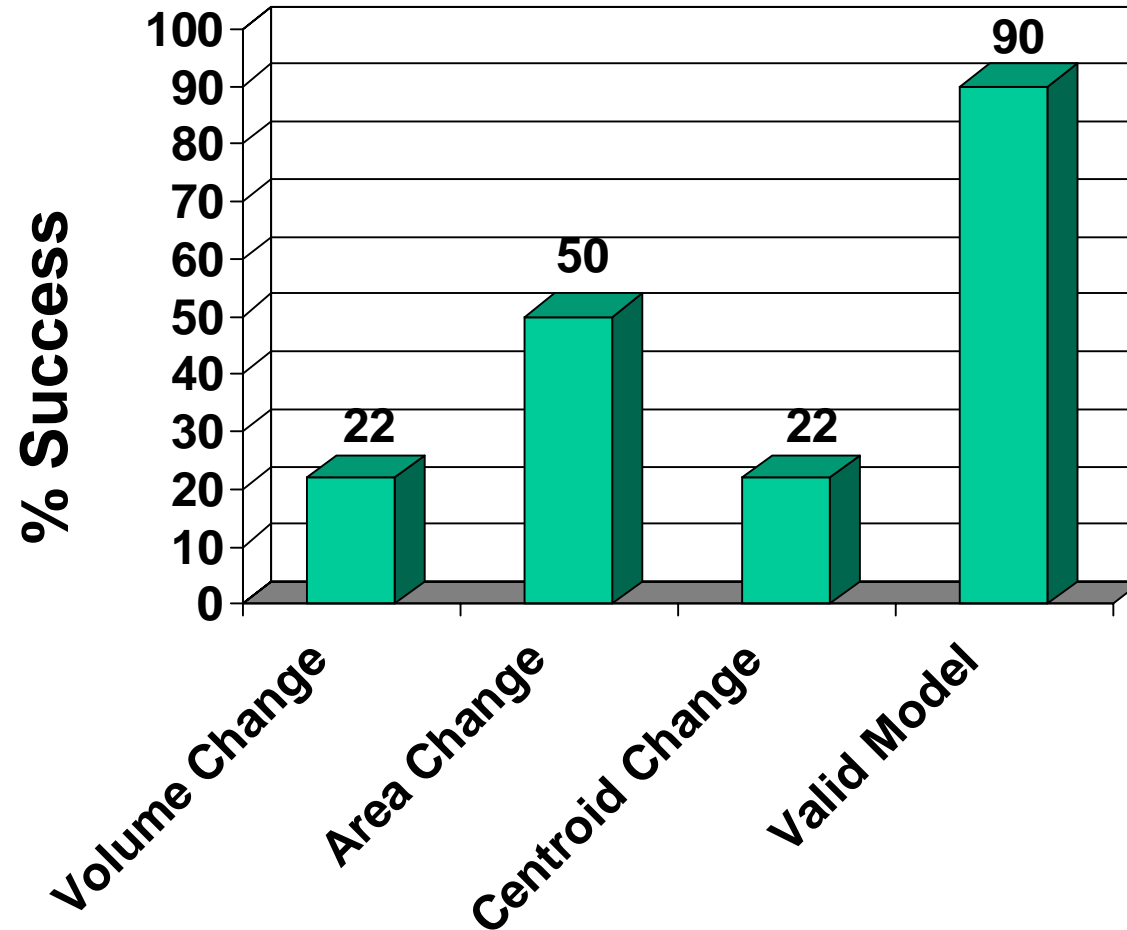
From Pro/E



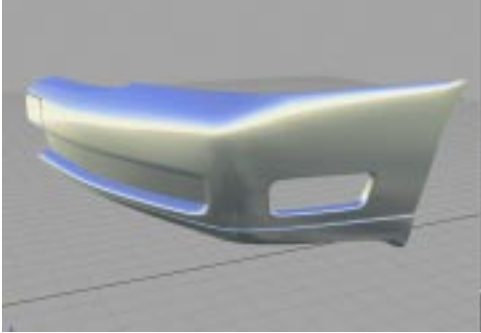
## Results for Production Model 'ug'



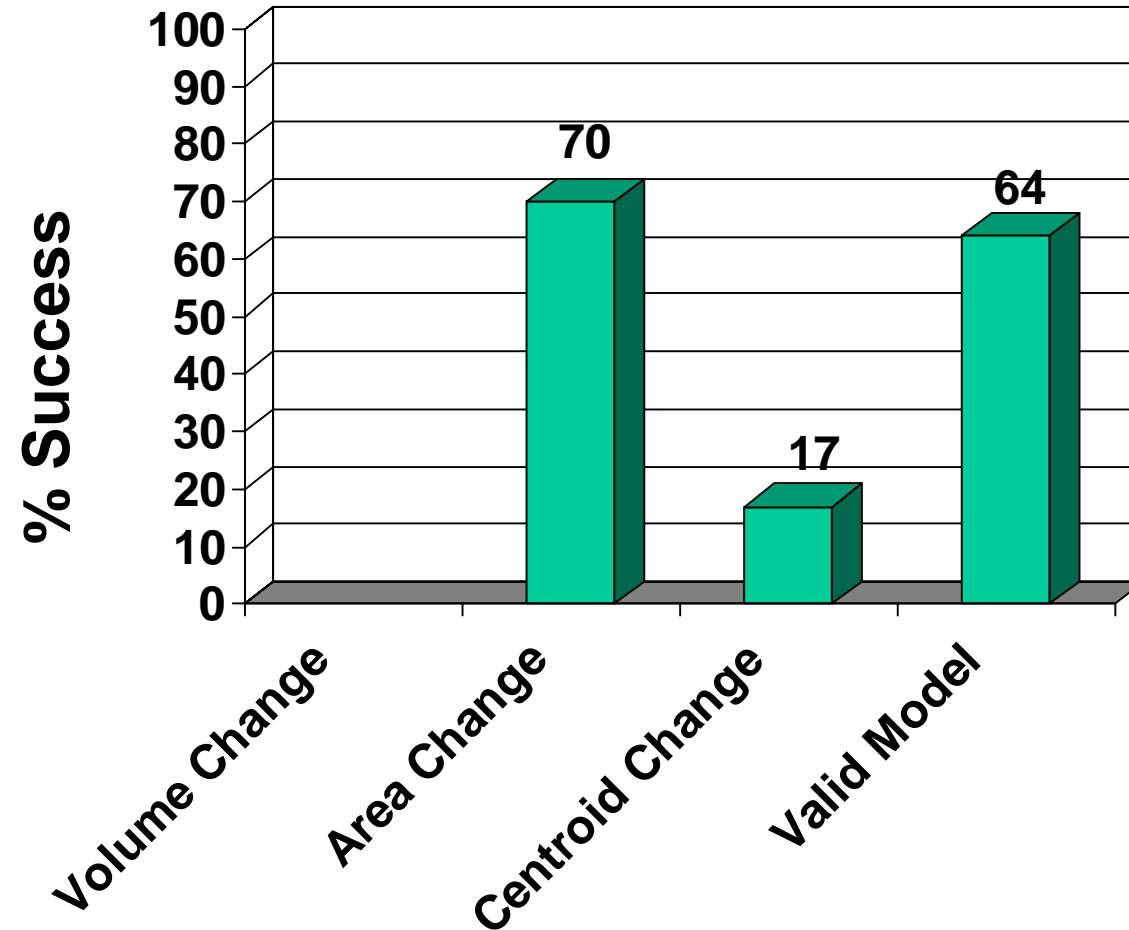
From UG/P&W



## Results for Production Model 'al'



From Alias



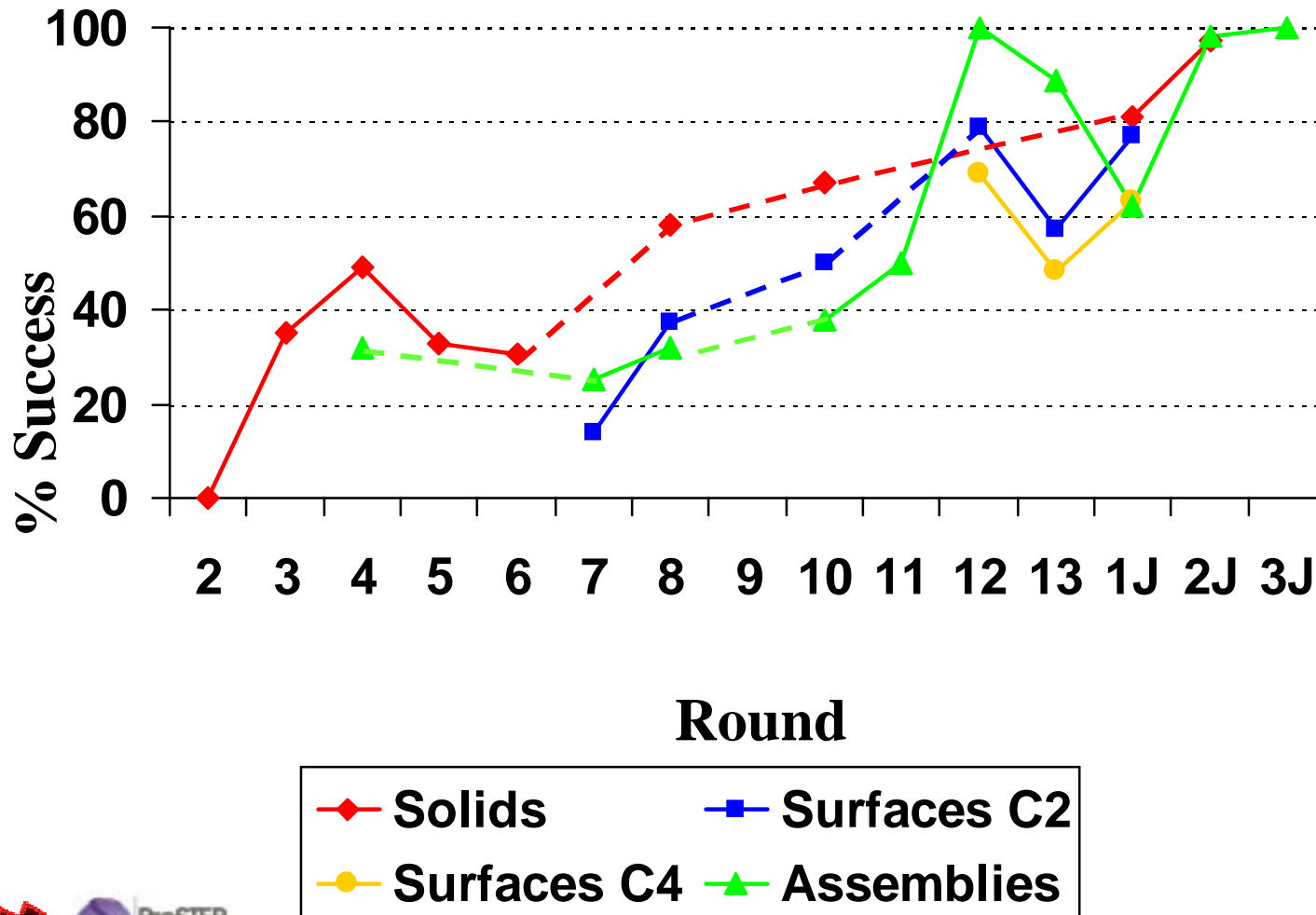
## Round 3J -- Production Models Recommendations

- “Clean up” models
- Increase Production Models suite
- Retest in Round 4J using Validation Properties

## Conclusions of Round 3J

- **Validation Properties: Ready for “Prime Time”**
- **Limited interest in drafting**
- **Further testing still needed to improve geometry exchange**
- **New process for collection and evaluation of test data greatly improved meeting efficiency**
- **Issue resolution process is working; quality of test results shows improvement**
- **Round 4J plans established**

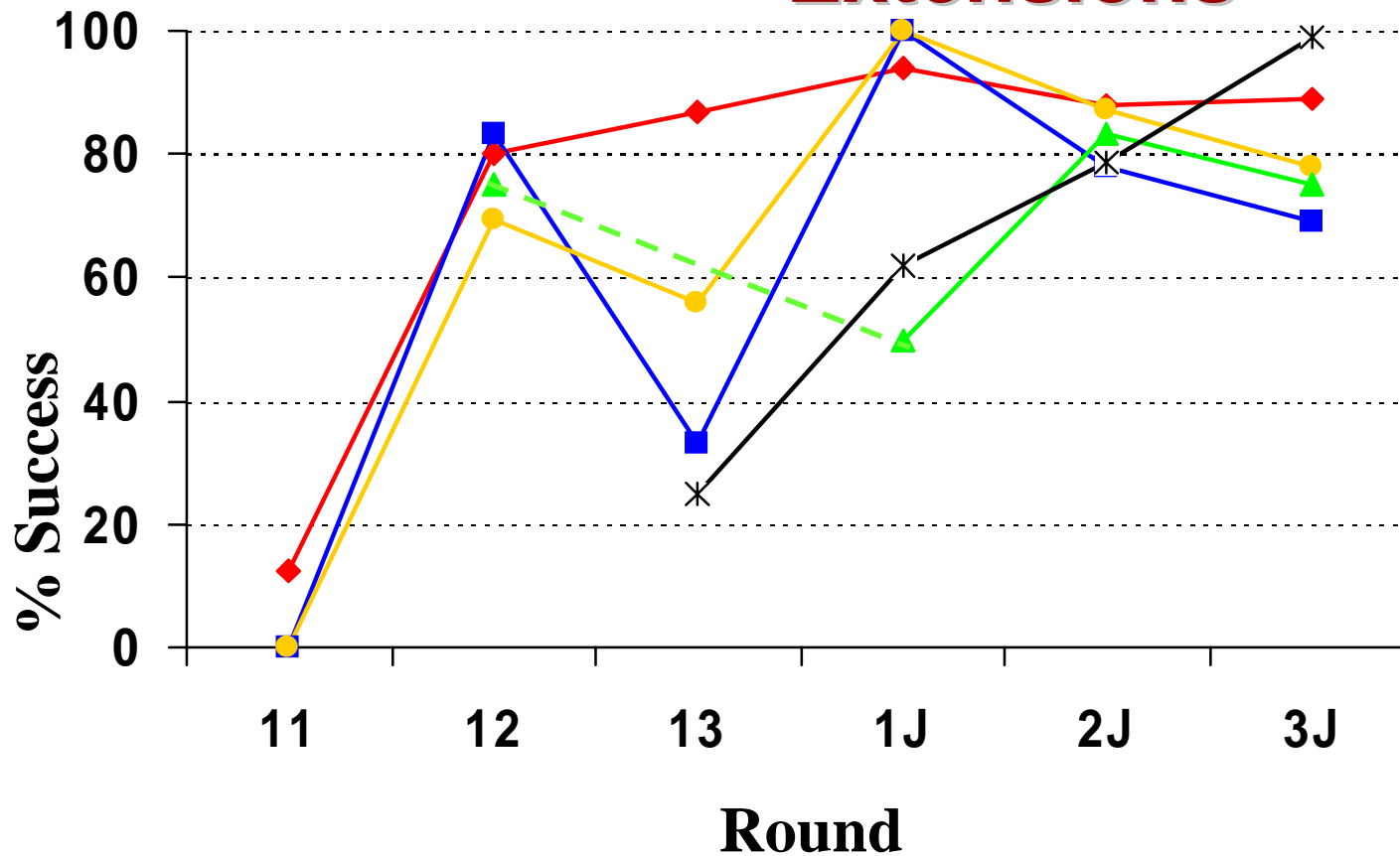
## STEPnet/CAX-IF Testing Results Summary



Please note:

- Statistics do not take into account model complexity, which may vary from round to round
- Statistics reflect the “state” of the group of CAX vendors, the participants of which change over time
- Dotted lines signify interpolation where data is unavailable

# STEPnet/CAX-IF Testing Results Summary -- Extensions



Please note:

- Statistics do not take into account model complexity, which may vary from round to round
- Statistics reflect the “state” of the group of CAX vendors, the participants of which change over time
- Dotted lines signify interpolation where data is unavailable

◆ Solid Color    ■ Edge Color    ● Face Color  
 ▲ Text    -\*- Val. Prop.



## Summary

- Increased players in CAX-IF Round 3J ...positive direction
  - *Need to increase participation in all areas of testing*
- Colors are primetime; available today in released vendor software
  - *UG, I-DEAS, CATIA, AutoCAD, CADDs, Pro/E, and Bentley*
- Impressive progress with Validation Properties
  - *Limited production release*
- Round 4J scope and future direction plans identified
- Vendors NEED Member Companies to SET PRIORITIES

1- Has plans

2 – Has interest

3 – No interest

Vendor/ System	Associati ve Text	Drafting	Colors/ layers	Geometric/ Dimensional Tolerances	Construction History	Geometric Validation Properties	Features	Ext. Ref
AutoDesk AutoCad	Done	3	Done	2	2	1 (Q2 00)	2	2
AutoDesk/ Inventor	1	3	1	2	2	1 (Q3 00)	2	2
Bentley/ Microstation	2	3	1	2	2	1	2	2
Dassault/ CATIA	2	2	Done	2	1	1 (V5)	2	1
Debis/CATIA	1	Done	Done	3	3	3	Done	Done
Alibre	2	2	1	2	2		2	
ITI/SDRC	1	3	Done	2	2	Done	2	2
PTC/ProE	1 (Q2 00)	Done	Done	2	1 (Q3 00)	Done	2	Done
STEP Tools/ ACIS	1	3	Done	1	3	1 (Q1 00)	1 (Q3 00)	2
Theorem/ CATIA	Done	1 (00)	Done	1 (Q2 00)	1 (Q3 00)	1	3	1
Theorem/ CV	Done	1 (00)	Done	1 (Q2 00)	2	Done	3	1
Unigraphics/ UG	1	2	Done	2	2	Done	2	2
Spatial	3	3	2	3	2	2	2	3
HiCAD	2	1	1	2	2	2	2	2
Matra	3	3	1	1	2	1	2	1
Alias	2	3	Done	3	2	1	3	2

## Round 4J Scope (Testing ends July 2000)

- External References - Product structure in one file, geometry in other files
- Production models
- Validation Properties
- Surface model - New test case from Theorem
- Drafting
- ~~Dimensional Tolerances~~ - Not being tested

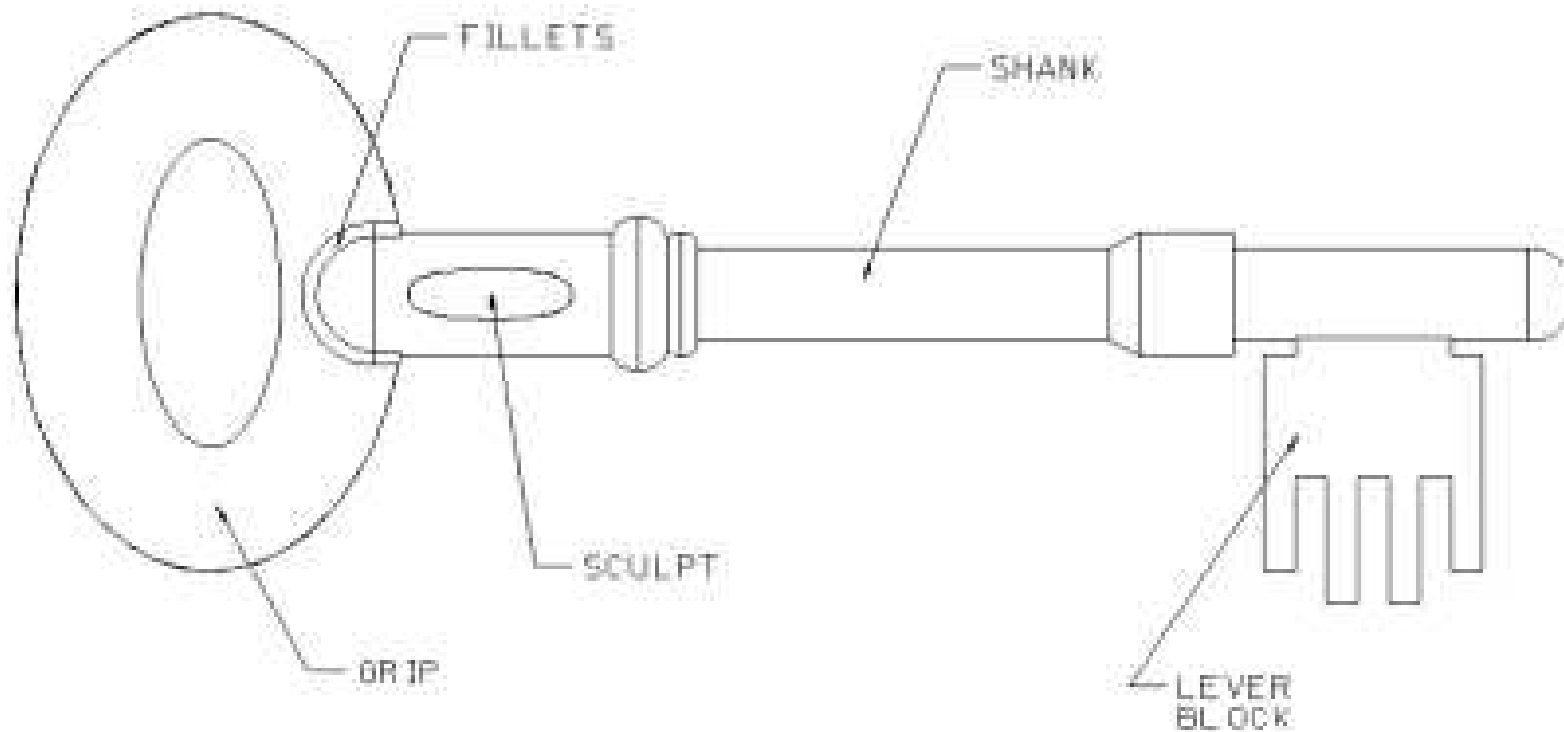
## Who's going to do what in Round 4J?

Vendor	Ext. Ref.	Prod. Models	Val. Props	Surf. Model	Drafting	Dim. Tol
Spatial		x		x		
MDT		x	x	x		
Inventor		x				
Bentley		x	x	x		
CATIA		x		x		
I-DEAS	x	x		x		
PTC	x	x	x	x	x	
STI	I	I	I	I		
Theorem-CADDS	x	x		x	x	
Theorem-UG	x	x	x	x	x	
Alias	I	x	I	I		
UG		x	x	x		
debis	x	x		x	x	
Matra	x	x	x	x		
ISD CAD	x	x		x	x	
Alibre		x	x	x	x	

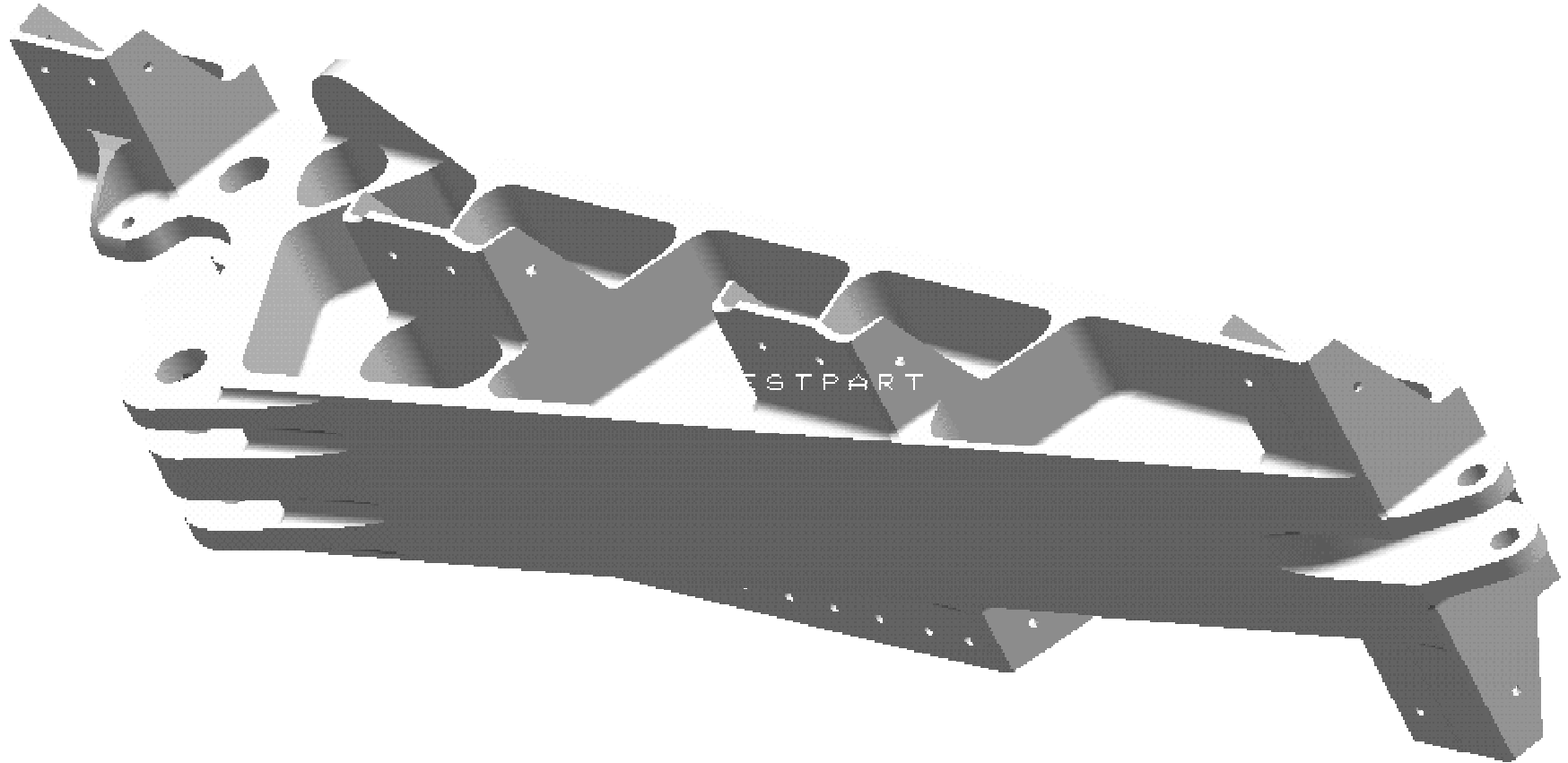
### Legend of Terms

x -- Participation / I -- Import only / E -- Export only

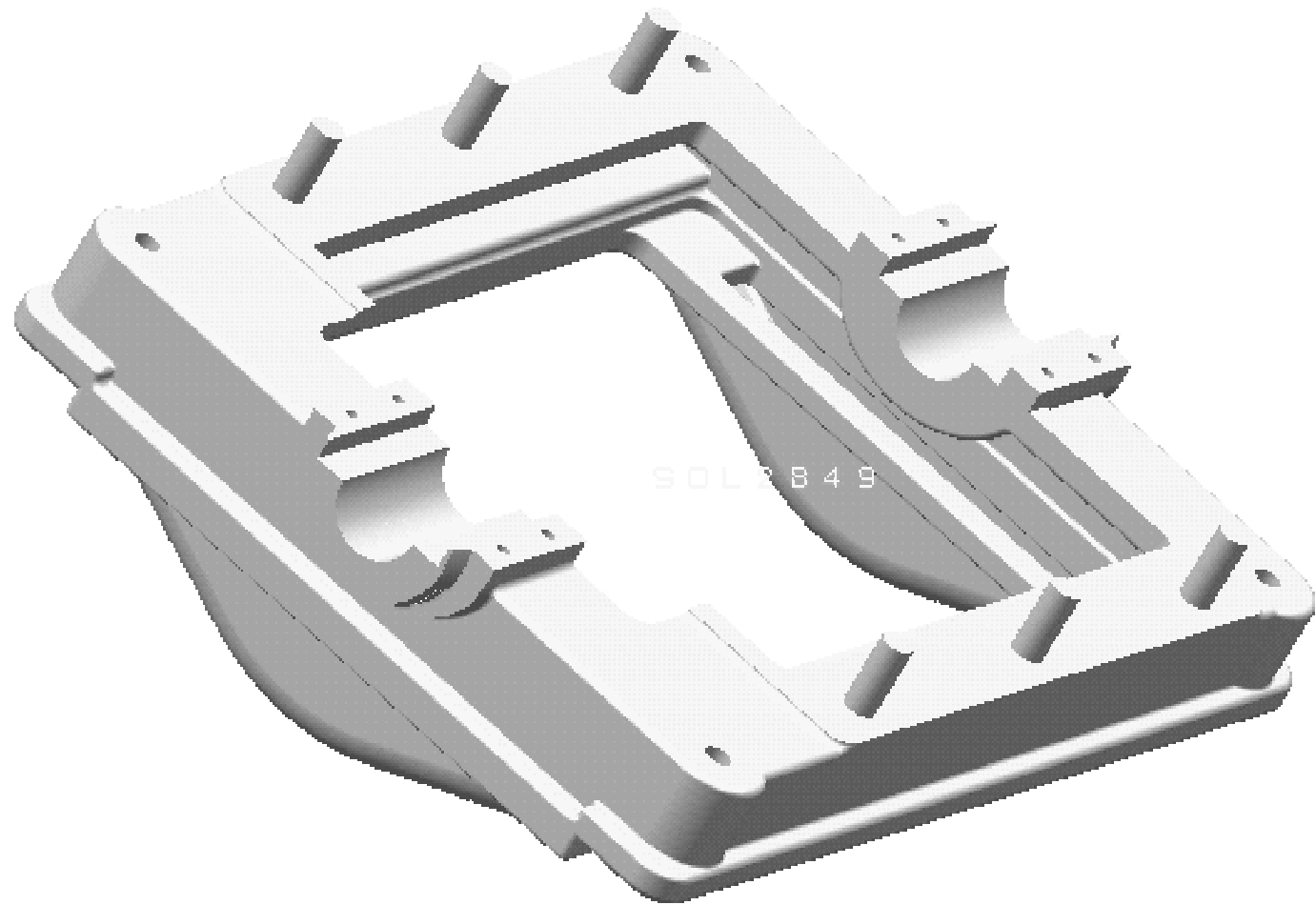
## Surface Test Case



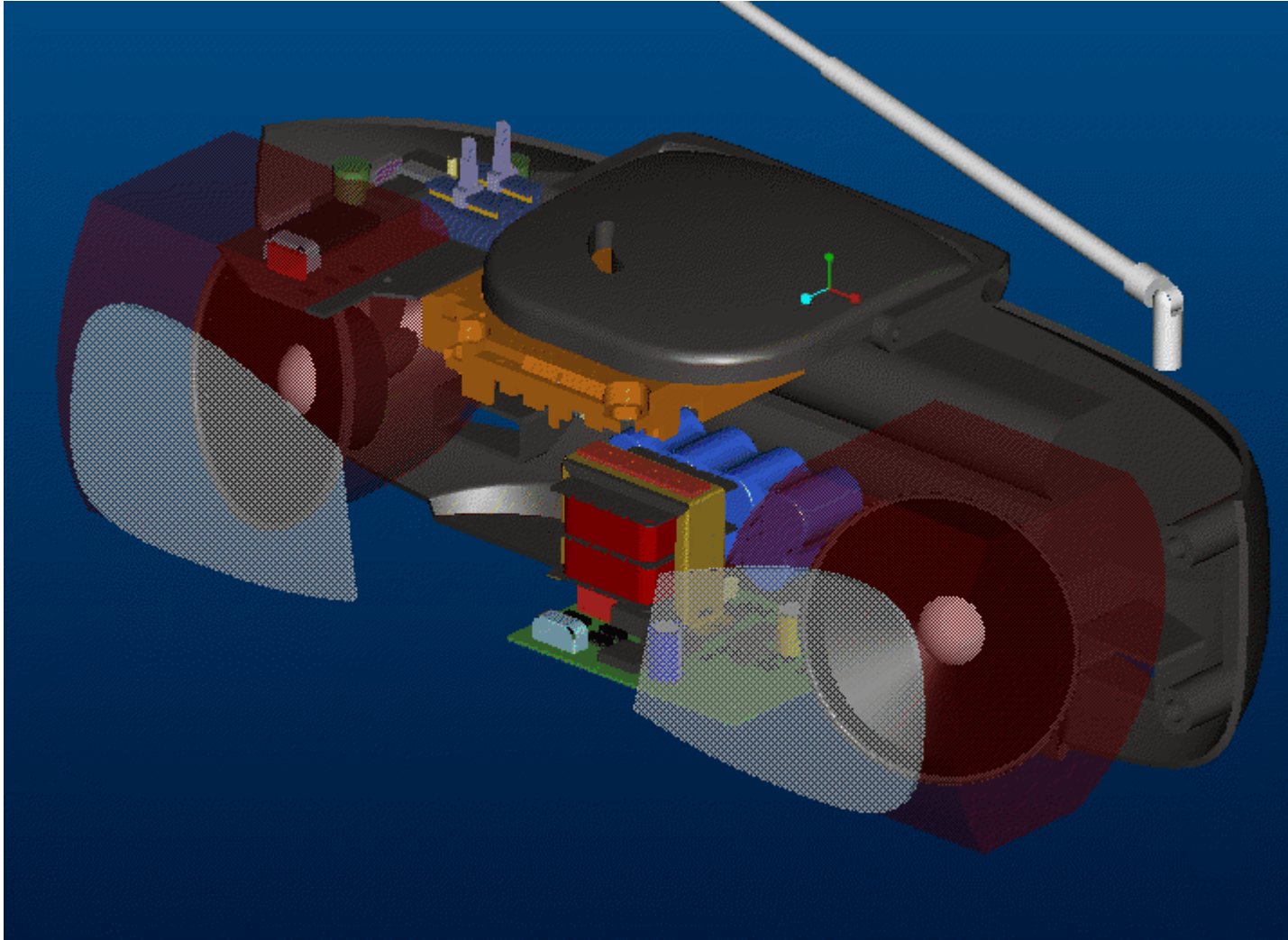
## Production Test Case CATIA -- Lockheed Martin



## Production Test Case CATIA -- Electric Boat

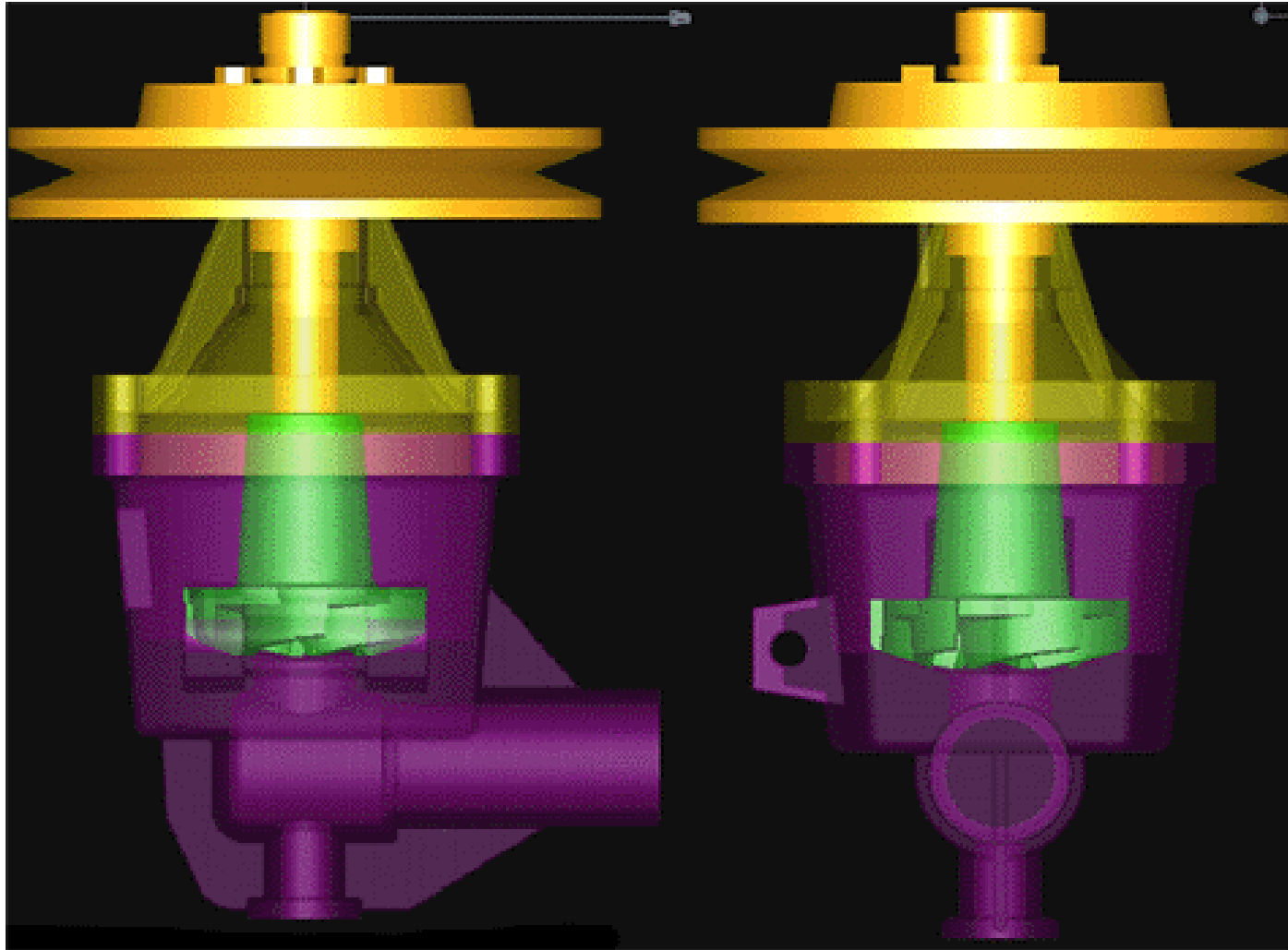


# Production Test Case ProE2000i<sup>2</sup> (Boombox) -- PTC

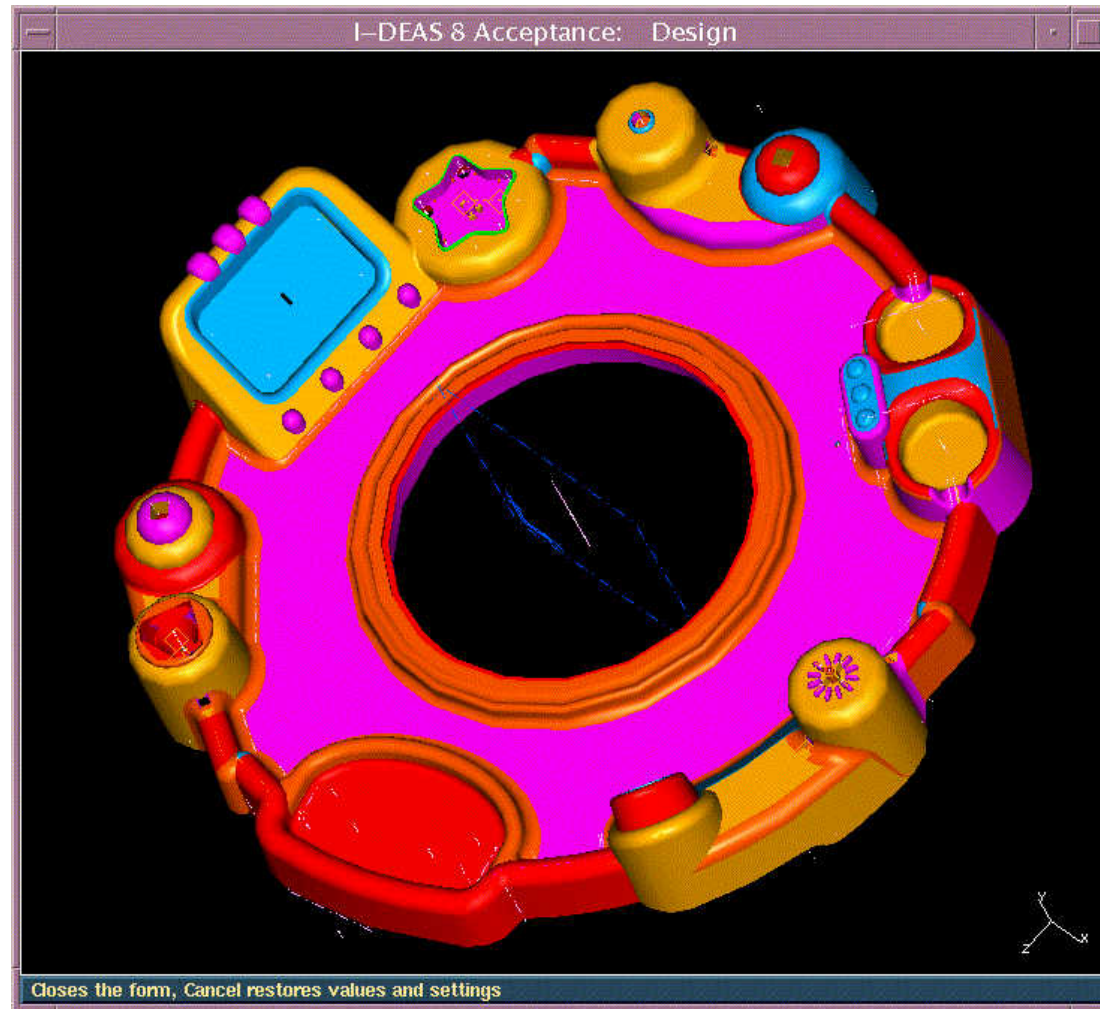




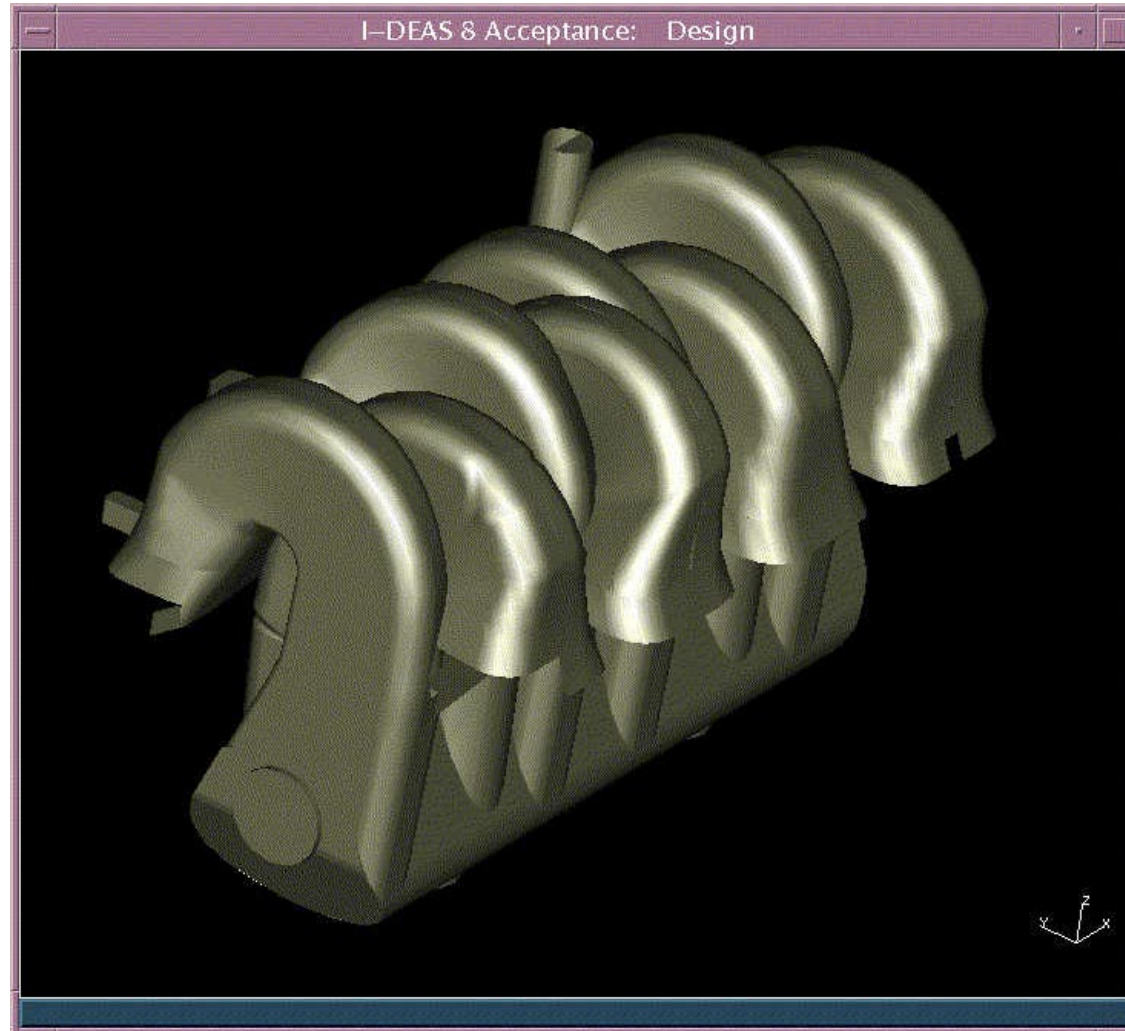
# Production Test Case CASCADE (Pump Rotor) -- Matra



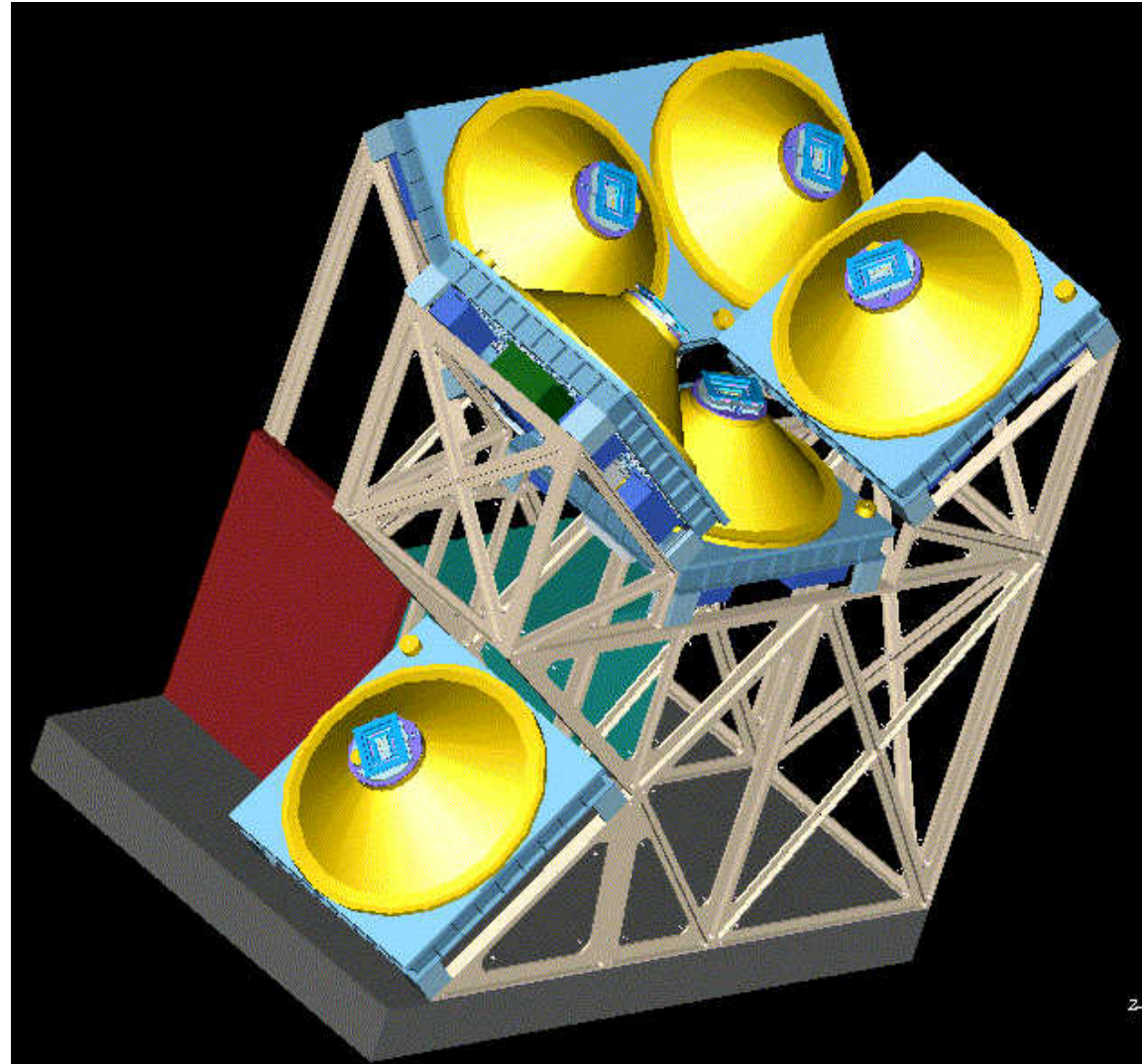
# Production Test Case I-DEAS (Toy tray) -- SDRC/ITI-OH



# Production Test Case I-DEAS (Manifold) -- SDRC/ITI-OH

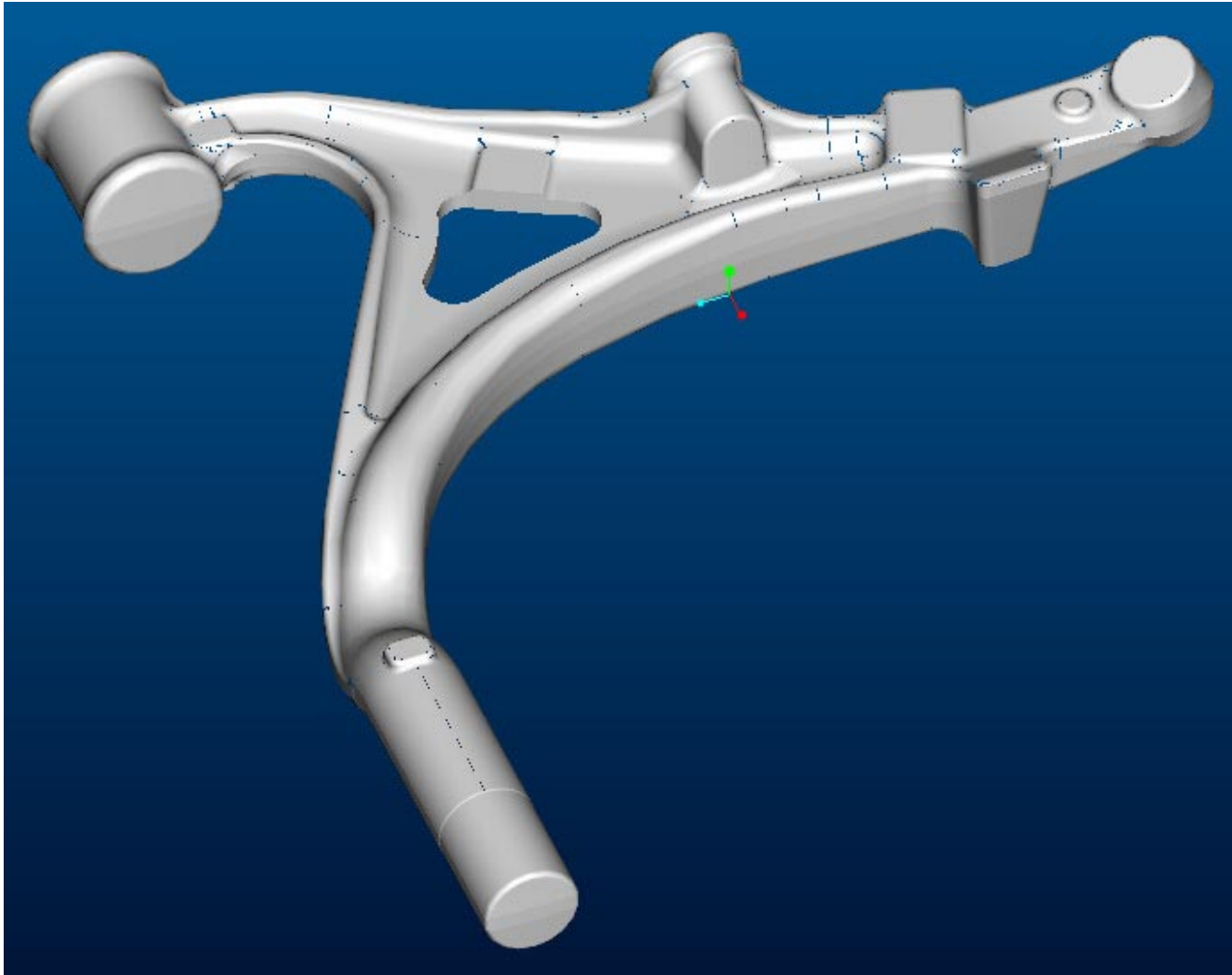


# Production Test Case I-DEAS (Receiver) -- NASA

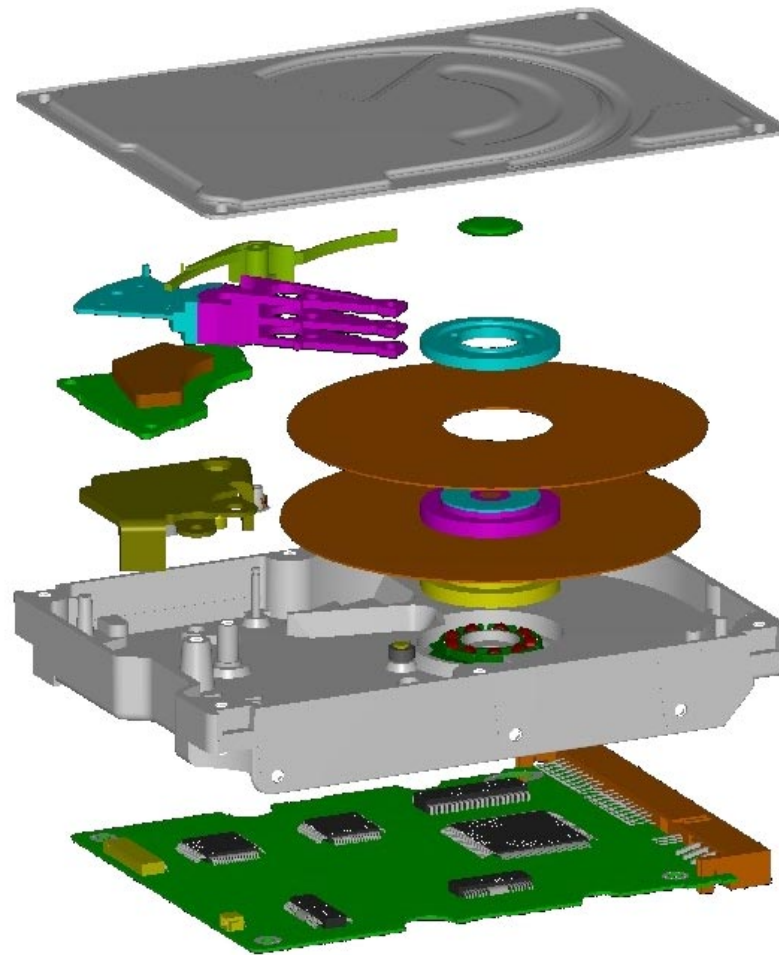




## Production Test Case ProE (suspension arm) -- ProSTEP



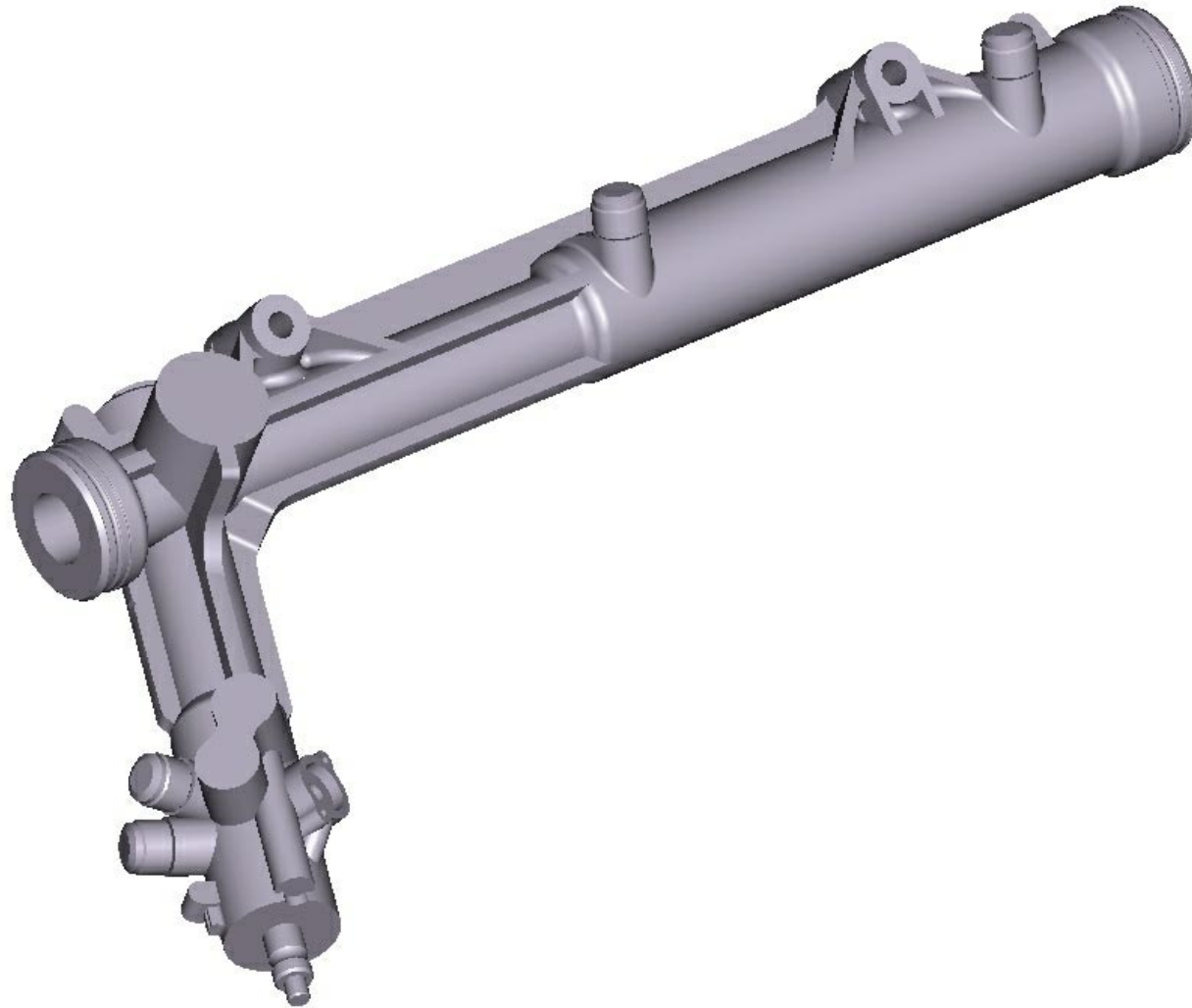
# Production Test Case MicroStation (PC Drive) -- Bentley



## Production Test Case Inventor (Mountain Bike) -- AutoDesk

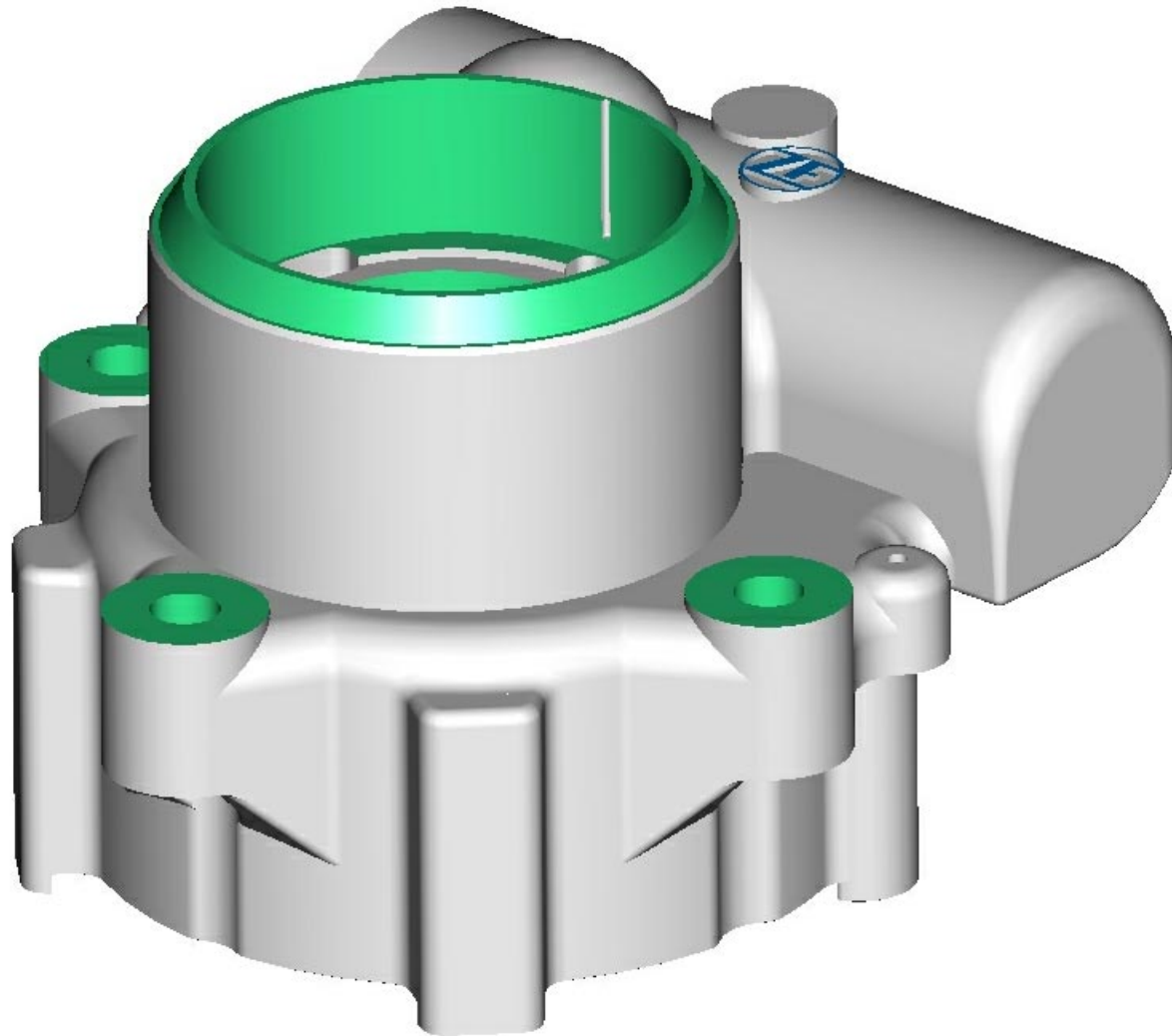


# Production Test Case Pro/E -- ZF





# Production Test Case Pro/E -- ZF



# Production Test Case Pro/E -- ZF

