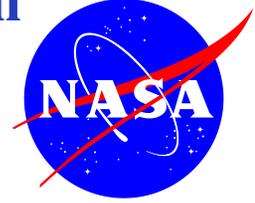


# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

---

## Technical Integration Technologies

### Current State and Proposed Direction

**Dr. William Henry Jones**

National Aeronautics and Space Administration  
John H. Glenn Research Center at Lewis Field  
Cleveland, Ohio

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

## Current State of the Effort

### 1. Multiple Commercial Vendors

1.1 Engineous, IBM, PTC, Phoenix, Technosoft, Unigraphics, ...

### 2. Multiple Research Efforts Leading To or Already At Products

2.1 CAPRI, CGNS, FIPER, PIA, RECIPE, STEP, VADOR, ...

### 3. End-User In-House Efforts



## Recurrent Stumbling Blocks

### 1. Geo-Centric Focus

1.1 Useless when geometry is not a part of the problem

### 2. Man-in-the-Loop Integration

2.1 Limits the range of integration achievement

### 3. Focus on information source

3.1 Leads toward N-squared integration problem

### 4. Single-source solution

4.1 Problem too big

4.2 Unfavorable capital/problem size ratio

4.3 Lack of solution variety

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

## The Fatal Flaw

### 1. Products/Systems Do Not Interoperate

1.1 Suppliers do not “get it”!

1.2 Houses will not interoperate

1.3 Same disastrous path as CAD

1.4 Customer must pick based on his anticipation of the future

1.5 Customer’s information capital assets become a hostage of vendor

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

## The Reasonable Solution

### **1. The Community Should Adopt an Open Standard**

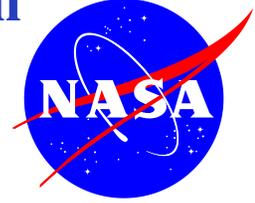
- 1.1 Conversion from individuals in the marketplace to an industry**
- 1.2 Player's "get it"**
- 1.3 Eliminates customer's concerns about which way to go**
- 1.4 Player's need not solve the whole problem; extends effective industry capitalization**
- 1.5 Customers can play, too, as their special needs press them**

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

## The Nature of the Standard

- 1. Documented, open-source, freeware; secured as a standard**
- 2. Net-enabled**
- 3. Operationally secure**
- 4. Scalable, infinity and beyond**
- 5. Self-revealing**
- 6. Semantically-infused, information focused**

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

## **The Direction Beyond the Standard**

### **1. Autonomous Solution Systems**

- 1.1 Building upon the technology of self-revelation, it should be possible to formulate a method whereby the solution to posed problems can be automatically devised by the machines, themselves**
- 1.2 This provides the ability to reach beyond the manual assembly of integrations**

# Turbomachinery and Propulsion Systems Division

Engine Systems Technology Branch

National Aeronautics and  
Space Administration

John H. Glenn Research Center  
Lewis Field  
Cleveland, Ohio  
44135-3191



Unclassified

---

**And, As it Just So Happens...**

## **Project Integration Architecture**

<http://www.grc.nasa.gov/WWW/price000/index.html>