



2020 Vision of Engineering Analysis and Simulation  
October 29 - 31, 2008 | Hampton, Virginia

## FUTURE BREAKTHROUGHS IN CREATING, MANAGING AND ANALYZING SIMULATION DATA FOR NEAR REAL-TIME DECISION MAKING

JP Evans  
Dassault Systemes, SIMULIA



# Introduction

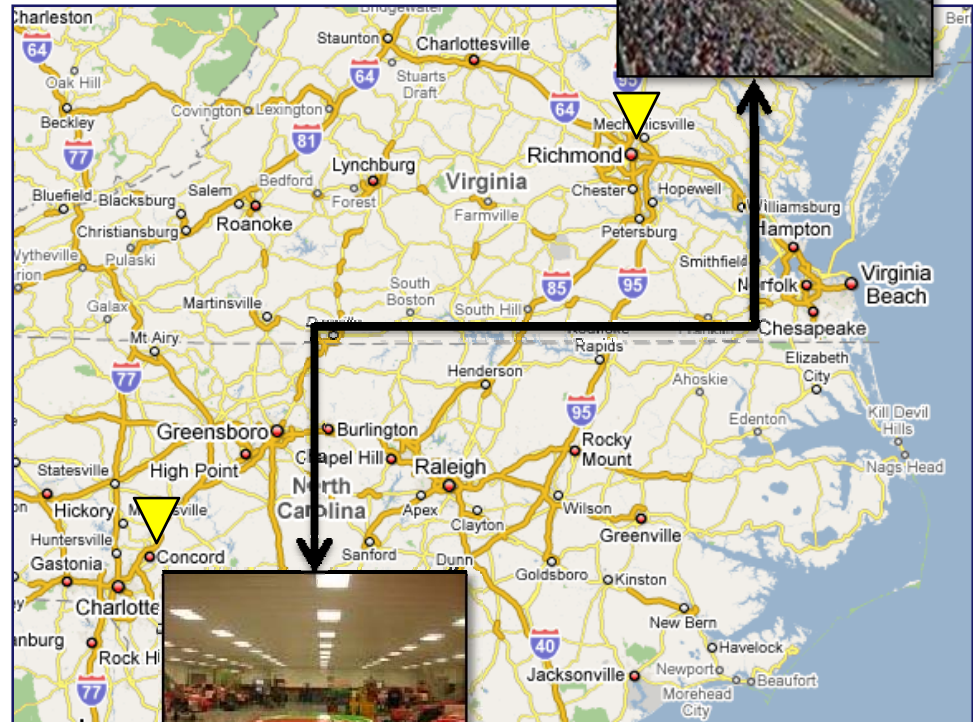
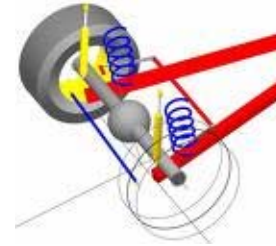
- Highly competitive markets are driving the need for faster / better design solutions
  - With **increased confidence**
- Individuals users have come to expect near real-time answers
  - Future advancements will continue to fulfill this reality
- This cannot be accomplished with disconnected users, applications and data
  - It requires **order to simulation**





# Near Real-Time Use Case

- A leading NASCAR team uses FIPER to automate their simulation processes
- FIPER enables trackside optimization of car set-up on qualifying day





# Hypothetical Use Case

## Problem Description:

- Nose gear of SLP500 collapsed during routine approach in PDK on 7/21/11
- FAA is contemplating grounding the SLP 500
- Objective: Find root cause and propose immediate acceptable solution to FAA

## Root Causes:

- Current 7050-T7451 high strength aluminum alloy deployed in the SLP500 nose gear is too fatigue sensitive according to realistic simulations.
- 'Overpeening' of nose landing gear during a repair may have also contributed.

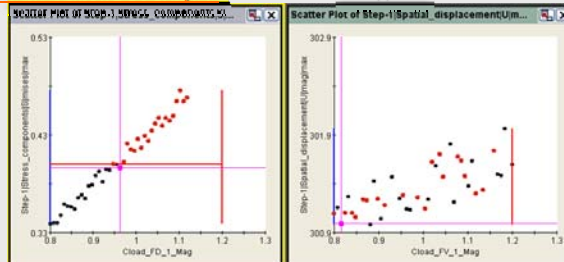
## Decision Support Live

### Analysis

- Abaqus Explicit /Ncode
- Normal FAR 23 X56.67.9 fatigue spectrum
- Standard M95.6 DOE template

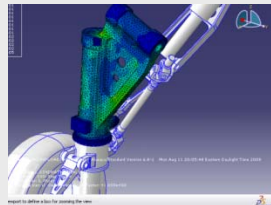
### Status

- 8/15/2011.3:15 **locked** by: Mike Brady
- 89 materials
- 19 suppliers



### Proposed Solution

- Use 2024 T6 BODEX/Aluminum
- Cost
- Schedule
- Still adequate strength and better fatigue life
- Same manufacturing methods
- Lowest cost



## Additional Remedies:

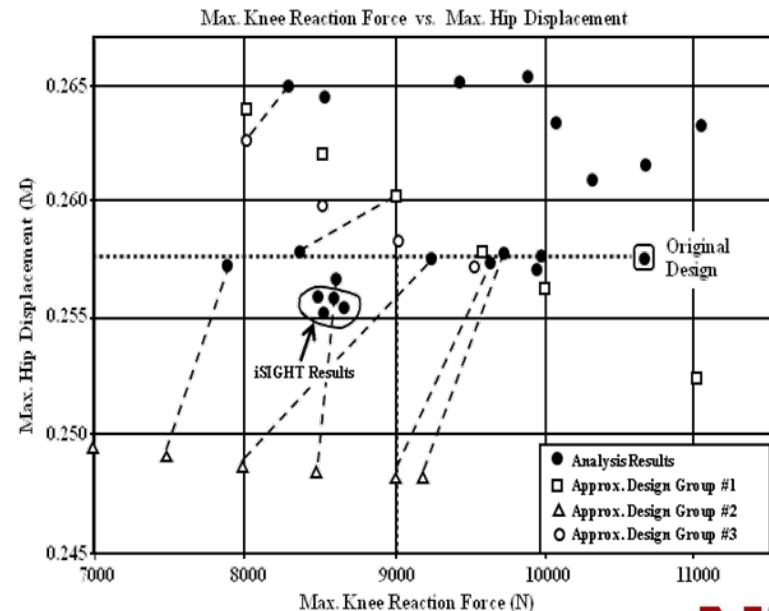
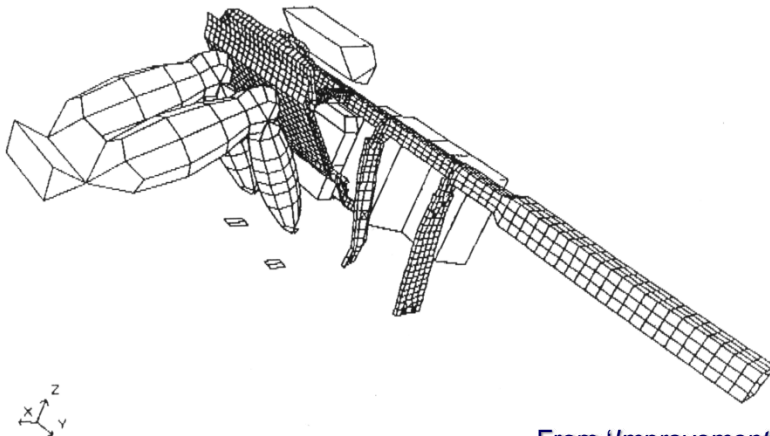
- Could consider titanium if there do turn out to be issues with the maximum loads
- Over peening was definitely a cause here. Recommend maintenance bulletin to all customers

Action Plan	Responsible	Due	Target
Senior Mgt approval of remedy	Mike Brady	Now	Approval by 8/18
Contact FAA for approval of remedy	Jim Rice	8/21	Approval by 9/15
Manufacturing modification	Frank Body	8/18	Actionable by 9/15
Supplier contacts	Julie Cox	8/18	Approval by 9/16 depended on FAA approval
Train operators	Frank Body	9/15	5 machinists from XYB dept. by 9/20
3 months QA	Ivonna Harly	12/20	ISO 9000.123 compliance
Follow Up	Responsible	Due	Target
Replace NG on SLP500 NA region	Jim Morris	12/31/12	100% replacement
Assign field resources to monitor fatigue	Will Brooks	2/1/12	90% screening in 2012 / NA region
Fatigue reports monthly to ENG/QA	Will Brooks	3/1/12	On Time / Accurate
Results	2011	2012	2013
Unacceptable crack growth instances	3	N/A	N/A
Cost versus target	+20%	N/A	N/A

Release 2011R2.123

# Data is Valuable and Reusable

- Data can be used to correlate, validate and complement simulation
- Real world testing can be reduced
- Surrogate models can be used as means to an end to solve “impossible” problems
  - Use case example: Knee Bolster Design

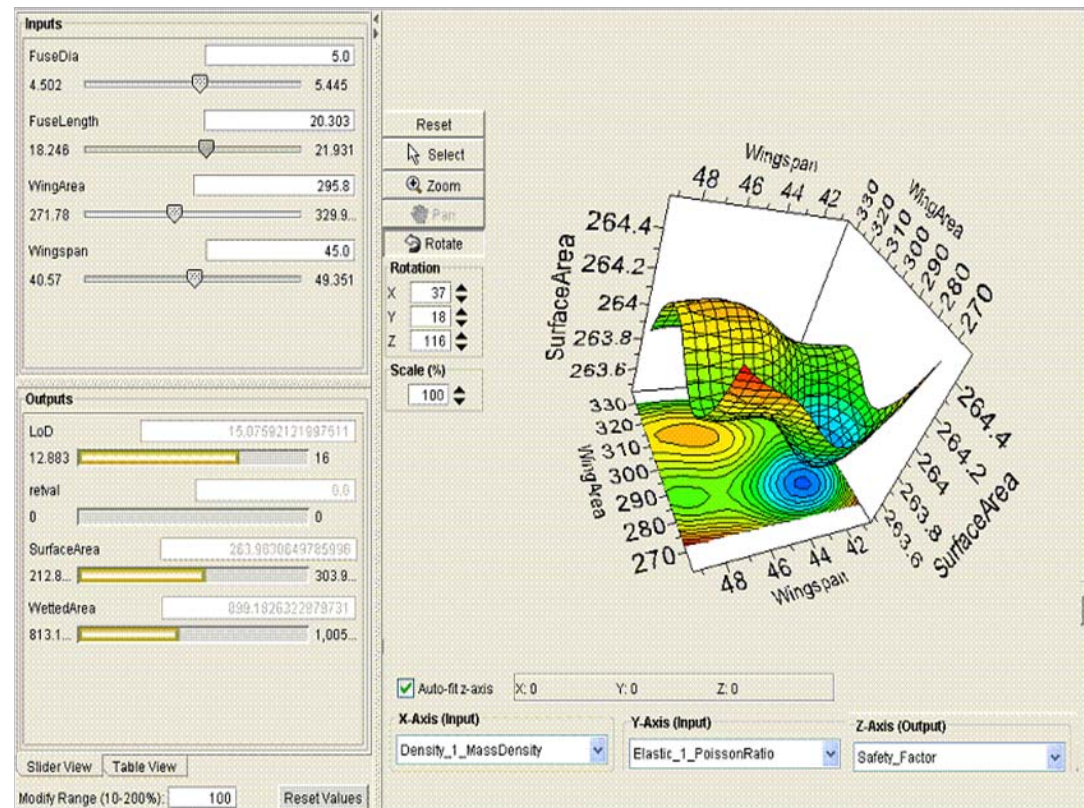
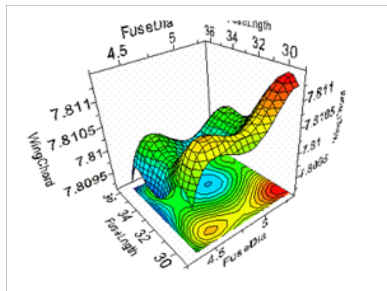


From 'Improvement of Crash Characteristics through a Design Optimization Application'



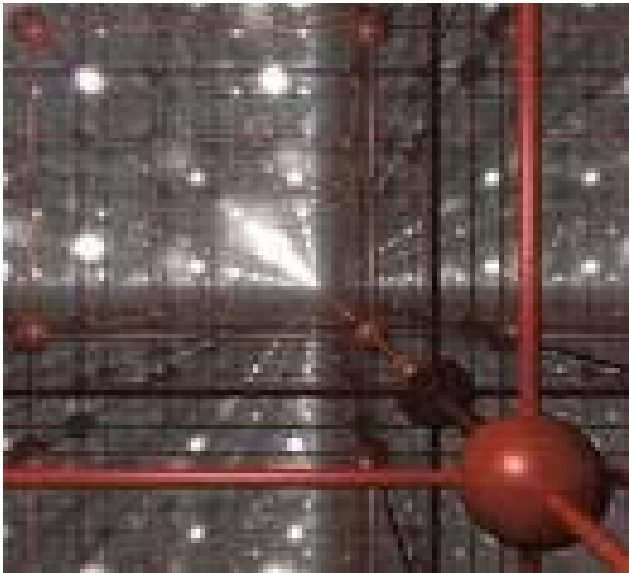
# Data is Valuable and Reusable

- Data from virtually any source can be used to construct surrogate models
- Real time trade studies enabled through visual interfaces



# Leaps in Computing Power and Distributed Resources

- Heterogeneous compute environments are common and necessary
  - Resources need to be synchronized and used efficiently



- Cloud Computing
- Emerging technologies are aiming toward “virtualized” global resources
- Automated, secure provisioning



# Summary

- Process Automation / Decision Support need to be tightly coupled with SLM to support near real-time decision making
  - The data must be easy to access and understand
  - The user must be ensured they are accessing the right data at the right time
  - Huge volumes of data must be effectively managed and reused for efficiency
  - Advances in compute power and DRM are enablers

