

Increasing Reliability for Industrial Applications

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About Us

Prencsia Solutions is part of a global engineering organization

- **A new OSI Partner!**
- 6,000 companies served
- 25,000 reliability and durability engineers trained

Empowering decisions through **software and service solutions** to convert engineering data into **actionable information** to improve **efficiency, availability, reliability, safety, durability...**



General Dynamics



Lockheed Martin

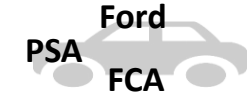
NASA

US Army



John Deere

GM



PSA

General Electric



Reliability, Durability and Prognostics... Multiple Industries



Software Tools

nCode

Component
Performance



- Design Optimization
- Operational Usage
- Safety Design
- Damage prediction
- Vibration analysis
- Deterioration

ReliaSoft.

System
Performance



- Design Optimization
- Life Cycle Cost Analysis
- Predicting reliability
- Forecasting
- Safety Design
- Risk Analysis
- Maintenance Strategy

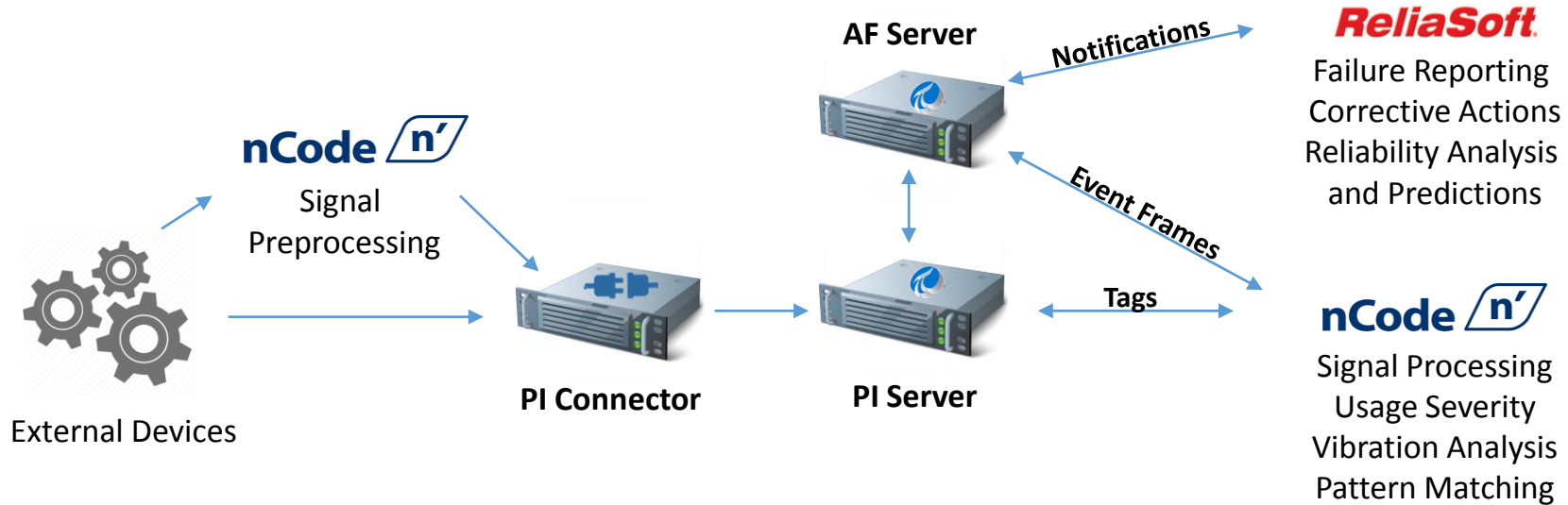
Reliability/Durability Solutions

Prenscia^{HBM}
Solutions



- KPI Monitoring
- Maintenance Optimization
- Forecasting
- “What-if” Scenarios
- Continuous monitoring
- Failure Mode Analysis
- Key parameter identification
- Prognostic analysis for remaining useful life

OSI Interfaced Architecture



External Devices

nCode n'

Signal
Preprocessing

PI Connector

AF Server

Notifications

ReliaSoft.

Failure Reporting
Corrective Actions
Reliability Analysis
and Predictions

Event Frames

nCode n'

Signal Processing
Usage Severity
Vibration Analysis
Pattern Matching

Tags

PI Server

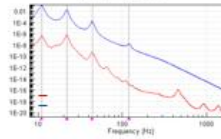
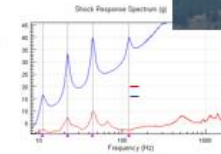
Our Business

By combining physics of failure with patterns of failure

... our models, analysis and systems provide high confidence information to support

... accelerated development, improved operations, greater safety, risk management, improved asset management, and other key business decisions

Deeper knowledge, superior insight and assurance delivered



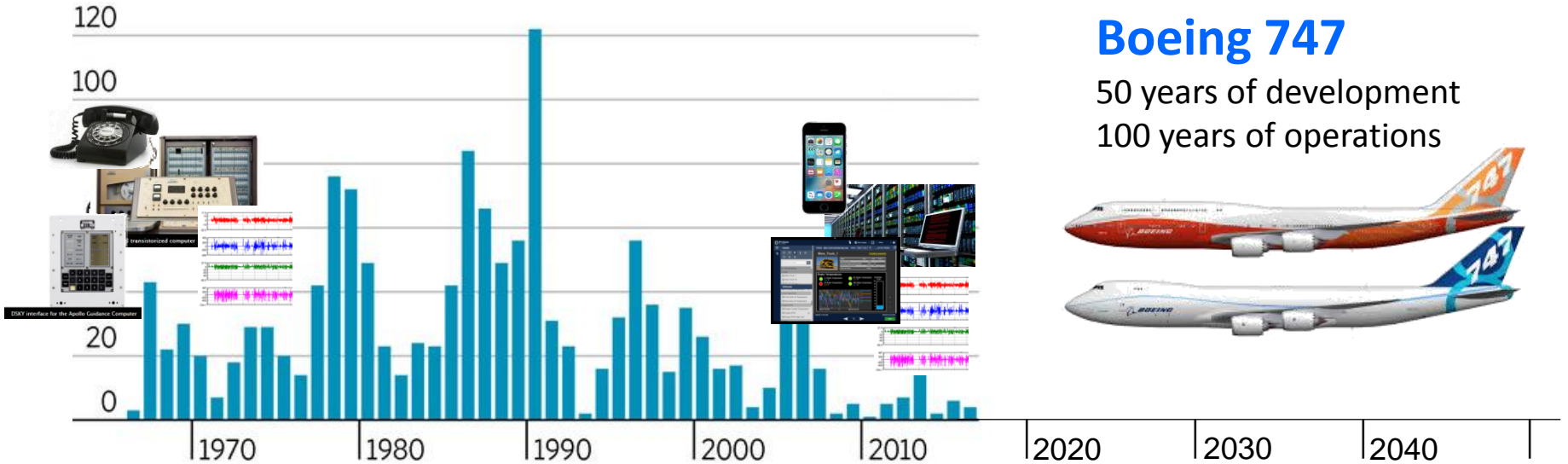
Asset Lifecycle Performance

Cradle to grave: from initial design to last use

Development

Operating Aircraft

Annual orders for 747s

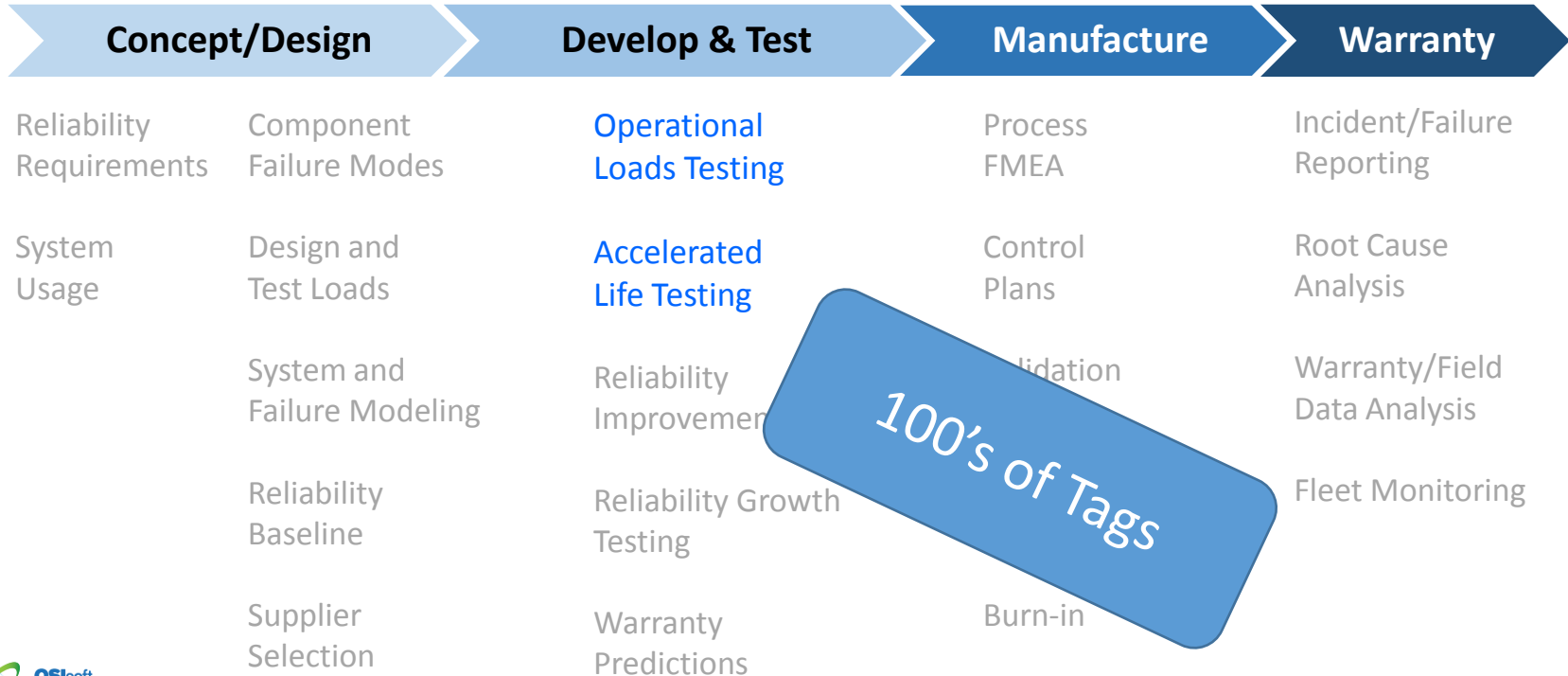


Boeing 747

50 years of development
100 years of operations



Development Lifecycle



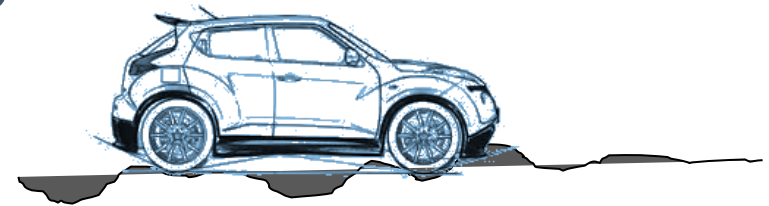
Accelerating Real World Conditions

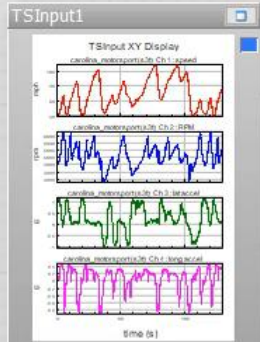
Optimum proving ground schedule to replicate field failures:

- What surfaces/distances?
- What vehicle weight conditions?
- What road speeds?
- What manoeuvres?

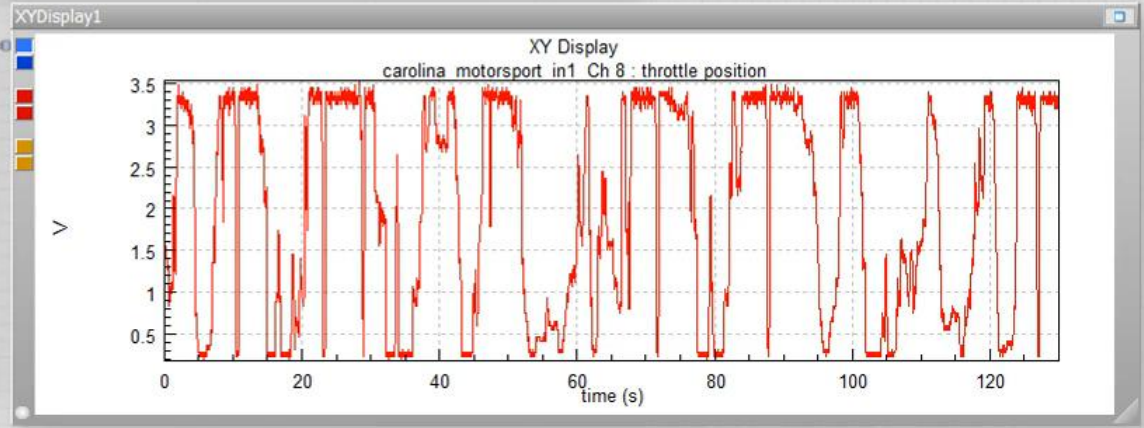
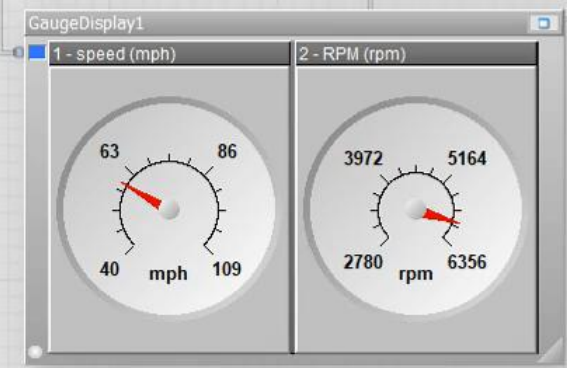
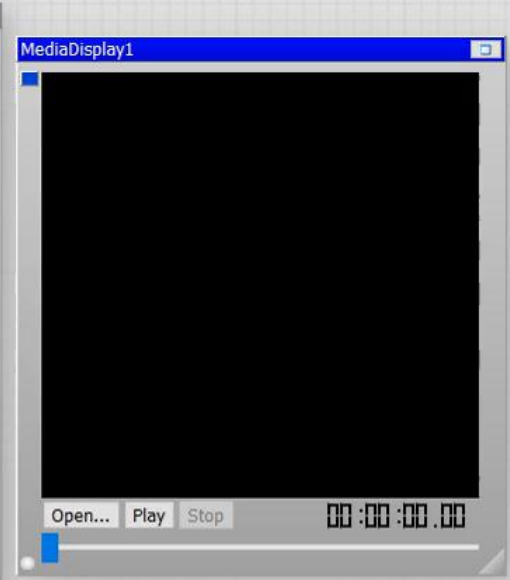
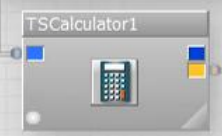
Acceleration factor?

Correlations between proving grounds?

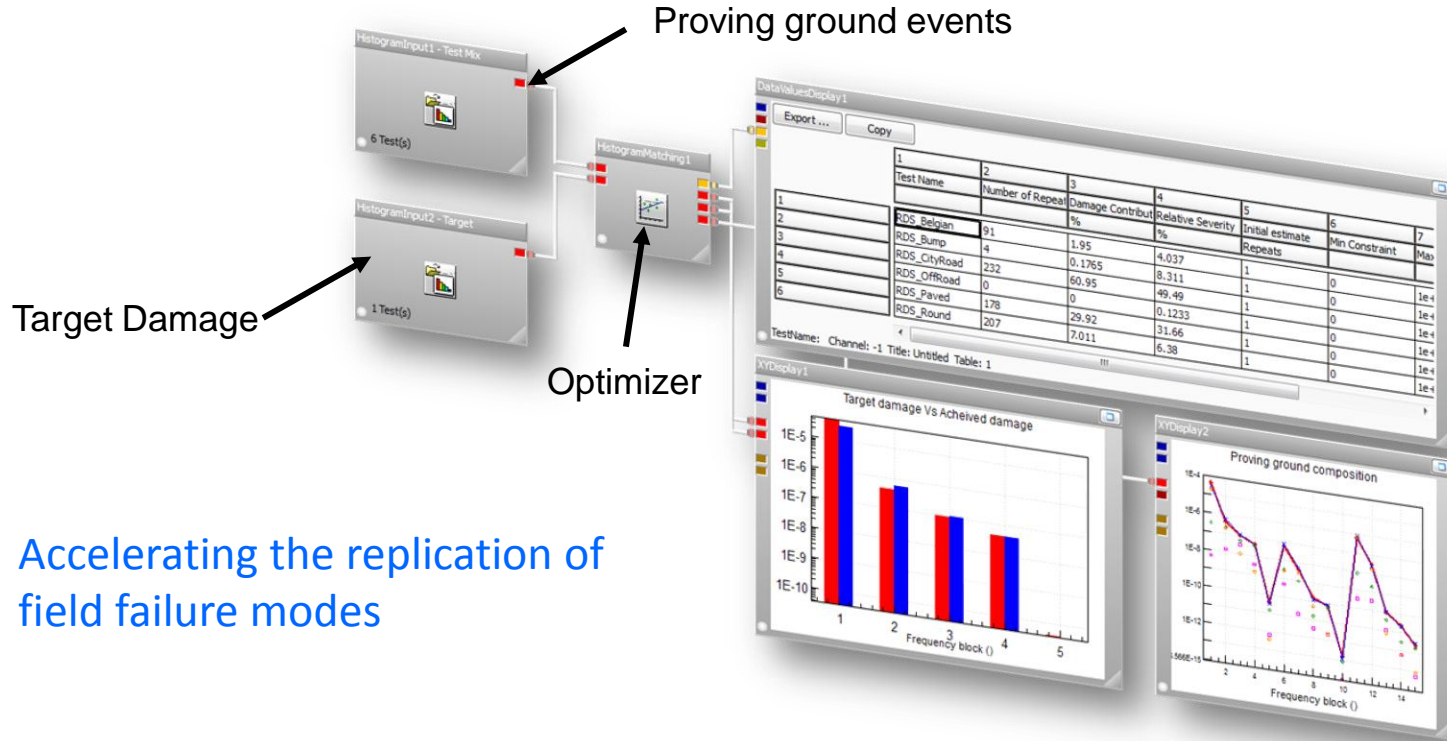




1 Test(s) Display

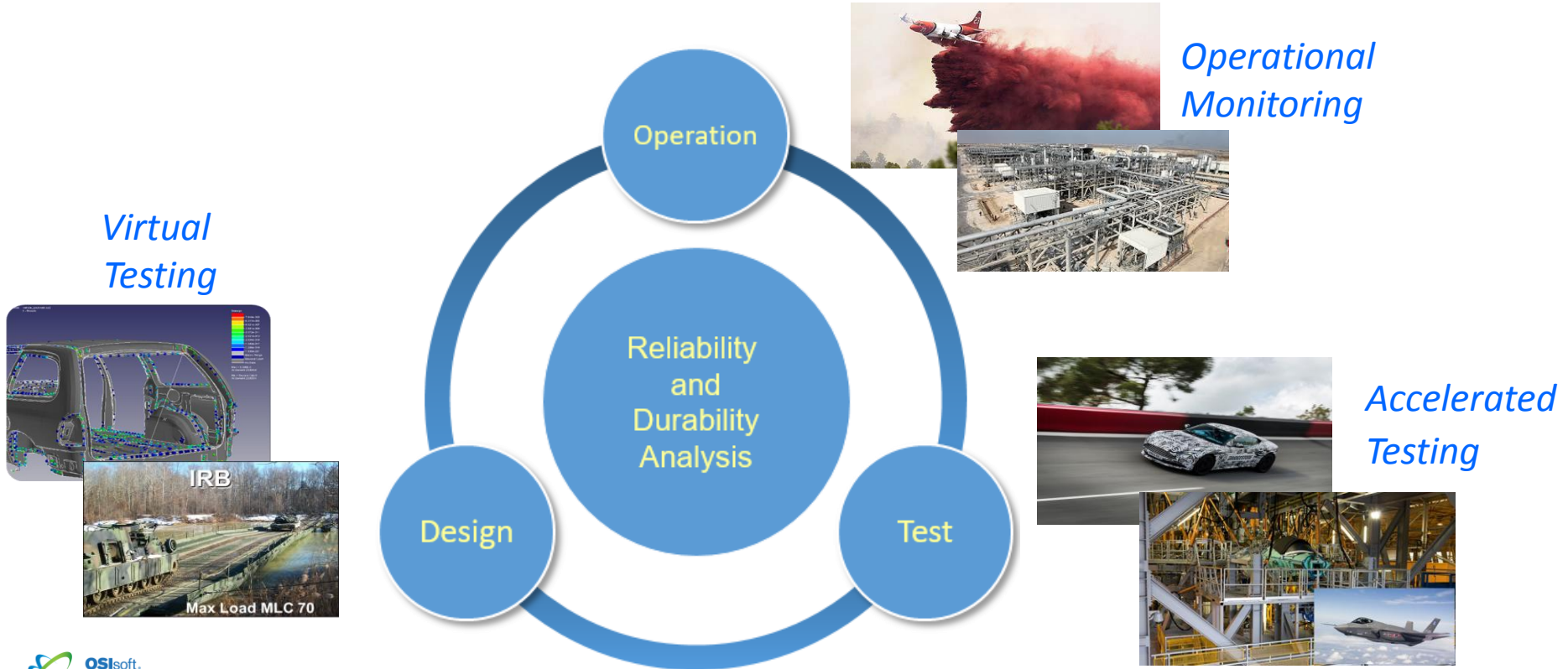


Matching Damage to the Real World



Accelerating the replication of field failure modes

Develop Products for Reliability and Durability



Development Lifecycle



Operational Feedback
Readily available data (tags)

Understanding what's Important

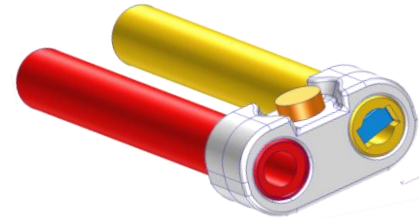
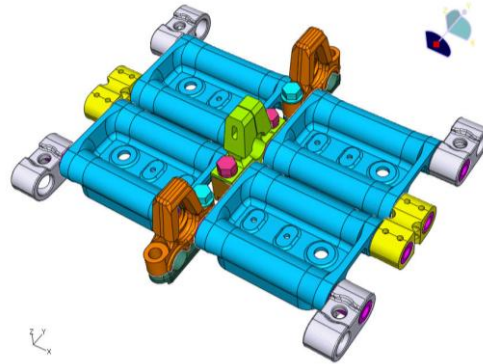
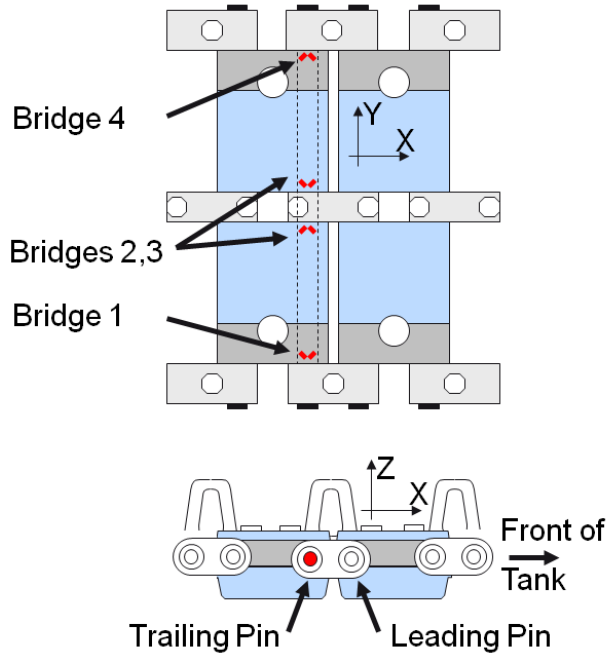
Delivering more with less!

Army Tank originally designed for European theatre

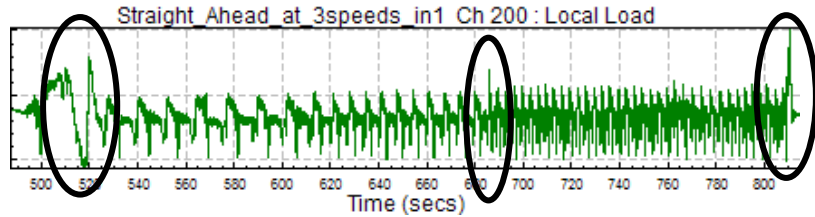
- Needed to operate in other locales
- Significant suspension and track failures observed
 - Understand failure modes first
 - Identify key data influencing failures
 - Then consider redesign



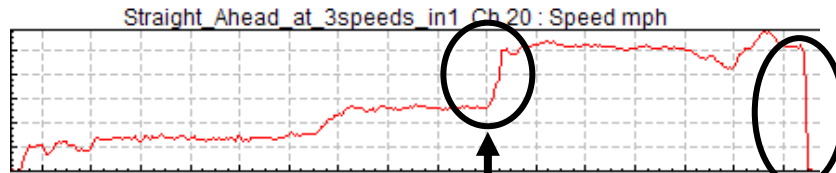
Creative Instrumentation



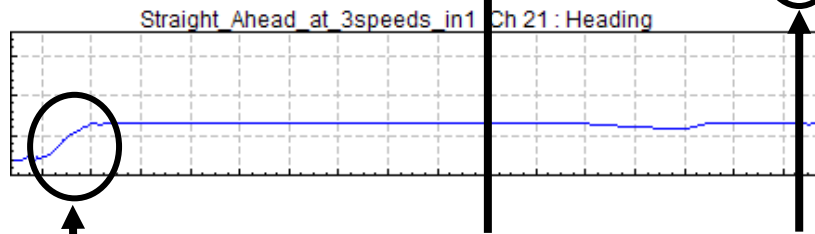
Deriving Damage from Available Tags



Component Loading



Vehicle Speed



Vehicle Heading

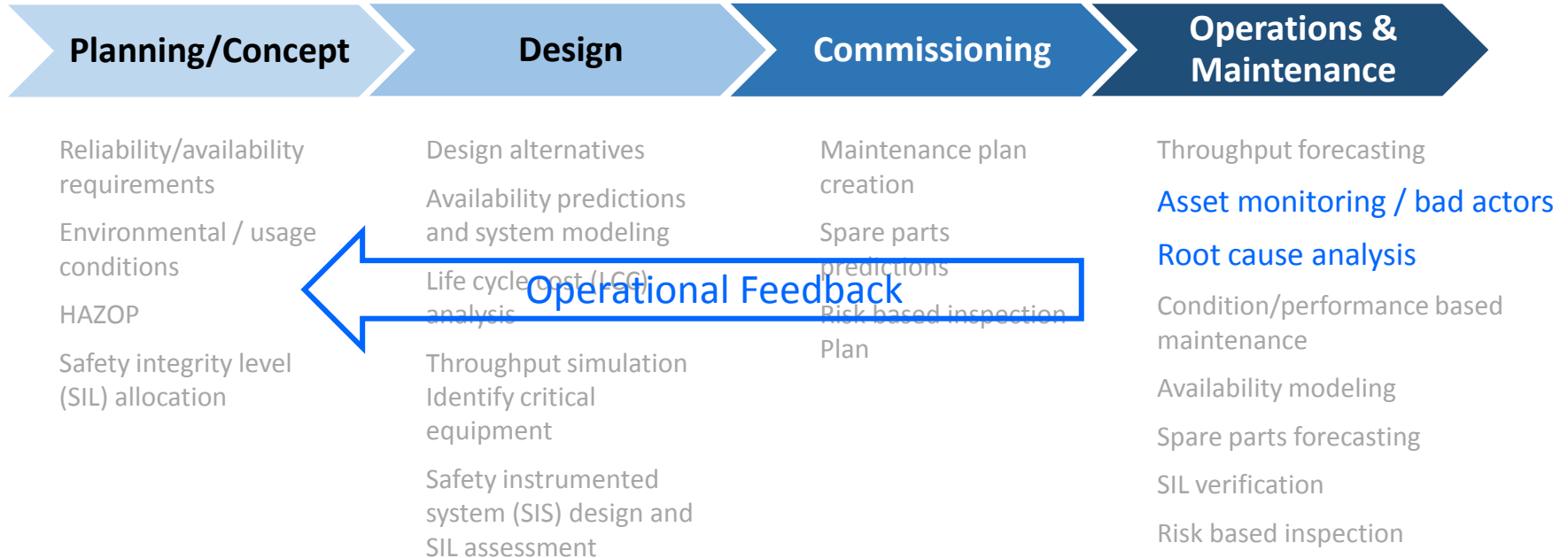
Readily available tags

Turning

Acceleration

Braking

Operations Lifecycle

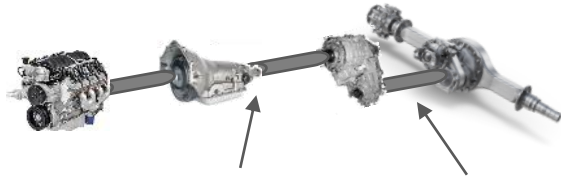


Challenge to obtain accurate Operational Data

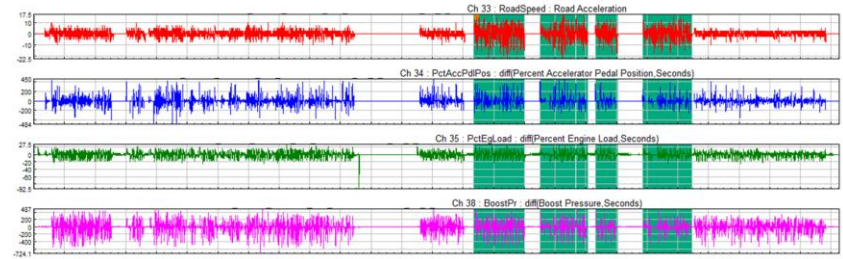
Problem

Want to correlate vehicle speed to damage

- Poor correlation observed



Speed measured here but needed here



Approach

- Identify Neutral-Neutral cycles
- Meaningful cycles (Speed > 5mph, Duration > 15s)
- Apply machine learning (ML) to vehicle bus parameters
- Apply appropriate physics

Results

Correlated high/low range to vehicle bus

- 80% accuracy with ML
- 95% accuracy with ML and physics

Operations Lifecycle

Planning/Concept

Reliability/availability requirements
Environmental / usage conditions
HAZOP
Safety integrity level (SIL) allocation

Design

Design alternatives
Availability predictions and system modeling
Life cycle cost (LCC) analysis
Throughput simulation
Identify critical equipment
Safety instrumented system (SIS) design and SIL assessment

Commissioning

Maintenance plan creation
Spare parts predictions
Risk based inspection Plan

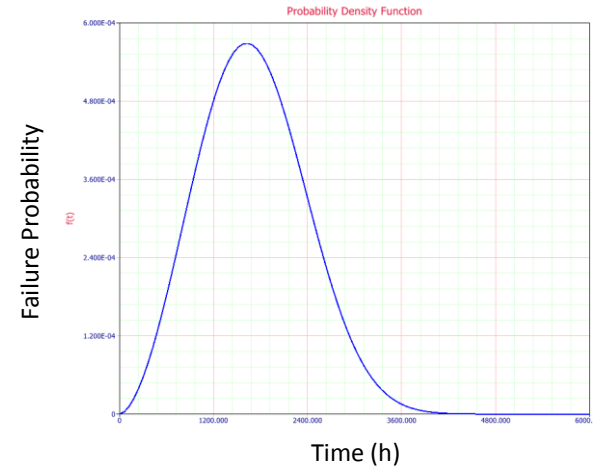
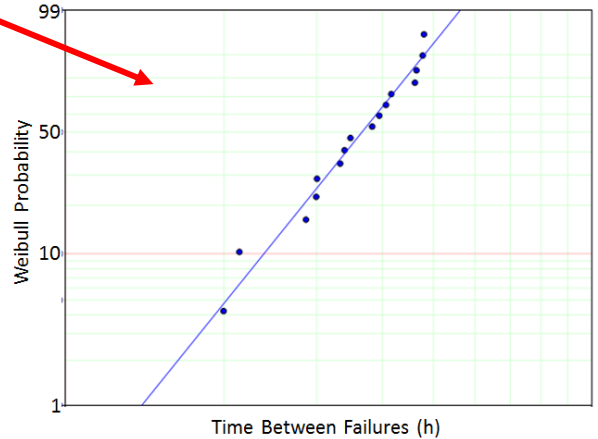
Operation & Maintenance

Throughput forecasting
Asset monitoring / bad actors
Root cause analysis
Condition/performance based maintenance
Availability modeling
Spare parts forecasting
SIL verification
Risk based inspection

Modeling Failures ... Subsystem Level

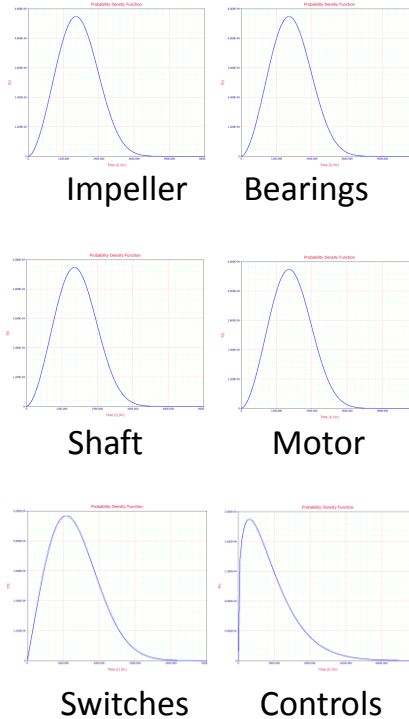
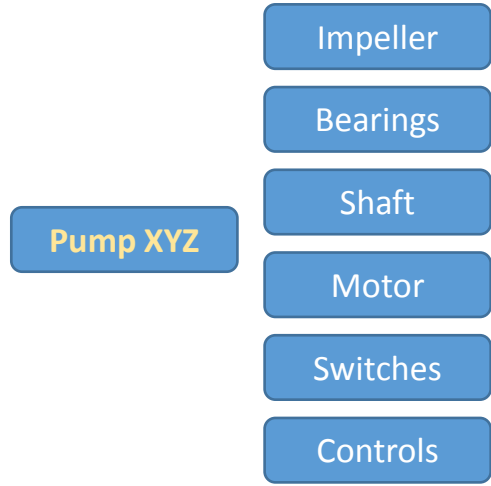
Pump XYZ

- Impeller
- Bearings
- Shaft
- Motor
- Switches
- Controls

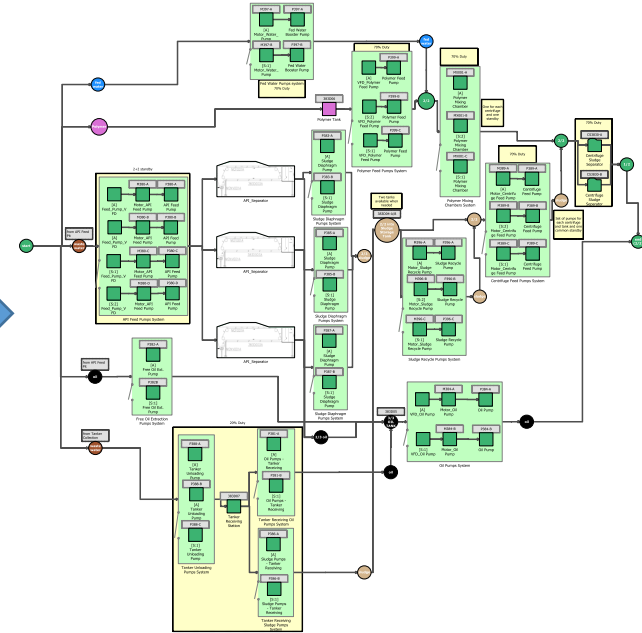


Building a Digital Twin... Representative of System

Operating Data



Digital Twin



Digital Twins ... Help Decision Making

Plant:	WWT-1	Location:	North Dakota		
RANK	System	RCI	3 months	6 months	12 months
1	Pump XYZ	61	No Change	Better	Worse
2	Centrifuge	133	Better	No Change	No Change
...					

Ranking

- Likelihood
- Severity

Measure and Report

- Detect emerging problems
- Identify trends

Actionable Information

- Predict failures
- Optimize availability
- Assess improvement

Summary



Providing tools, analysis, people and solutions to enhance system reliability, durability and safety



CHALLENGE

- Extend asset life
- Increase system availability
- Improve product designs
- Accelerate product testing

SOLUTION

- Understand why assets fail
- Prioritize the failures
- Focus on key failure modes
- Prudent system monitoring
 - *Advanced analysis to derive insight*
 - *Reliability assessment to understand impact*

RESULTS

- On average 10% reduction in maintenance costs
- Comparable improvement in system availability
- More reliable products delivered to market faster

About the Presenters



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Questions

Please wait for the **microphone** before asking your questions



State your **name & company**

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Merci

谢谢

Спасибо

Danke

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado

Optional: Click to add a takeaway you wish the audience to leave with.