Technology

Innovation

Transforming

Atoms to Systems

Jeff Smith
Brian Christensen
Dassault Systemes
September 27, 2016

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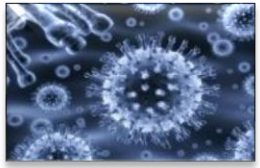
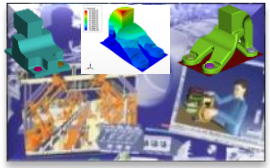
Enable The Future Today…

The Innovation Race will be won by whoever enables "New Technologies" in the Product Life-Cycle the Fastest

Future Factory Today



Advanced Materials



Simulation & Optimization

Multi Robotic Advanced Manufacturing

Certification On Demand

"New Technologies" – Product, People, Processes, Tools

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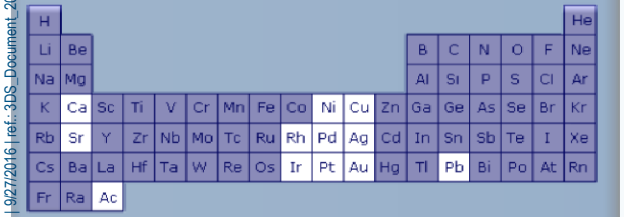
Evolution of Materials…Designed vs Selected…

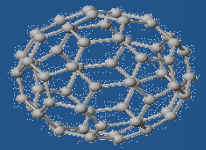


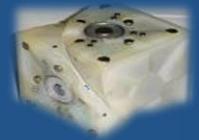
MATERIAL ENGINEERING

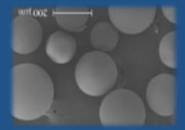
Steels, Light Alloys, W, Cu, Nb, DU, etc.

COMPOSITES / POLYMERS

Carbon Laminates, Kevlar, Rayon, etc.







ENGINEERED MATERIALS

Nano, Multifunctional, Biomimetic, Self healing, Self replicating, etc.

TRADITIONAL

TODAY

FUTURE

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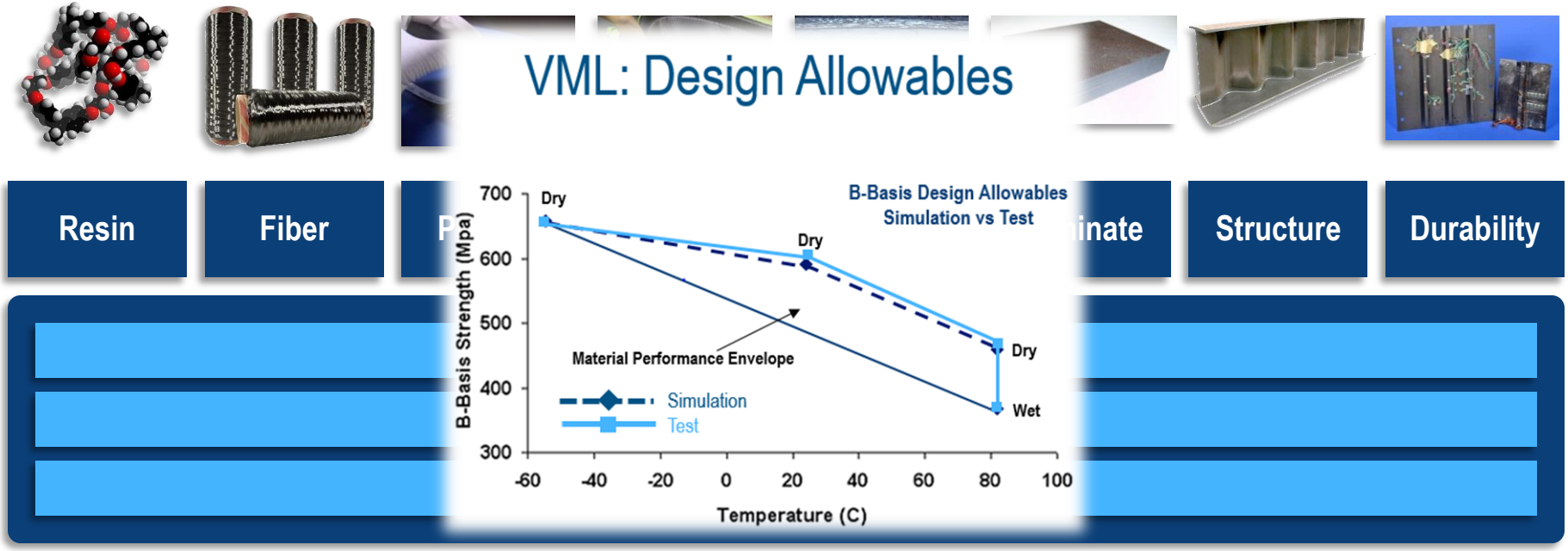
Virtual Materials Lab: “VML”



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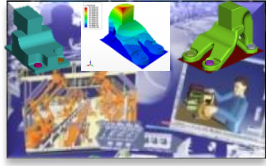
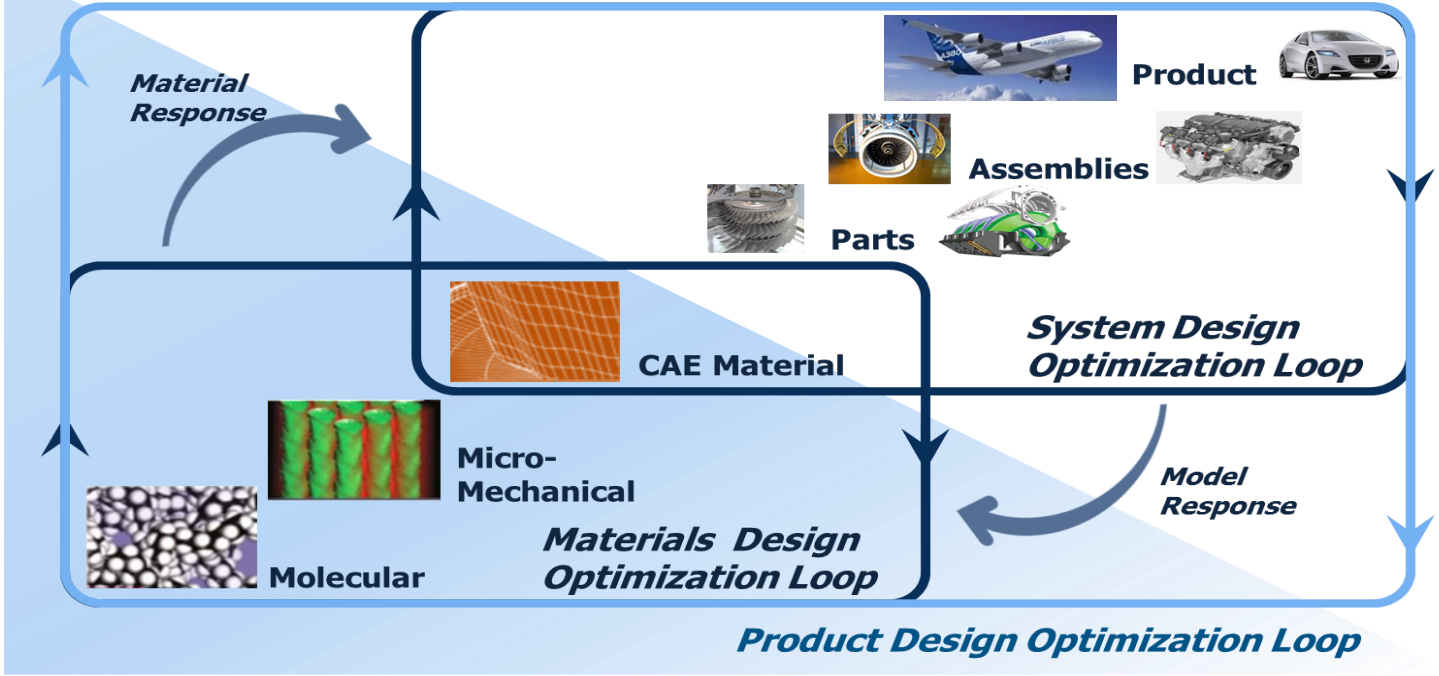
Enabling Multi-Scale Optimization (BIOVIA + CATIA + SIMULIA + DELMIA)



Multi-Scale Modeling: Atoms to Systems



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The Goal: Automation and “Print” a System

Inspection
Dim/X-Ray/UT

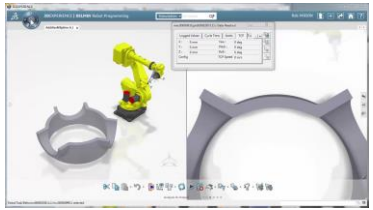
Alignment
Clean-up

Paint

Lay/Pull
Cabling Plumbing

AM Polymer

MRAM



Machine

Pick & Place

Fasteners/Rivets

Weld

Composite
Layup

AM Metal

Enabling Multiple Robots to Perform the Right Task at the Right Time

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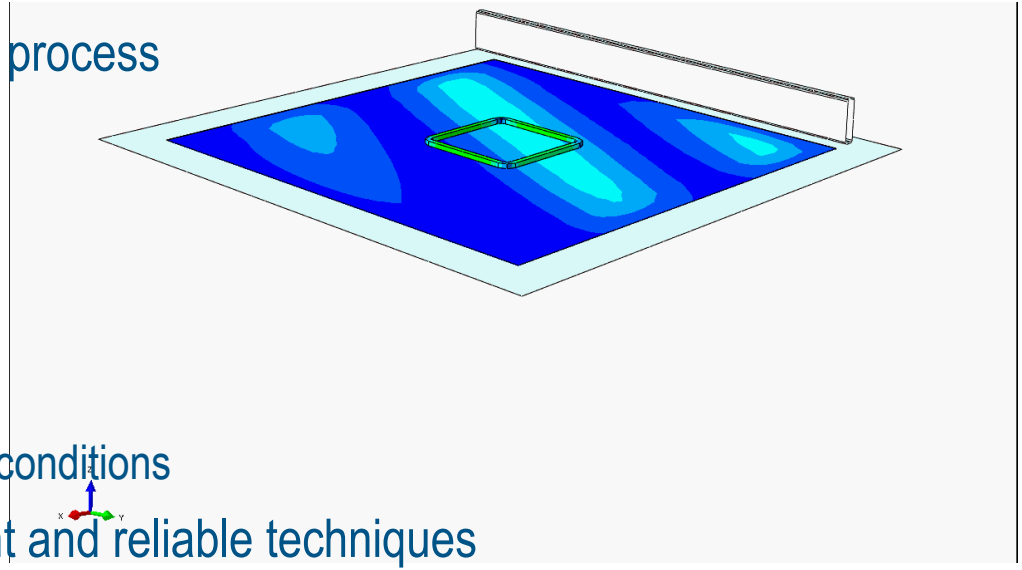
Manufacturing Certification| **Simulating the AM Processes**

- Need to accurately represent the process
  - Geometric features
  - Heat Source Path
  - Dwell Time
  - Build Orientation
  - Material thermal properties
  - Thermal and structural boundary conditions
- Need to provide scalable, efficient and reliable techniques
  - Progressive Material Addition
  - Temperature Profiles



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Aerospace and Defense The Future of AM

Beyond Prototyping: Direct Part Production via Additive is set to Transform the Aerospace Industry.

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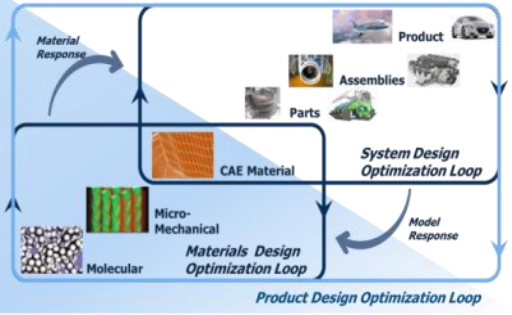
3 Keys To Increase Industrial AM Adoption…

Engineered Materials

Implement a Virtual Materials Laboratory from Design to Validation and Test/QA



Functional Generative Design

Remove barriers between Modeling, Simulation and Optimization, from Concept to Detailed Organic Shapes

Manufacturing Process Control

Generative 3D Printer Programming, coupled with Process Simulation & Optimization

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Where can we bring the future into REALITY?…

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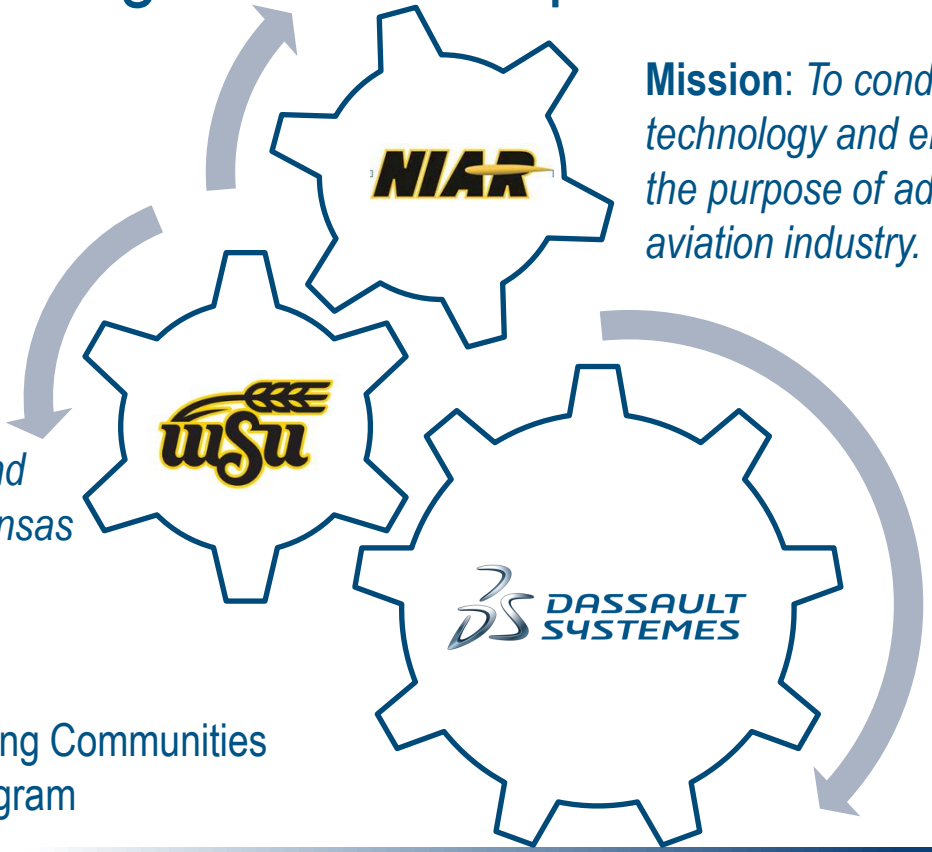
Building a Strategic Partnership to Innovate



Mission: *To conduct research, transfer technology and enhance education for the purpose of advancing the nation's aviation industry.*

Mission: *Essential educational, cultural and economic driver for Kansas and the greater public good.*

Mission: *Provide businesses and people with virtual universes to imagine sustainable innovations through our 3DEXPERIENCE Platform*

Investing in Manufacturing Communities Partnership (IMCP) Program

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Innovation Center Labs

25 HANDS-ON LEARNING LABORATORIES

- Aerospace propulsion lab
- Aerospace structures lab
- Astronautics lab
- Biomedical & biosensor development lab
- Collaborative software studio
- Computational hub
- Computer studio
- Controls lab
- Electronics hub
- Entrepreneurship engineering studio
- Flight simulation lab
- Fluids lab
- Innovative bio imaging & bio computational modeling lab
- Maker space
- Manufacturing process lab
- Materials and Metallurgy lab
- Metrology lab
- Multidisciplinary human biomechanics & design lab
- Power and engines lab
- Project & prototyping lab
- Project innovation hub
- Renewable energy lab
- Vehicle design lab
- Virtual instrumentation studio
- 3DExperience Center/Lab

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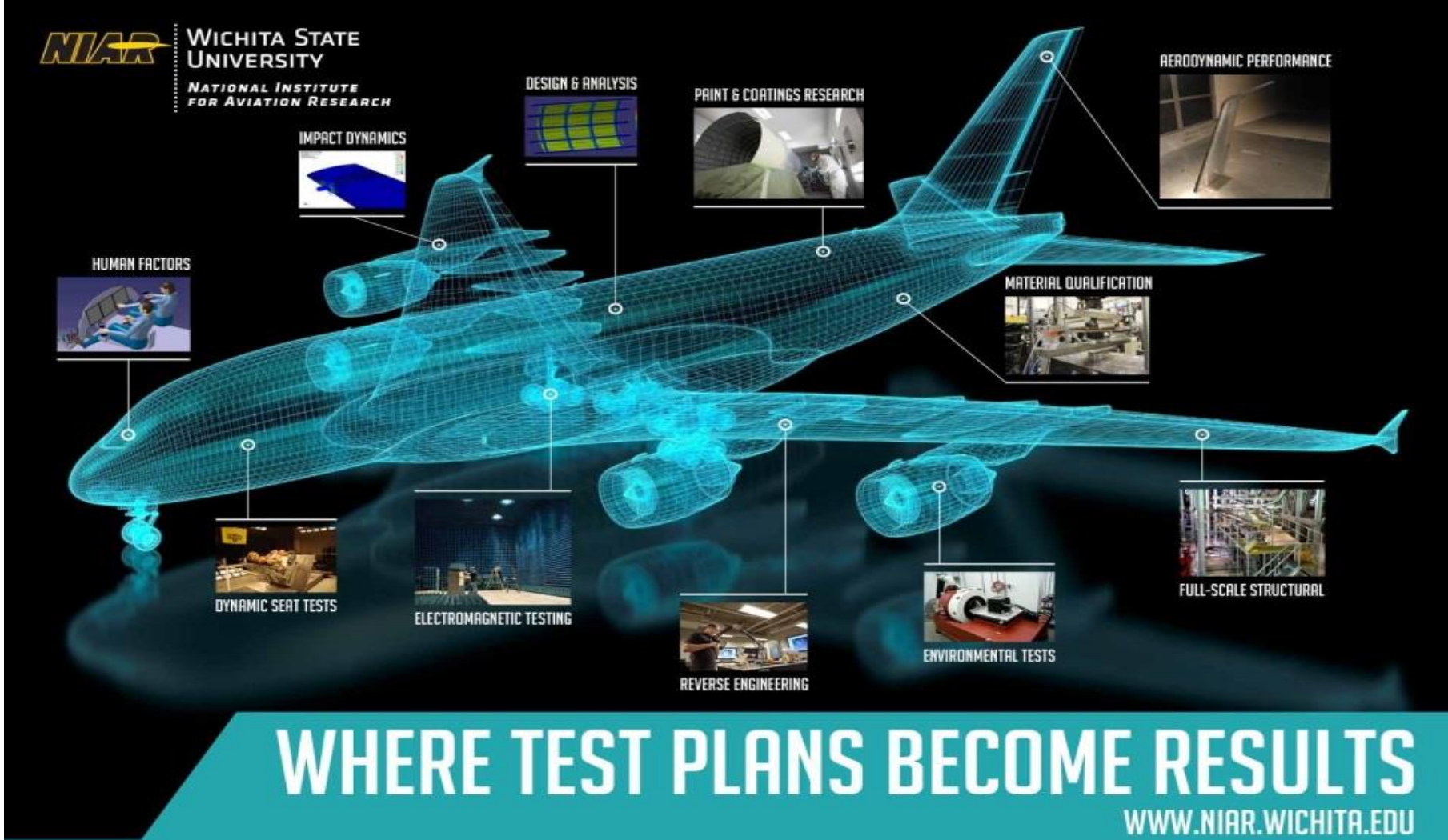

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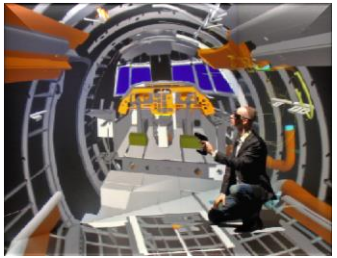
Building on the Foundation to Enable the Future…Now…

Innovate the Future of Product Development and Advanced Manufacturing



Immersive Technologies

3DEXPERIENCE®

Additive Manufacturing

Robotics

The 3DEXPERIENCE Center will be the showcase of the Innovation Center

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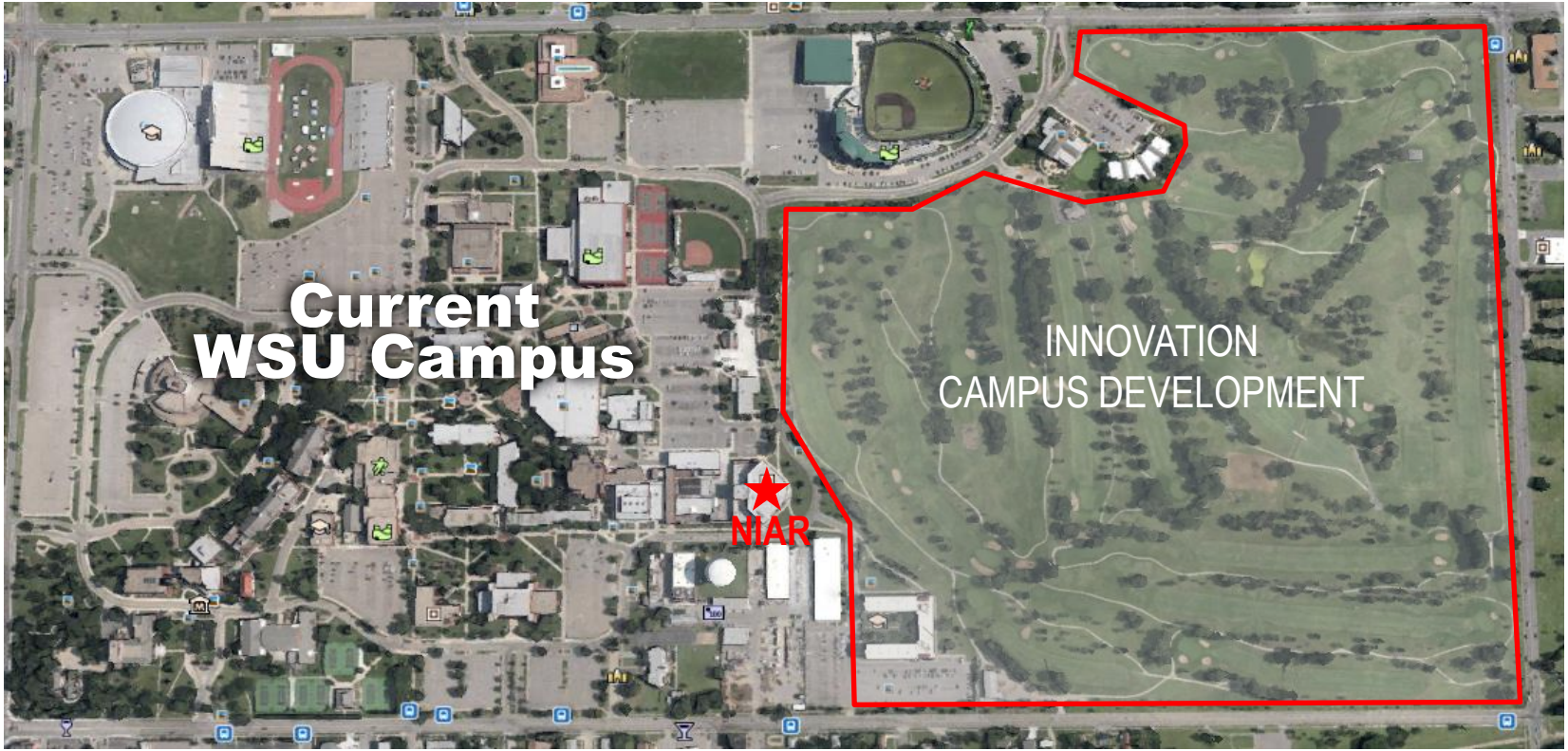
Overview of the Innovation Campus…



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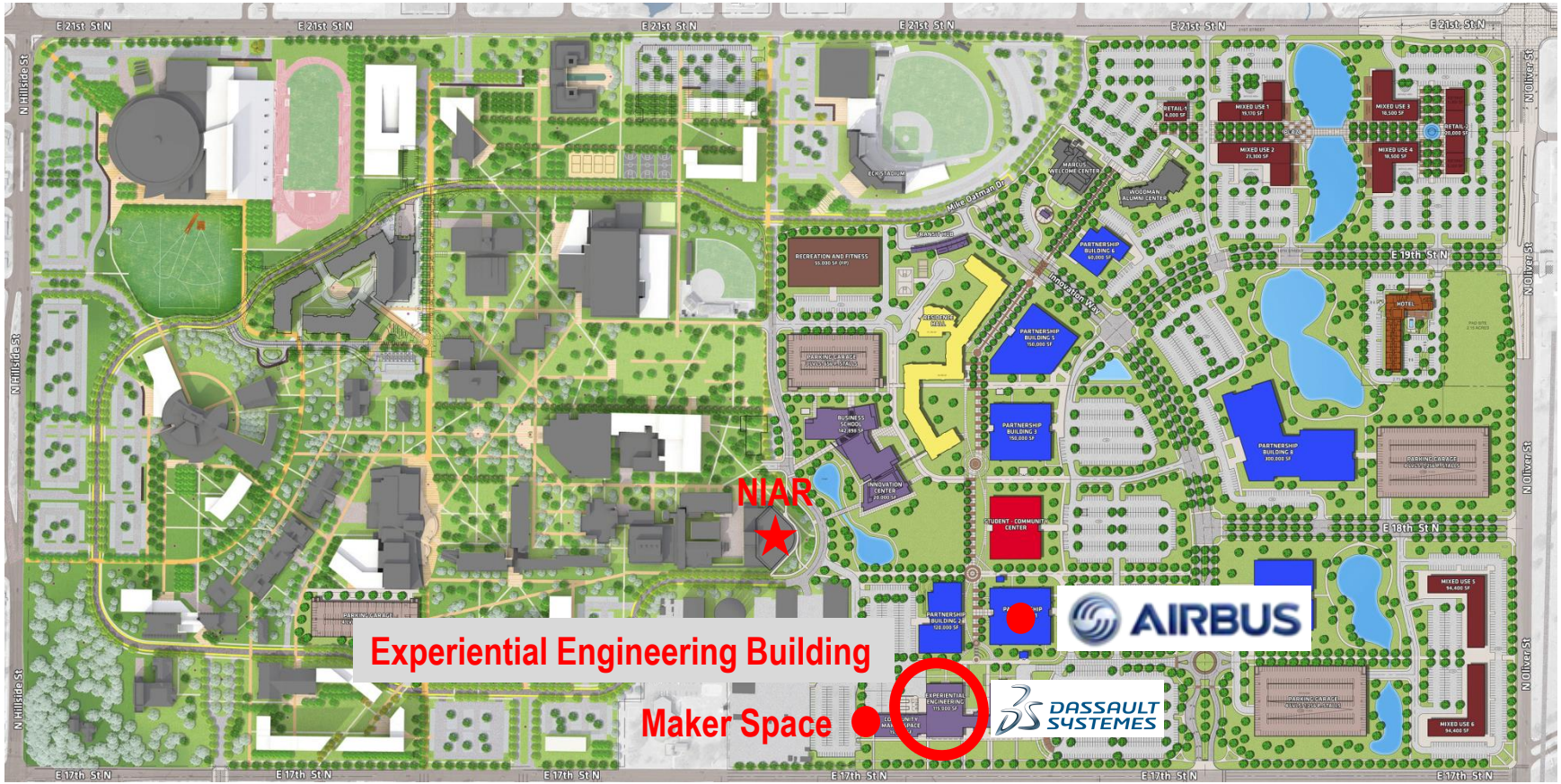
Innovation Center Master Plan…



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Project Status Taking Shape…

Airbus Partnership Building
October 2016

Experiential Engineering Building
3DExperience Center
DS Offices/Lab
November 2016

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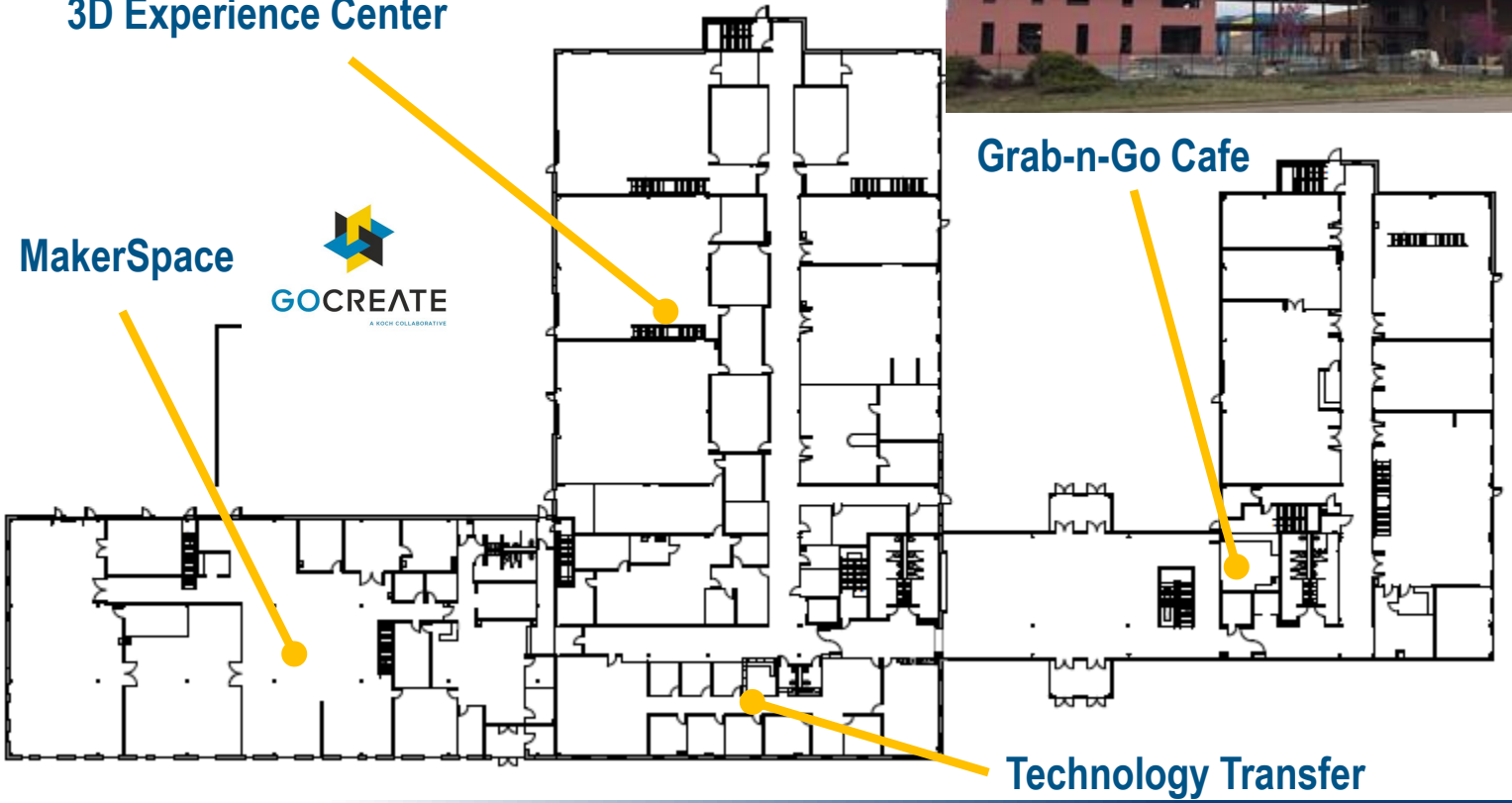
Experiential Engineering Bldg.



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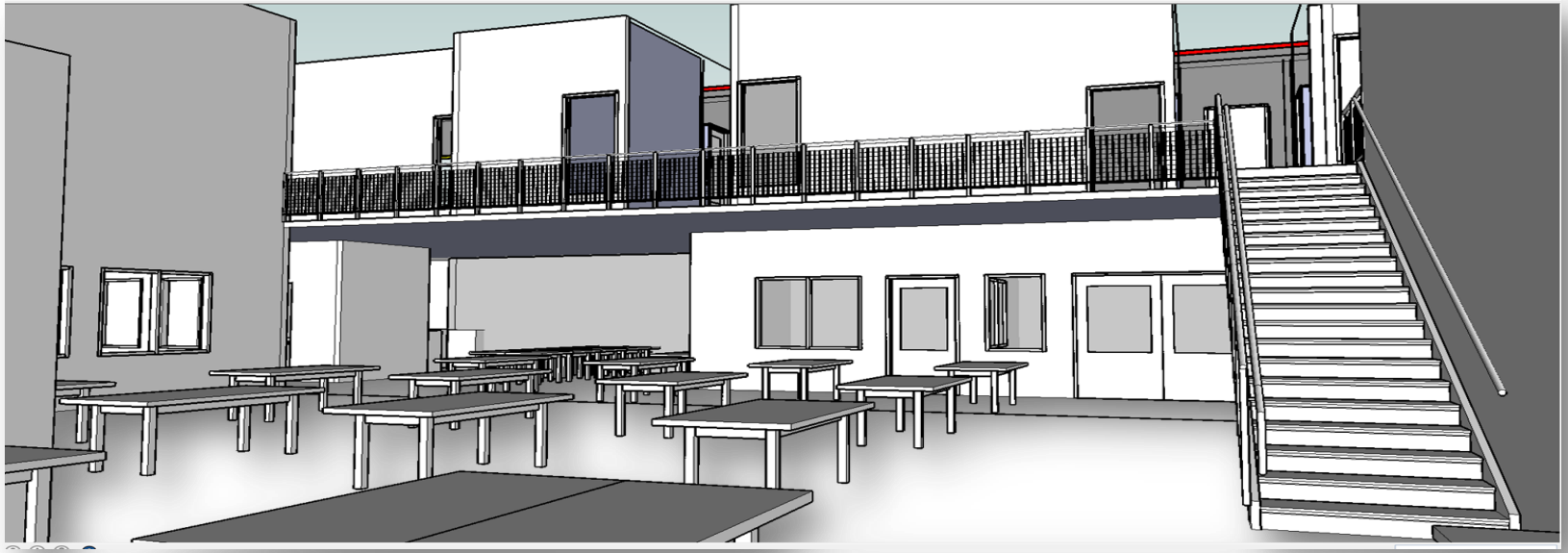
WSU Maker Space



Idea Accelerator/Collider

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A SPACE FOR DREAMERS AND DOERS

OPENING
FALL
2016

GOCREATE

A KOCH COLLABORATIVE

- 3-D Printing
- Metal
- Wood
- Plastic
- Textile
- Electronics
- Software Design
- Advanced Materials (Composites)

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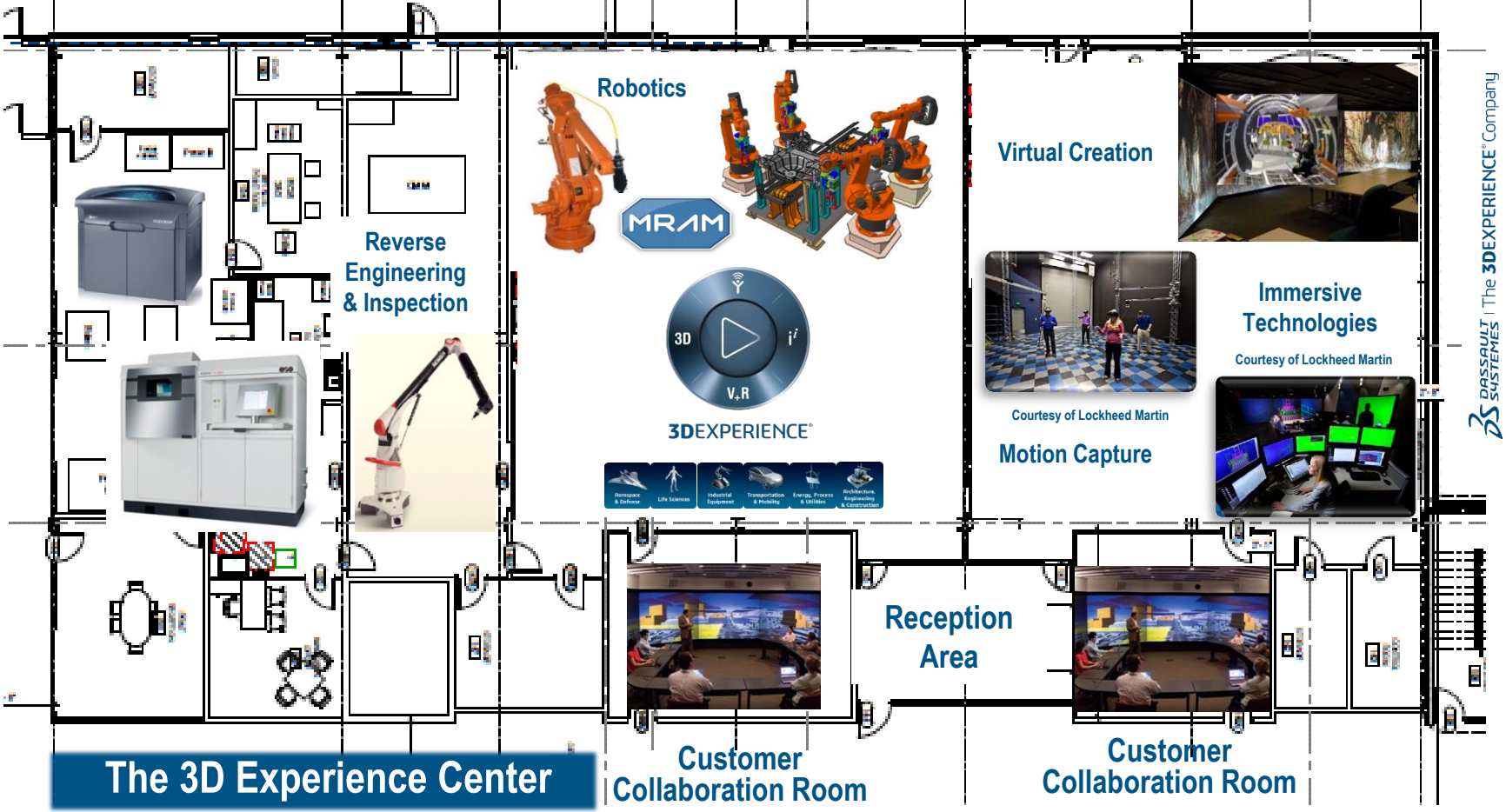

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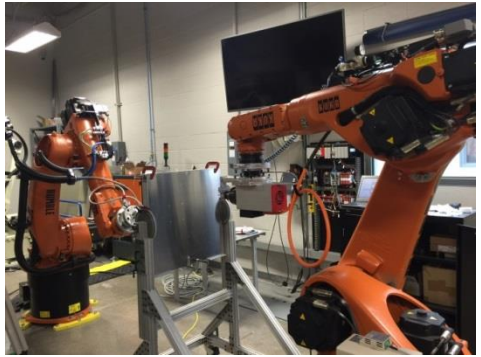
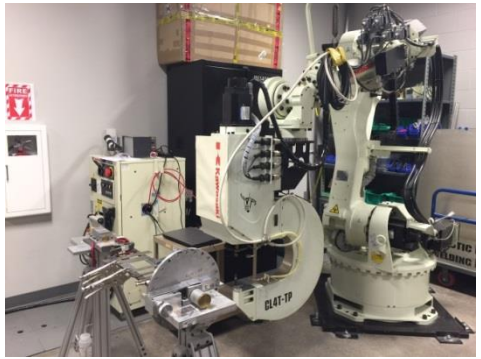
Project Status Taking Shape…

Multi Robotic Advanced Manufacturing





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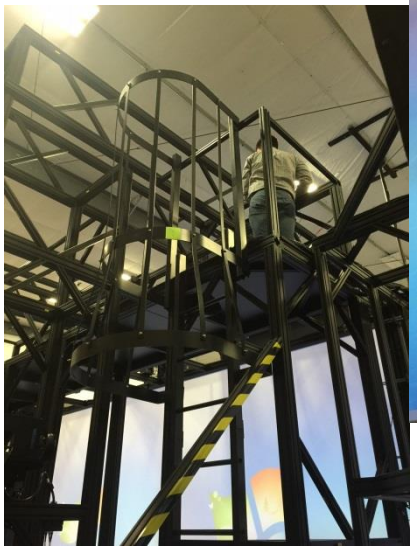
Project Status Taking Shape…



Immersive Flex CAVE
20’ front wall & 10’ side walls
Flex to 40’ Power Wall
Largest in world

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The Ultimate Use Case

- **Build a System** (ex. UAV, Satellite, Missile currently 3-5 year development) from requirements and concept development to production and first flight in 90 Days or less
- Develop the **technologies and processes** to fully demonstrate and prove the “Dream to Reality” at the WSU/NIAR Innovation Campus

We Are On A Journey To Drive Innovation…Affordability…Excellence

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Accelerate Concept to Take-Off *in 90 days*

Setting The Baseline

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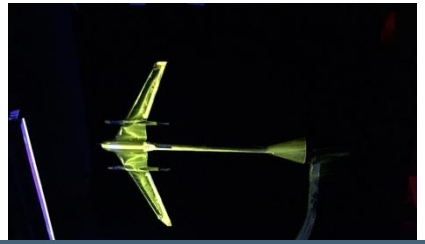
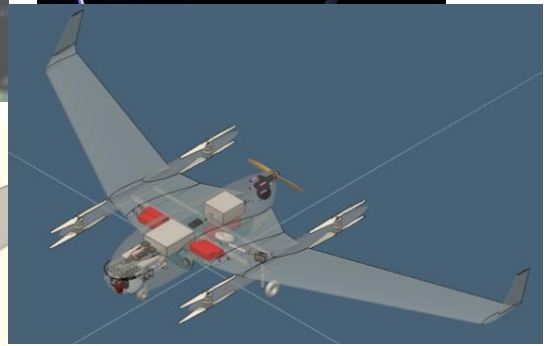
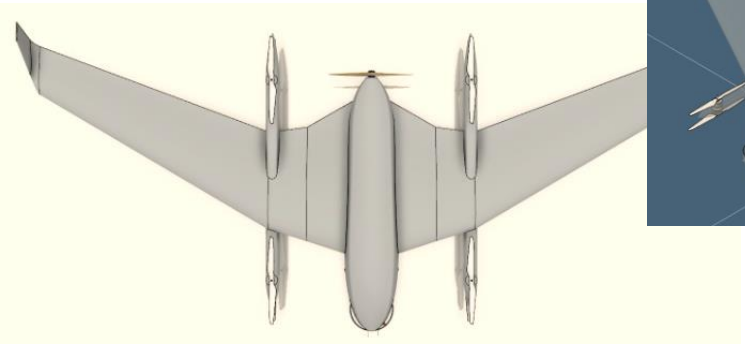
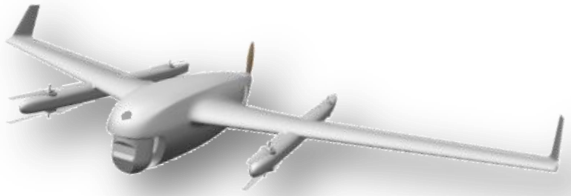
Search and Rescue UAS









ID Card

Multi-Mission/Multi-Variant

- 25 Kg weight
- 2.3 Kg payload
- 3.6 m span
- Hybrid propulsion
- C/VTOL
- Retractable landing gear
- 4 hours range

Setting The Baseline

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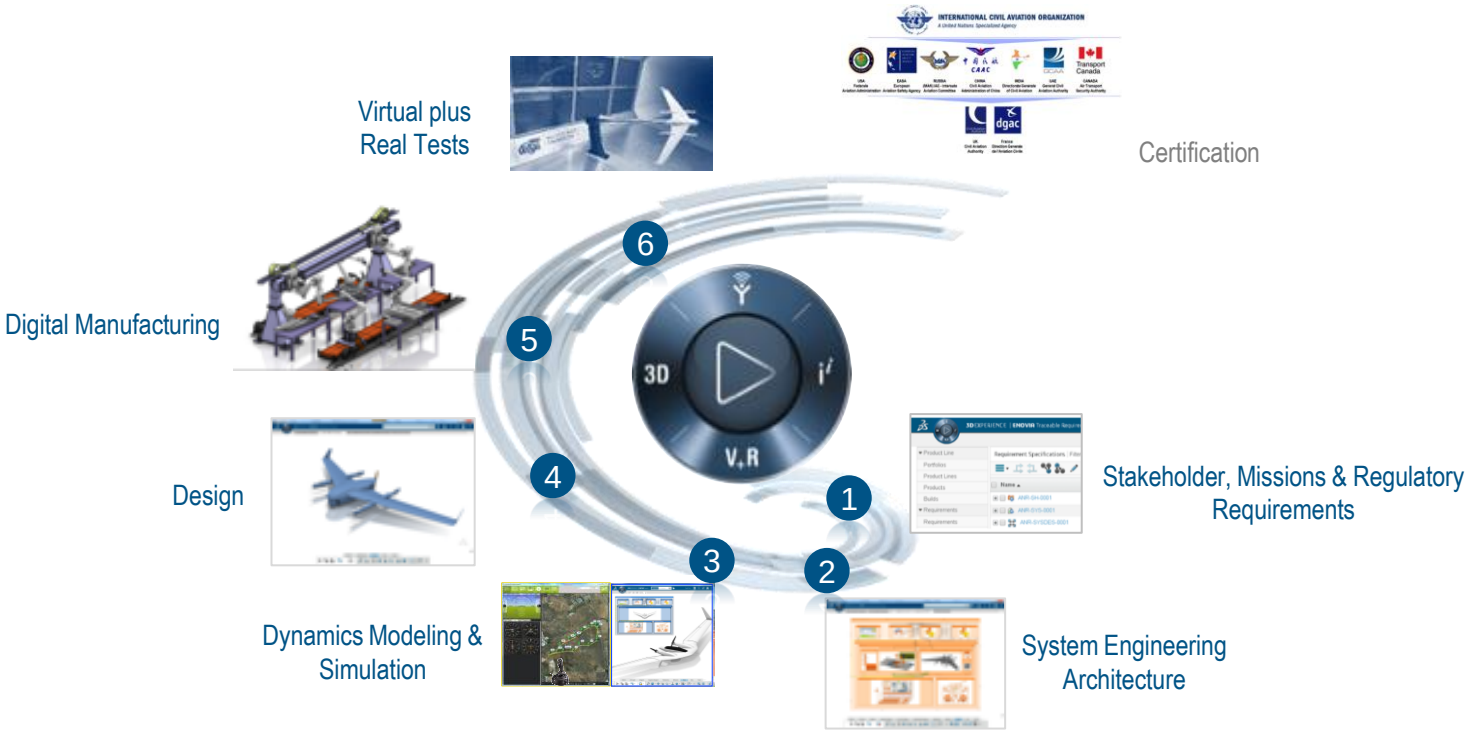
The journey to 90-days: A snapshot in time…



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Schedule | Gantt Chart | Milestones | **Phase Gates** | Baselines

Mar 21, 2016 - Apr 1, 2016	Gate 1	Mar 21, 2016 - Jul 7, 2016	Gate 2	May 13, 2016 - Aug 12, 2016	Gate 3	May 16, 2016 - Aug 31, 2016	Gate 4	May 27, 2016 - Dec 9, 2016	Gate 5	Mar 21, 2016 - Jan 6, 2017
Program Planning		Conceptual Design		Preliminary Design		Detailed Design		Manufacturing		Test and Evaluation
Milestone Kick Off Meeting		Milestone System Functional Review		Milestone PDR		Milestone CDR and MRR		Milestone Flight Test Review		

Legend

Legend	State	Name	Estimated Finish Date	Actual Finish Date
1	Create	Program Planning Gate	Apr 1, 2016	
2	Create	Conceptual Design Gate	Jul 7, 2016	
3	Create	Preliminary Design Gate	Aug 12, 2016	
4	Create	Detailed Design Gate	Aug 31, 2016	
5	Create	Manufacturing Gate	Dec 9, 2016	

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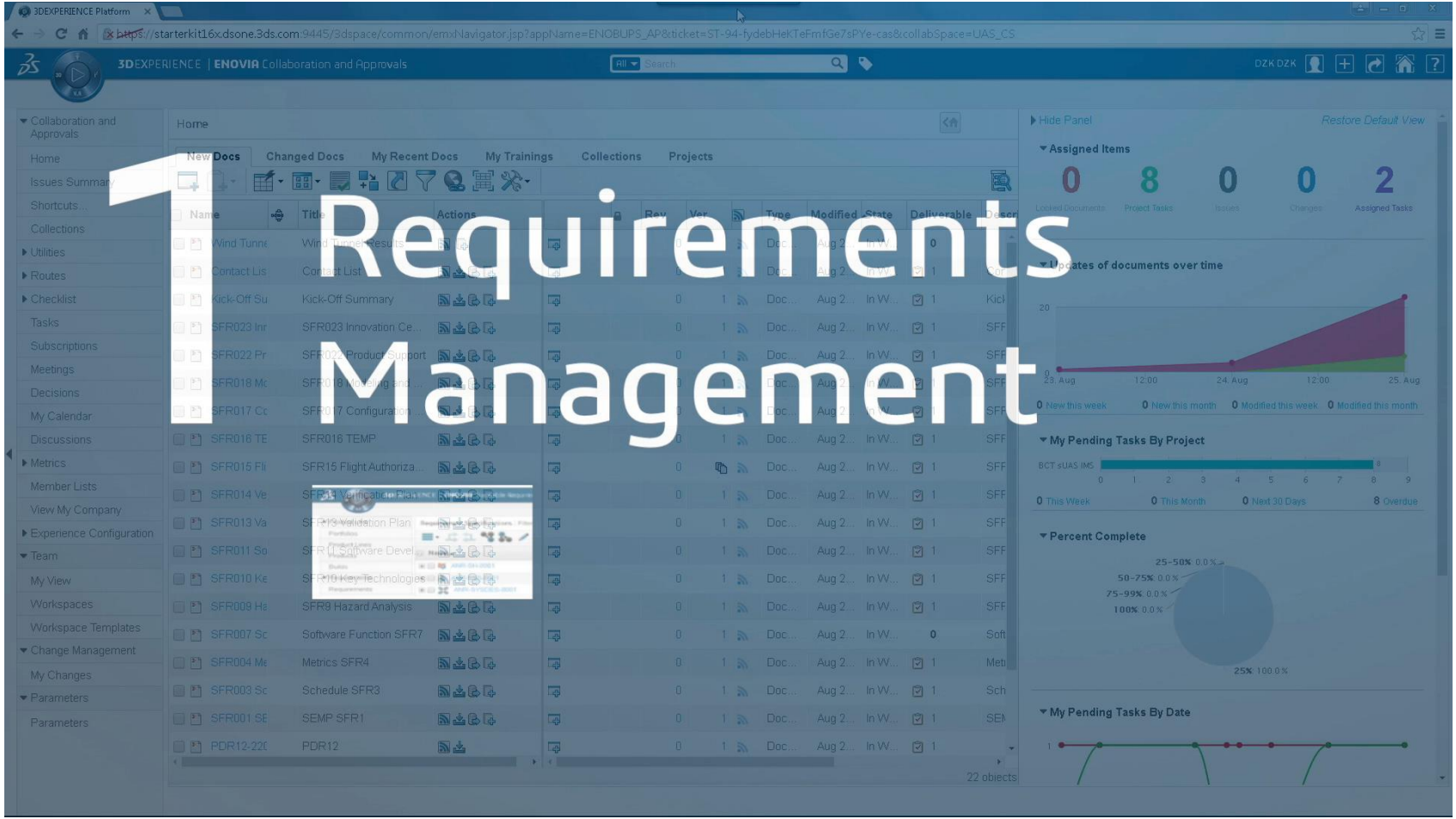
1 Requirements Management



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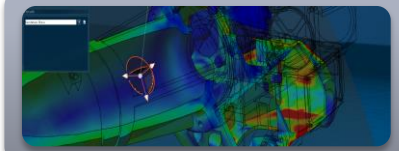
Imagine for a Moment…

Additive Manufacturing …Direct Manufacturing…Supply Chain "3D Faxing" and Factory Physics … Bottom Line Improvements …

A Library of Virtual Production Facilities, Process Capabilities, Machine and Tool Capabilities tied to Product Families …



A Model Centric Paradigm … Master Model … Maturing throughout the Product Life-Cycle … A Rich Interactive Model that supports Advanced Simulation and Analysis vs a PDF File

Family of Experiences Complimented by Immersive Engineering … Collaboration … Release to Production and Launch sooner … Producible, Zero Rework and Escapes

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Come… See… Experience...

The Innovation Center demonstrate Virtual to Reality through the 3DEXPERIENCE Platform

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Questions?

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IF WE™