



2025 User Conference - Craig's Intro 2025-06-17.pptx

Craig Collier

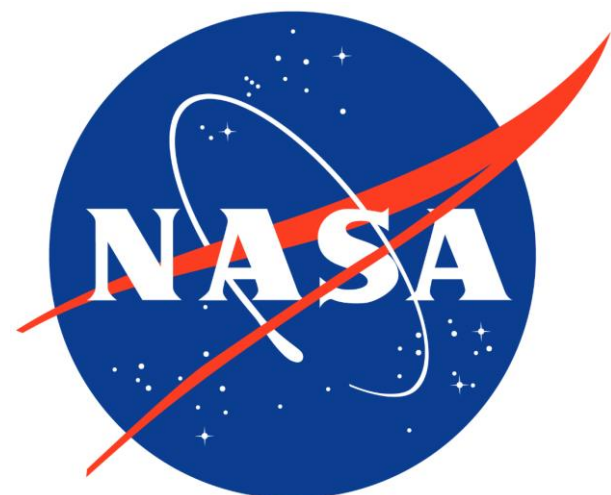
Contact us: www.collieraerospace.com

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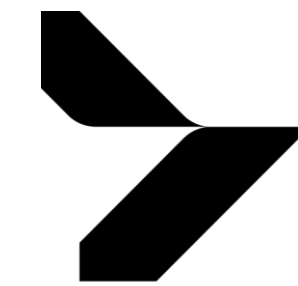


We Appreciate Company Speakers and Attendees

Company Speakers



Company Attendees

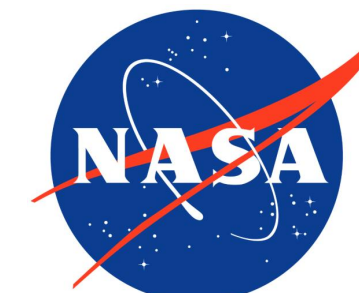


Heart
Aerospace



SWARM

LOCKHEED MARTIN



Gulfstream



BOOM



Northeastern
University

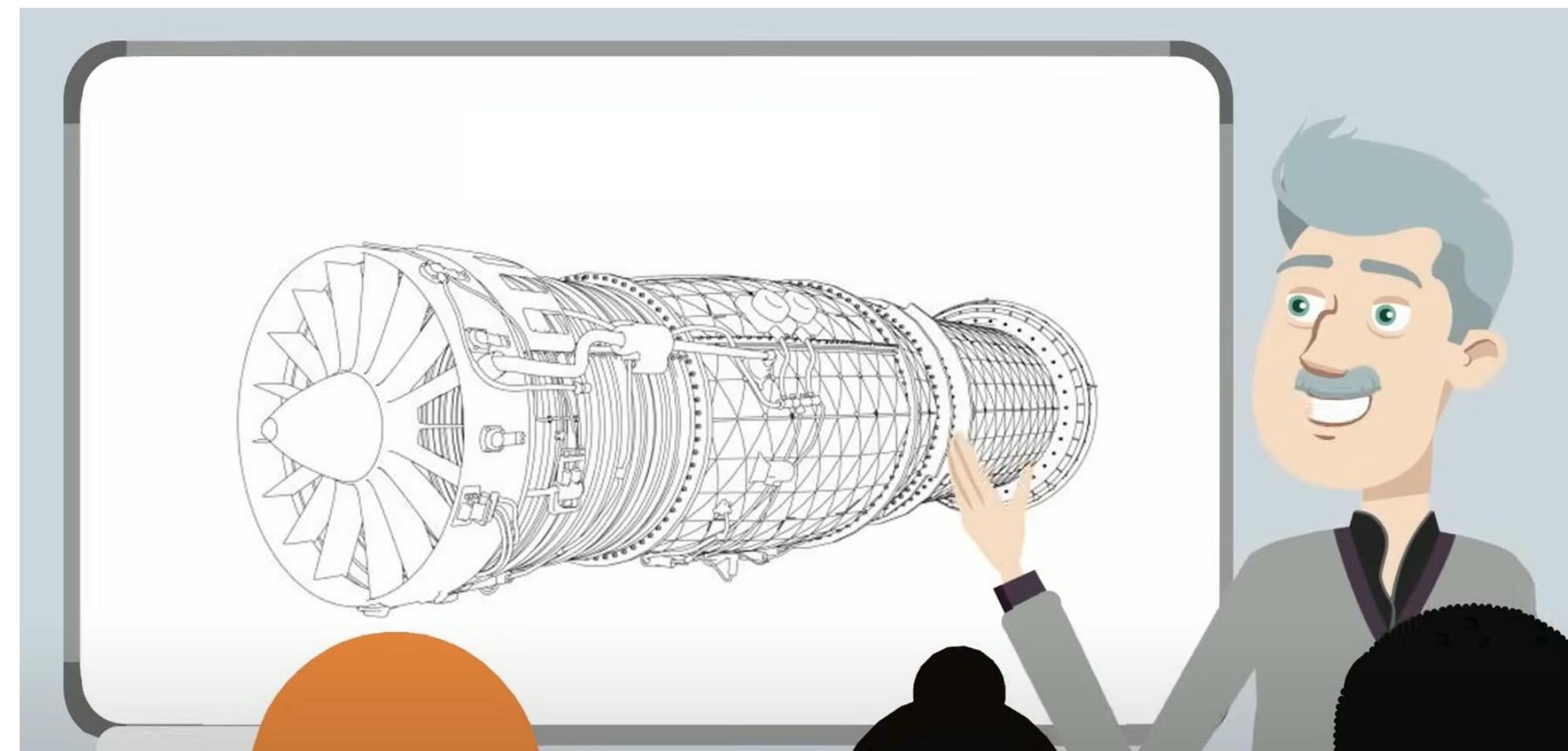
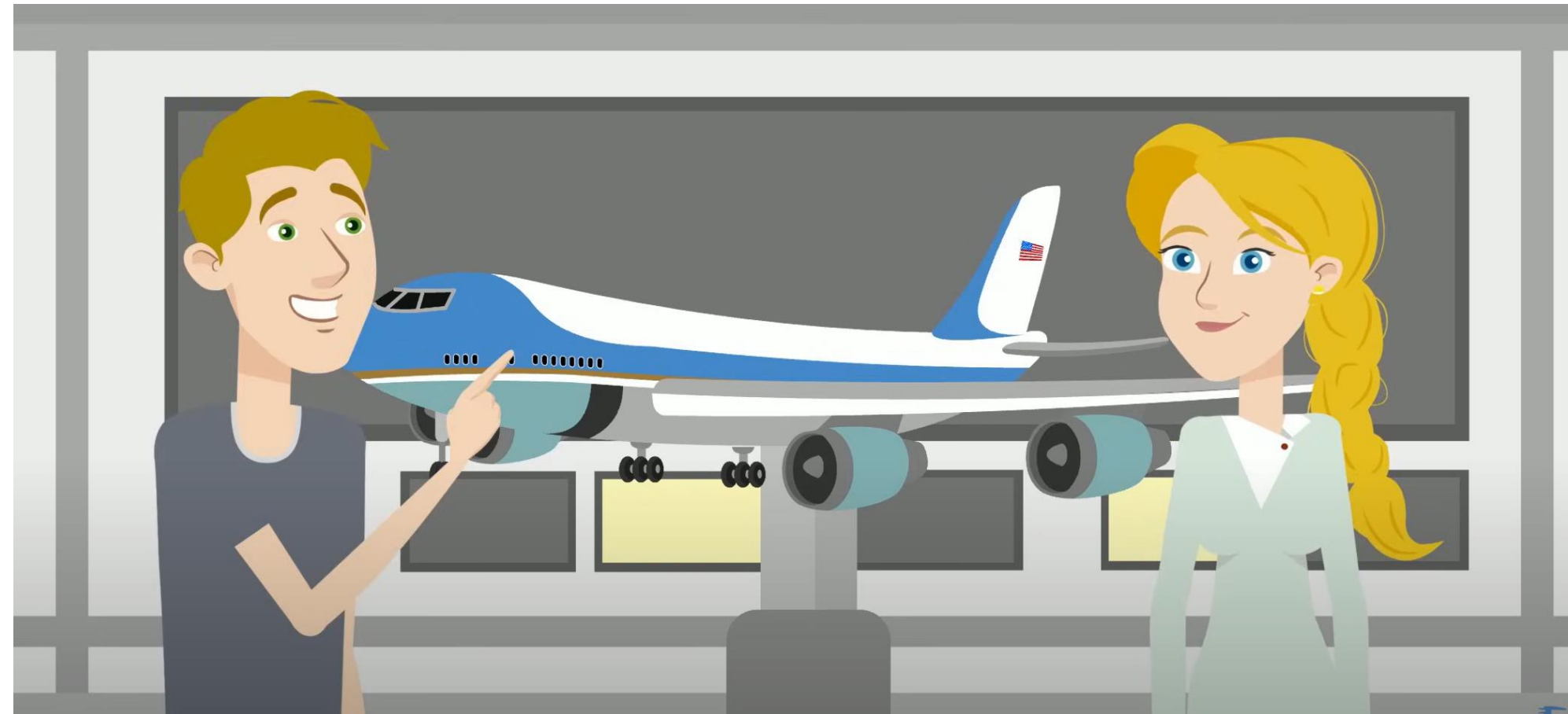


RADIA



WICHITA STATE UNIVERSITY

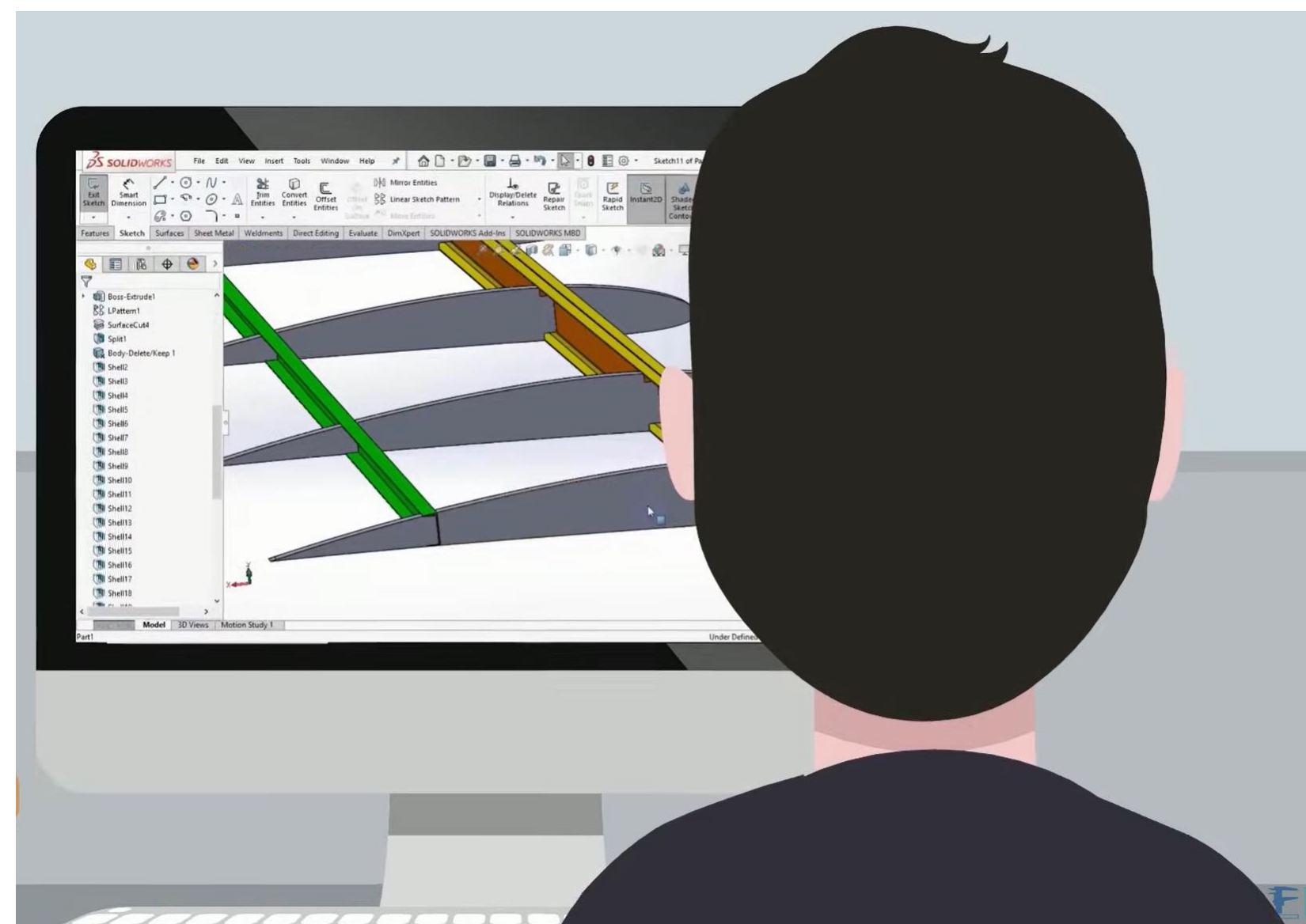




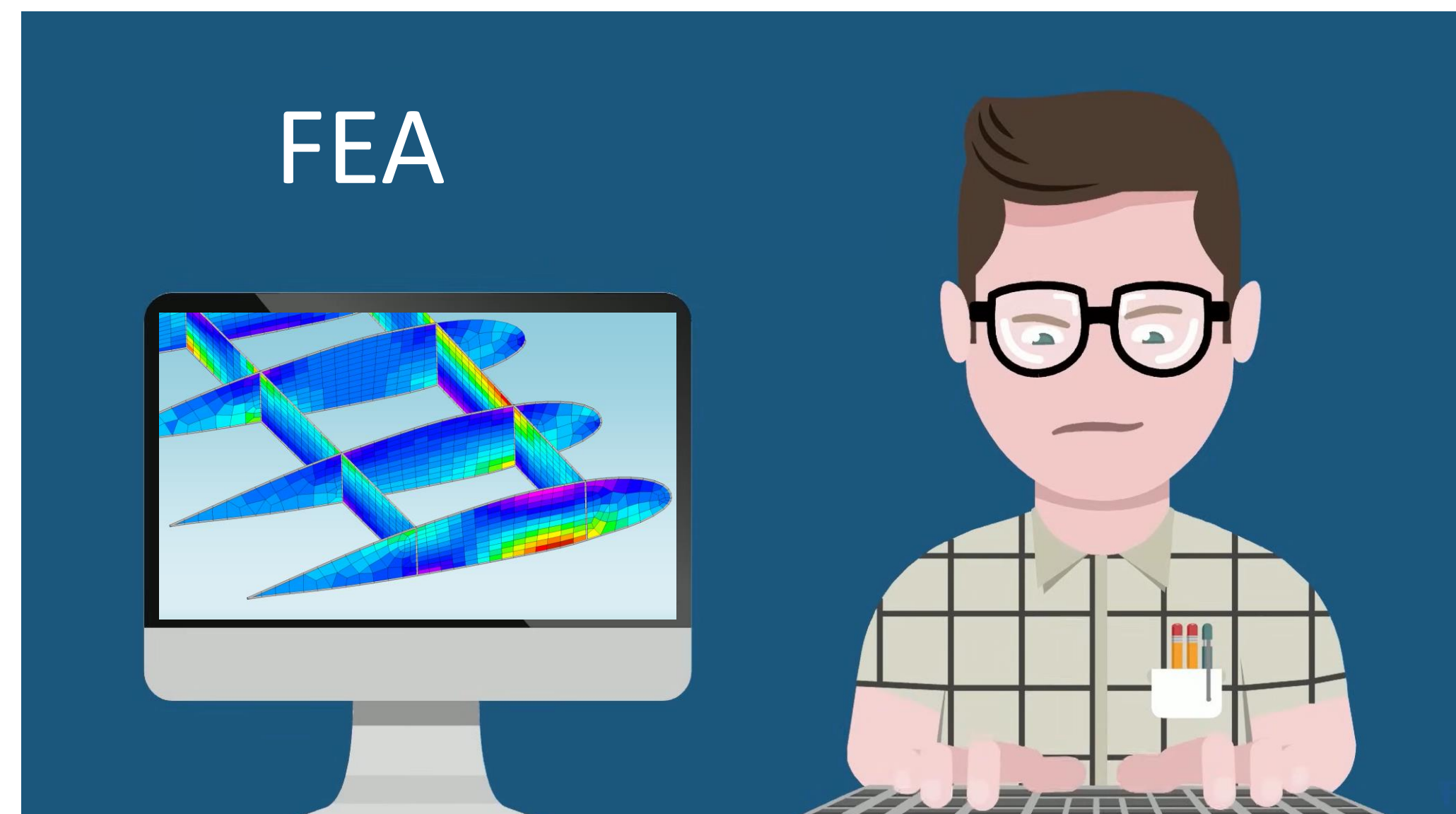
Three designers



One stress guy
(Happy)

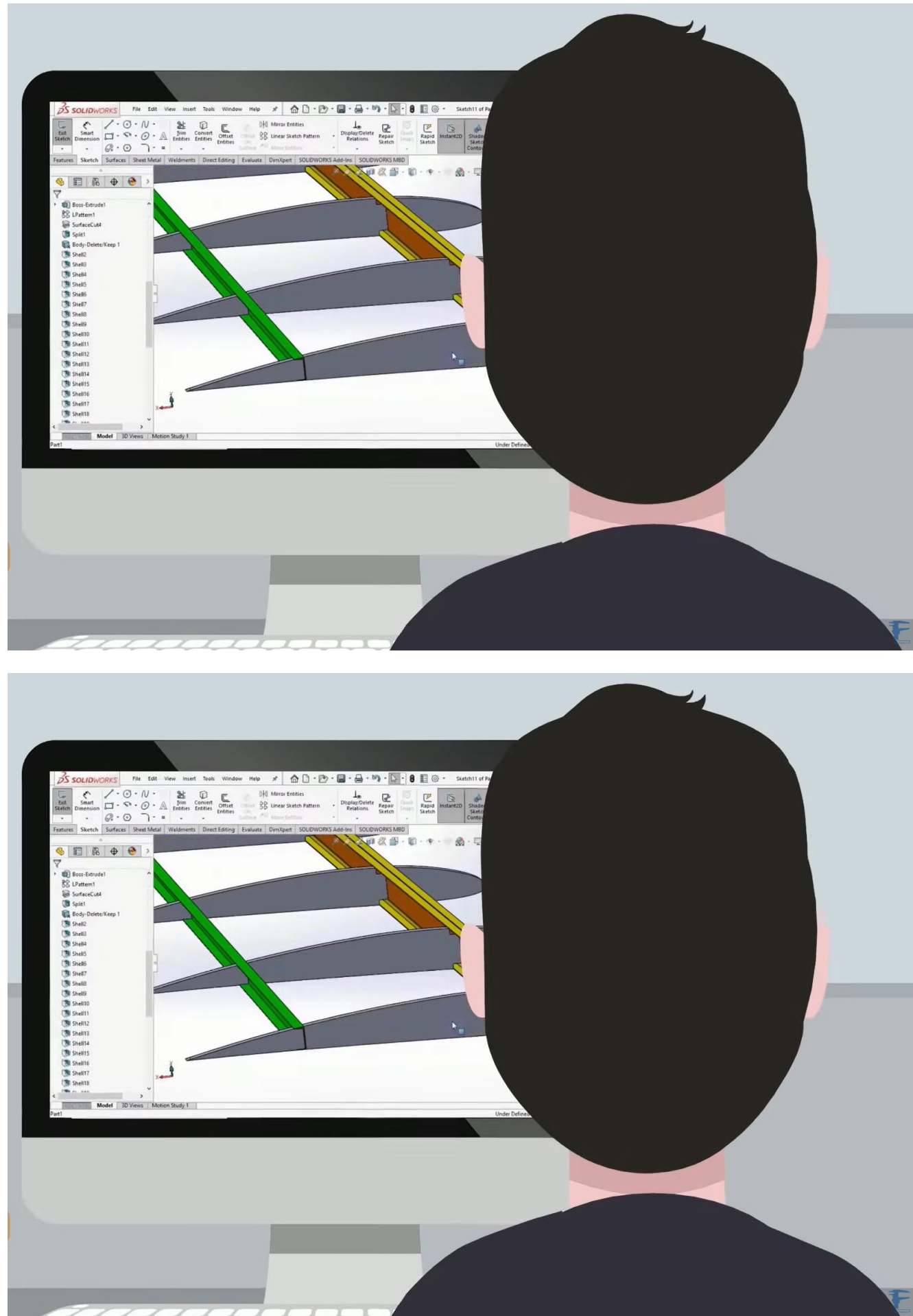


One designer

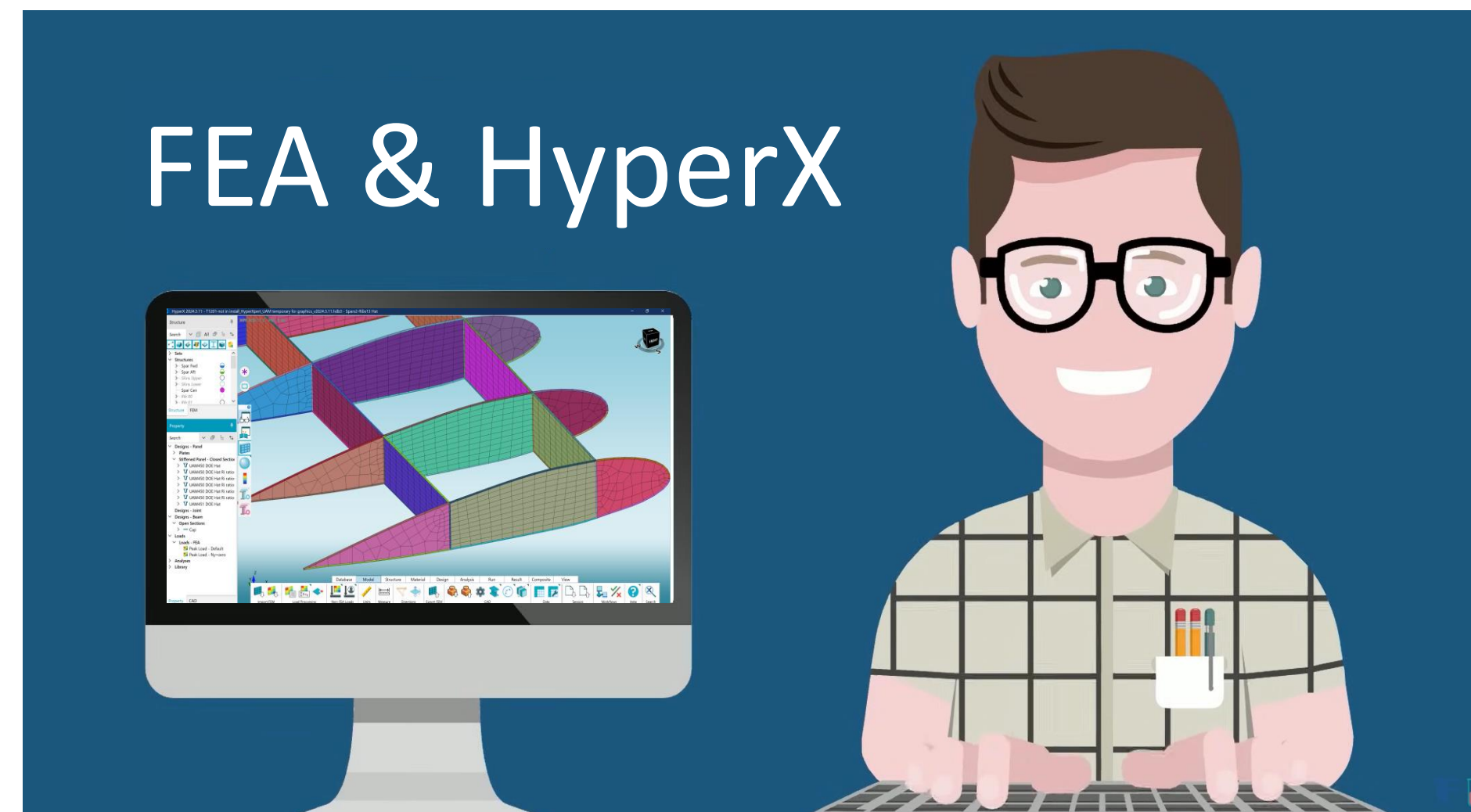


One stress guy
(Not so Happy)

Let's get to this



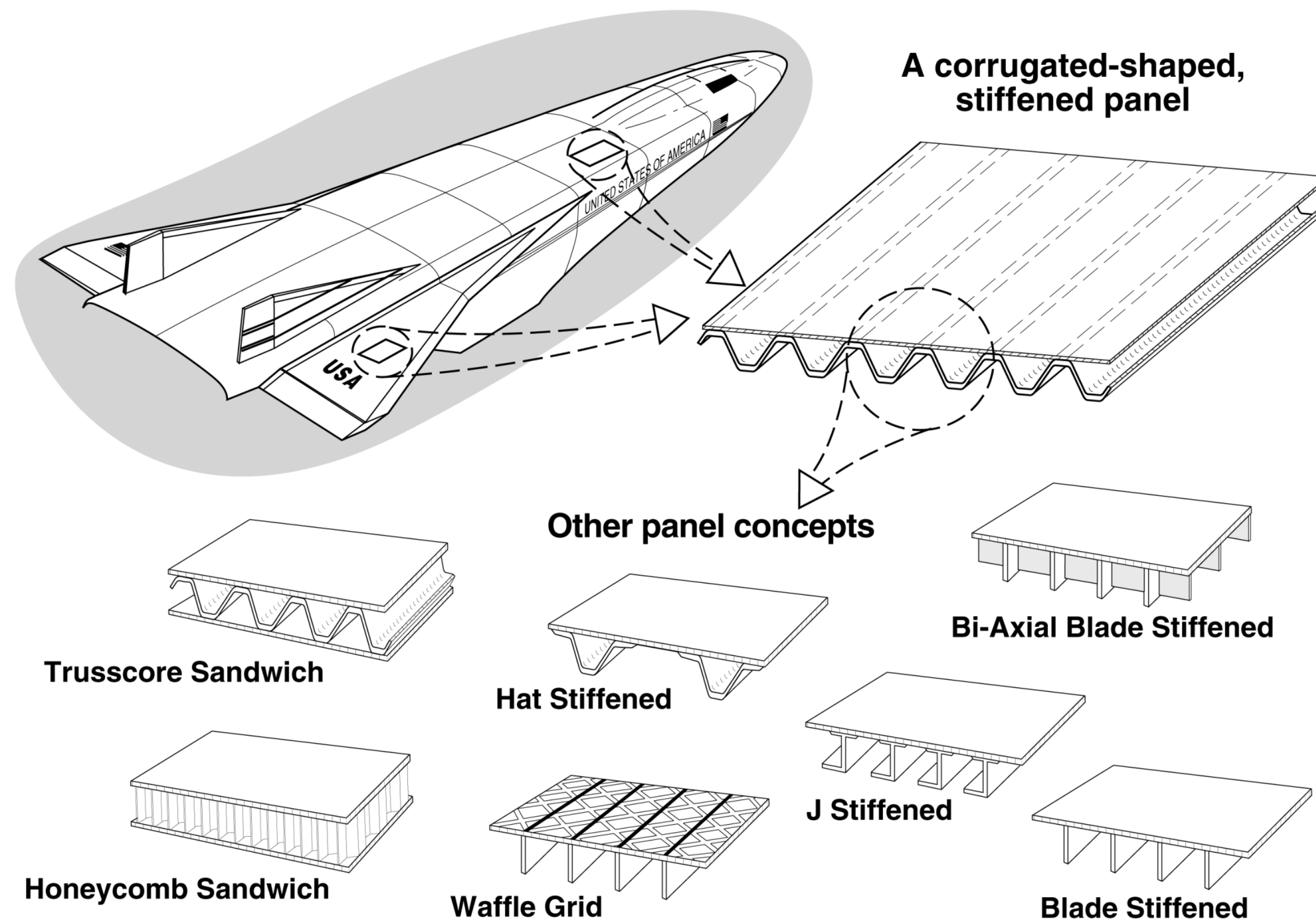
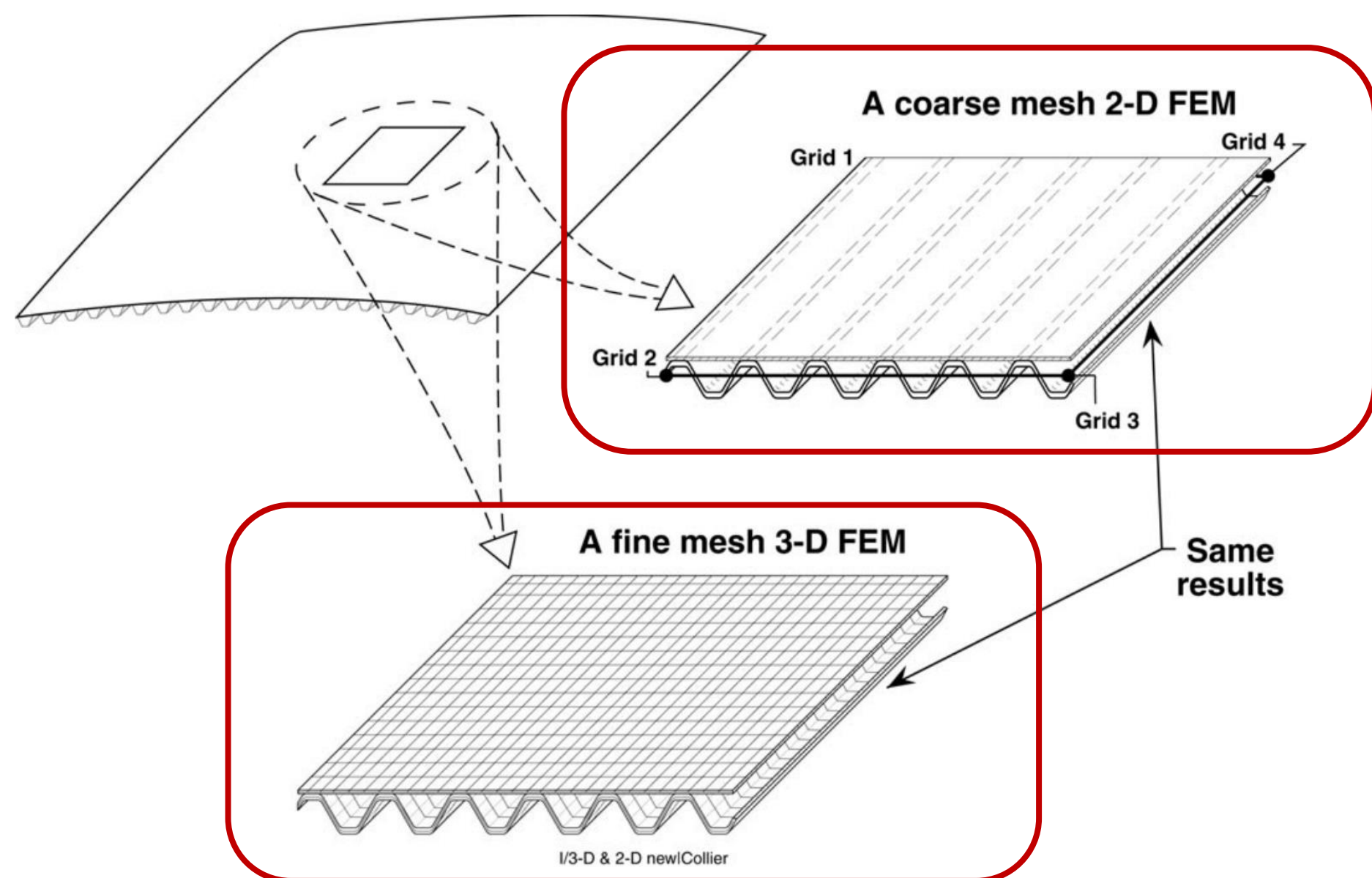
Two designers



One stress guy
(Happy again)

Performant Automation

NASA Hypersonic program 1988-1995



Automation Implemented by Early 2000s

Each of you use these for Less Work – not More Work

Import GFEM

– elements, properties, load cases,...

Extract FEA force

– element N_x , N_y , N_{xy} .. Per load case

Assign analysis failure criteria

– stiffened panel crippling

Setup Material Database

– complicated laminate allowables

Resolve negative margins

– new loads drop

Size to reduce weight

– quickly find optimum design

Update GFEM update

– properties (PSHELLS/PCOMPS/PBARS)

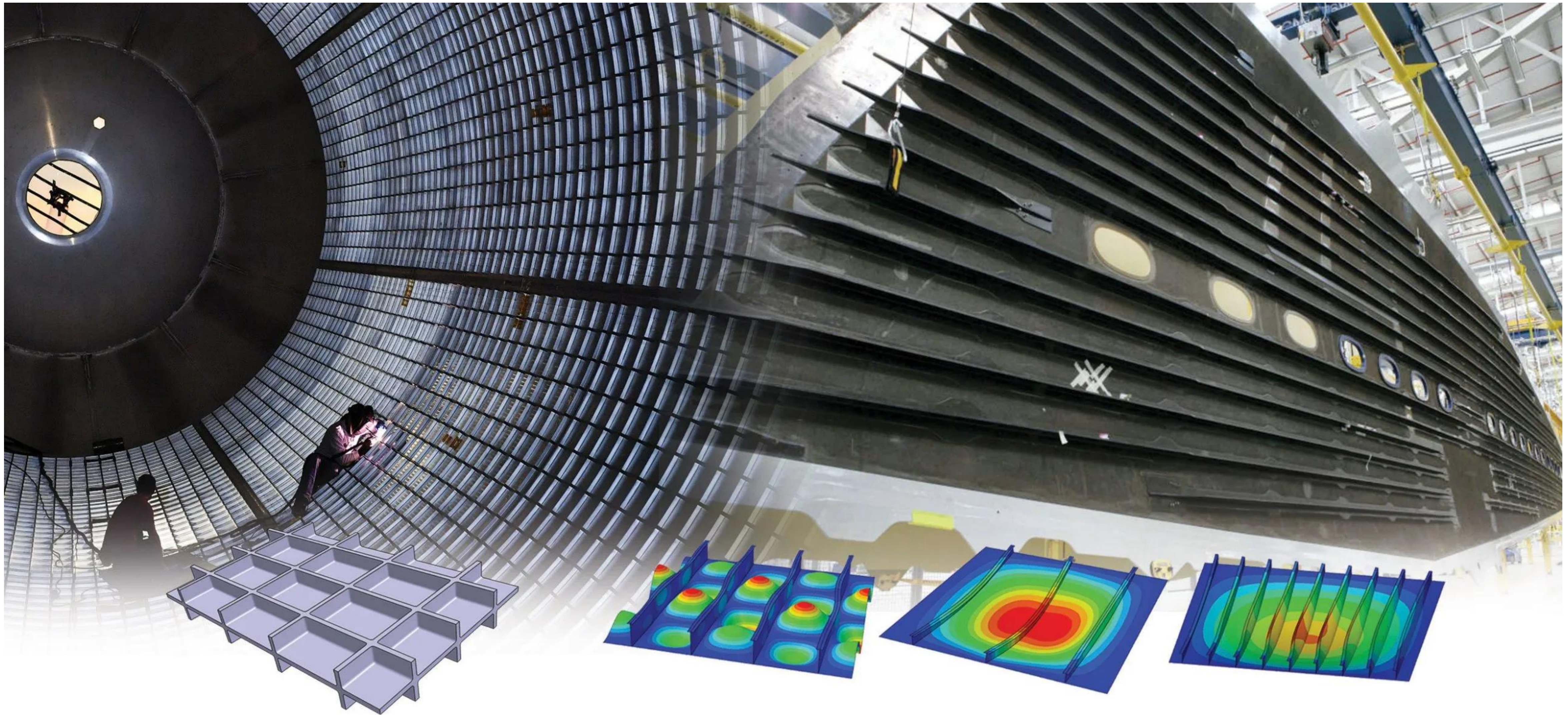
Iterate with FEA – HyperFEA®

– converge internal load paths

Generate Stress Reports

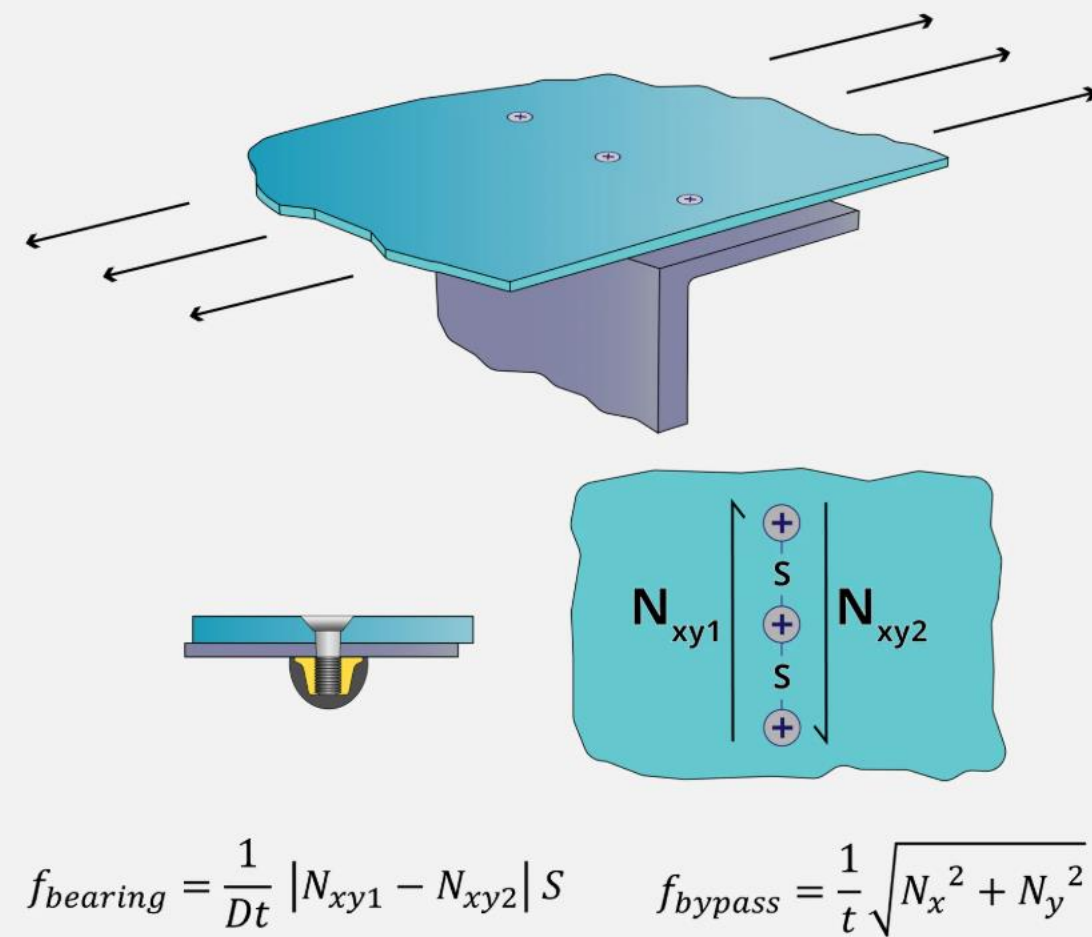
– Excel, Word example calcs with formulas

A Lot of Acreage Structure is Analyzed & Sized with HyperX

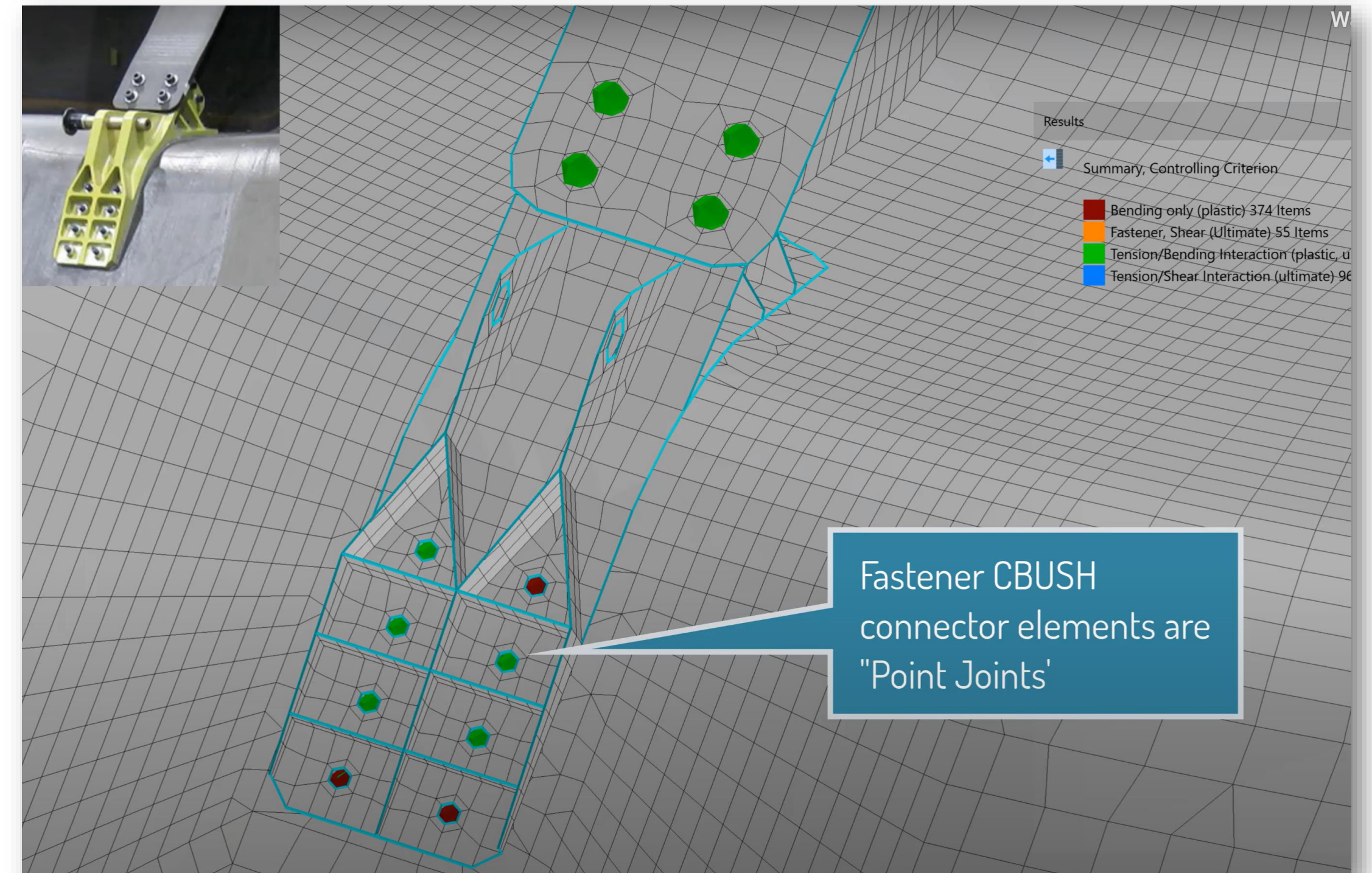
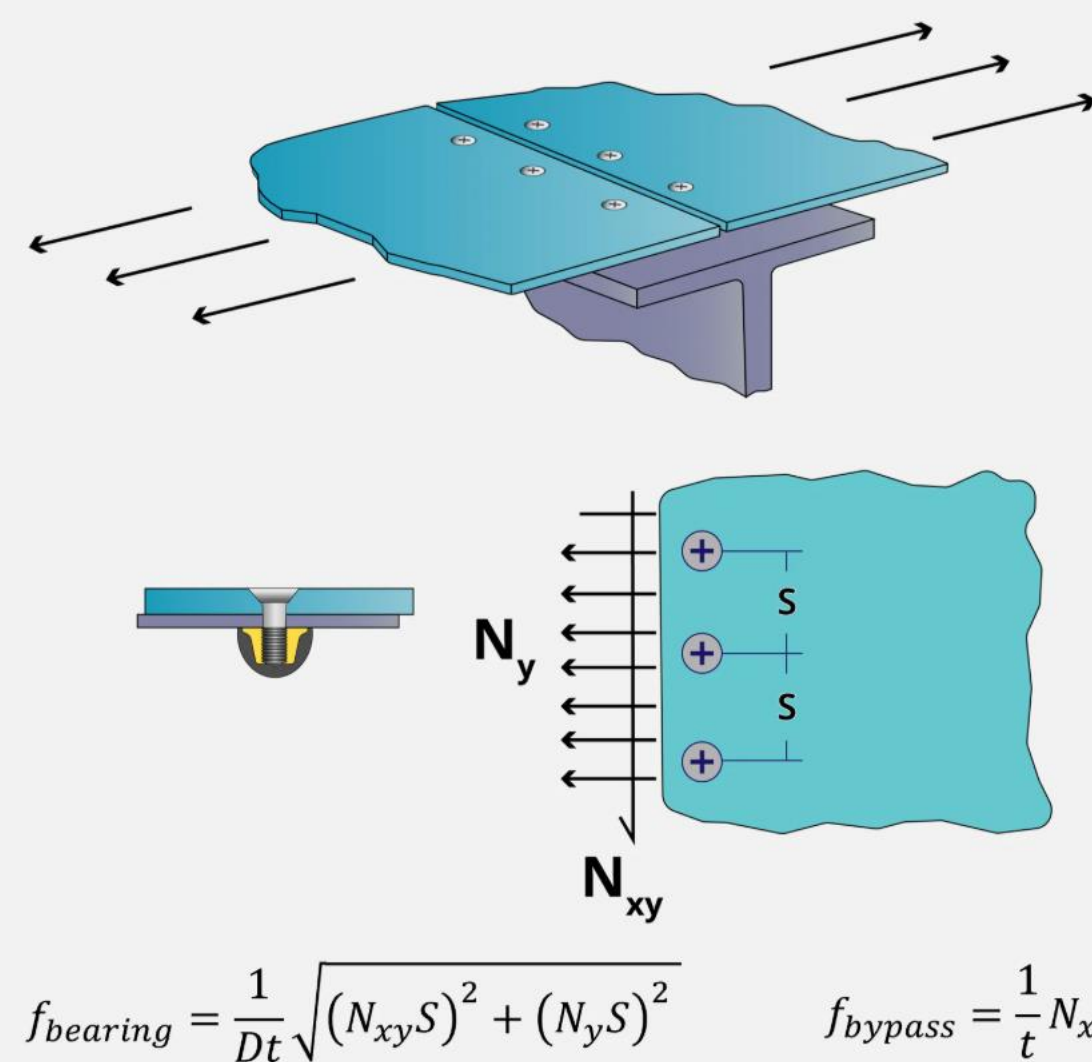


A Lot of Structural Joints are Analyzed & Sized with HyperX

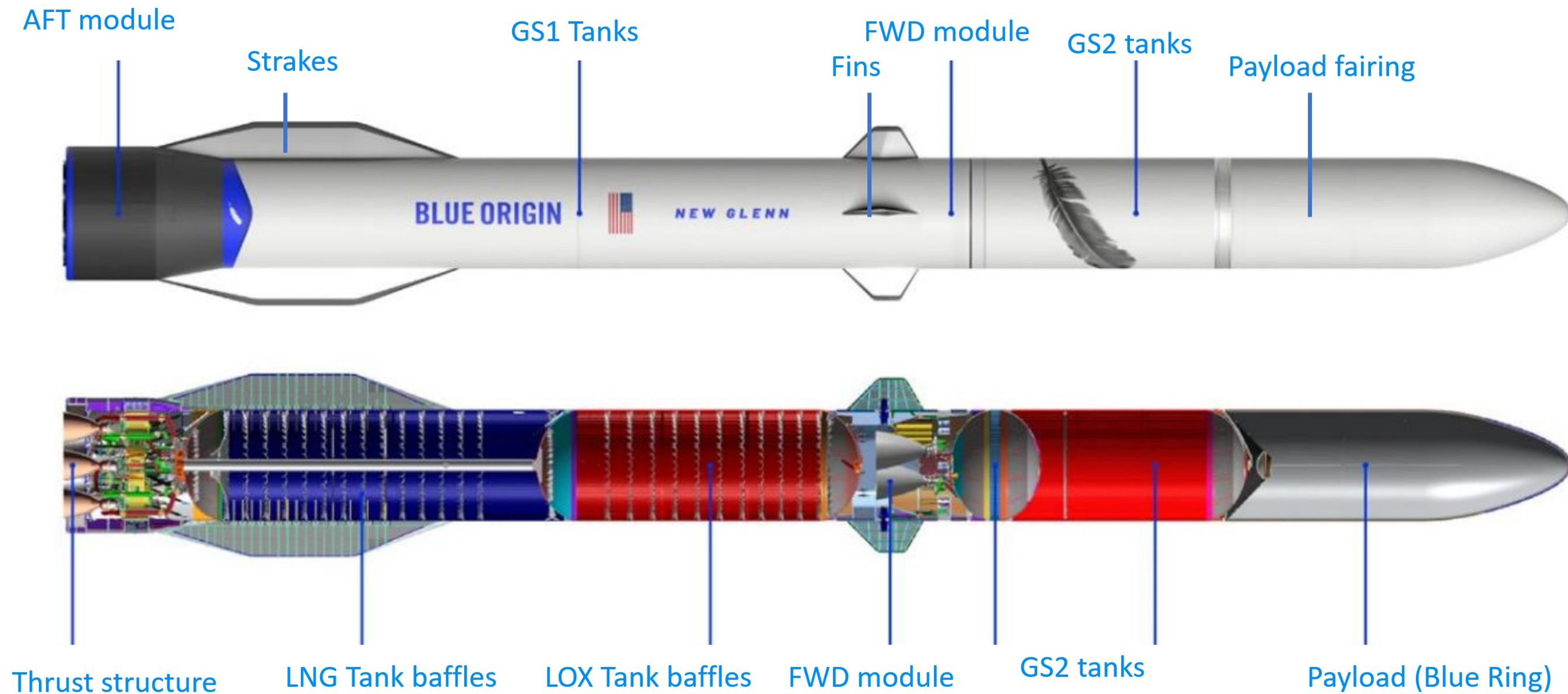
Continuous Skin



Discontinuous Skin



Blue Origin New Glenn Launch Vehicle - A lot of Rocket Structure Analyzed and Sized with HyperSizer/HyperX



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User Conference Presentations – Industry –

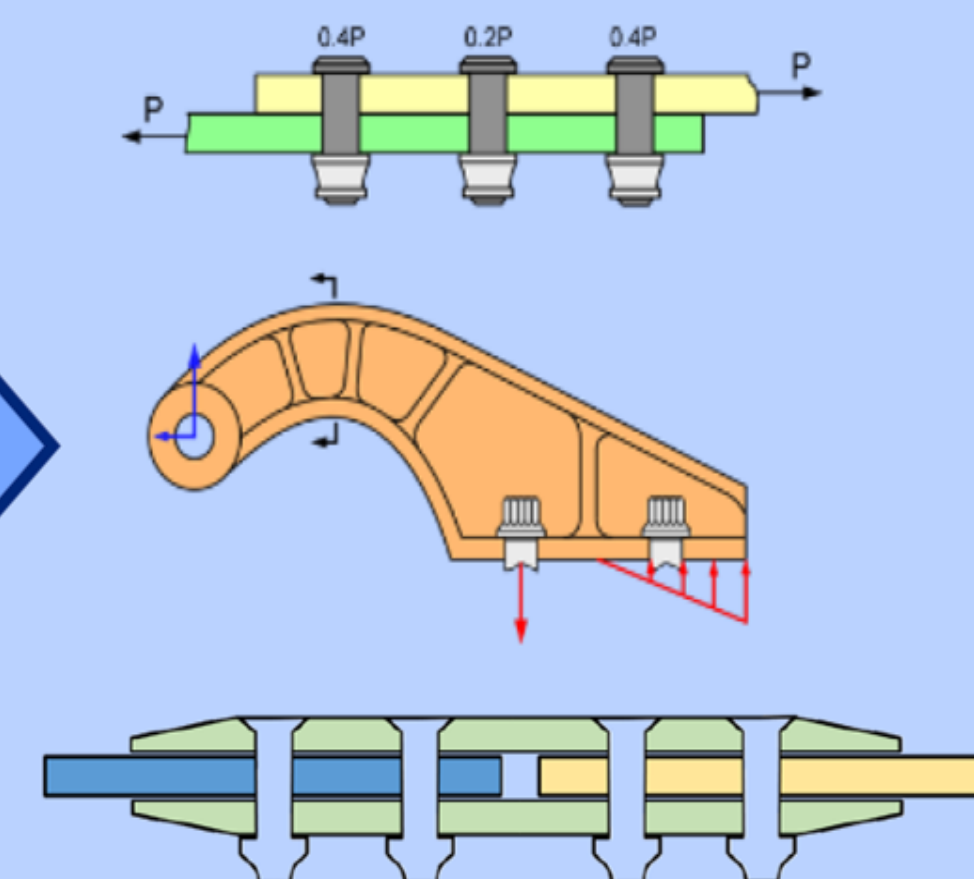
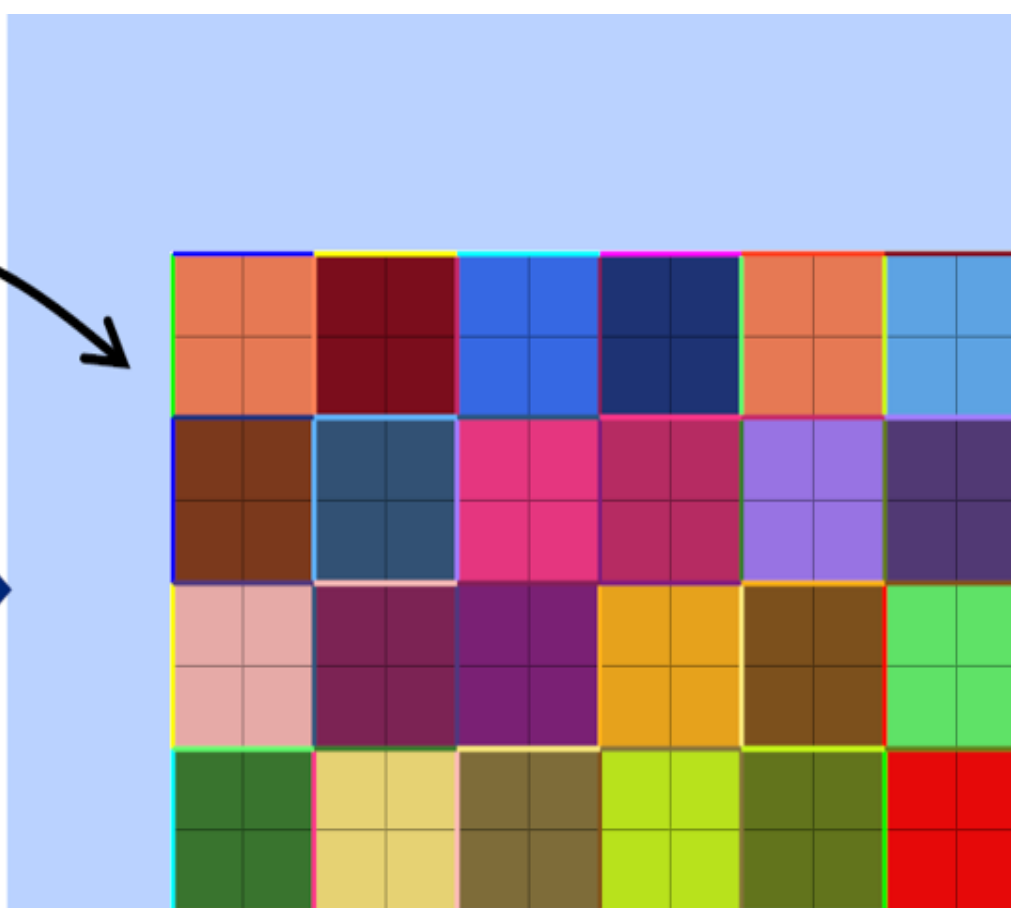
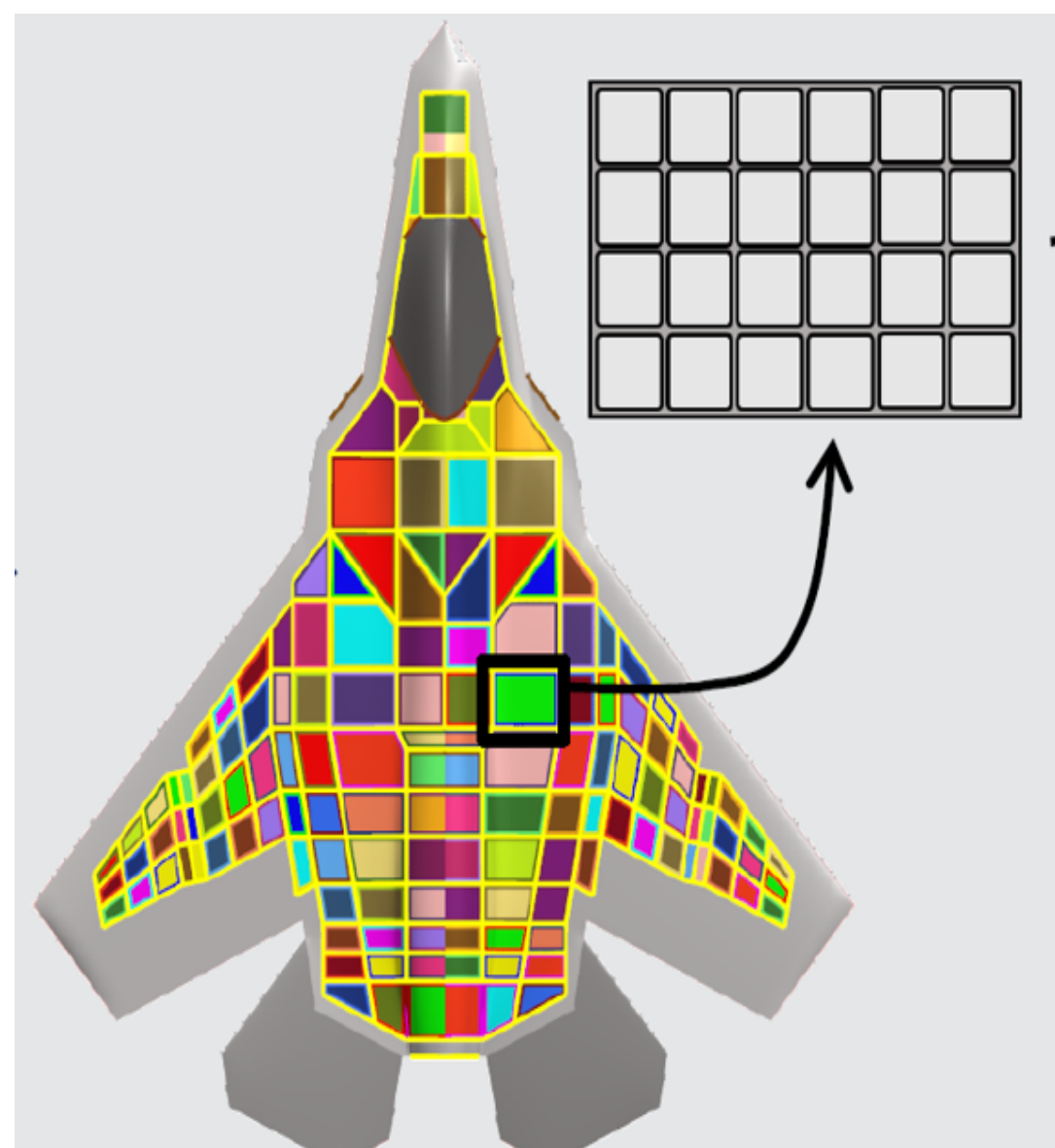
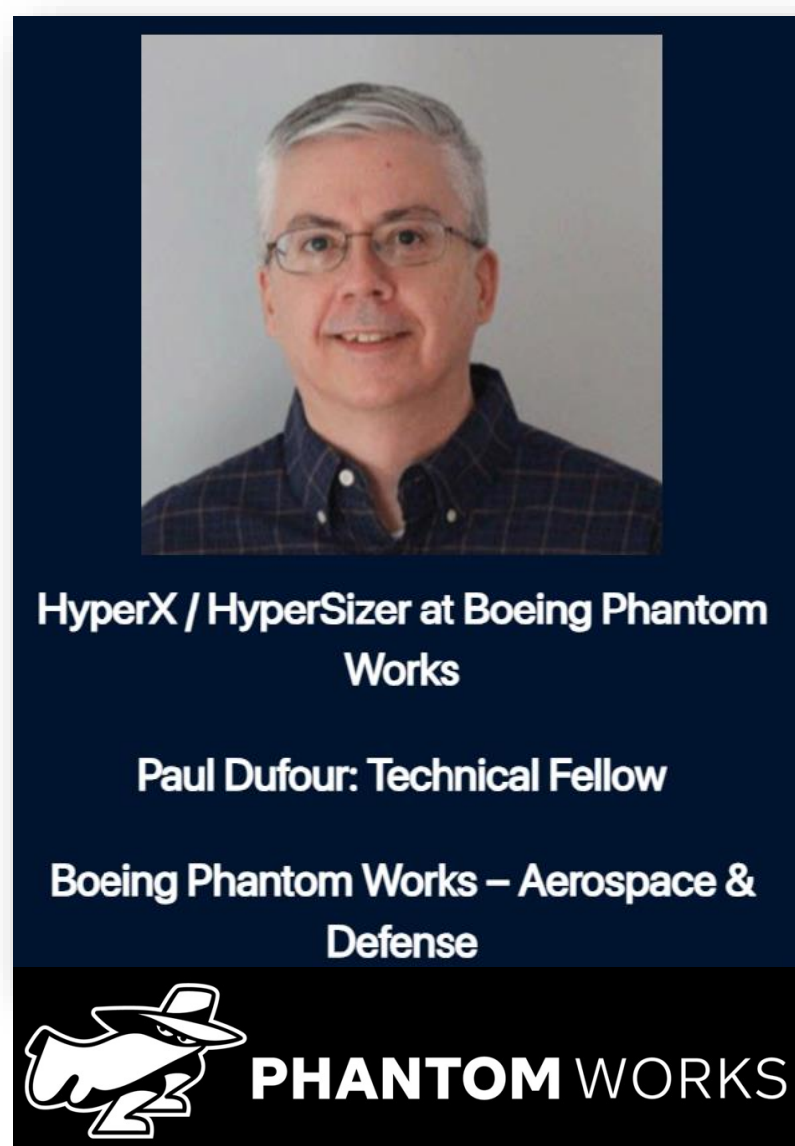
Boeing Phantom Works, Aerospace & Defense – Paul Dufour: Technical Fellow

→ HyperX/HyperSizer at Boeing Phantom Works

Spatial arrangement of part features
via rapid sizing trade studies
HyperSizer Smeared optimization

Local sizing pocket-by-pocket,
stiffener-by-stiffener
HyperSizer Discrete optimization

Sizing of fittings, joints,
transitions, cutouts



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HyperSizer® ✓
HYPERX ✓

HyperSizer® ✓
HYPERX ✓

HyperSizer® ✗
HYPERX ?

RADIA – Blake Berk: Structural Analysis Engineer

→ Designing WindRunner™, The World's Largest Aircraft



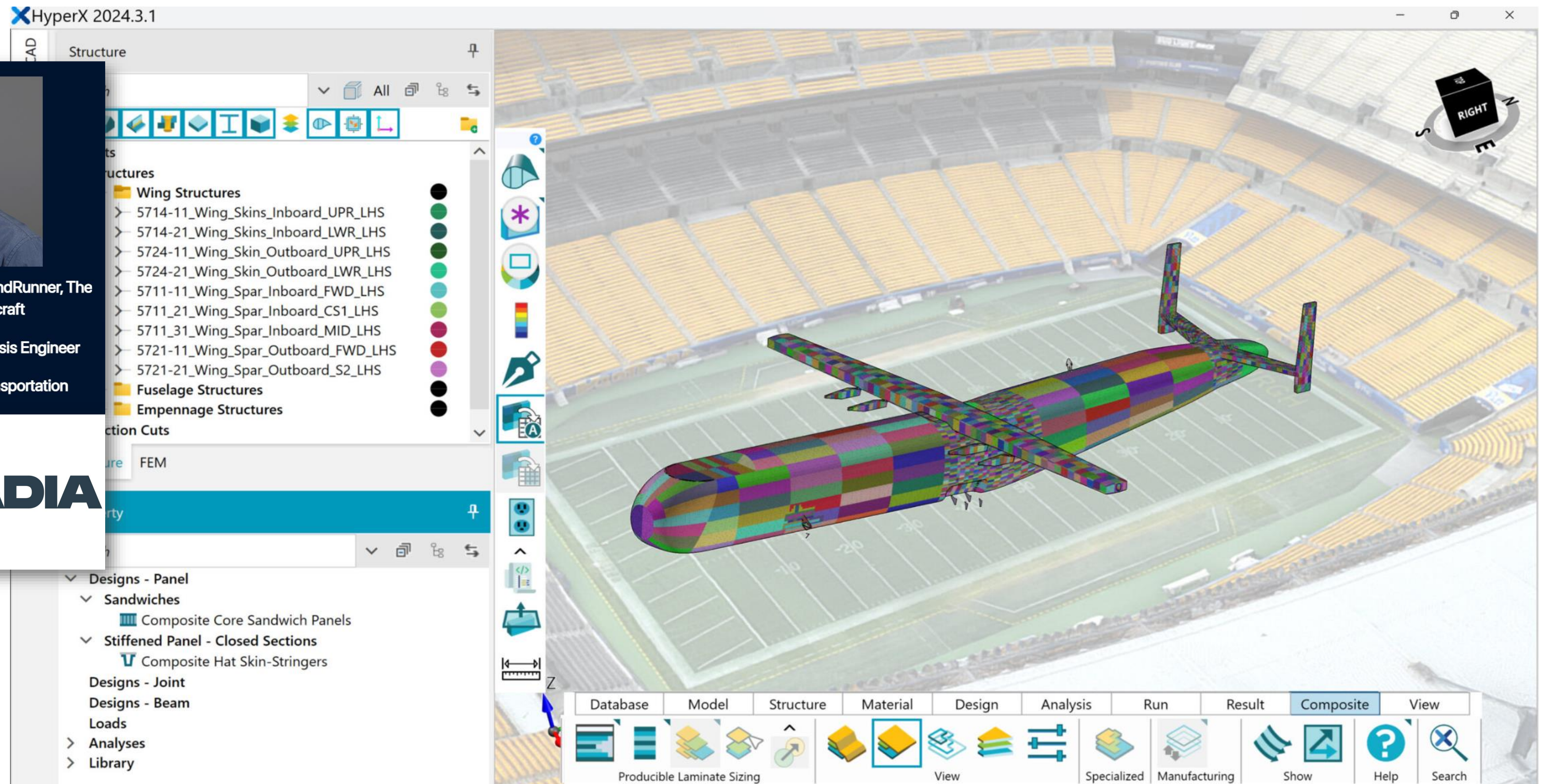
Automation Processes for WindRunner, The World's Largest Aircraft

Blake Berk: Structural Analysis Engineer

Radia – Wind Turbine Transportation



RADIA



General Atomics – Jonathan Russell: Airframe Lead for Sea Guardian MQ-9B

→ Airframe Certification of MQ-9B Remotely Piloted Aircraft using HyperX



Airframe Certification of MQ-9B Remotely Piloted Aircraft using HyperX

Jonathan Russell: Airframe Lead for Sea Guardian MQ-9B

General Atomics – Unmanned Aircraft Systems (UAS)



EOS Aircraft – Donn Hethcock: Engineering Technical Fellow

→ Using HyperX to Define Aerostructures for Sustainable Regional Transport Aircraft



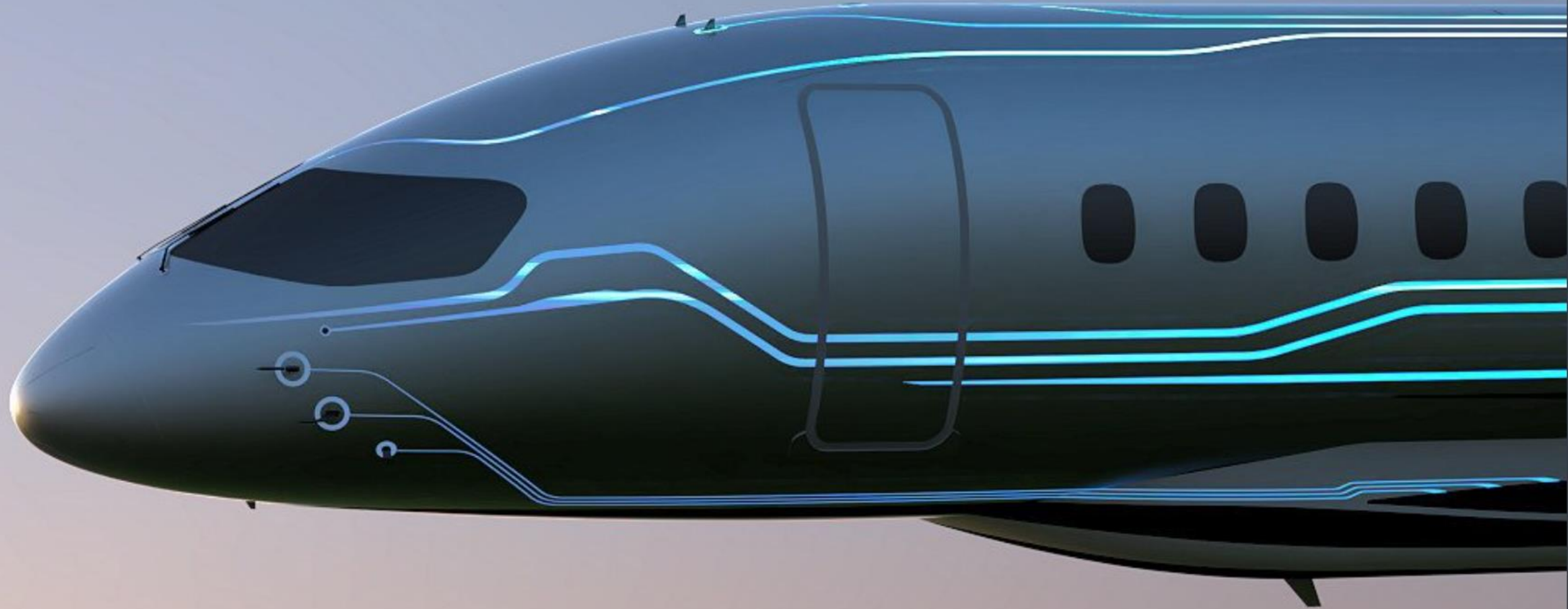


Using HyperX to Define Aerostructure for Sustainable Regional Transport Aircraft

Donn Hethcock: Aerospace Structures

EOS Aero – Electric Regional Aircraft

USHERING IN A NEW DAWN OF REGIONAL AVIATION



CAREERS

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NASA Langley– Dave Paddock: Senior Aerospace Engineer

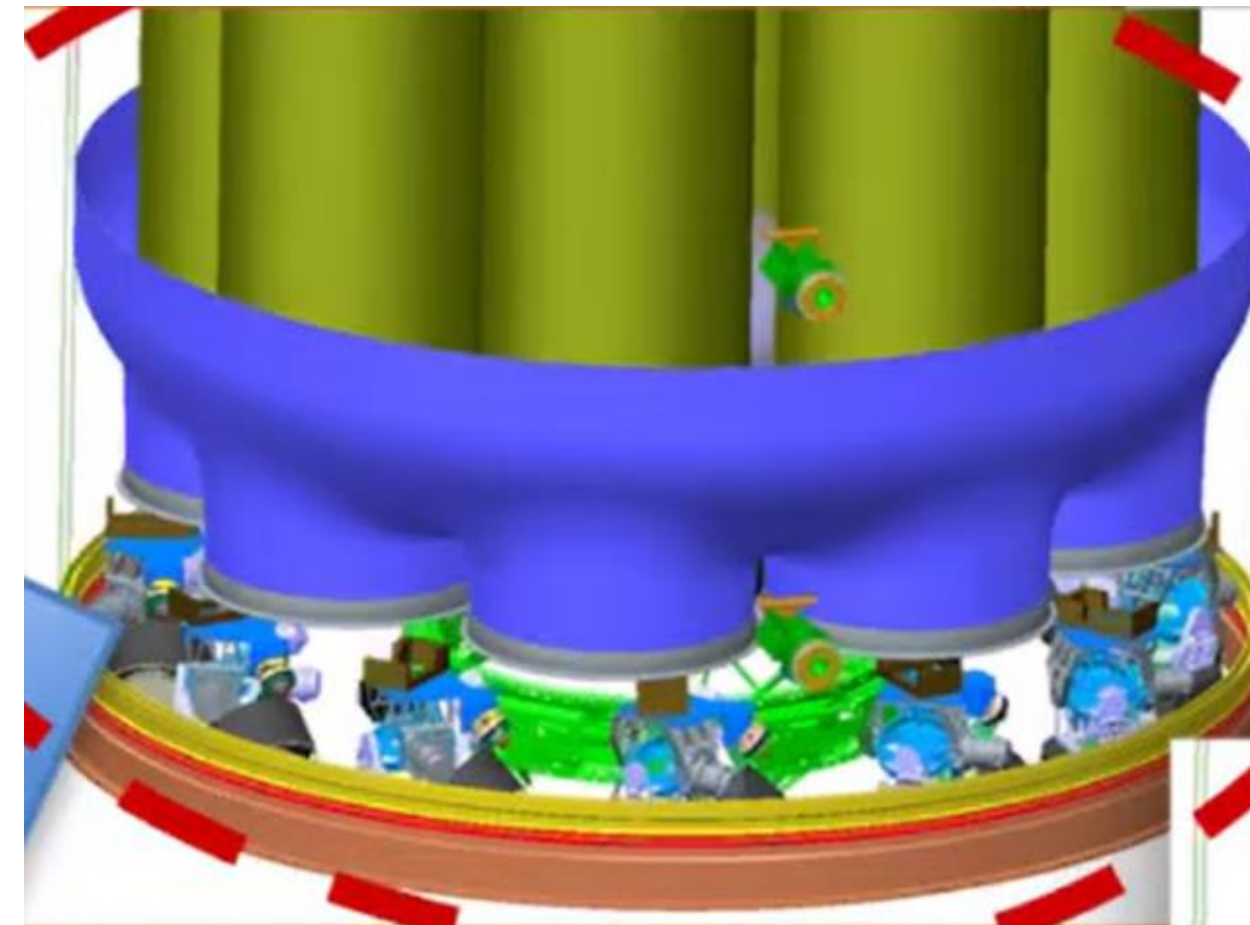
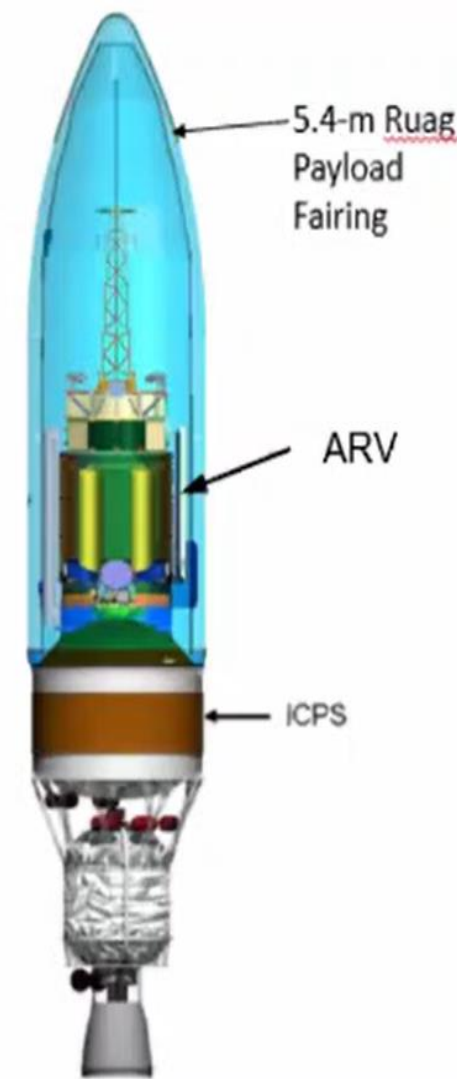
→ Buckling Analysis of Complex Spacecraft Structure



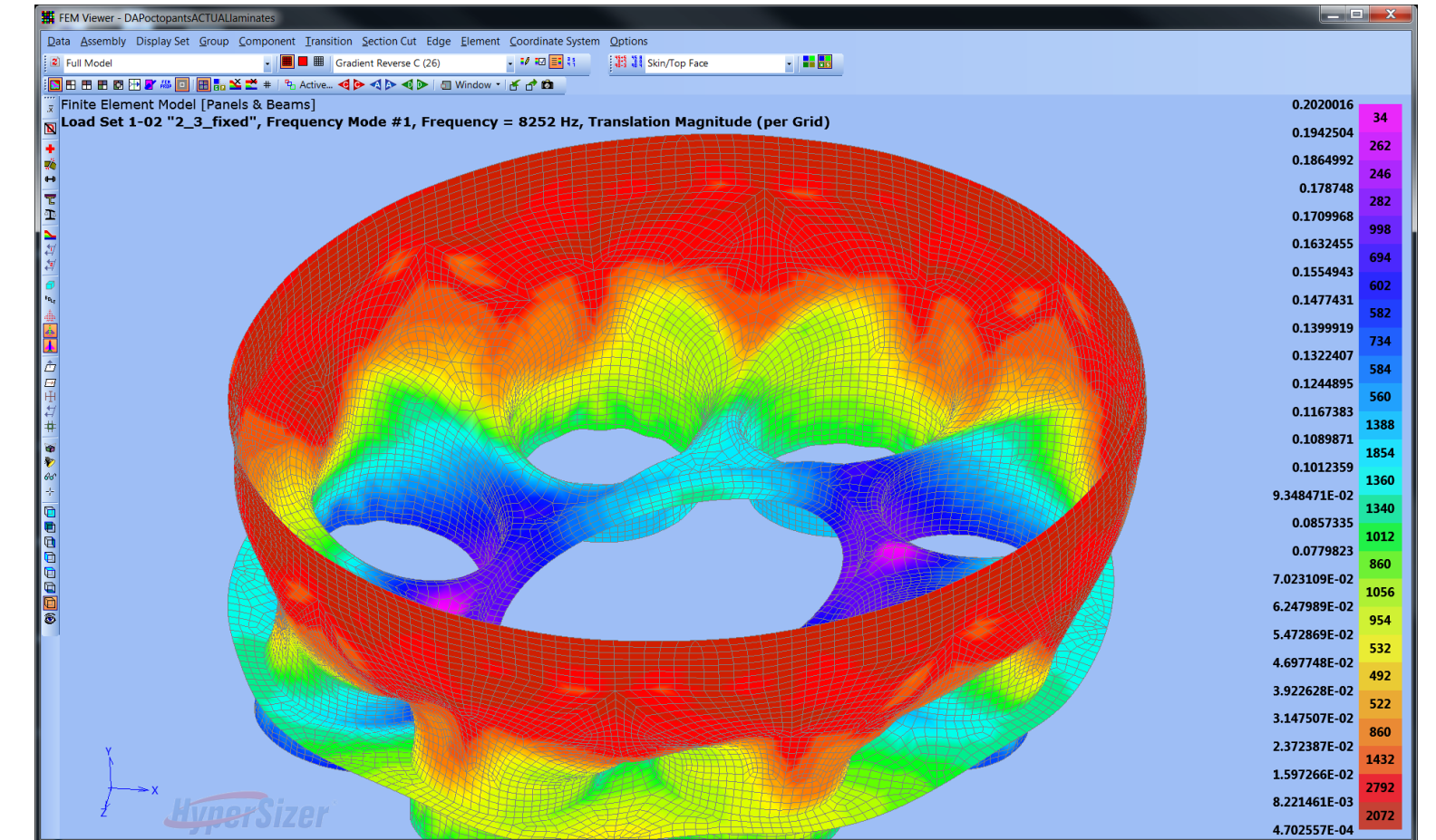
Buckling Analysis of Complex Spacecraft
Structure with Lighter Weight

Dave Paddock: Senior Aerospace Engineer

NASA Langley Research Center

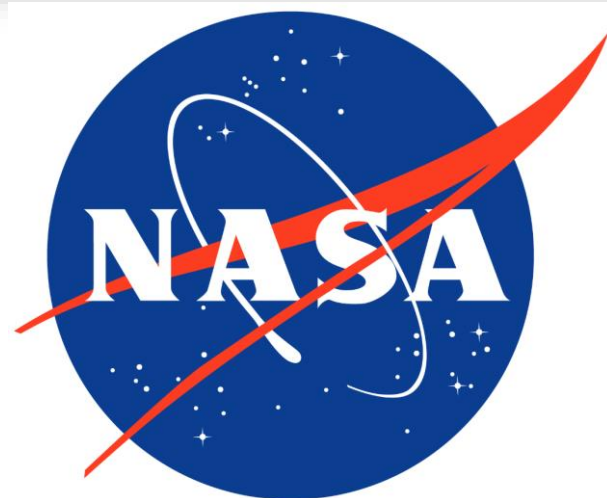
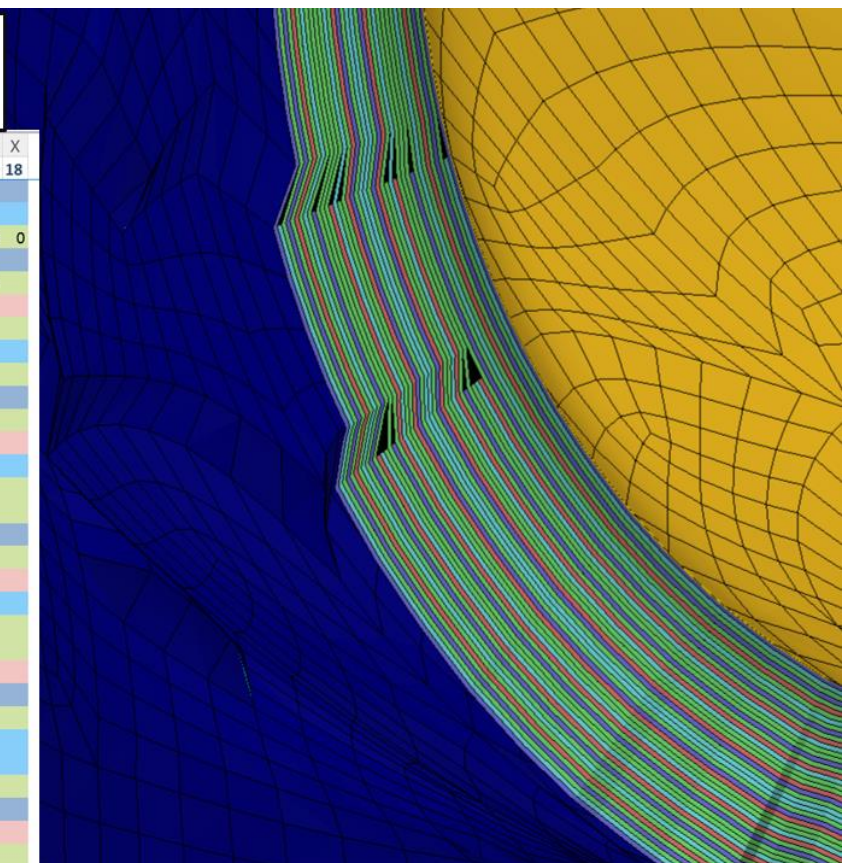


Called “Octopants”



Interleaved Laminate family

Layer	Thickness (in)	Material	Angle	D															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.0024	M55J /954-3 unidirectional tape	-45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
2	0.0024	M55J /954-3 unidirectional tape	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45
3	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.0024	M55J /954-3 unidirectional tape	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
5	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0.0024	M55J /954-3 unidirectional tape	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
8	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0.0024	M55J /954-3 unidirectional tape	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45
10	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0.0024	M55J /954-3 unidirectional tape	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
12	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0.0024	M55J /954-3 unidirectional tape	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
14	0.0024	M55J /954-3 unidirectional tape	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45
15	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0.0024	M55J /954-3 unidirectional tape	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
17	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0.0024	M55J /954-3 unidirectional tape	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
19	0.0024	M55J /954-3 unidirectional tape	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45
20	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0.0024	M55J /954-3 unidirectional tape	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
23	0.0024	M55J /954-3 unidirectional tape	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
24	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0.0024	M55J /954-3 unidirectional tape	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45
26	0.0024	M55J /954-3 unidirectional tape	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45	-45
27	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0.0024	M55J /954-3 unidirectional tape	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
29	0.0024	M55J /954-3 unidirectional tape	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
30	0.0024	M55J /954-3 unidirectional tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Northrop Grumman - Howard Nestman : Staff Engineer Structural & NAVDER – SA & FF

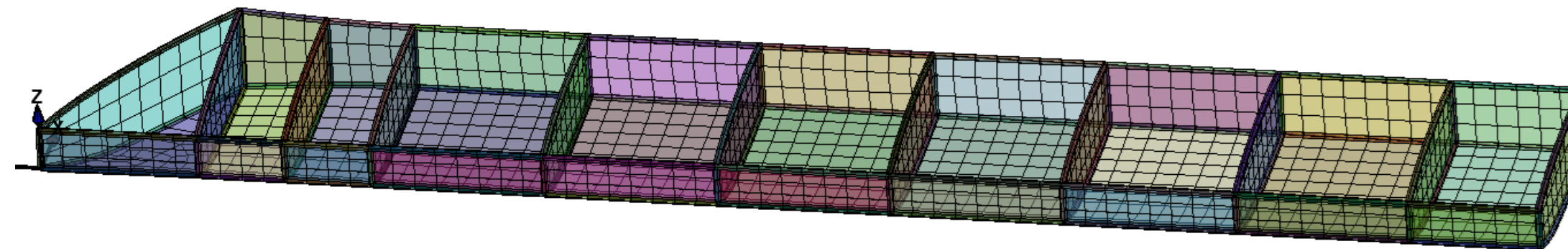
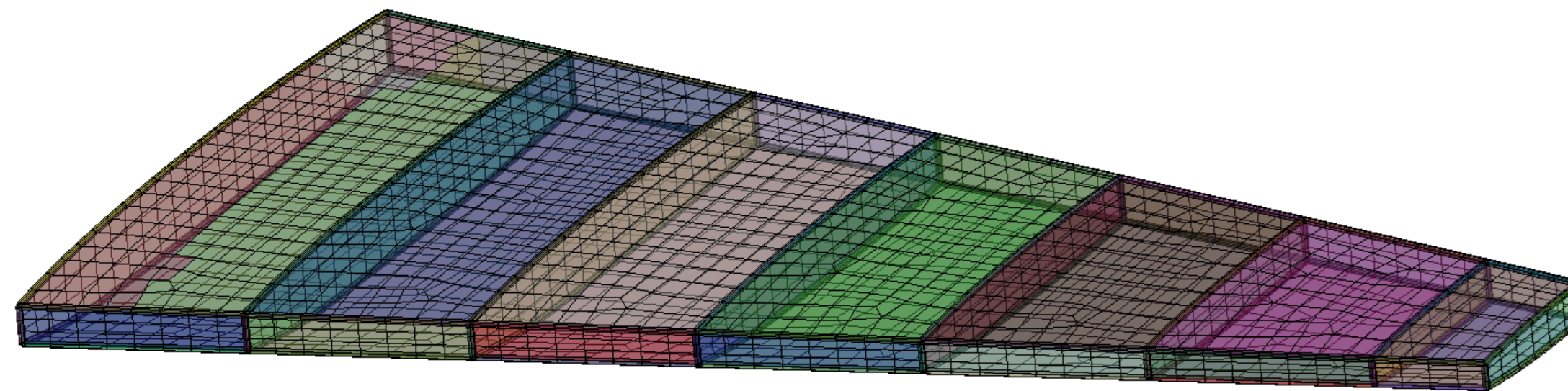
→ Comparing Optimized Aircraft Configurations Using HyperX



Comparing Optimized Aircraft
Configurations using HyperX

Howard Nestman: Staff Engineer
Structural & NAVDER – SA & FF

Northrop Grumman



Aurora Flight Sciences– Michael Peck: Structural Staff Analyst

→ Program Level Analysis for GFEM Management with HyperX Enterprise



Program Level Analysis for GFEM
management with HyperX Enterprise

Michael Peck: Structural Analyst

Aurora Flight Sciences



A Boeing Company



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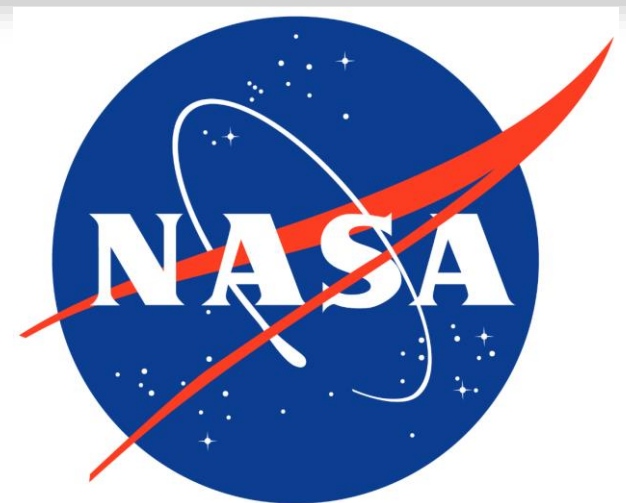
NASA Glenn- Brett Bednarczyk: Discipline Lead for Analytical and Computational Mechanics

→ HyperX API for Machine Learning of Multiscale Composite Cryotank Design



Leveraging the HyperX API for Machine Learning with Application to Multiscale Composite Cryotank Design

Brett Bednarczyk: Discipline Lead for Analytical and Computational Mechanics



NASA/Boeing Composite Cryotank Demonstration 5.5 m (2015)

21 | Electra Aero- Gary Wolfe: Principal Structures Engineer

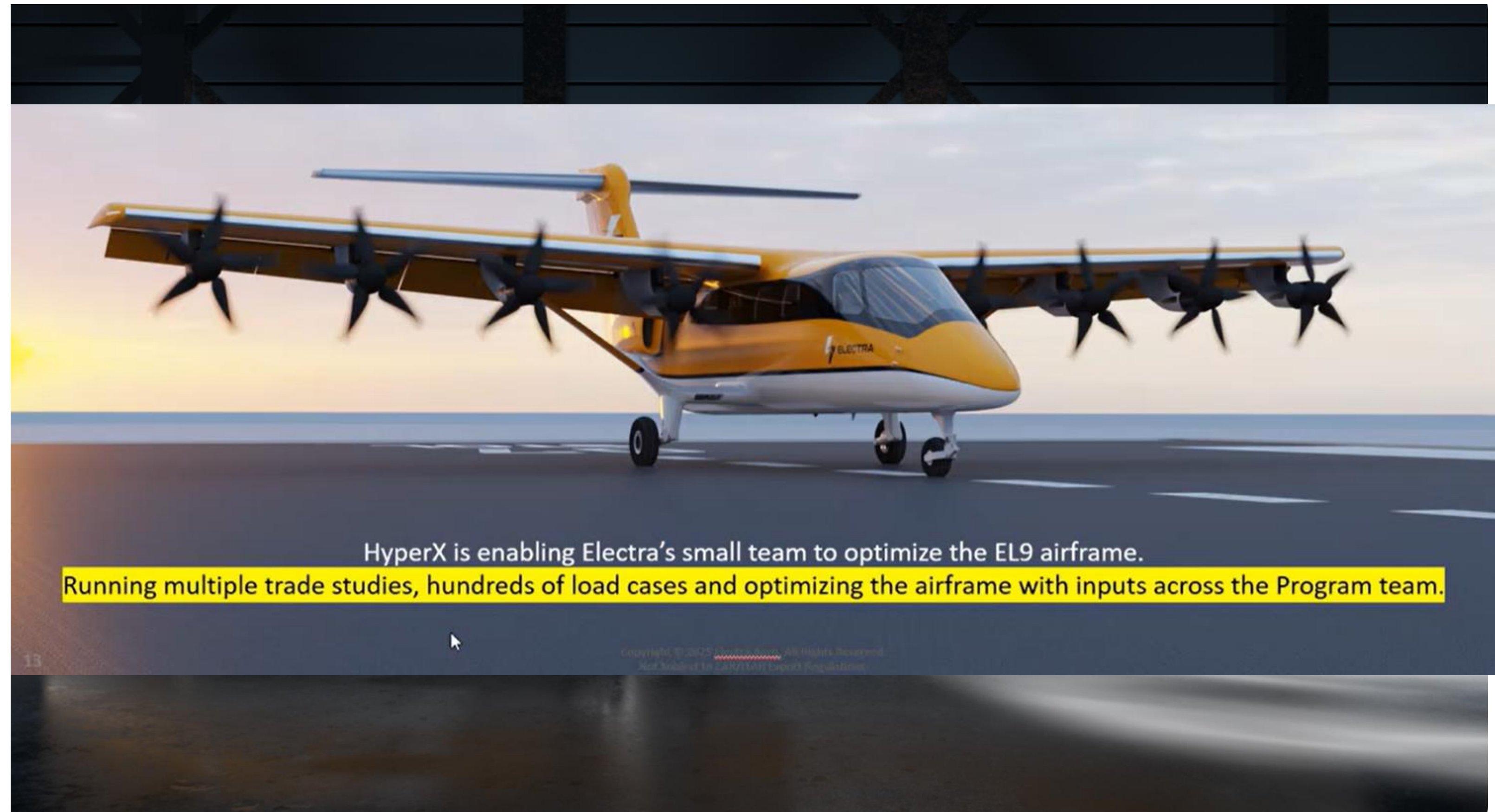
→ Electra's Ultra Short Aircraft Designed Using HyperX



Electra's Ultra Short aircraft designed using HyperX

Gary Wolfe: Principal Structures Engineer

Electra Aero – Ultra Short Electric Aircraft



Electra's Hybrid-Electric Ultra Short Achieves Breakthrough Wind Tunnel Performance, 7X Greater Lift than Conventional Aircraft

User Conference Presentations – Industry – Day 2

Swift Engineering– Mahesh Patel: Structural Analysis Engineer

→ Optimizing the X-59 Composite Nose Cone with Collier's Software



Optimizing the X-59 Composite Nose Cone with Collier's software

Mahesh Patel: Structural Analysis Engineer

Ex-Swift Engineering – Aerospace



Swift Engineering Inc.



24 | JetZero- Logan Thomas: Structural Analysis Engineer

→ HyperXpert's Role in Trade Studies of JetZero's Blended Wing Body BWB Aircraft



HyperXpert's role in trade studies of JetZero's Blended Wing Body BWB Aircraft

Logan Thomas: Structural Analysis Engineer

JetZero - Aerospace

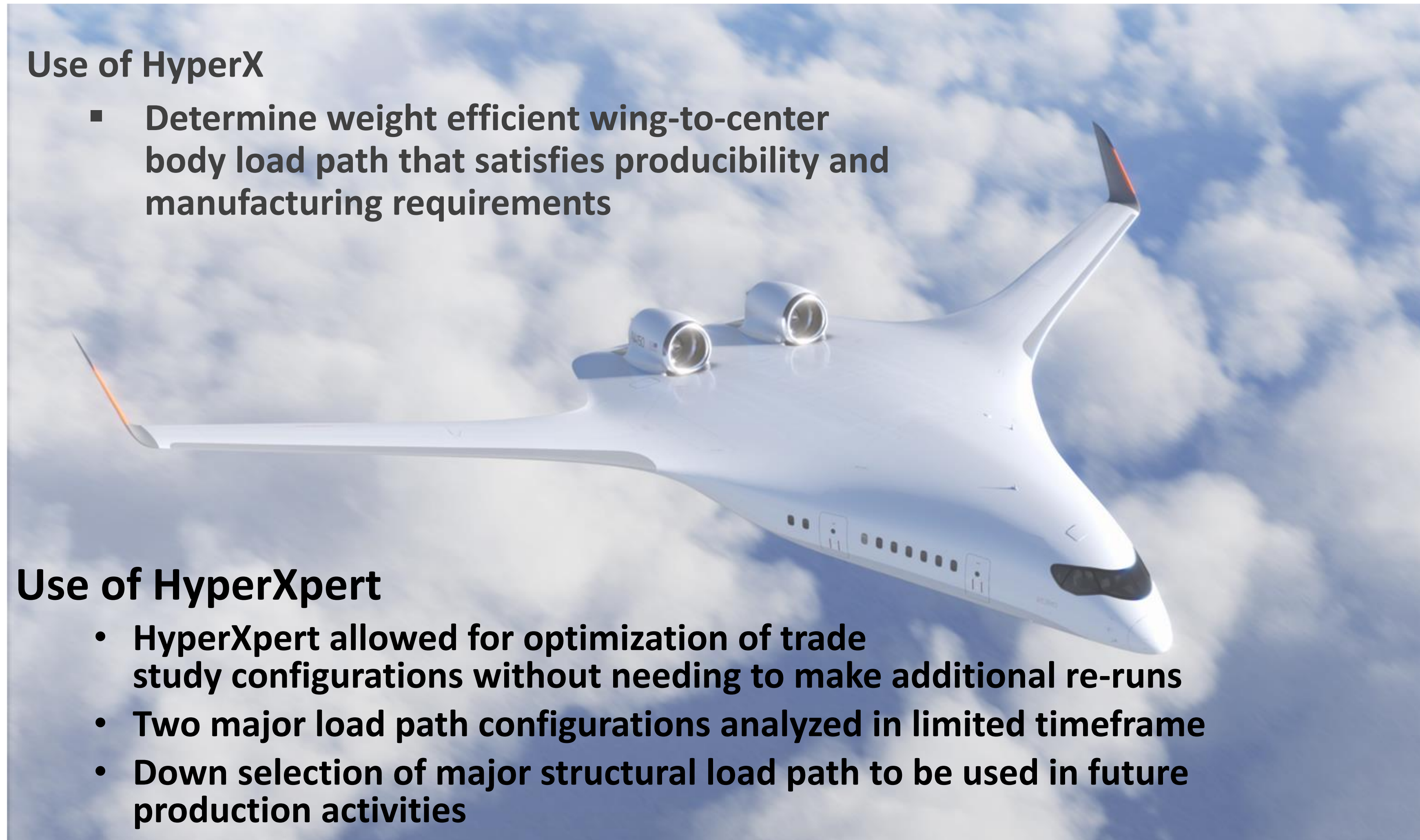
jetzero

Use of HyperX

- Determine weight efficient wing-to-center body load path that satisfies producibility and manufacturing requirements

Use of HyperXpert

- HyperXpert allowed for optimization of trade study configurations without needing to make additional re-runs
- Two major load path configurations analyzed in limited timeframe
- Down selection of major structural load path to be used in future production activities



25 | JetZero– Napsia Buddhamat: Structural Analysis Engineer

→ Aeroelastic Wing Sizing of JetZero's Blended Wing Body BWB Aircraft



Wing Sizing of JetZero's Blended Wing Body BWB Aircraft

Napsia Buddhamatya: Structural Analysis Engineer

JetZero – Aerospace

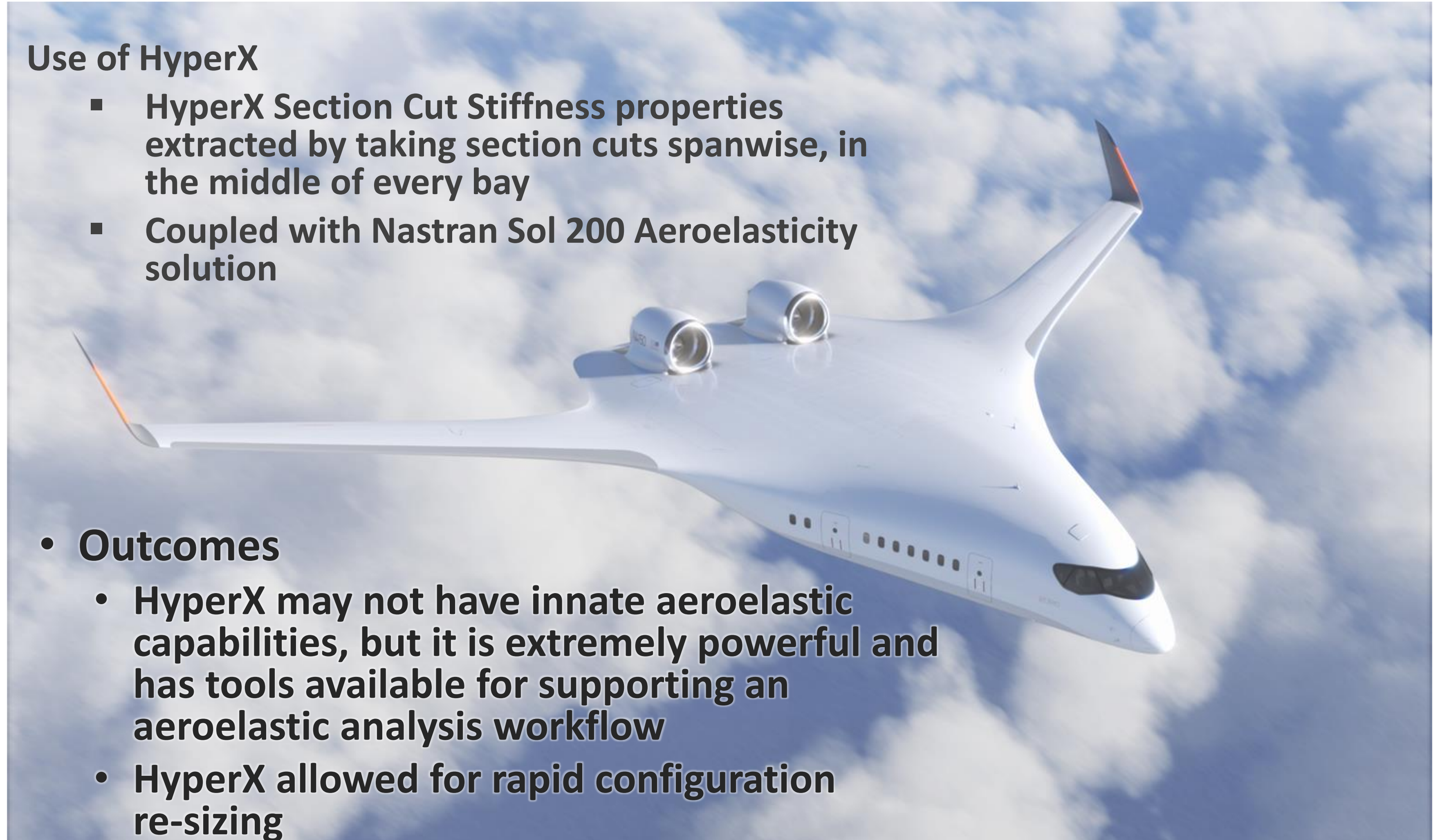
jetzero

Use of HyperX

- HyperX Section Cut Stiffness properties extracted by taking section cuts spanwise, in the middle of every bay
- Coupled with Nastran Sol 200 Aeroelasticity solution

• Outcomes

- HyperX may not have innate aeroelastic capabilities, but it is extremely powerful and has tools available for supporting an aeroelastic analysis workflow
- HyperX allowed for rapid configuration re-sizing



→ Delta Spaceship Deploys HyperX at Scale from Conceptual Design to Detail Design and Part Release



Carey Cross: Aerostructures Manager

Bell Flight – Aerospace and Defense



Jorge DeLeon: Stress Lead, Virgin Galactic at Bell

Bell Flight – Aerospace & Defense



Max Silva: Aerostructures Stress Engineer

Bell Flight – Aerospace and Defense



Justin May: Senior Aerospace Structural Engineer

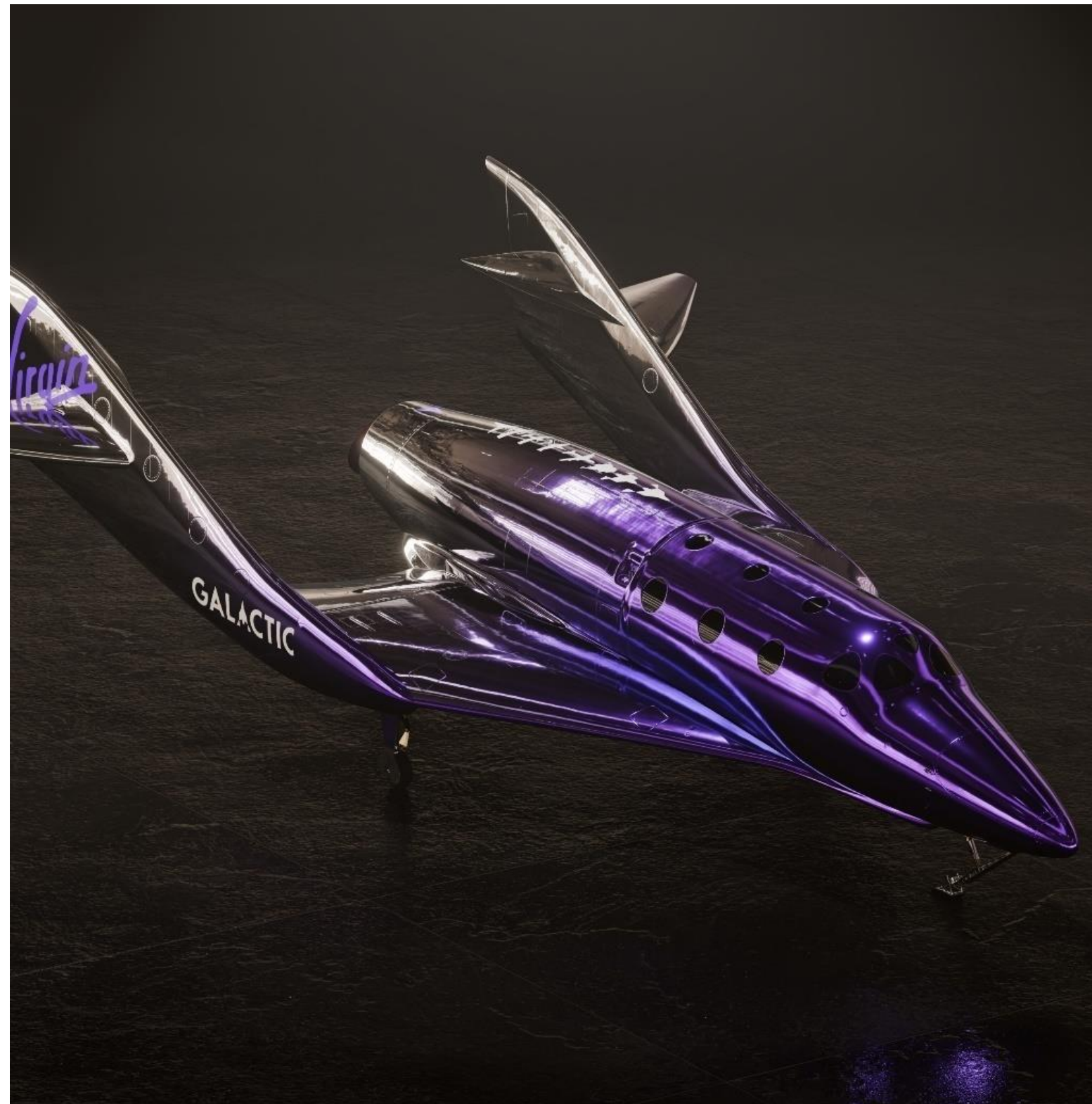
Collier Aerospace

-  Bell Engineers
-  Collier Engineers
- 

Put in

Bell Flight – Panel

→ Delta Class Spaceship Deploys HyperX at Scale from Conceptual Design to Detail Design and Part Release



Feather and Flight Control Surfaces Team

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7



Design authority



Engineering design
Structural analysis

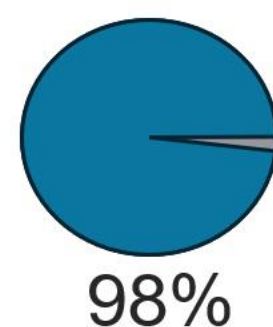
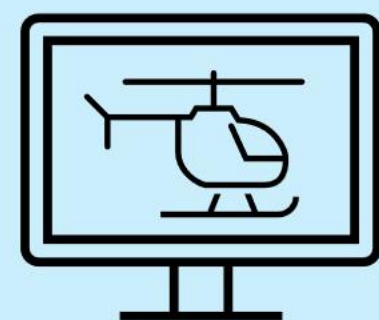


Structural analysis
Plugin creation and support

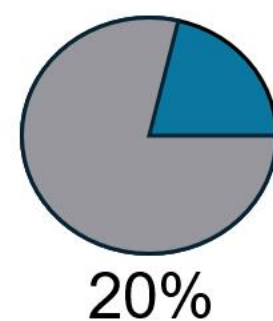
→ Delta Class Spaceship Deploys HyperX at Scale from Conceptual Design to Detail Design and Part Release

Analysis Process Planning | Workflow

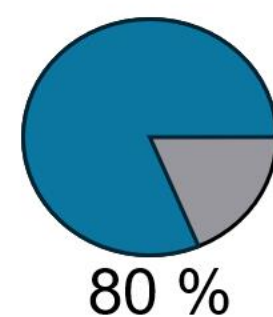
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10



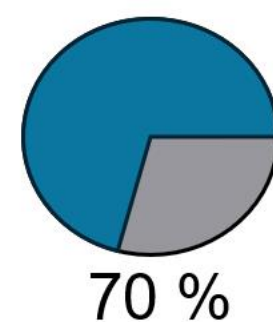
Initial Acreage Sizing



Stability Analysis



Initial Joint Sizing



Final Sizing Review & Stress Notes

 HyperX
 Other Tools

NASA Langley – Lloyd Eldred: Structural Analysis Team Lead

→ Automated Preliminary Aircraft Sizing with HyperX



Automated Preliminary Aircraft Sizing with
HyperX

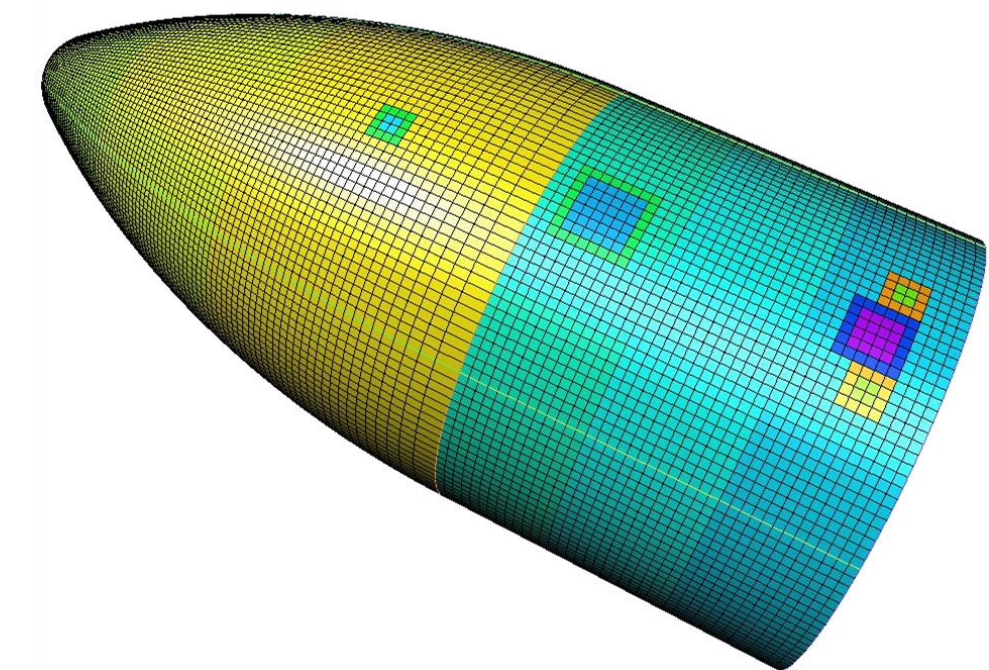
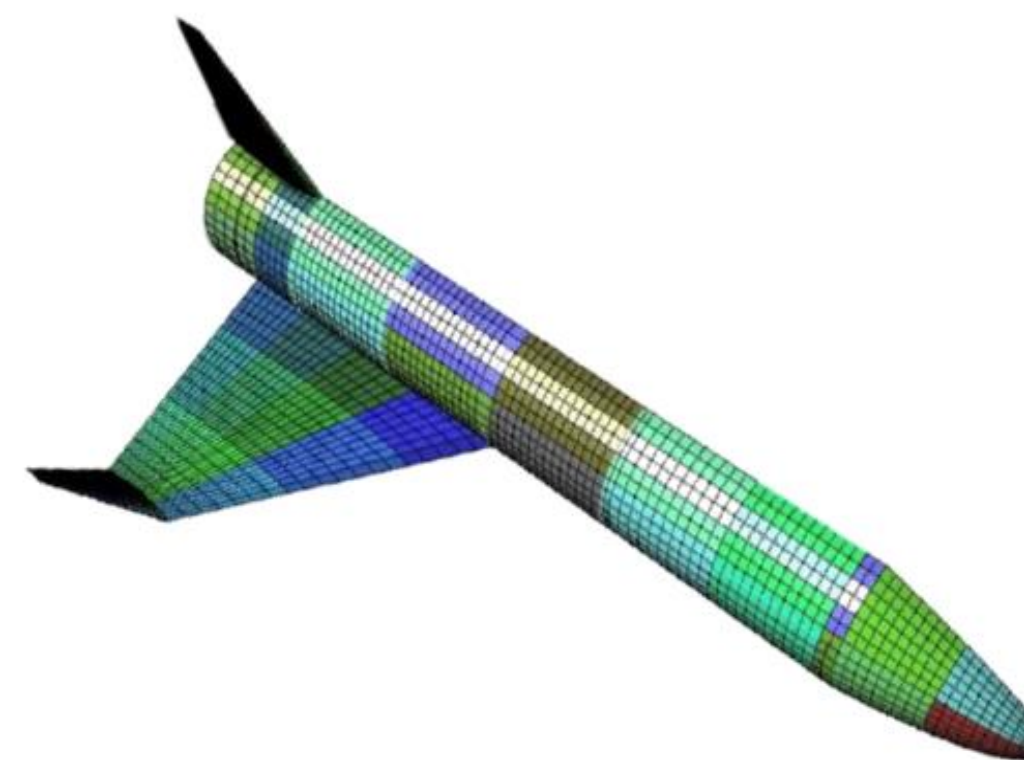
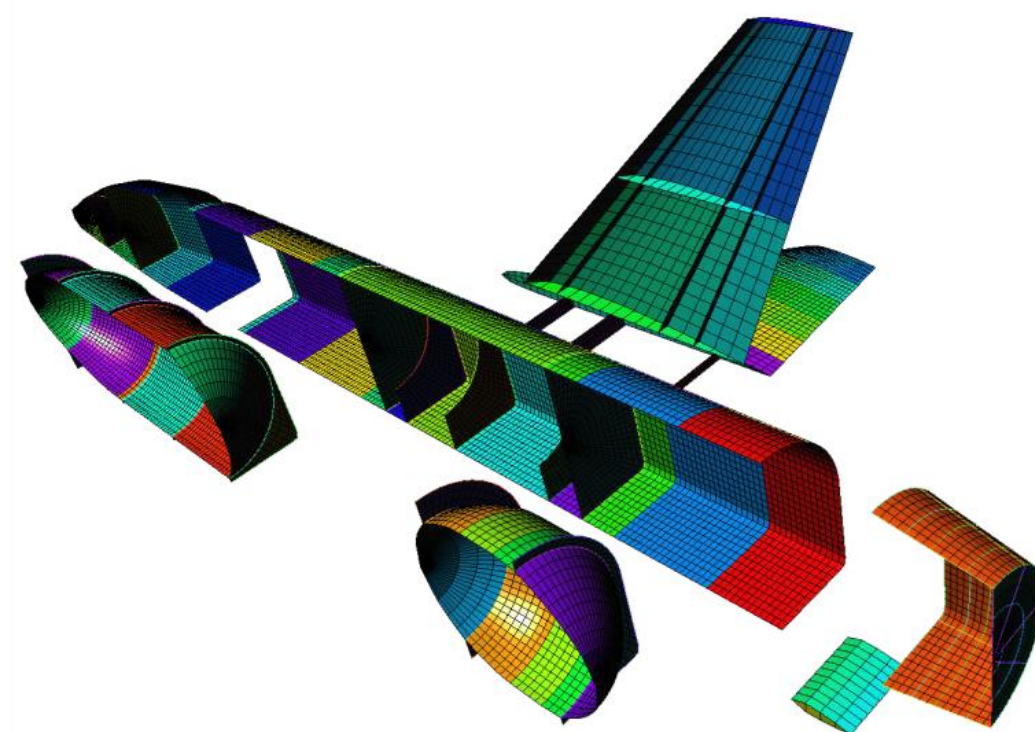
Lloyd Eldred: Structural Analysis Team Lead

NASA Langley Research Center

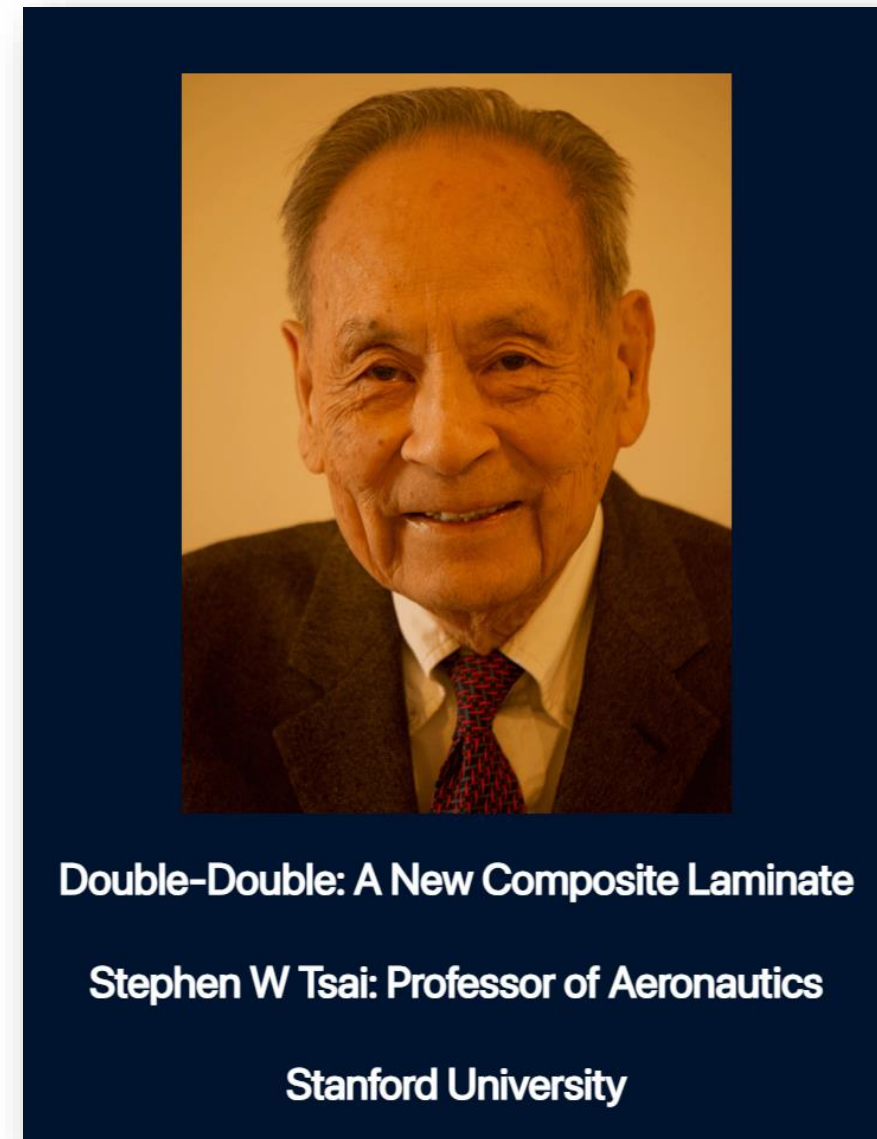
SPARC overview

Structural Preliminary Analysis for aeRospaCe vehicles

- Structural & Load Modeling in *Loft*
- Weight estimation and structural sizing in HyperX
- Is currently in active use for component design studies such as 50+ different wing designs for a high-speed vehicle



→ Double-Double: A New Composite Laminate



Laminate Family Generator

Composite: T700 / TC1225 Tape

0/45/90 Double/Double

Base Name (Optional)

Stephen W Tsai Double Double

Laminate Preferences

MSS Count Target: 40

Angles

	Min	Max	Step
φ	0	40	10
ψ	50	90	10

☒ Remove matching angle pairs

Drop Patterns

△ ▽ ◇ ⊗ ≡ ≡

Candidate Families: 25

Generate Close

Stephen W Tsai Double Double DD Hourglass 0/-50/0/50

Stephen W Tsai Double Double DD Hourglass 0/-60/0/60

Stephen W Tsai Double Double DD Hourglass 0/-70/0/70

Stephen W Tsai Double Double DD Hourglass 0/-80/0/80

Stephen W Tsai Double Double DD Hourglass 0/-90/0/90

Stephen W Tsai Double Double DD Hourglass 10/-50/-10/50

Stephen W Tsai Double Double DD Hourglass 10/-60/-10/60

Stephen W Tsai Double Double DD Hourglass 10/-70/-10/70

Stephen W Tsai Double Double DD Hourglass 10/-80/-10/80

Stephen W Tsai Double Double DD Hourglass 10/-90/-10/90

Stephen W Tsai Double Double DD Hourglass 20/-50/-20/50

Stephen W Tsai Double Double DD Hourglass 20/-60/-20/60

Stephen W Tsai Double Double DD Hourglass 20/-70/-20/70

Stephen W Tsai Double Double DD Hourglass 20/-80/-20/80

Stephen W Tsai Double Double DD Hourglass 20/-90/-20/90

Stephen W Tsai Double Double DD Hourglass 30/-50/-30/50

Stephen W Tsai Double Double DD Hourglass 30/-60/-30/60

Laminate Family: Stephen W Tsai Double Double DD Hourglass

Name: Stephen W Tsai Double Double DD Hourglass 10/

Layer	Thickness (in)	Material	Angle	1	2	3	4	5	6	7	8	9	10
1	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
2	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
3	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
4	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
5	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
6	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
7	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
8	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
9	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
10	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
11	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
12	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
13	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
14	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
15	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
16	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
17	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
18	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
19	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
20	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
21	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
22	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
23	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
24	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
25	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
26	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
27	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
28	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
29	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
30	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
31	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
32	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
33	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
34	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
35	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
36	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
37	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10
38	0.0054	T700 / TC1225 Tape	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
39	0.0054	T700 / TC1225 Tape	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
40	0.0054	T700 / TC1225 Tape	70	70	70	70	70	70	70	70	70	70	70
41	0.0054	T700 / TC1225 Tape	10	10	10	10	10	10	10	10	10	10	10

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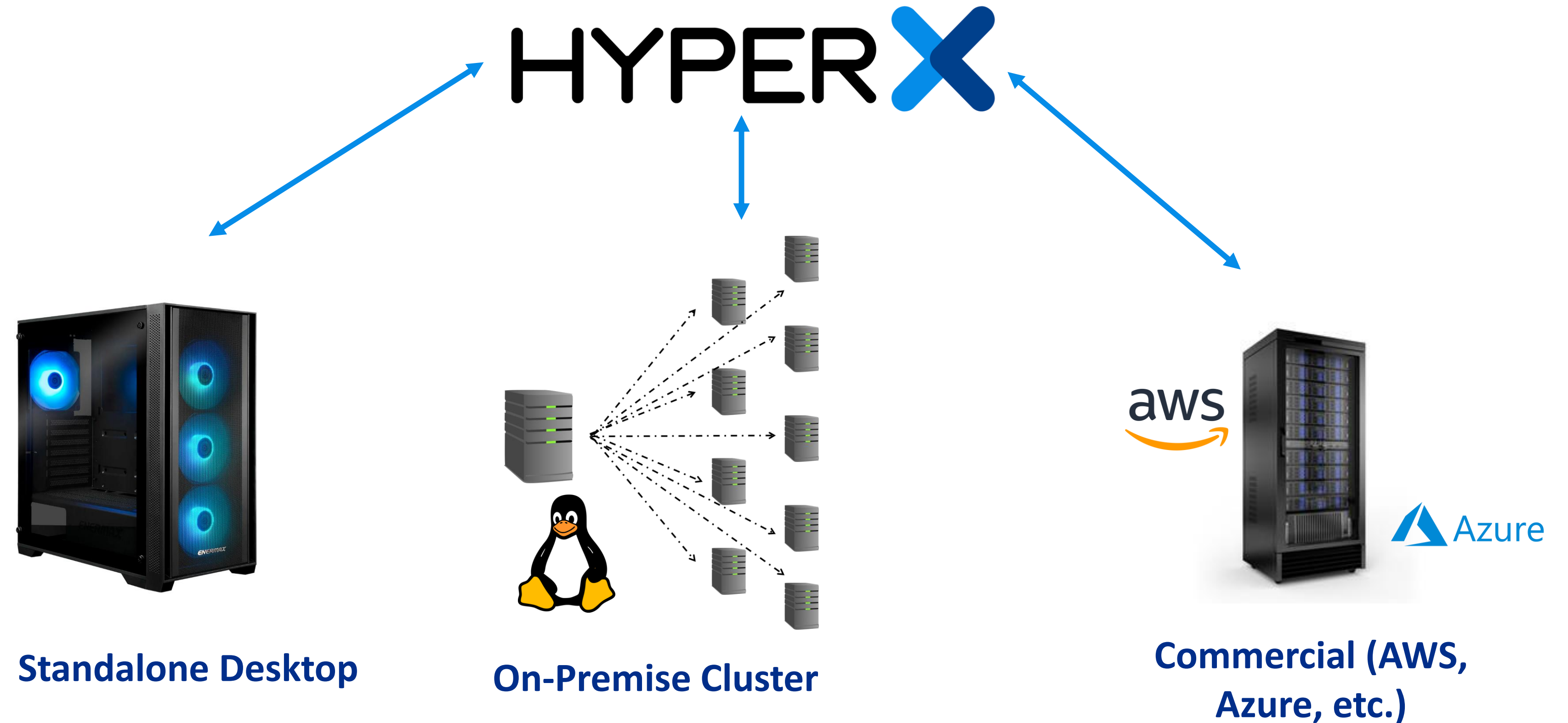


User Conference Presentations – Collier –

New Capabilities

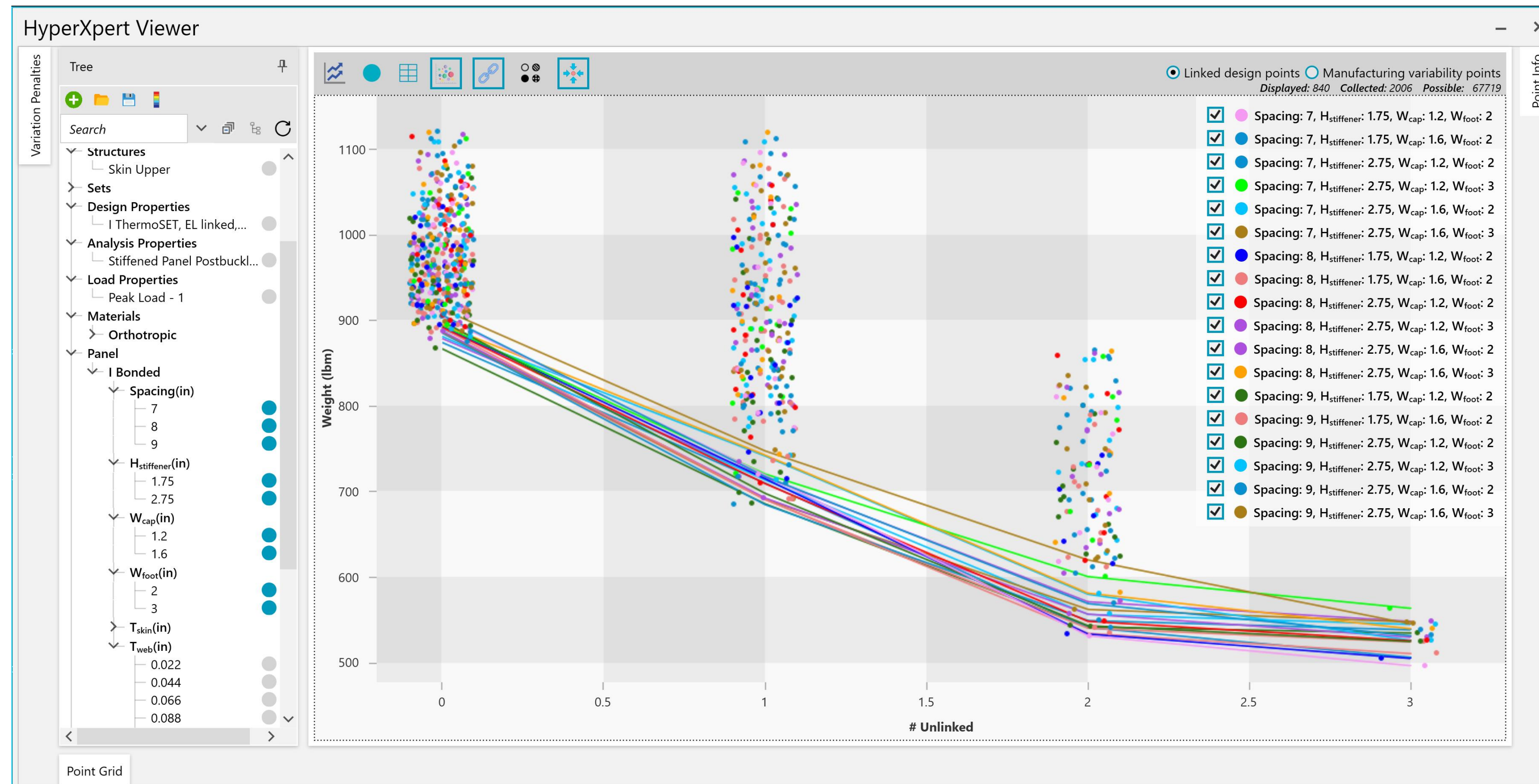
Collier Aerospace – Stephen Jones: VP Product Development

→ New HyperSolver Multithreaded/Multiprocessed High Performance Analysis & Sizing



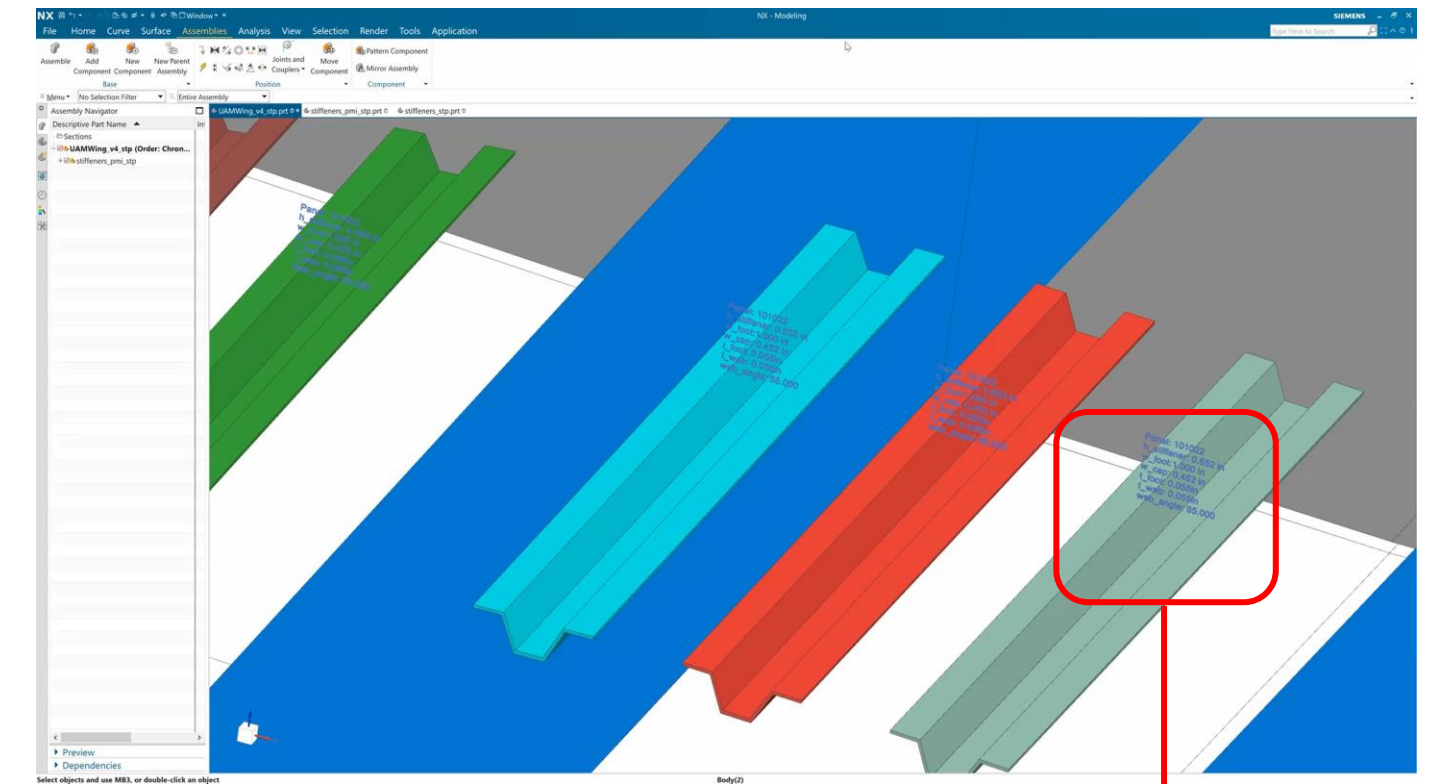
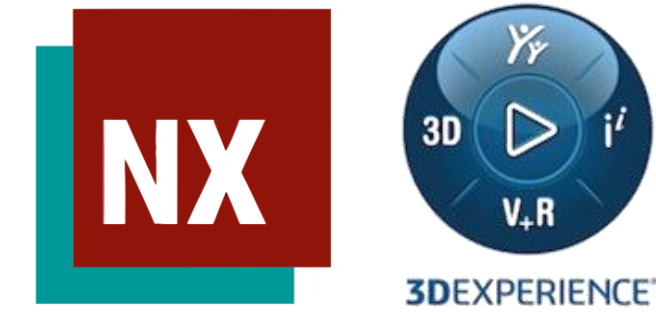
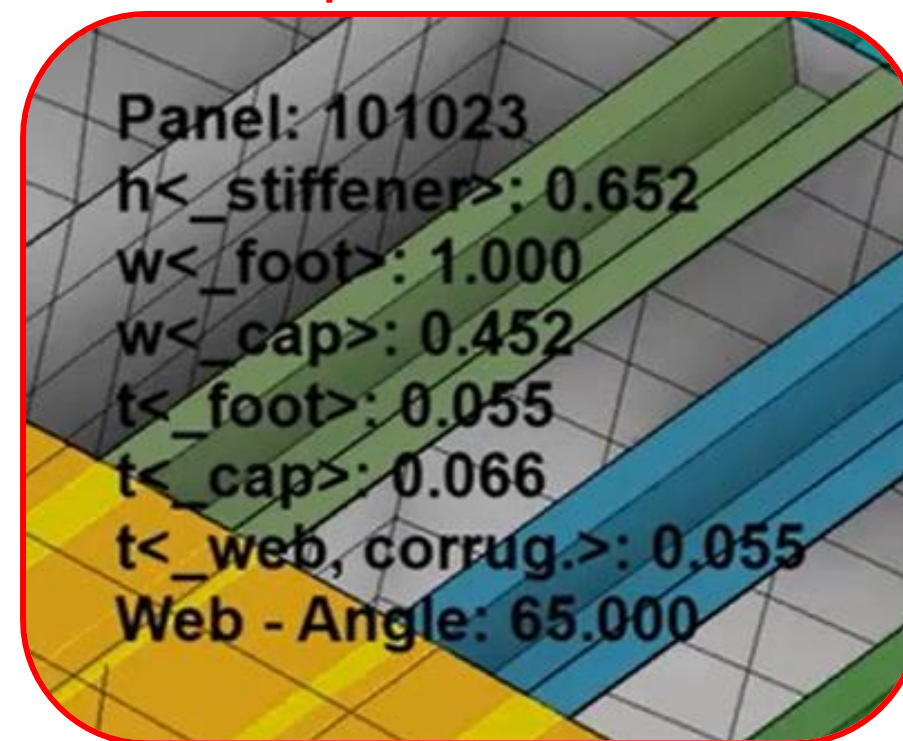
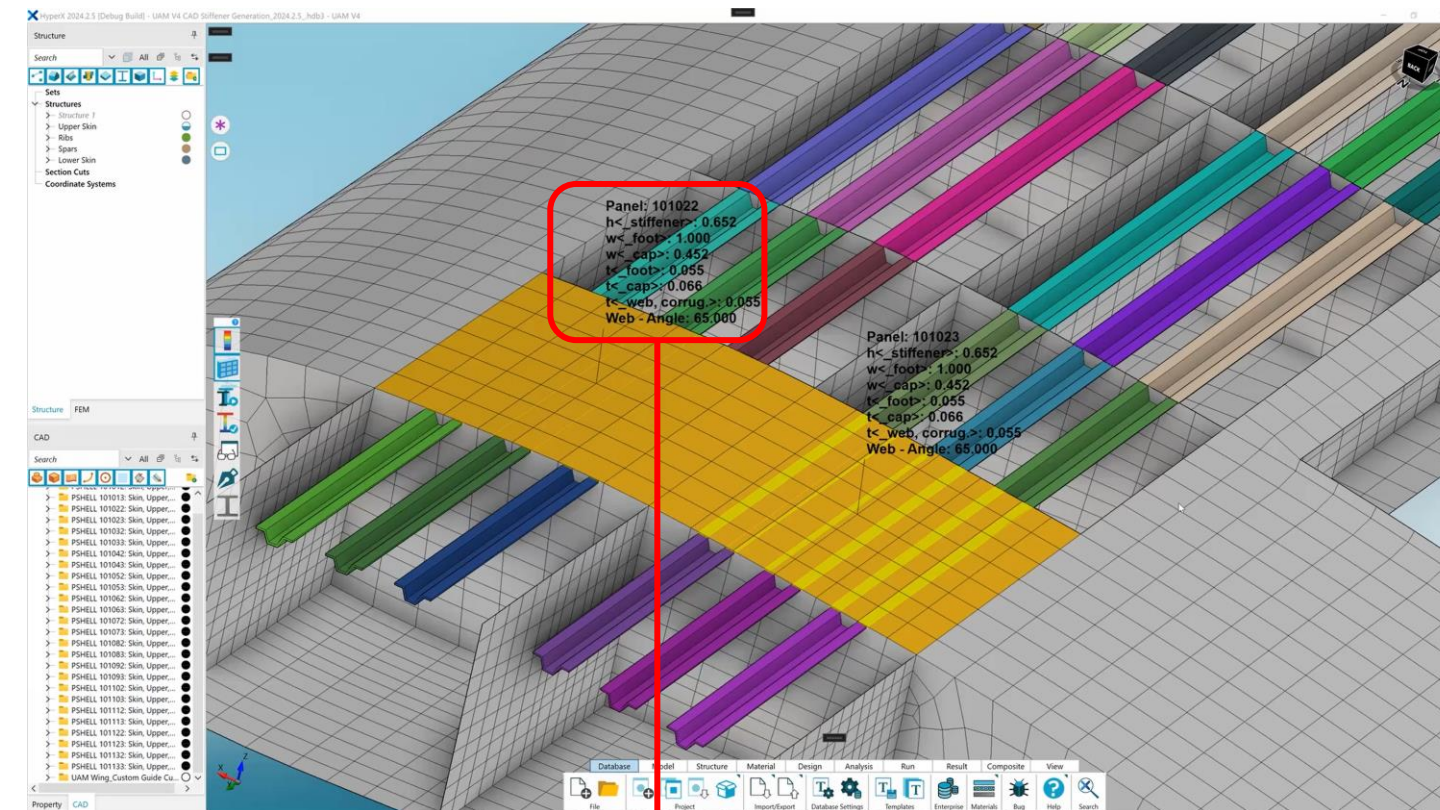
Collier Aerospace – Craig Collier: CEO, President, & Founder

→ HyperXpert for Finding Lightweight and Manufacturable Designs



34 | Collier Aerospace – August Noevere: Director of Research

→ HyperX Generated CAD and Metadata for Design Data Handoff from Analyst to Designer



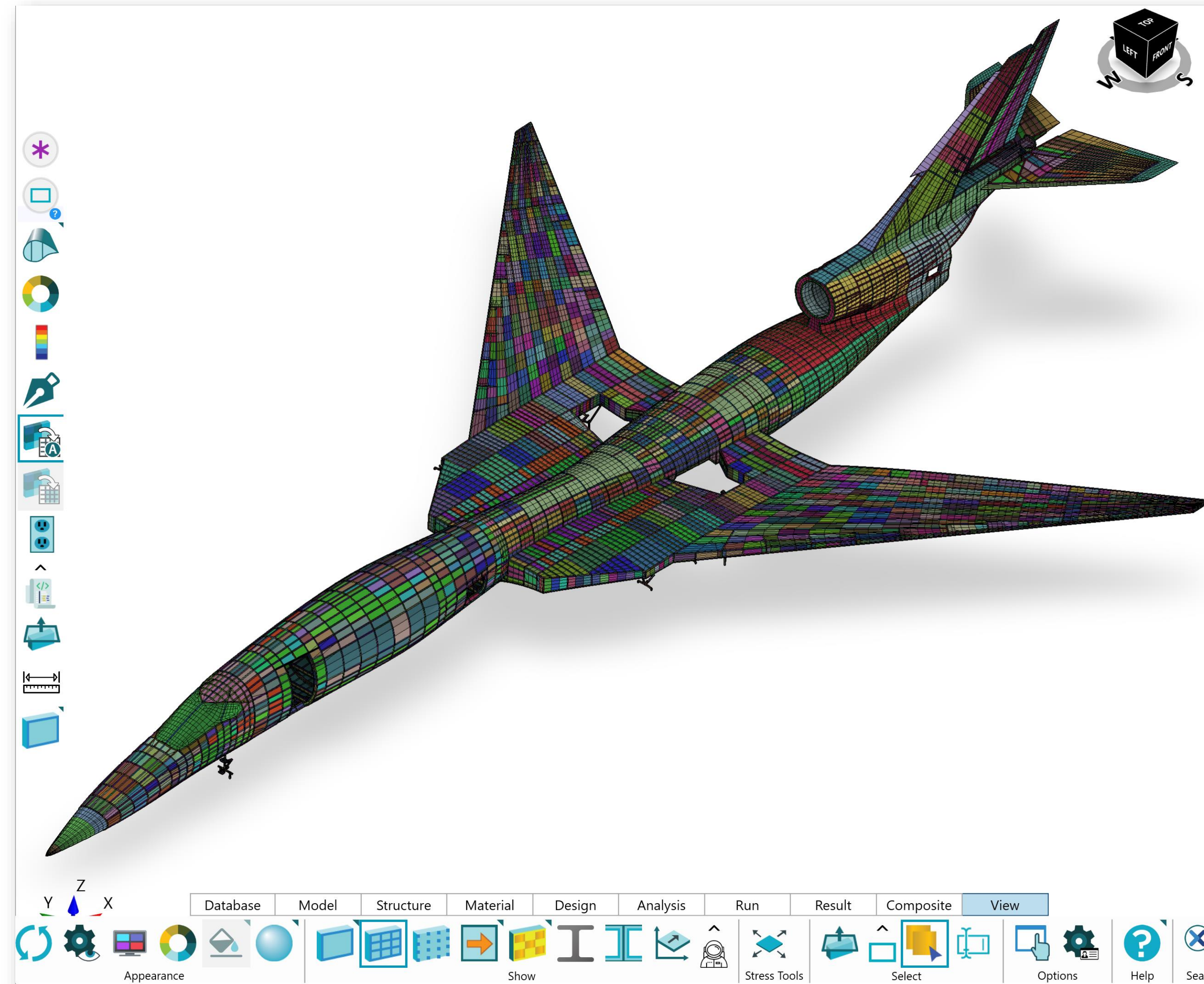
Collier Aerospace – James Ainsworth: VP Engineering Services

→ Engineering Services Providing HyperX Customers with Experienced Airframe Design & Analysis Know-How



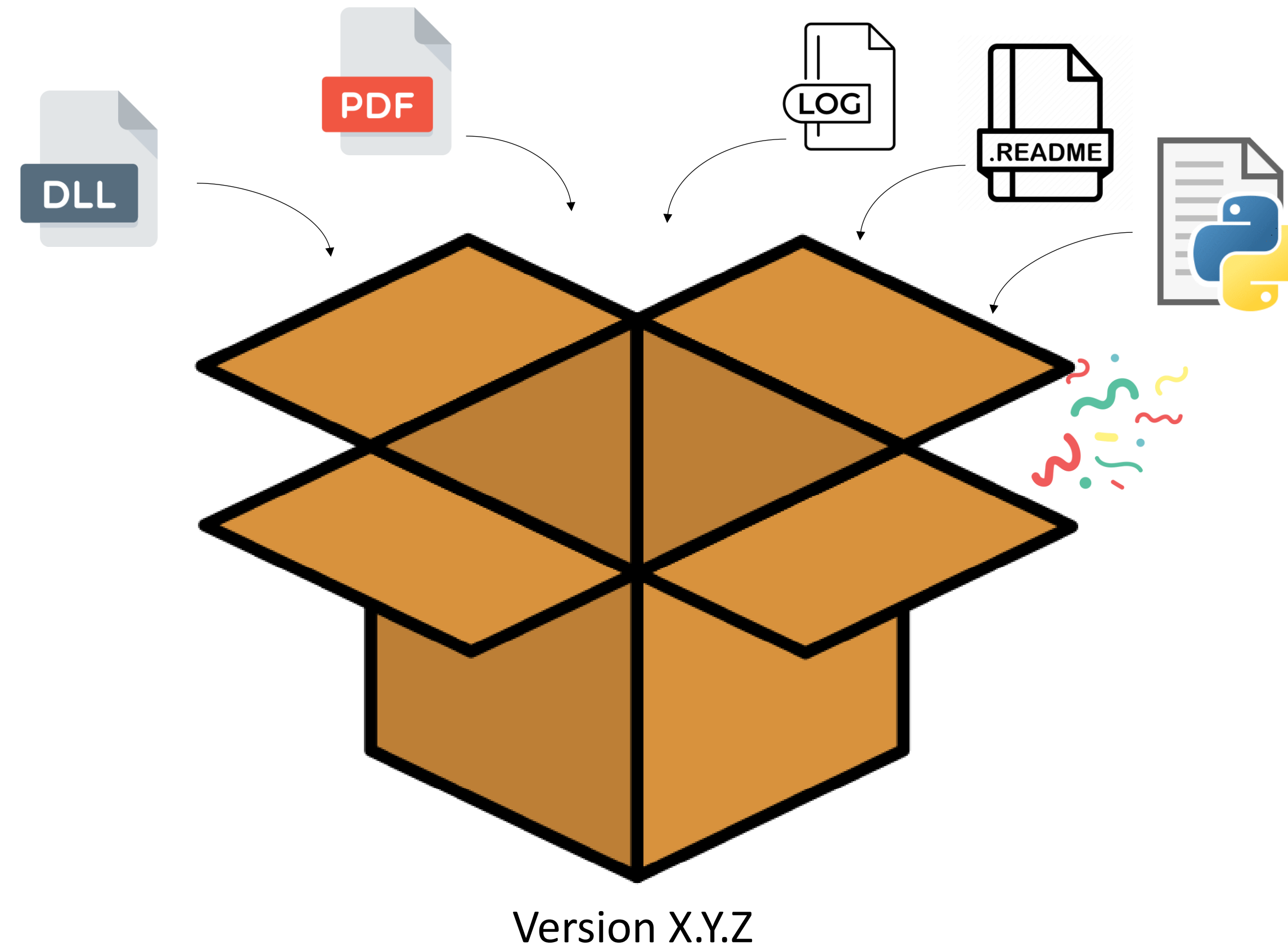
Engineering Services Providing HyperX Customers with Experienced Airframe Design & Analysis Know How

James Ainsworth: Vice President of Engineering Services



36 Collier Aerospace–Noah Prezant: Manager, Methods & Automation

→ Introducing Our Methods & Automation Services for Customizing HyperX for Customers



Collier Aerospace - Ryan McLoughlin - Aerospace Structural Engineer

→ High Performance Composite Bikes: Laminate Optimization When Every Ounce Lighter Matters

