





Webinar:
**LiftShip - Simulating Ship Module
Lifts and Turns with Femap**


Vicki Harris, ATA Engineering
December 16, 2021

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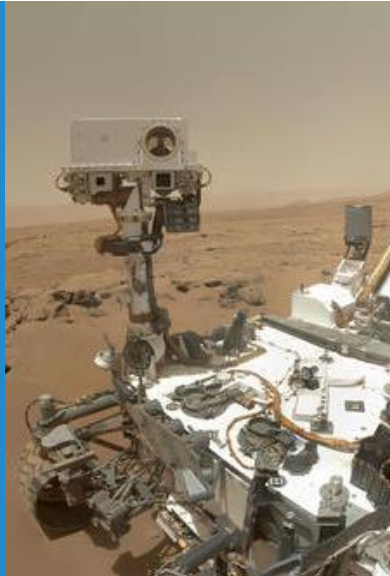
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 - Simcenter Femap
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 - Simcenter 3D
 - NX CAD & CAM
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The screenshot shows the top navigation bar with 'ATA ENGINEERING, INC.' logo and links for ABOUT, SERVICES, SOFTWARE, INDUSTRIES, PORTFOLIO, CAREERS, CONTACT, and a PROJECT INQUIRY button. The main content area is titled 'Siemens Solution Partner' and includes a paragraph about ATA's role as a VAR for Siemens Digital Industries Software CAE packages. Below this is a paragraph explaining their primary services role. Three product cards are displayed: 'NX' (next-generation digital product development system), 'Solid Edge' (industry-leading mechanical design system), and 'Simcenter Femap' (finite element analysis modeling solution). Each card includes an image, a brief description, and a 'LEARN MORE' button.

The screenshot shows the top navigation bar with 'ATA ENGINEERING, INC.' logo and links for ABOUT, SERVICES, SOFTWARE, INDUSTRIES, PORTFOLIO, CAREERS, CONTACT, and a PROJECT INQUIRY button. The main content area is titled 'SOFTWARE SUPPORT HOTLINE' and includes a paragraph describing the live hotline's comprehensive technical support. Below this is a paragraph stating the current contact information: 877-ATA-4CAE (877-282-4223) from 5:00 AM to 5:00 PM Pacific or anytime through the web interface. Two images are shown: a man working on a laptop and hands using a tablet. Below the images are two sections: 'Events and Training' (ATA has more than a decade of experience in the development of training materials) and 'Free Resources' (Our software website also hosts a variety of training materials, including whitepapers, training videos, and tutorials). Each section includes a 'VIEW' button.


The advertisement features a large image of a person in a white protective suit standing in a large industrial tunnel. A Siemens logo is in the top left. A blue box in the bottom right contains the text: 'Femap', 'Powering today's most advanced engineering analysis environment', and the URL 'siemens.com/plmfemap'.




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LiftShip

Simulating Ship Module Lifts and Turns with Femap

Thursday 16 December 2021



Outline

- The NSRP LiftShip Program
- ATA's Femap Tools for LiftShip
 - The Lift and Turn Workflow
 - The Femap API
 - Model Generator Tool
 - Lift and Turn Tool

LiftShip Overview




WORKBOAT NEWS BLOGS RESOURCES EVENTS

HOME SHIPYARD WORKER KILLED IN CRANE ACCIDENT

Shipyard worker killed in crane accident

By Workboat Staff on OCTOBER 18, 2012

SHARE f t in



ERIE, Penn. – Craig Plyler, a 48-year-old employee of **Donjon Shipbuilding & Repair** here, was killed yesterday morning when he became tangled in machinery while servicing a crane 100 feet in the air. According to Erie County coroner Lyell Cook, he was killed almost instantly as a result of "trauma injuries."



Why do we have these failures

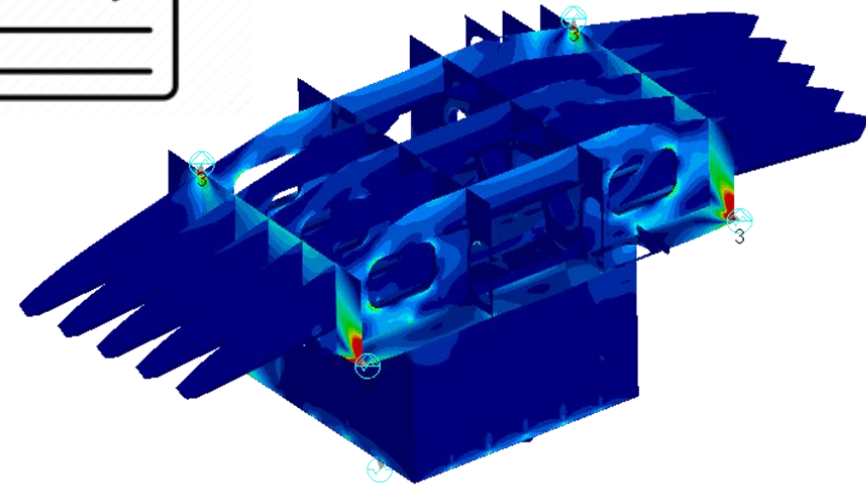
- Equipment:
 - Damaged
 - Overloaded
- Environmental:
 - Wind
 - Rain
 - Snow & Ice
- Calculation Issues:
 - Assumptions due to complexity and/or incomplete information
 - Using past project data which may be similar but not the same
 - Changes made after calculations performed

Lift Calculations

- Organizations define risk-based criteria for classifying 'critical' lifts
- Engineering calculations mitigate risk for each lift category

Many ways to perform lift calculations:

- pencil, paper, and a calculator
- spreadsheets
- finite element analysis software (FEA)



Finite Element Analysis Software

- FEA offers highly-detailed insights into structural integrity

So - Why isn't FEA used?

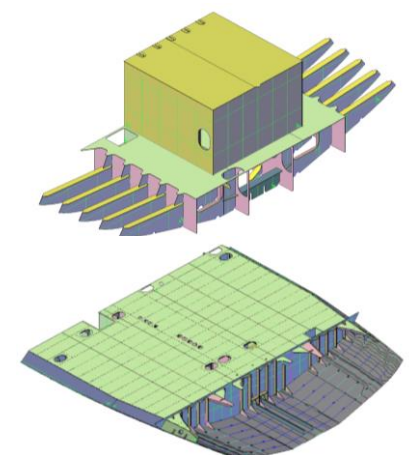
- FEA software requires a high level of expertise to efficiently develop models that yield accurate results. Even with expertise, development of models is tedious requiring significant labor.
- Legacy hand calculations are much faster and can often mitigate risk of large-scale failure with sufficient conservatism (*assumptions adding factors for additional margin*)
- The benefits of speed (schedule & budget) and simplicity outweigh the potential to identify local yielding, distortion, and need for support structure (which you could get by using FEA)

LiftShip

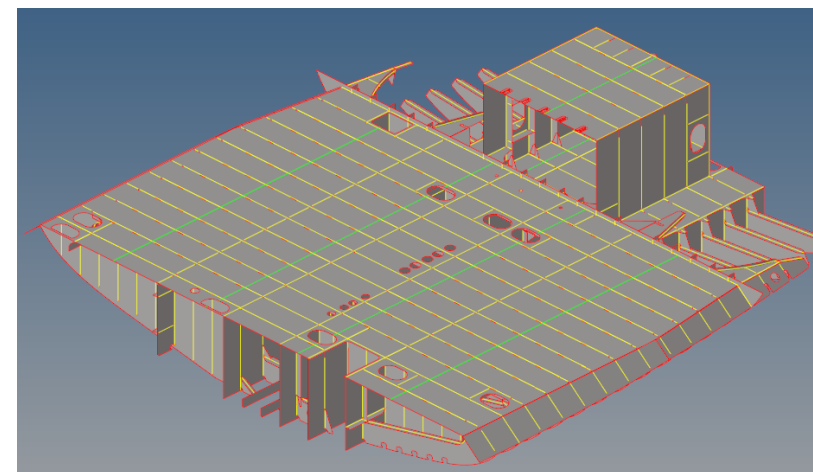
What if we can tip the balance and achieve the accuracy benefits of FEA in less time by automating the FEA process as much as possible?

LiftShip 1

Automation of geometry translation from ShipConstructor CAD software to Femap FEA software



CAD Model



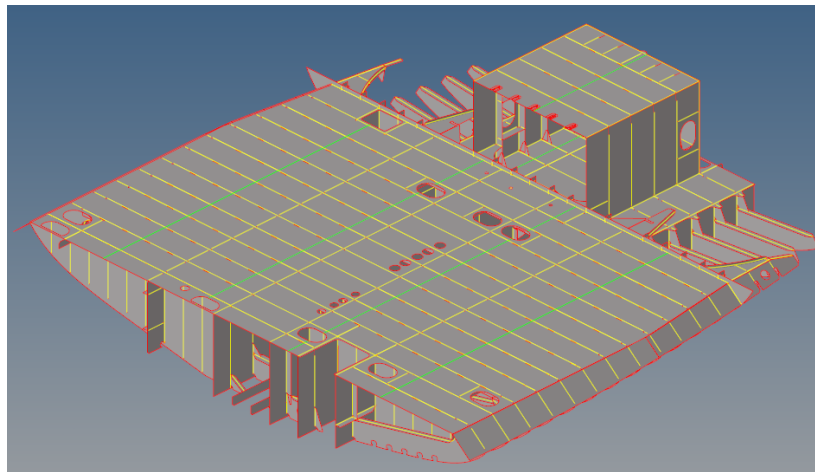
FE Model

LiftShip

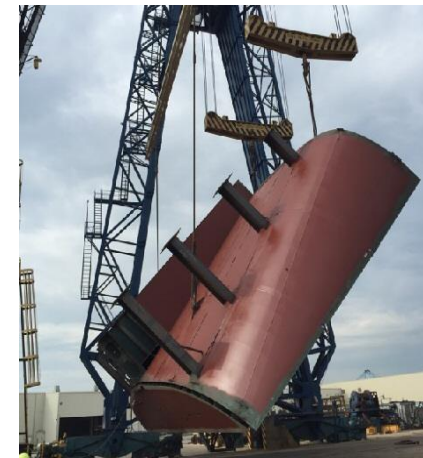
What if we can tip the balance and achieve the accuracy benefits of FEA in less time by automating the FEA process as much as possible?

LiftShip 2

- Lift & Turning (complex Lift Analysis)
- Level of Detail on geometry translation to the FE software
- Enhanced Visual Reporting



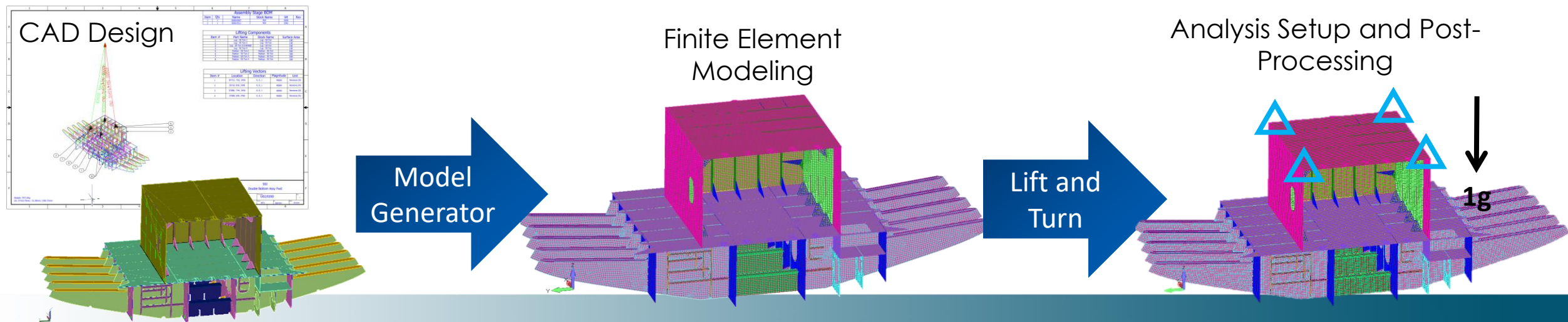
FE Model



Lift and Turn

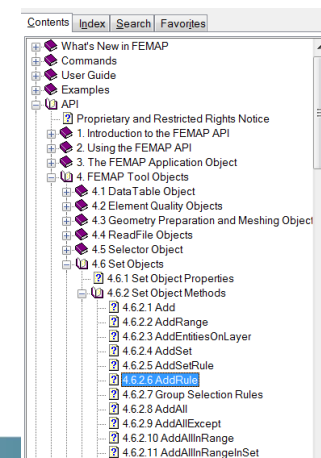
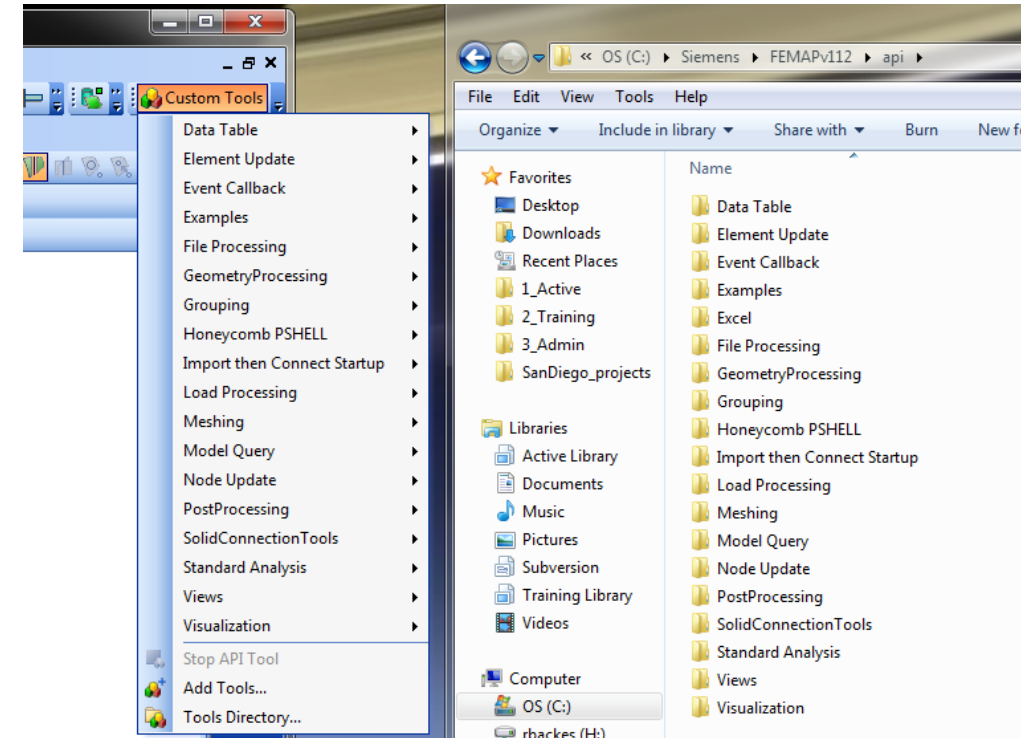
ATA's Lift/Turn Analysis Procedure

1. Translate geometry from ShipConstructor to Femap using Model Generator
2. Mesh ship module
3. Define lift steps using Lift and Turn
4. Analyze lift process
5. Review results
6. Add support structure (if necessary)
7. Analyze lifting solution again and check that support structure has resolved issues



The Femap API

- API (Application Program Interface)
 - The term API technically refers to the language and libraries that can control Femap
 - It's also used to refer to individual API programs
- Instead of opening Femap and clicking on tools or entering data manually, an API does the same tasks either inside Femap or from another program like Excel
 - Uses Microsoft's OLE/COM framework
 - Native language is Visual Basic (VB), but other languages can be used (Python, C#...)
 - Contains virtually every command in Femap
- FEMAP API enables the user to automate repetitive or tedious tasks via computer code by providing access to the objects in the model and FEMAP functionalities



Home > API > 4. FEMAP Tool Objects > 4.6 Set Objects > 4.6.2 Set Object Methods > 4.6.2.6 AddRule

Femap®
Version 12.0

4.6.2.6 AddRule

AddRule
(id, ruleID)

Description:

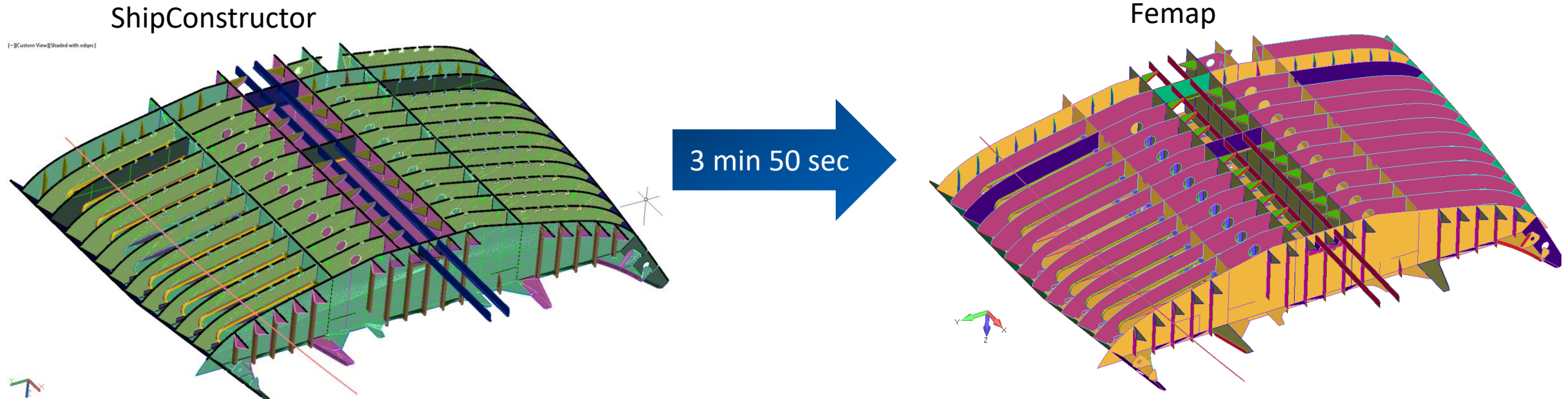
This function adds to a selection set by using one of the standard group selection rules.

Input:

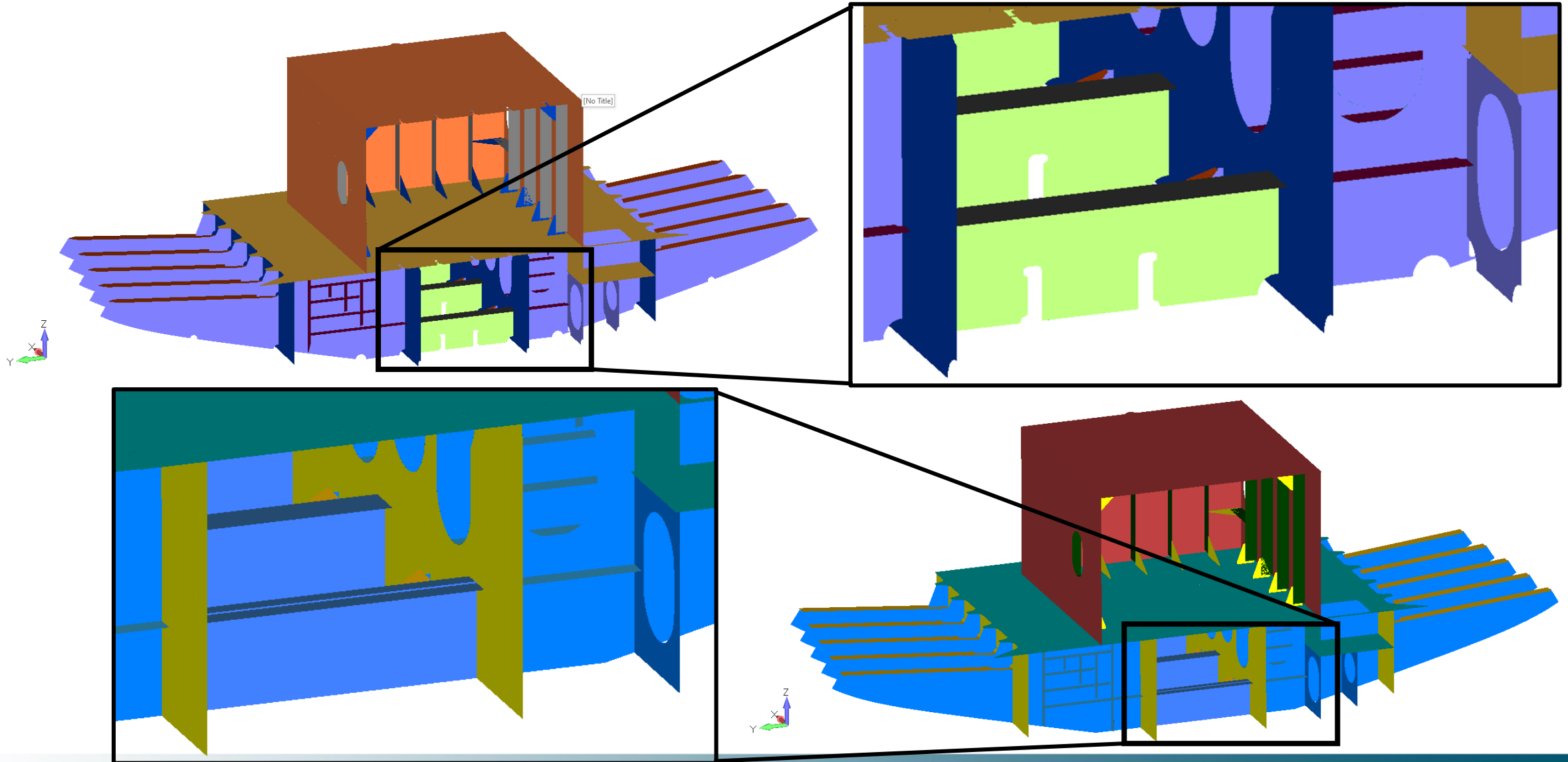
INT4 id	The ID that you are specifying. The interpretation of this value depends on the type of rule that you select.
INT4 ruleID	ID of a selection rule. For more information, see Section 4.6.2.7, "Group Selection Rules" .

Femap Model Generator

- Geometry information is extracted directly from ShipConstructor database and recreated in FEMAP, eliminating the time needed to export all part geometry from ShipConstructor
- Surface geometry is created in Femap with automatic assignment of entity names and physical and material properties, eliminating the time needed for manual property assignment and midsurfacing
- User selects of geometry level of detail
- All operations are executed by users through a graphical user interface (GUI)



Level of Detail is Controlled By the User





Model Generator Executes Through GUI

ATA / NSRP LiftShip to Femap Translator - LS2Femap 21.10.14

Translation Status

ShipConstructor Data to Translate

LiftShip data folder: 

ShipConstructor .pro file: 


Username:

Password:

Use Windows Authentication

Retain intermediate files (*.sxn) containing exported ShipConstructor data

FEM Generation Parameters

Folder for output Modfem file: 

Root name for Modfem file:

Structural plate details:

- Include plate edge cutouts
- Include plate corner treatments
- Include plate penetrations

Stiffener details:


- Include stiffener endcuts
- Include stiffener web and flange cutouts

Join (extend/trim/imprint) generated surfaces

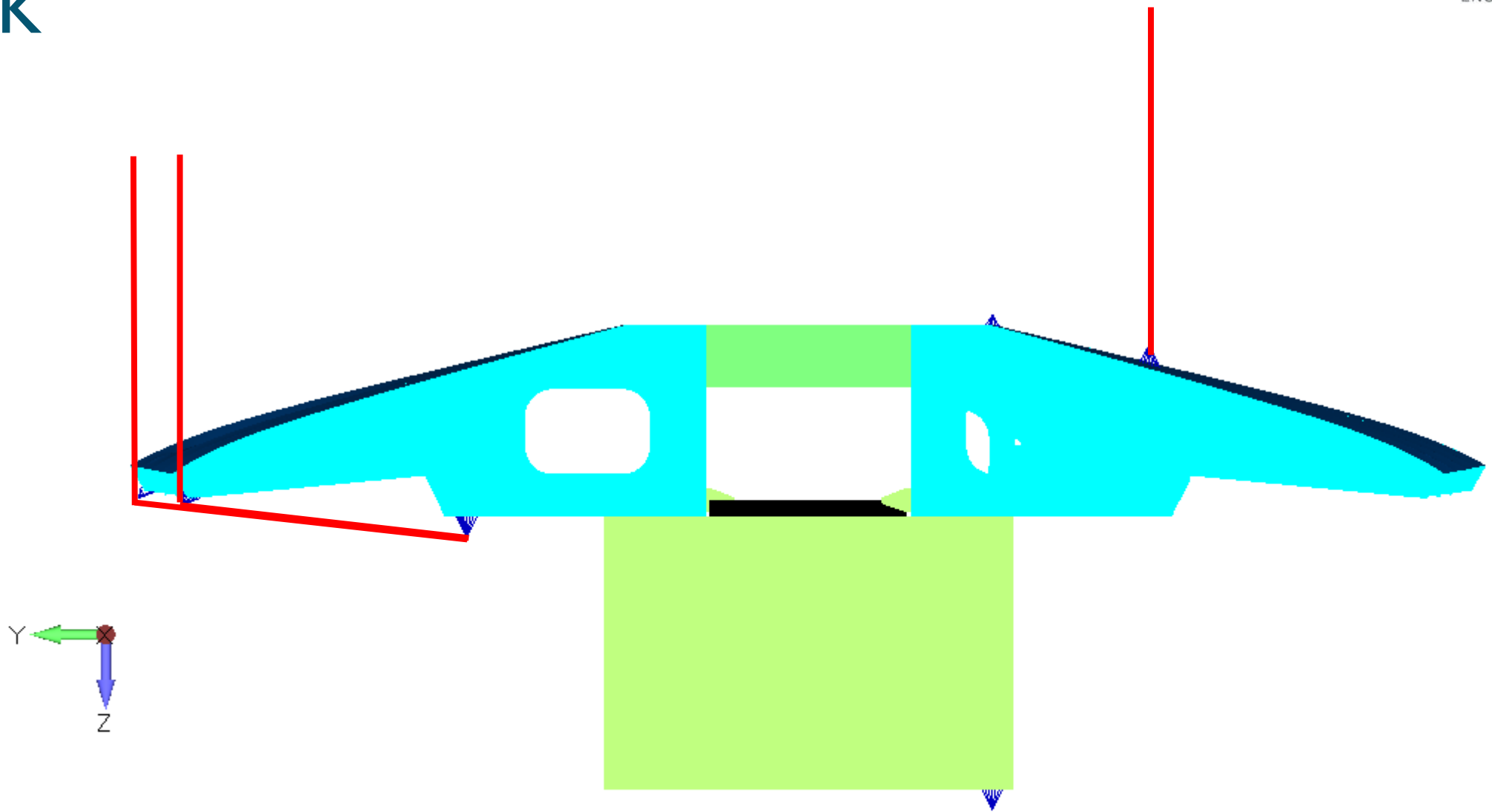
- Join even when some surfaces fail
- Generate mesh on completed geometry

Translate

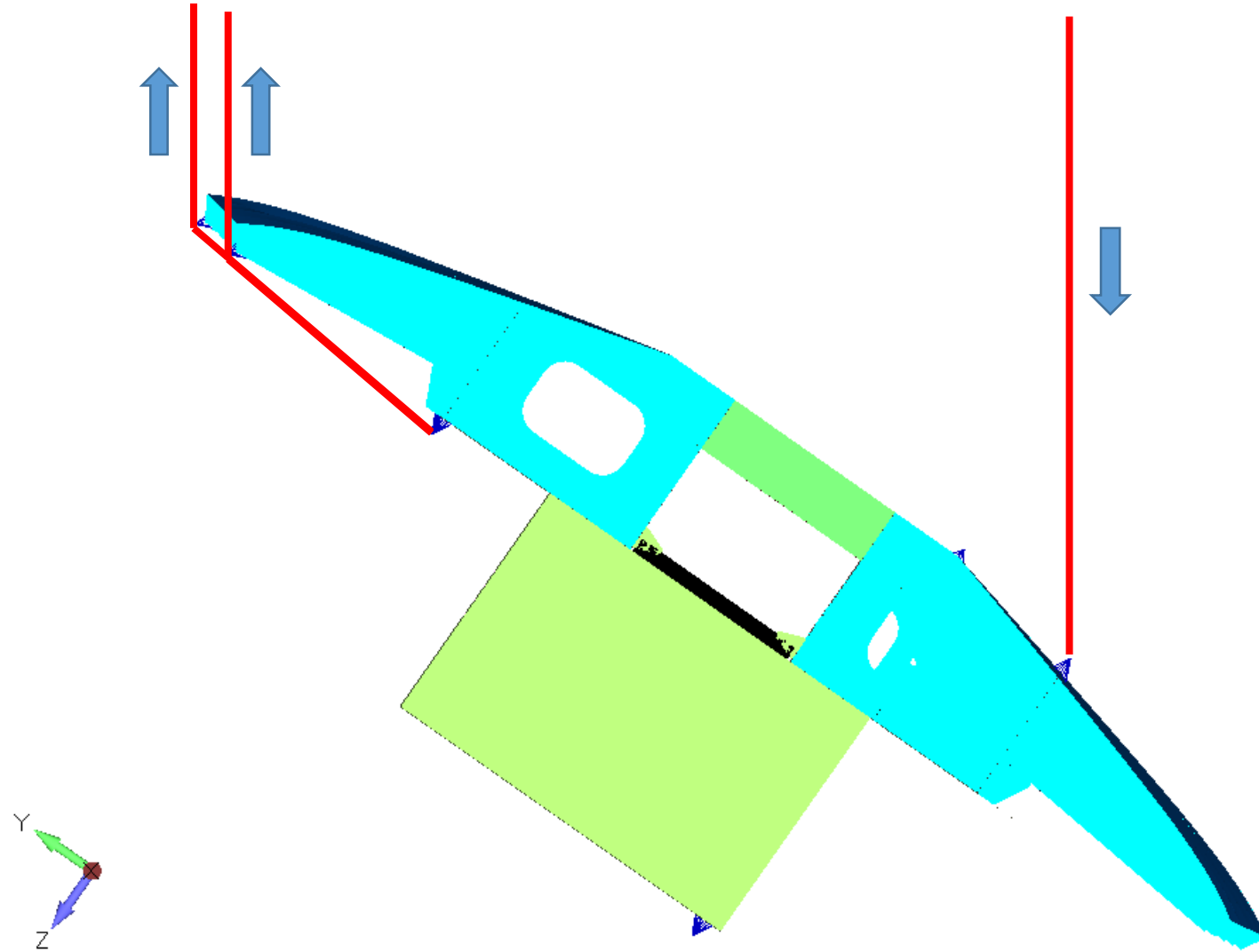
Done



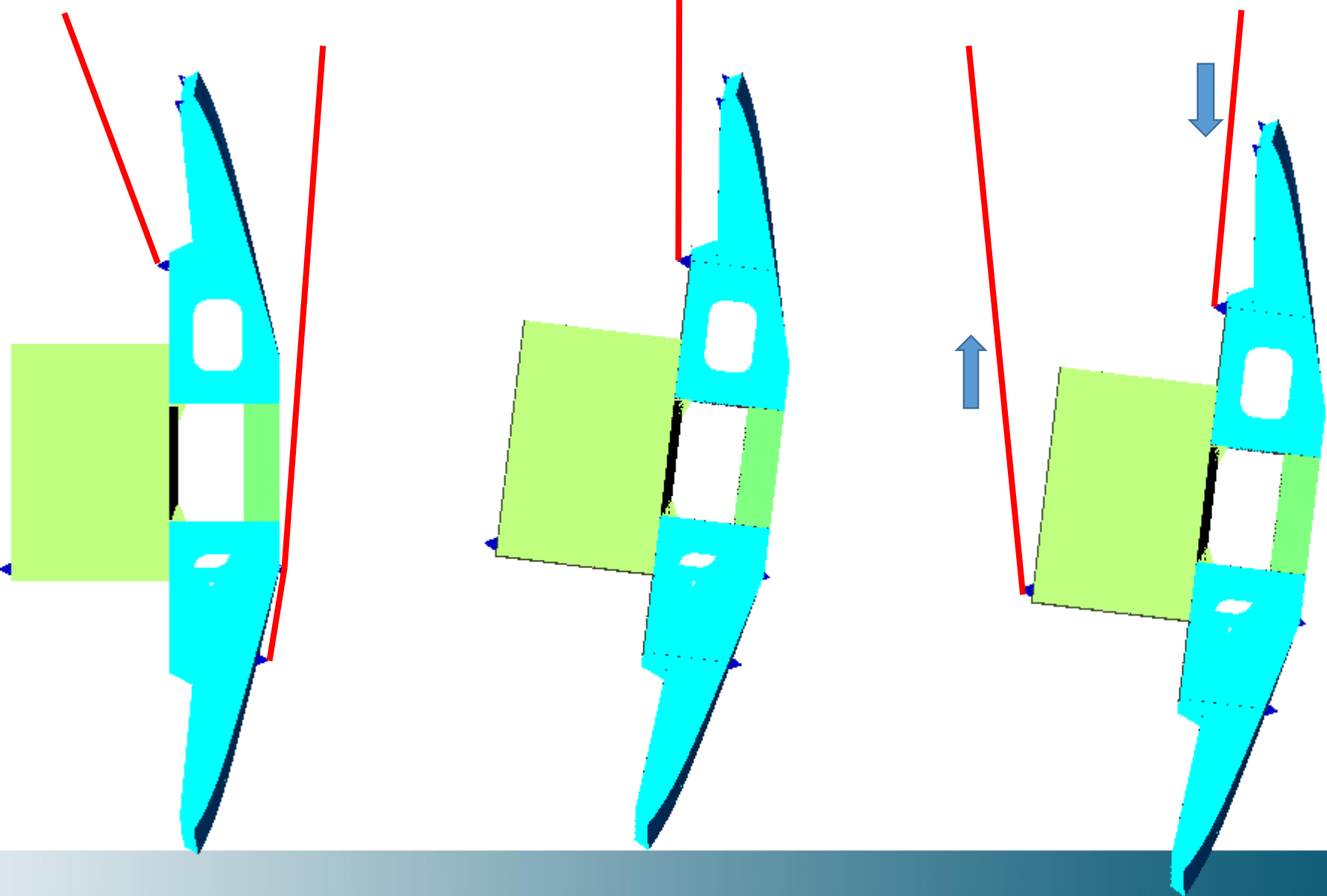
Pick



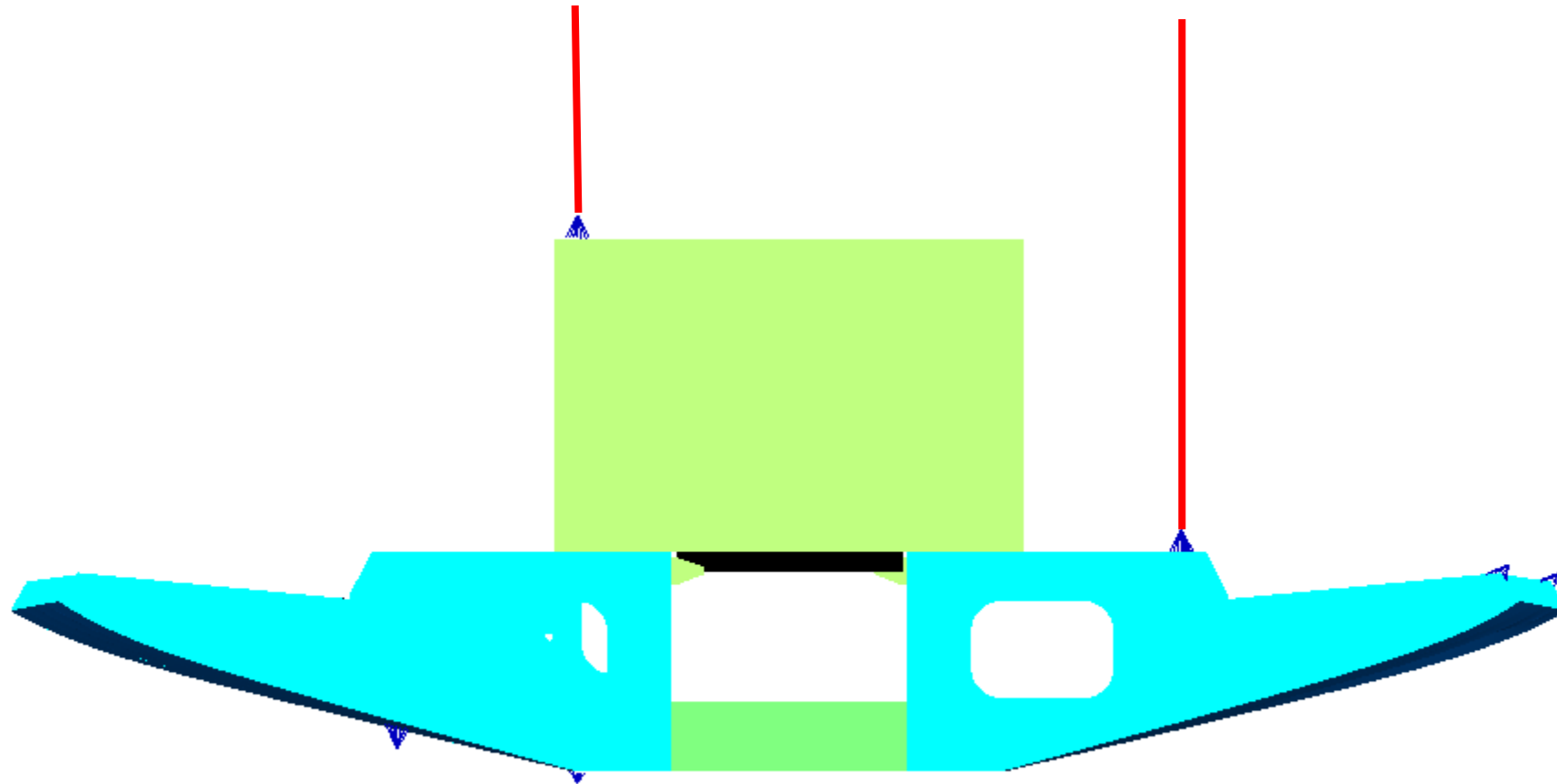
Turn



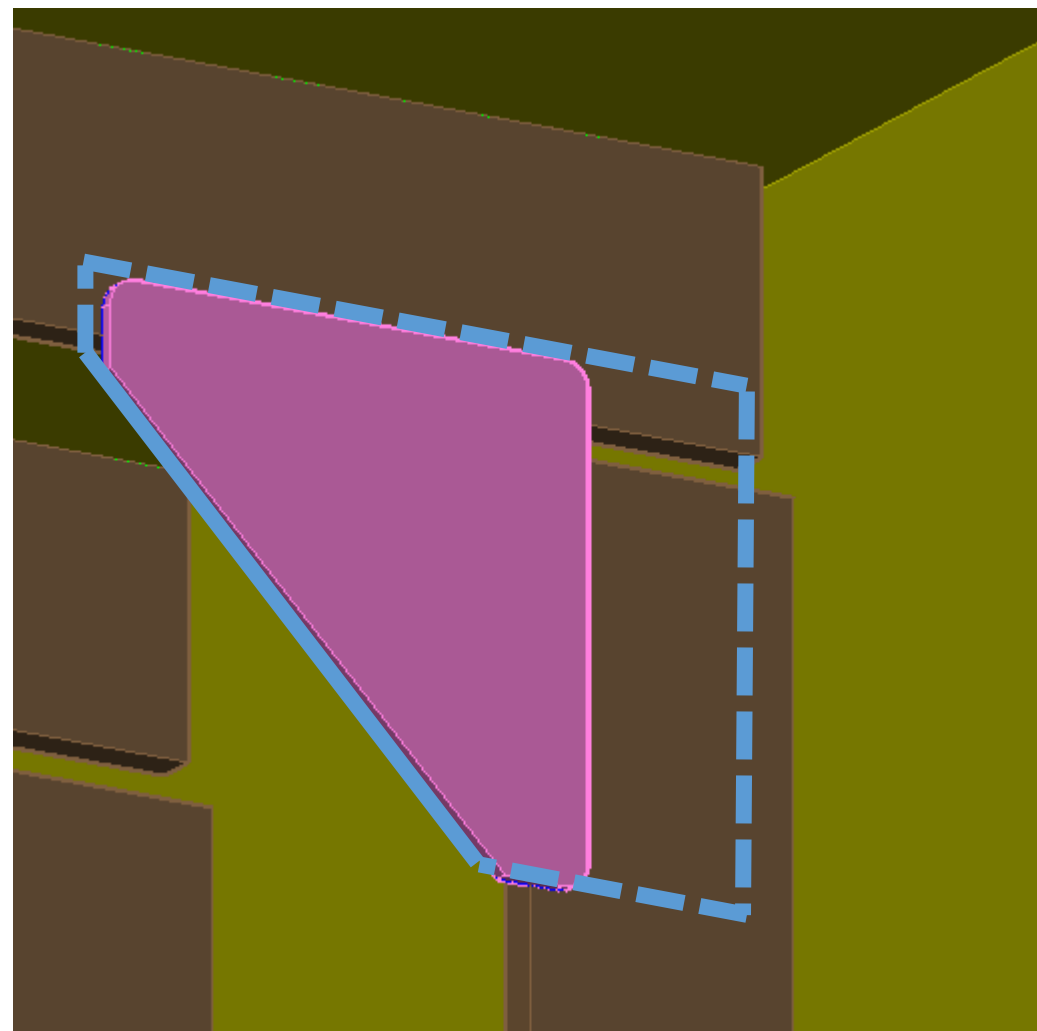
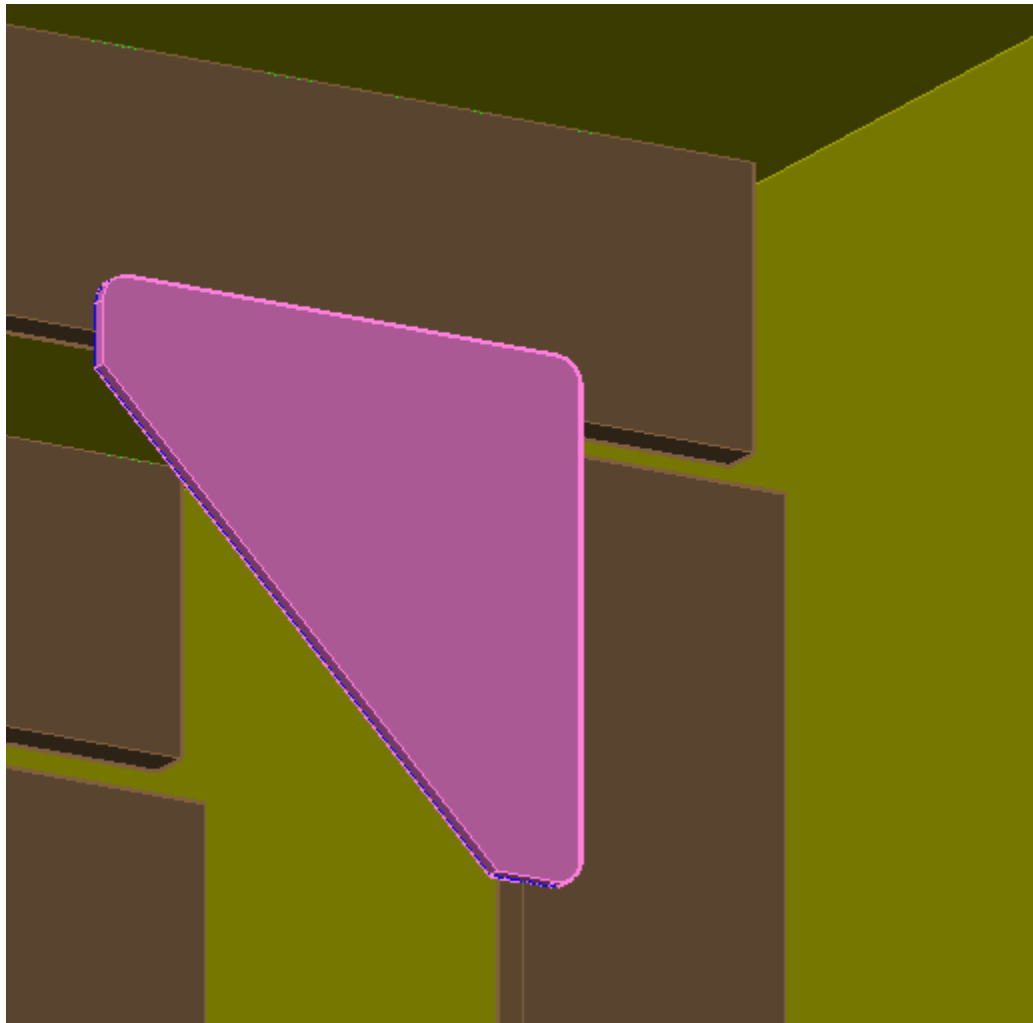
Free Hanging



Upright

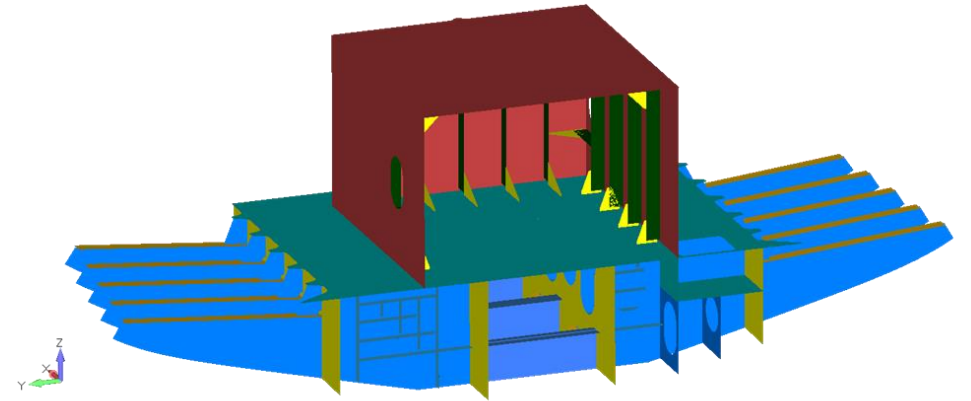


Stress Solution - Add A Reinforcing Plate



Quantitative Cost Analysis

- If our customer asked us to assess a lift of the demonstration module, we estimate it would be a 44-hour level of effort for ATA engineers.
- By leveraging the tools developed under this program, we estimate a 50% savings in effort.



Task	Standard Methods	With LiftShip Femap Tools
Geometry Preparation & Quality Checking	20 hrs.	4 hrs.
FE Meshing	8 hrs.	8 hrs.
Setup of Loads & Constraints	8 hrs.	1 hrs.
Results Post-Processing and Reporting	8 hrs.	8 hrs.
Total Labor Savings:		~ 50%

Summary

- LiftShip is an NSRP program for automating the simulation of ship module lifts and turns
- ATA Engineering is using the Femap API to produce a suite of LiftShip tools
 - Model Generator automates the ShipConstructor to Femap translation
 - Lift and Turn automates the setup of lift/turn analysis
- Combined use of tools should result in significant time savings

Questions?

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