

Simulation Projects Overview

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Fall 2009

Outline

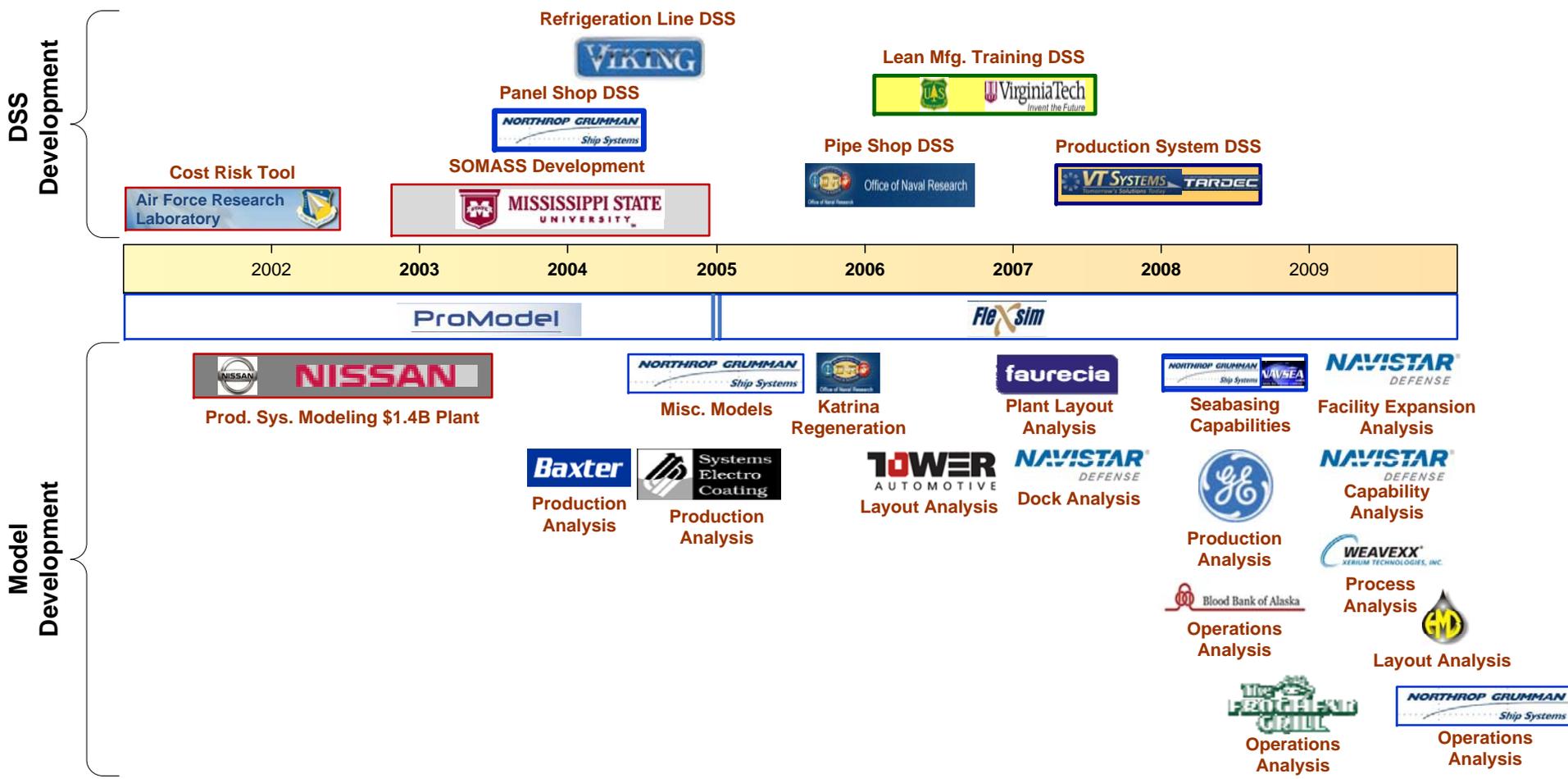
- Overview
 - About CAVS Extension
 - Simulation Timeline
- Simulation Models
 - Nissan Production Model
 - Navistar Defense
 - Navsea Seabasing
- Decision Support Systems
 - VT Halter Marine DSS

About CAVS Extension

- Overall Economic Impact
 - \$3,079,062,131 saved
 - 50+ companies helped
- Simulation Modeling
 - 25+ applied projects
 - ~ \$100 million saved
- Training
 - Six Sigma, Minitab, Simulation Modeling and Analysis, 3D Modeling, Quality Tools, Lean Manufacturing, Logistics, Ergonomics



Simulation Model Development



Nissan Production Model



Project Overview

Model the operations of the plant from the body shop through pre-delivery. The plant produces four vehicle platforms – Titan, Quest, Armada and Altima.

Questions:

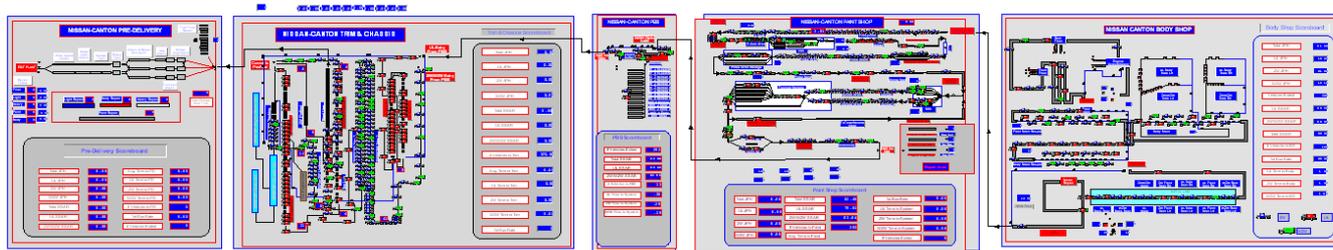
- Analyze any constraints that prevent the achievement of key performance measure.
- Provide recommendations for improvements to the facility.
- Analyze scenarios raised by Nissan engineers with layout and resource alternatives.

Nissan Production System Model



INTEGRATED MODEL SCOREBOARD

	Total JPH	UL JPH	ZW JPH	WZW JPH	1st Run Rate	UL Time in System	ZW Time in System	WZW Time in System
Overall	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Body Shop	51.64	28.47	21.06	22.13	98.86	1.46	1.49	1.48
Paint Shop	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
PBS						-34	-29	-29
Trim & Chassis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pre-Delivery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total SSAR	UL SSAR	ZW/ZW SSAR	# Vehicles in System	# Vehicles Exited	UL STAR	ZW STAR	WZW STAR
Overall	0.00	0.00	0.00	0	0	0.00	0.00	0.00
Body Shop	98.86	99.20	98.66	121	695			
Paint Shop	82.45	79.81	79.81	392	0			
PBS	82.82	81.00	83.77	13	291			
Trim & Chassis	0.00	0.00	0.00	273	0			
Pre-Delivery	0.00	0.00	0.00	0	0			



Springfield Assembly Plant Simulation for FMTV



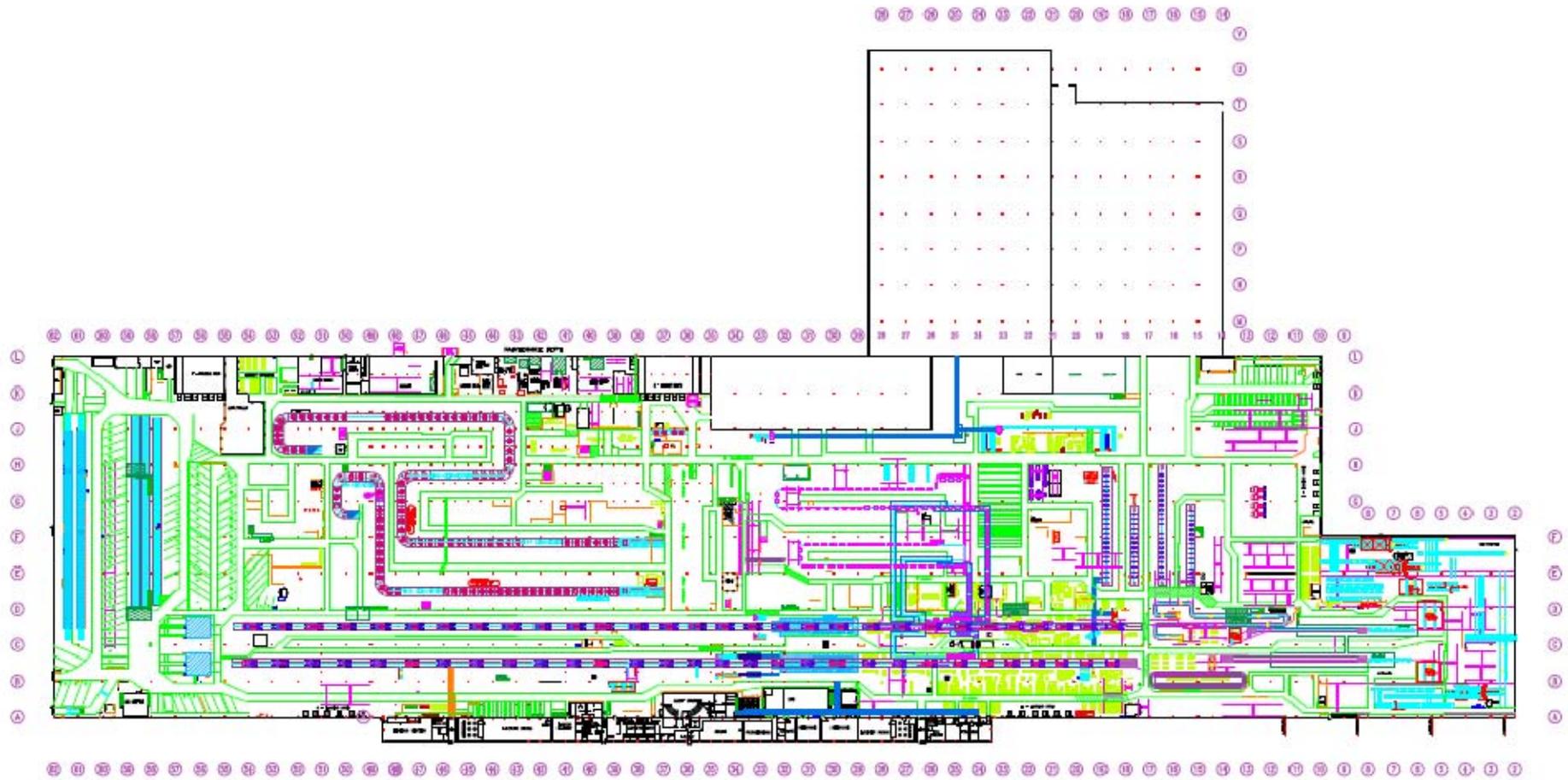
Project Overview

Model the operations of the plant including production vehicle movement through the facility, vehicle road tests, test and tune operations, government sign-off, finished goods storage, and shipping.

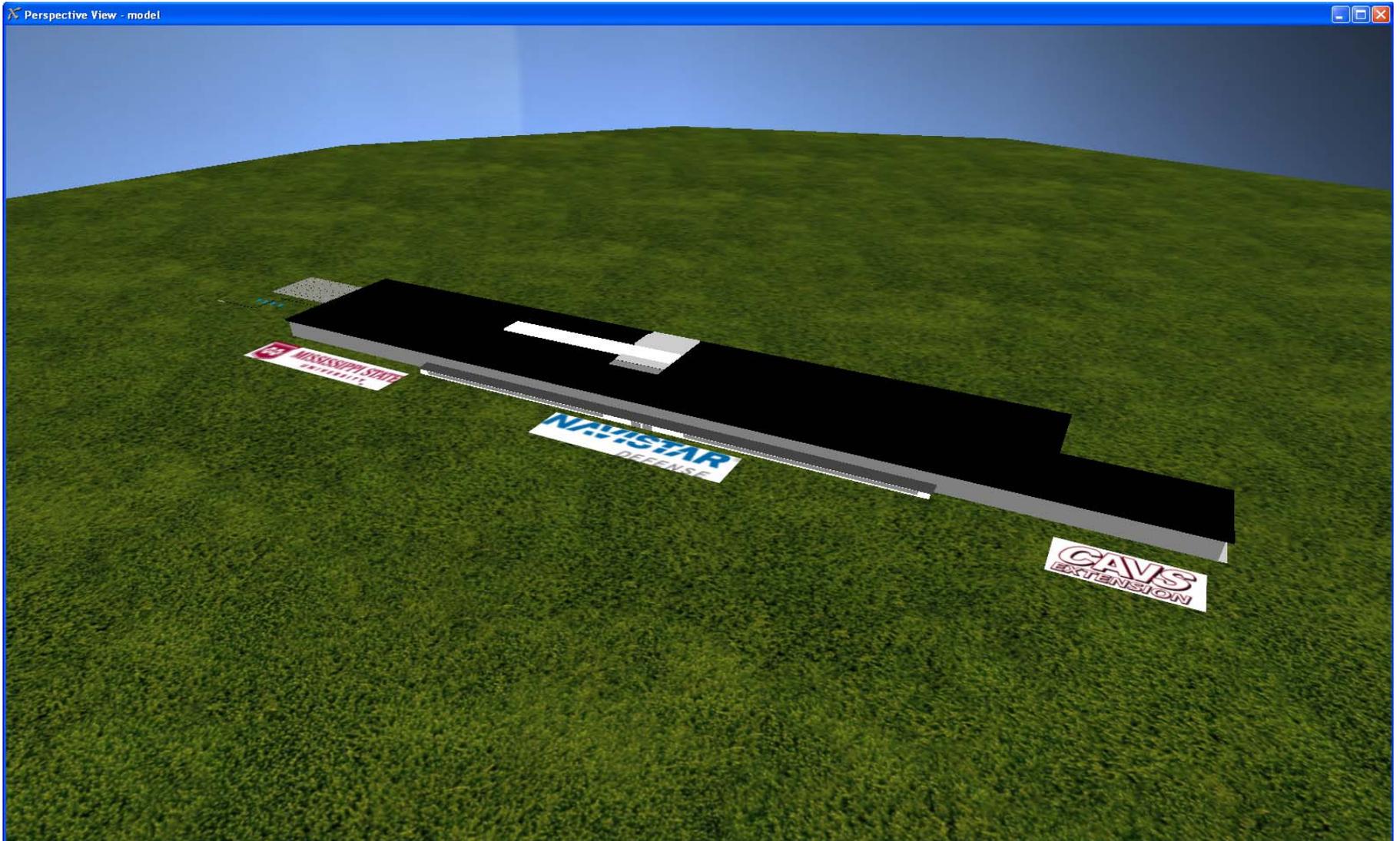
Questions:

- How many bays are needed in the DCMA building to perform repair and government sign-off operations?
- How many bays are needed for test and tune operations?
- How much parking area is required to stage finished goods?
- How many vehicle shipping ramps are required to be able to ship vehicles on time?

Layout



Simulation Model



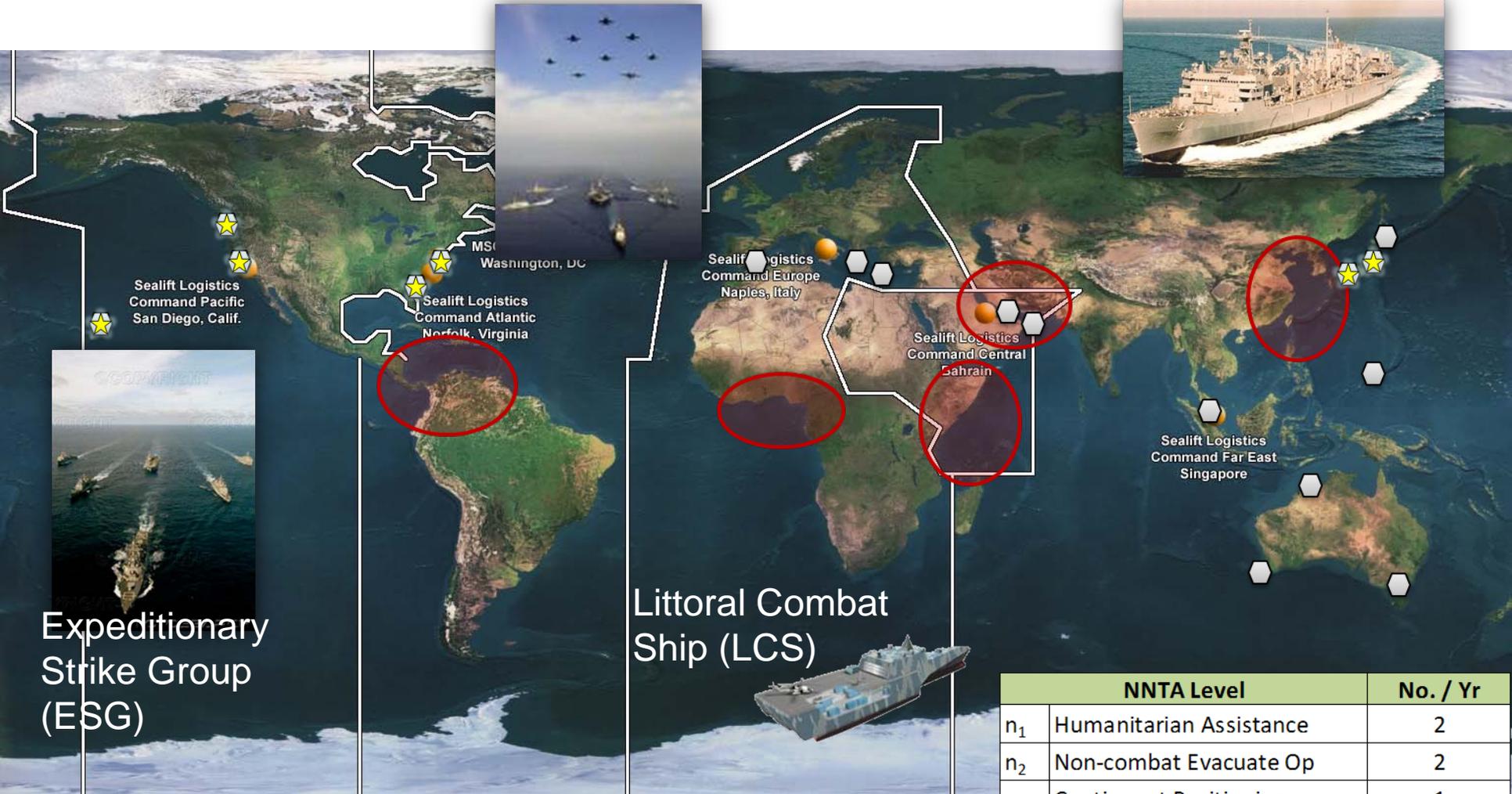
Simulation Modeling and Analysis Support for Seabasing Capability Studies



NORTHROP GRUMMAN

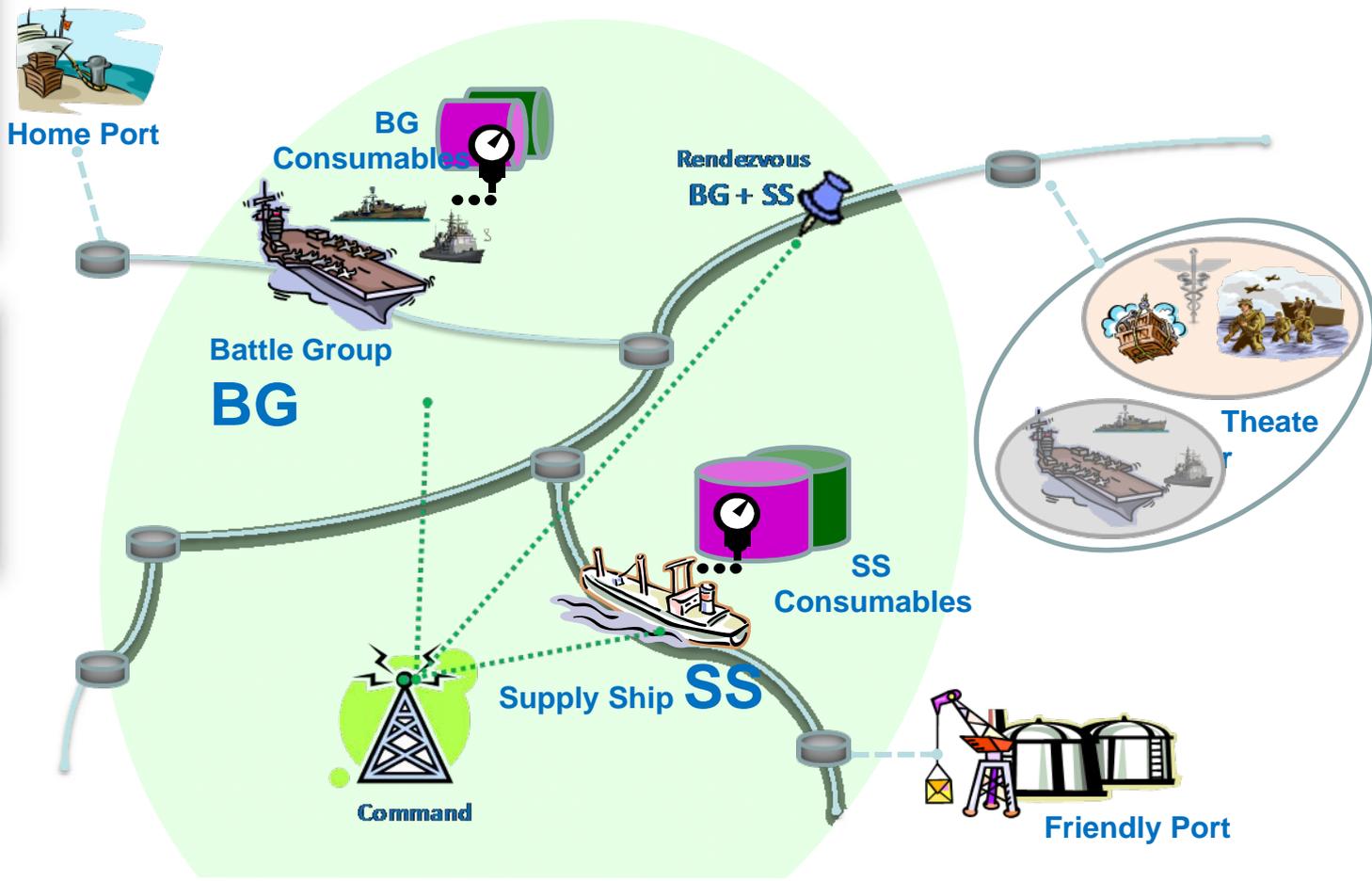
Carrier Strike Group (CSG)

Supply Ships



NNTA Level		No. / Yr
n ₁	Humanitarian Assistance	2
n ₂	Non-combat Evacuate Op	2
n ₃	Contingent Positioning	1
n ₄	Show of Force	3
n ₅	Combat	3

Conceptual model & key objects



General modeling approach



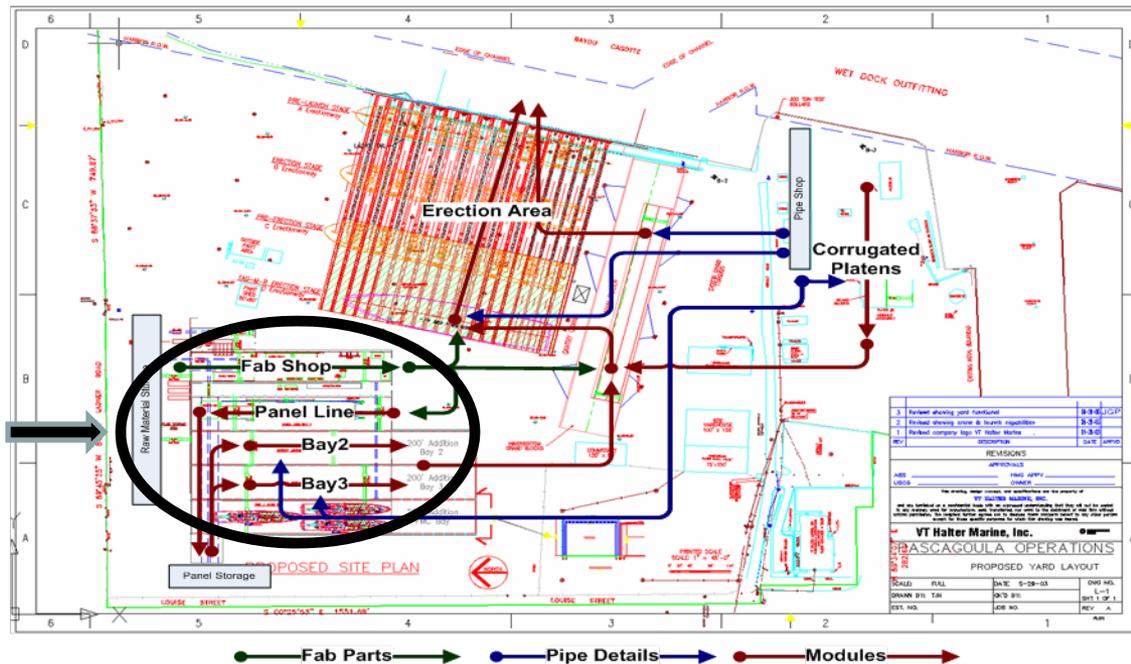


Production Systems Modeling & Decision Support for VT Halter Marine

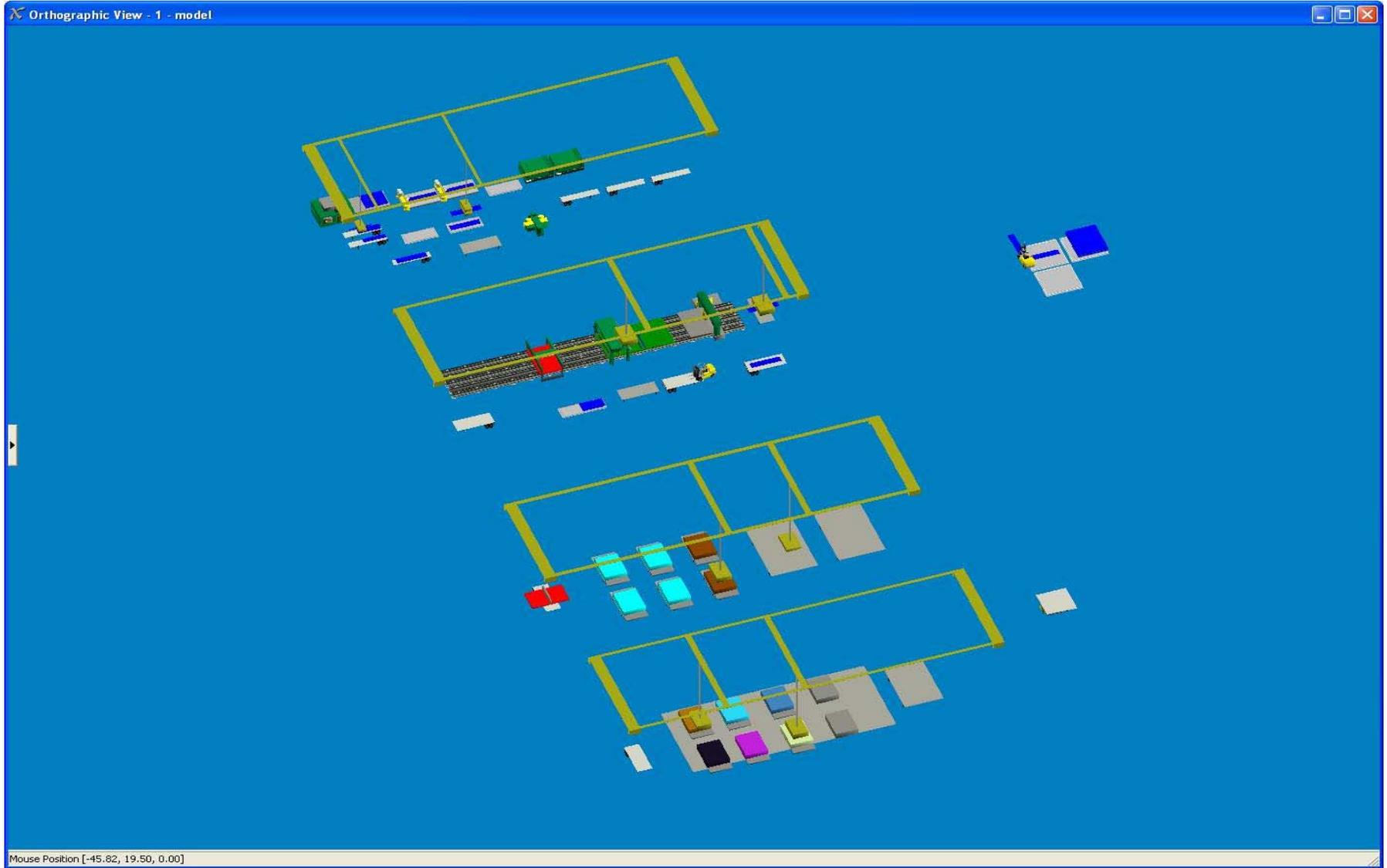


Project Overview

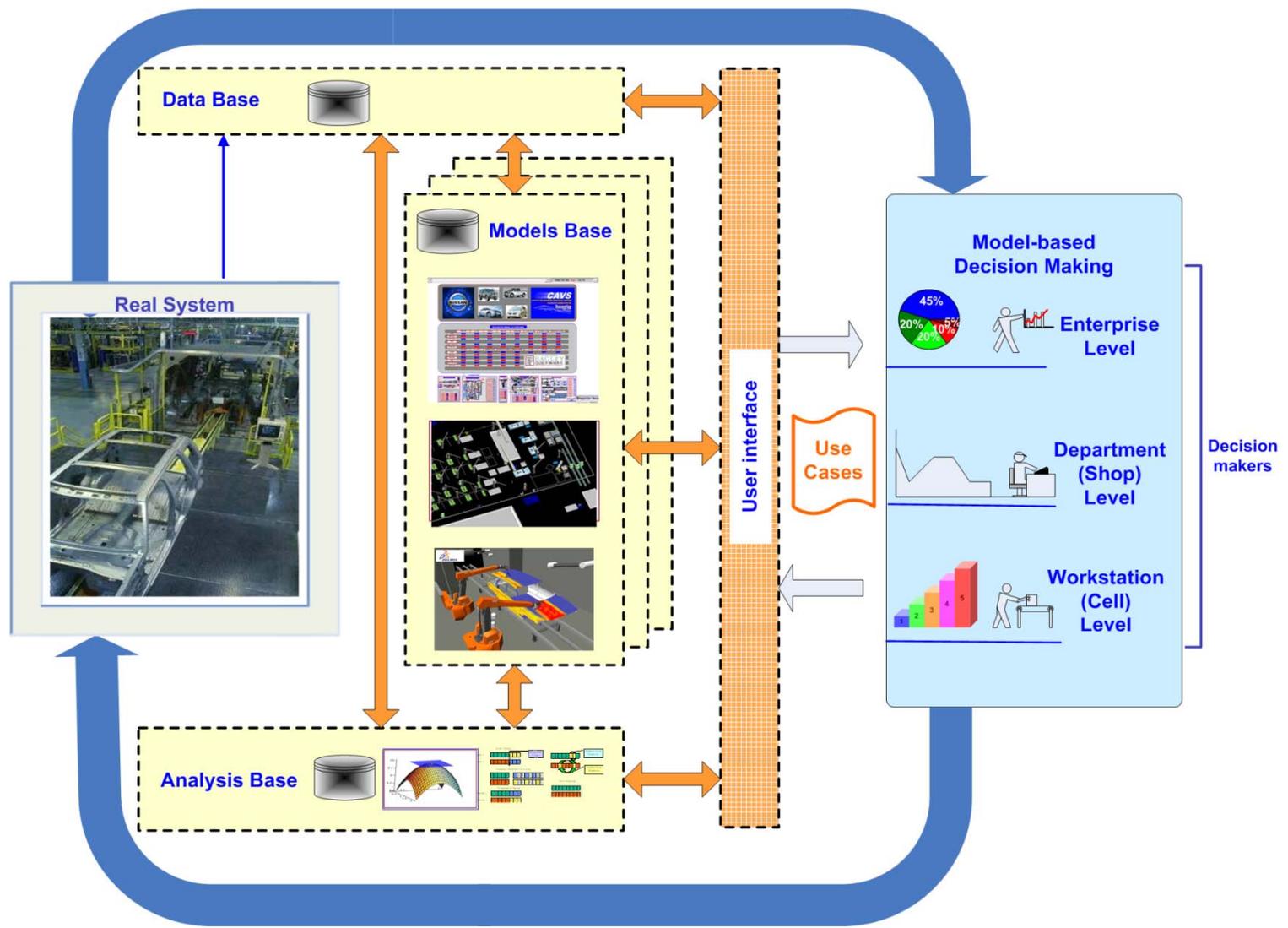
- **Yard Operations:** simulation model focuses on the “Shop” which includes material prep, panel line, and unit assembly.
- **Ship Structure:** Sections-Modules-Blocks-Units.
- **Requirements Development:** estimating requirements given the level of knowledge known at the time of analysis.



Simulation Model



Model Based Decision Support Systems



System Architecture

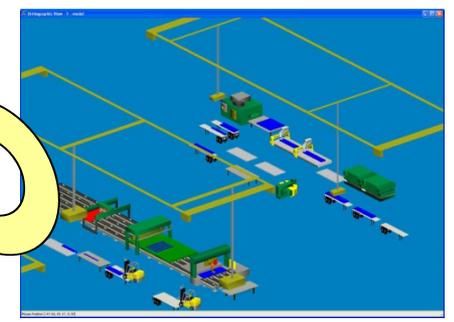
Ship Data

CROWLEY BARGE BX11						
	Matl	Unit	No. of Plates	No. of Strcut	No. of Panels	No. of Stanes
Mid-Body						
2300A						
2300B	2300BZ	20	175	6	15	100
2300C	2300CZ	17	275	6	20	100
2300D	2300DZ	20	20	0	0	0
2300E	2300EZ	12	12	0	0	0
2300F	2300FZ	10	75	4	6	0
Total/Panel		100	500	20	45	200
Total/Panel						
Starboard						
2300G						
2300H	2300HZ	20	175	6	15	100
2300I	2300IZ	17	275	6	20	100
2300J	2300JZ	20	20	0	0	0
2300K	2300KZ	12	12	0	0	0
2300L	2300LZ	10	75	4	6	0
Total/Panel		100	500	20	45	200
Total/Panel						
Starboard						
2300M						
2300N	2300NZ	20	175	6	15	100
2300O	2300OZ	17	275	6	20	100
2300P	2300PZ	20	20	0	0	0
2300Q	2300QZ	12	12	0	0	0
2300R	2300RZ	10	75	4	6	0
Total/Panel		100	500	20	45	200
Total/Panel						
Starboard						

User Interface

Type	Start Date	Complete Date
Scheduled	4/24/2009	5/1/2009
Simulated	1/1/1900	1/1/1900
Actual	1/1/1900	1/1/1900

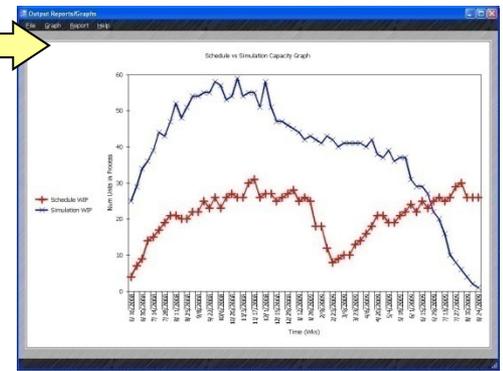
Simulation Model



Process Data

Name	Shift	Min. Proce	Max. Proce	Avg. Proce	Routing	Percentage
Wheabrator	10	50	200	100	100	100
NC Plasabun	10	50	200	100	100	100
NC Plasabun	10	50	200	100	100	100
Bevel Table	10	50	200	100	100	100
Break Press 1	10	50	200	100	50	50
Stiffener Shaps	10	50	200	100	100	100
Edge Prep	10	50	200	100	100	100
Seamer	10	50	200	100	100	100
Stiffener Prep	10	50	200	100	100	100
Stiffener Fit	10	50	200	100	100	100
Stiffener Tack	10	50	200	100	100	100
Fillet Welder	10	50	200	100	100	100

Reports



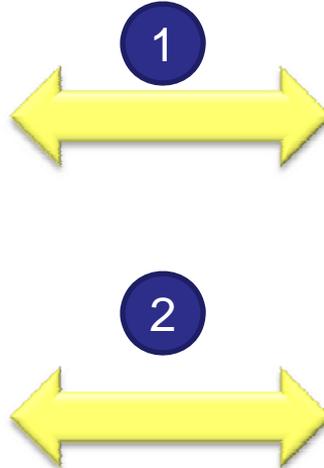
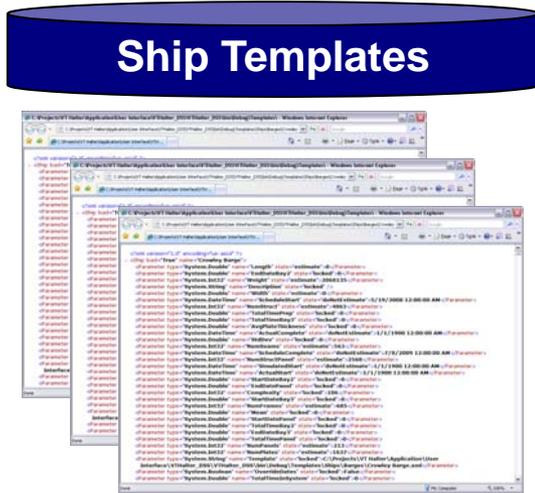
Planner



Estimating Ship Requirements

Given total weight and “like” ship ...

- 1 Distribute & scale weight across the ship structure (sections, modules, blocks, units) using ship templates



User Interface

Type	Complete Date	Actual
Scheduled	4/24/2009	5/1/2009
Simulated	1/1/1900	1/1/1900
Actual	1/1/1900	1/1/1900

- 2 Based on weight distribution ... Estimate ship structure parameters (e.g., # of stiffeners, # of plates, ...) using ship templates.

- 3 Roll-up parameter data across all units to the ship level (e.g., total # of stiffeners, total # of seams).



Example Outputs

Output Reports/Graphs

Completion Projection Report

Crowley Barge

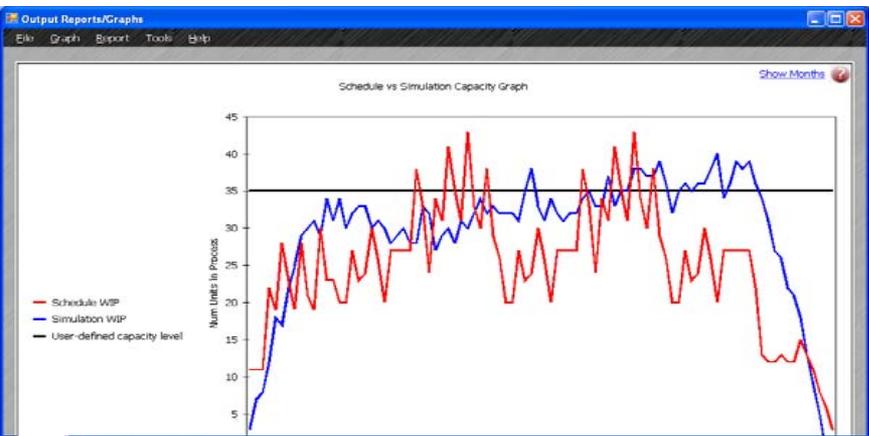
Confidence Level	80%	90%	95%	99%
Completion Date (Start: 1/1/1900)	2/19/2009	2/19/2009	2/20/2009	2/22/2009
Makespan (weeks)	35.44	35.52	35.59	35.88

Crowley Tug2

Confidence Level	80%	90%	95%	99%
Completion Date (Start: 11/30/2008)	12/31/2008	12/31/2008	1/1/2009	1/2/2009
Makespan (weeks)	28.35	28.4	28.45	28.65

Crowley Barge 2

Confidence Level	80%	90%	95%	99%
Completion Date (Start: 6/16/2008)	8/30/2009	9/1/2009	9/4/2009	9/13/2009
Makespan (weeks)	62.93	63.27	63.6	64.88

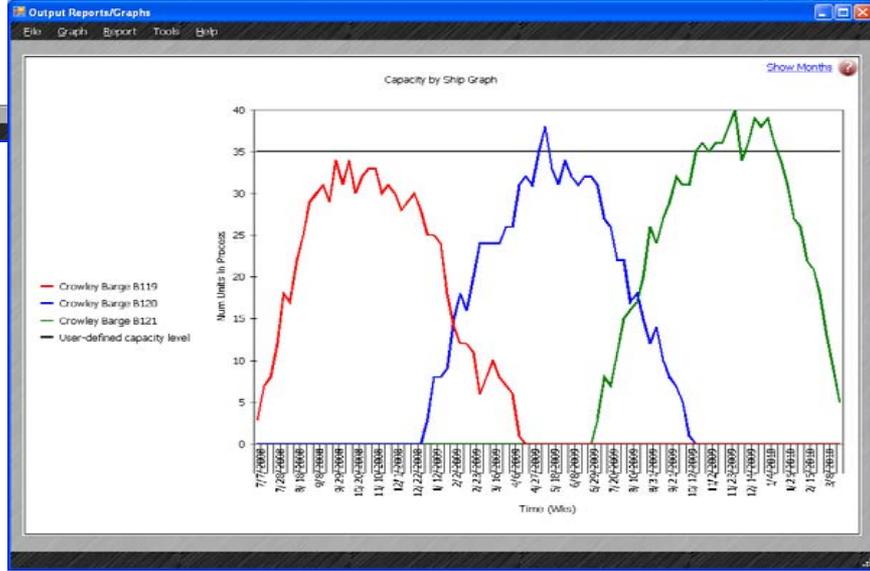


Output Reports/Graphs

Detailed Simulation Time Report

Crowley Barge

Section	Module	Block	Assembly	Prep Start	Prep Complete	Panel Start	Panel Complete	Unit Assembly Start	Unit Assembly Complete
Bow	1100	1101	1101	10/29/2008	11/4/2008	11/1/2008	11/12/2008	---	---
Bow	1100	1102	1102	11/1/2008	11/7/2008	11/8/2008	11/15/2008	---	---
Bow	1100	1103	1103	11/6/2008	11/10/2008	11/11/2008	11/17/2008	---	---
Midbody	2300A	2311/12	2311 FWD	6/16/2008	6/17/2008	6/21/2008	6/26/2008	7/9/2008	8/16/2008
Midbody	2300A	2311/12	2311 AFT	6/16/2008	6/20/2008	6/23/2008	6/27/2008	7/16/2008	8/16/2008
Midbody	2300A	2311/12	2312 FWD	6/17/2008	6/19/2008	6/24/2008	6/30/2008	7/17/2008	8/16/2008
Midbody	2300A	2311/12	2312 AFT	6/19/2008	6/21/2008	6/25/2008	6/30/2008	7/17/2008	8/16/2008
Midbody	2300A	2321	2321 FWD	6/21/2008	6/23/2008	6/26/2008	7/1/2008	7/18/2008	8/24/2008
Midbody	2300A	2321	2321 AFT	6/23/2008	6/25/2008	6/27/2008	7/2/2008	7/24/2008	8/24/2008
Midbody	2300A	2322	2322 FWD	6/25/2008	6/26/2008	6/30/2008	7/3/2008	7/24/2008	8/31/2008
Midbody	2300A	2322	2322 AFT	6/26/2008	6/29/2008	7/1/2008	7/4/2008	7/31/2008	8/31/2008
Midbody	2300A	2331	2331	6/28/2008	7/1/2008	---	---	---	---
Midbody	2300A	2332	2332	6/30/2008	7/2/2008	---	---	---	---
Midbody	2300A	2333	2333	7/1/2008	7/3/2008	---	---	---	---
Midbody	2300A	2341	2341	7/2/2008	7/6/2008	7/4/2008	7/10/2008	7/10/2008	7/25/2008
Midbody	2300A	2342	2342	7/4/2008	7/6/2008	7/6/2008	7/11/2008	7/12/2008	7/27/2008
Midbody	2400	2411/12	2411 FWD	7/5/2008	7/8/2008	7/7/2008	7/13/2008	8/1/2008	9/10/2008
Midbody	2400	2411/12	2411 AFT	7/7/2008	7/8/2008	7/8/2008	7/13/2008	8/2/2008	9/10/2008
Midbody	2400	2411/12	2412 FWD	7/7/2008	7/10/2008	7/11/2008	7/14/2008	8/4/2008	9/10/2008
Midbody	2400	2411/12	2412 AFT	7/8/2008	7/11/2008	7/12/2008	7/16/2008	8/11/2008	9/10/2008
Midbody	2400	2421	2421 FWD	7/10/2008	7/15/2008	7/13/2008	7/18/2008	8/12/2008	9/17/2008





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