Robots and Kaizan

Managing Disruptive Technologies with Lean Principles:
October 17, 2017

Why New Technology?

The public expects it

The best way to predict the future is to create it. If we do not adopt technology in a judicious way, the public will feel that their tax dollars are being wasted

Developed to our needs

Technology needs to fit our specific processes and mission environment. In some cases the market will move it's development to meet our needs, and in others we need to actively engage

We have the power

Public sector support has driven nearly all of what we call innovation. Because we are focused on outcomes, not profits, the public sector can nurture technology that is useful, but not ready for market

Opportunities

Computer Simulation

Process modelling (discrete event simulation,) Virtual Reality, and Augmented Reality

Augmentation

Shipyards are dangerous places, and technology could remove our workforce from harms way, or reduce the risk while they are in this environment, while enabling them to do more.

New Methods

New repair methods could dramatically reduce labor, schedule risk, improve quality, and reduce total cost, including Industrial Waste.

Creating an Environment

Lean methods

Use project Charters, and RIE's, to develop pilots, collect data, and create transition plans. Work cells that are in the habit of implementing improvements are far more likely to be open to and successful implementing disruptive technology.

Aligned Leadership

A comprehensive strategic plan, Gembas, and regular meetings to align improvement efforts.

Moonshine Rapid Prototyping

Safe to fail experimentation must become a daily habit. Don't dismiss the mundane.

People who do what they can with what they do have, don't waste time worrying about what they can't do with what they don't yet have

Moonshine creates Infrastructure and Culture
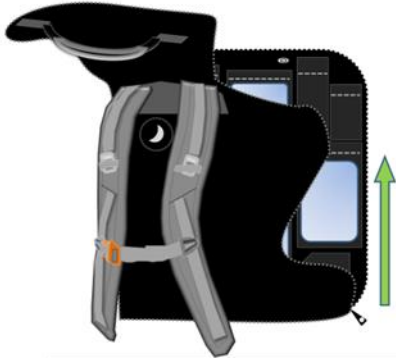
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(funds+resources+location)

Moonshine is a "*Try Before You Buy*" capability
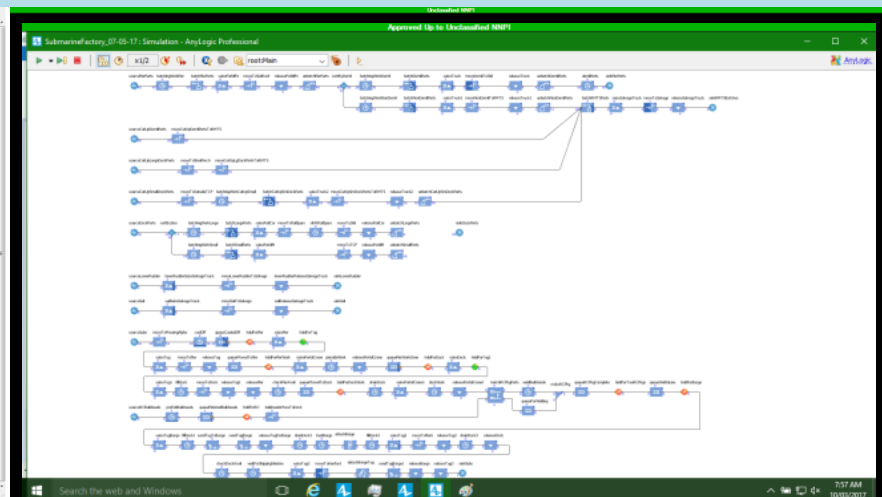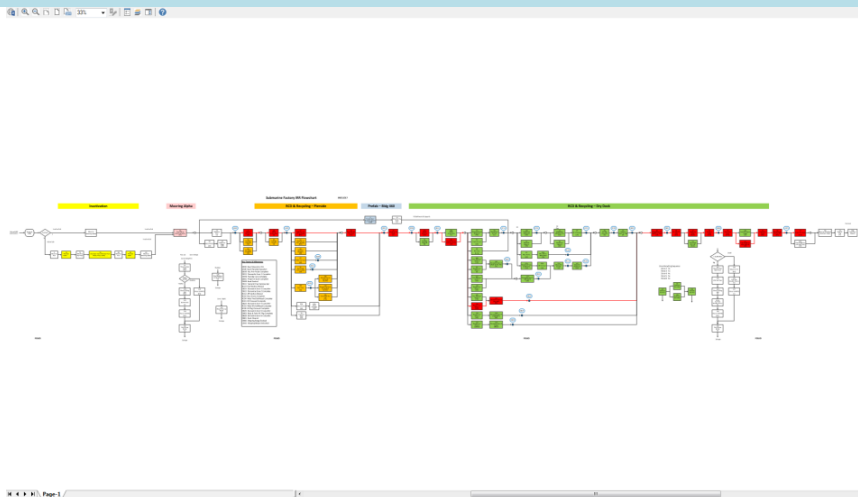## (aka Try-Storming vs. brainstorming)

Do everything to simulate, test and experiment before committing to any solution. The *PHYSICAL* nature of Moonshine creates ideas previously impossible to attain.

Tank access hole cutting

Mobile mast repair stand

Shipboard tool kit

Breaker repair fixture

LEARN BY DOING!

Process Mapping

From "Current State" to Simulation

Description: PSNS&IMF has over the last five years increasingly focused on developing computer simulation models for critical work processes. Simulation can improve process understanding and problem solving capability by an order of magnitude. Simulation, whether discrete event, system dynamic, or agent based is very powerful, particularly with the ability to run and test scenarios, see variable interrelationships, perform sensitivity analysis, and design systems for optimization.

Investment: $15K per AnyLogic software license

Benefit/ROI: Improve process modeling, decision making, apply systems thinking.
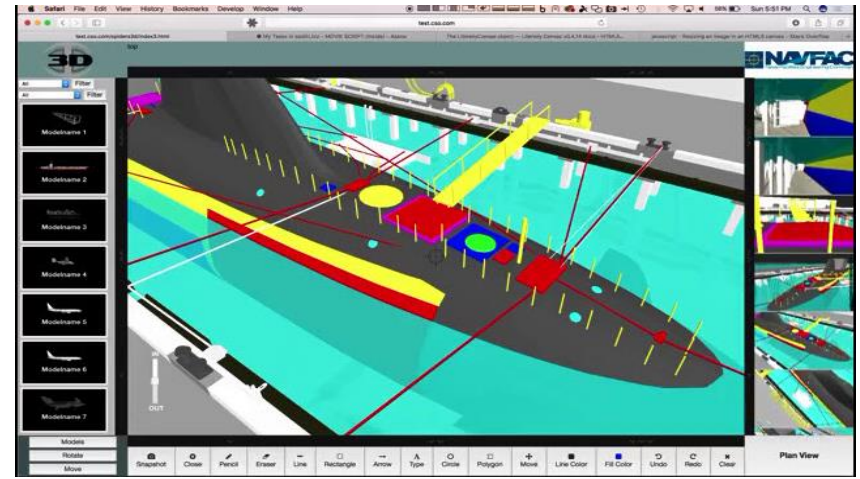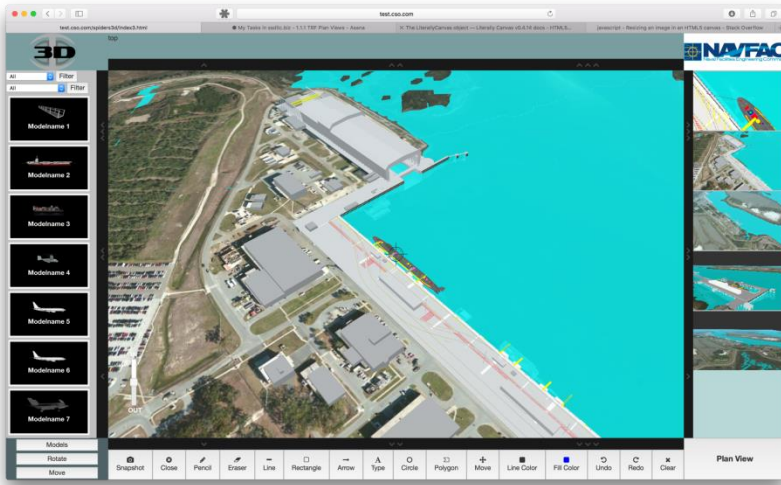
Simulation Modeling

Advantages: Visual , Control Input Variables, statistical accuracy, realism.

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3D Spiders VR

Visual planning tool for constrained facilities such as Dry-dock. Provides foundation for capture of best practice, training, briefing of evolutions, and process simulation.

- October 2014 Demo with C/380
- May 2015 Identified conversion software for CAD to X3D
- July 2015 Submitted workstation request for Cut Line/ recycle group
- October 2015 Took new position at IMF
- April 2016 Submitted workstation request for Process Improvement Office
- July 2016 Submitted purchase request for 3D Printer
- September 2016 Network Drops installed in PI Office
- May 2017 Requested moving licenses to support Pilot ERP capture
- October 2017 (Now) all requests still pending

Barriers: IT focused on Cyber Security, with little or no support for emerging needs. NMCI contracts cause additional layers of

bureaucracy. Cumbersome procurement reviews for IT equipment.

Augment and Protect

2011	2012-13	2015	2015	2015	2016	2017

LM HULC 2-days	LM Mantis 18-months	LM Fortis Own	BAE OLAD Own	Equipois Own	EksoBionics Own	Suit X Own

Description: PSNS&IMF has trial tested seven (7) exoskeleton systems since 2011. This promising human augmentation technology can make holding an industrial tool feel weightless, improving both ergonomics and productivity.

Problem: Currently there are no nationally recognized standards or test methods. We are collaborating with NIST and collaborating with ASTM to develop ASTM F48.

Action Needed: Seeking Human Factors and Ergonomics engineers to collaborate developing standard and test methods, and to fund the set-up of a NIST Exoskeleton test lab to support testing. POC: Ron Zmijewski, PSNS&IMF (360) 340-1226
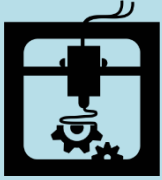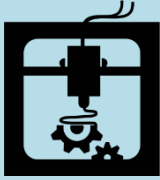
Cold Spray

Major Phases:

1. Develop portable dust control system that prevents ESD and EMI issues
2. Develop mobile ruggedized prototype for use inside the shop or pierside
3. Develop portable system approved for use inside vessels
4. Validate system in shop, offboard (outside hull), then inside hull

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Induction Heat Coating Removal

FastClad Paint
2.49 sq.ft/min

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Non-skid
0.54 sq.ft/min

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Sound Tile
0.15 sq.ft/min

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DIRECT BENEFITS

- **5x - 20x faster**
- **Safer, less fatigue**
- **No metal damage**
- **Faster & easier cleanup (paint chips vs. dust)**
- **Less PPE needed**
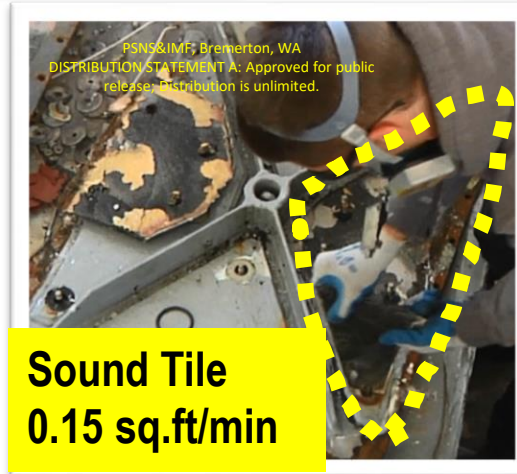
INDIRECT BENEFITS

- **Less cumulative injury**
- **Earlier starting time for subsequent tasks**
- **Greatly reduced waste $248K+++ to dispose of blasting waste for IMF in 2014**

Bridging the Gap: 3D Print and Scan
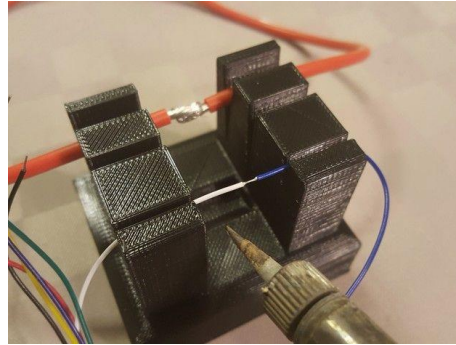
Get your people engaged in now solutions, to prepare them for the future

Cultural

Systemic

Regulatory