Innovation Progress and Future Outlook

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AIAA Innovation Workshop
January 29, 2016

Just what is it we are trying to manage?

Nothing.

We want to foster and enable, and then get out of the way.

Culture!

Environmental Assessment and Analysis

Surveys

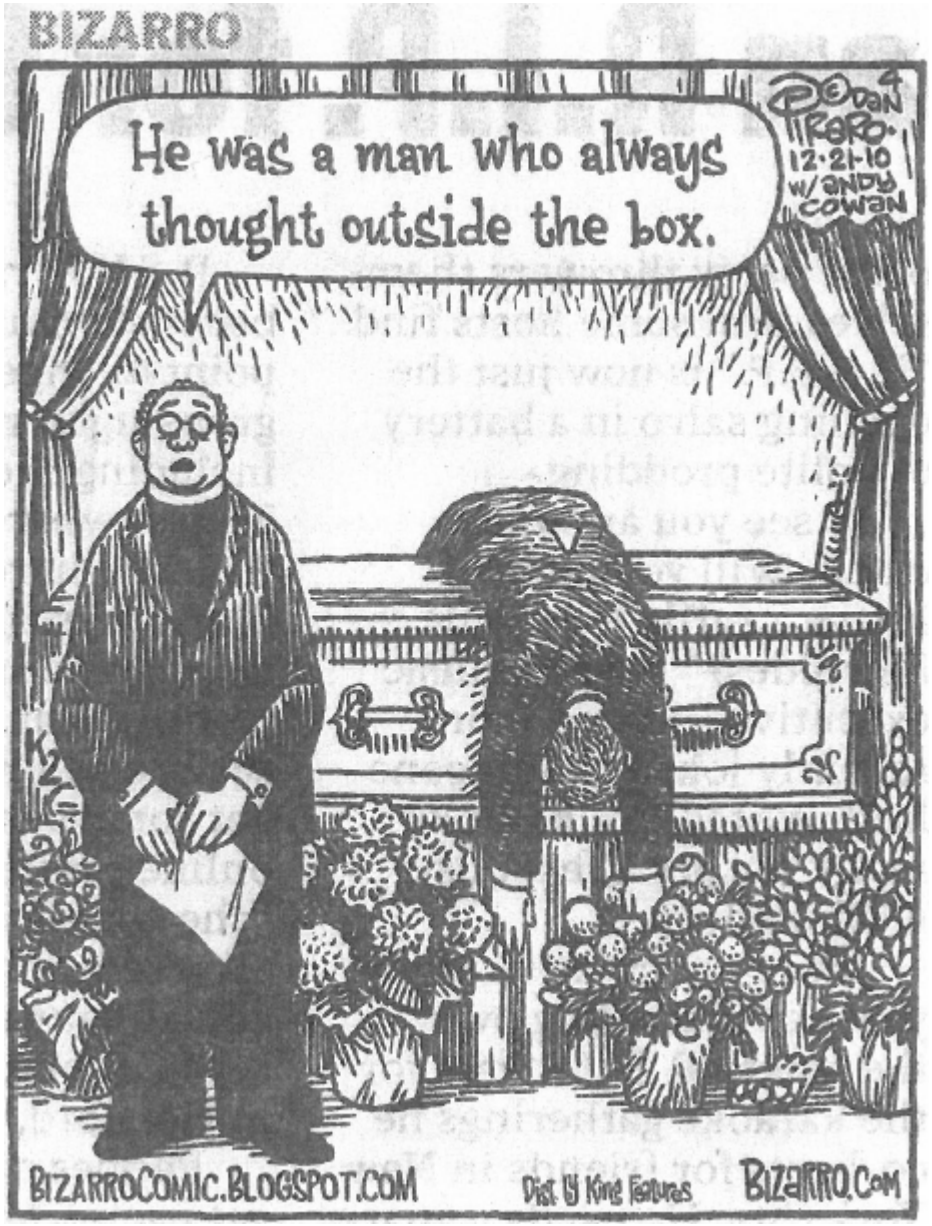
Workshops

Kaizen

Environmental Assessment and Analysis

Overcome Barriers

Define Innovation



No Freedom Kills!

Recognized Barriers to Innovation

- Management styles
  - Reluctance to promote innovative ideas
  - Fear of failure
- Institutional inertia
  - This is how we've always done it!
- Organizational walls/silos
  - One NASA? One JSC? Not really …
- Complexity of processes
  - Which boss or board do I go to?
- Barriers offer opportunities for innovative solutions

Critical Success Factors for Innovation

- Foster a culture of innovation
- Senior leadership commitment
- A plan, team and process for generating new ideas that result in innovations
- Focus on customer needs
- Promote and facilitate collaboration internally and externally to the organization
- Educate and communicate

Our Approach

- Dedicated Senior Leadership Team
- Self-Selected Implementation Team
- Implement to Plan

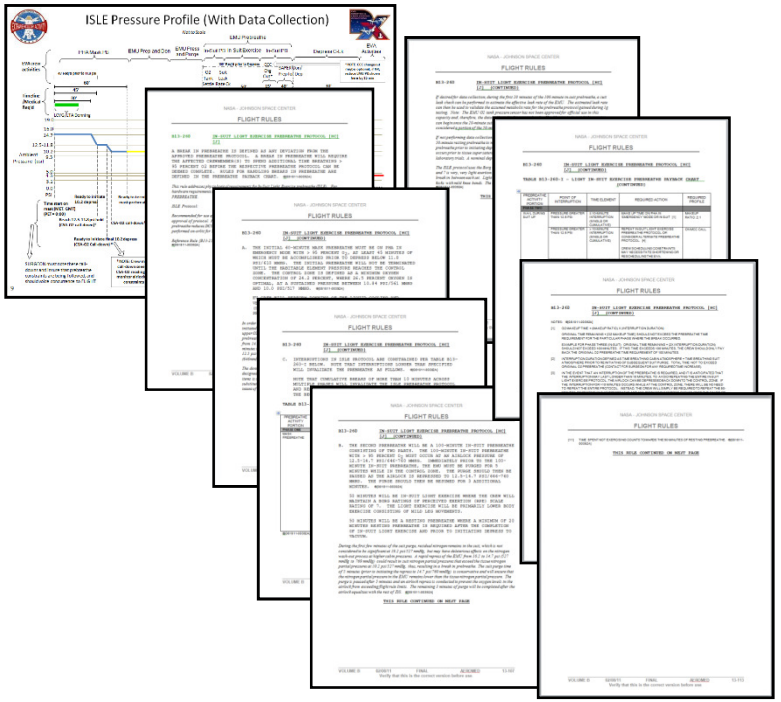
Initiatives

- Innovation catalysts
- Employee recognition
- Challenge calls
  - Seed funding for innovative ideas
  - Competitively selected

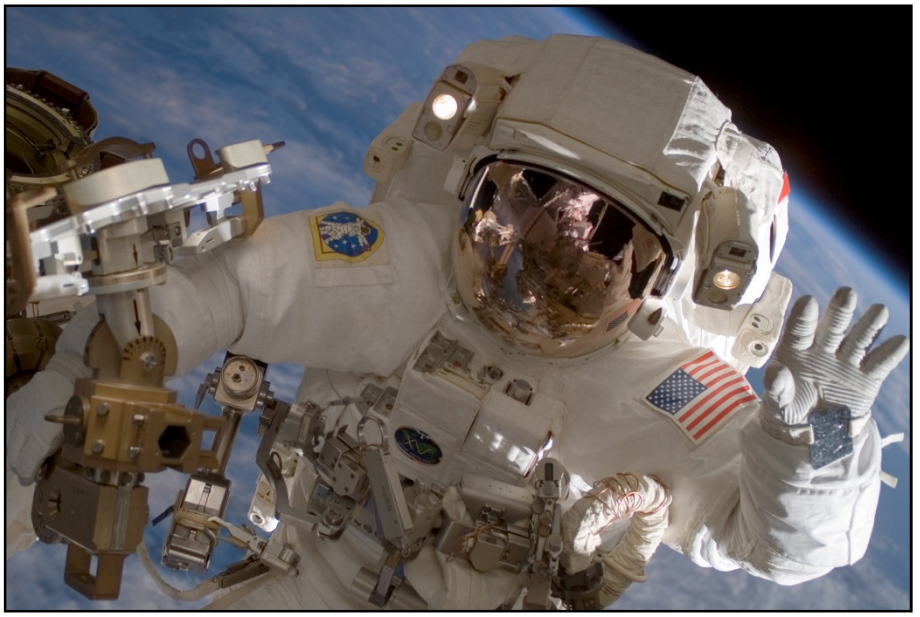
Challenge Calls – EVA Prebreathe

Prebreathe is how we safely

get from this…

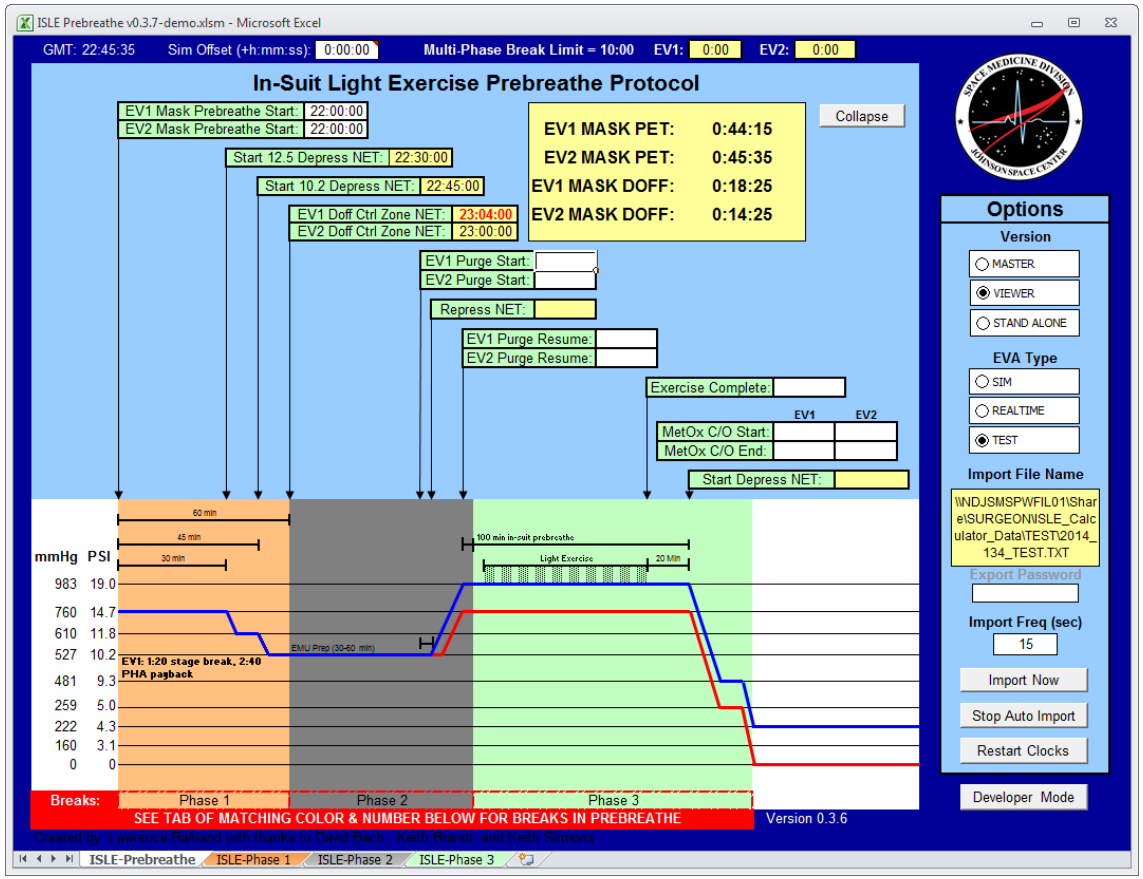


…to this.



Challenge Calls – EVA Prebreathe

How we did it better.

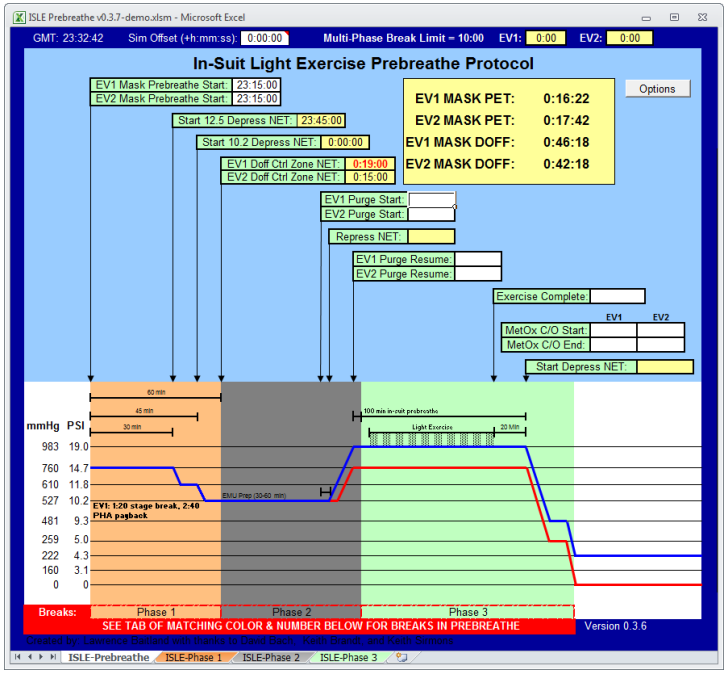


Using 4.5 hours of an 8 hour Innovation Challenge Grant was the catalyst that turned a spreadsheet into an interactive display.

Challenge Calls – EVA Prebreathe

What we did

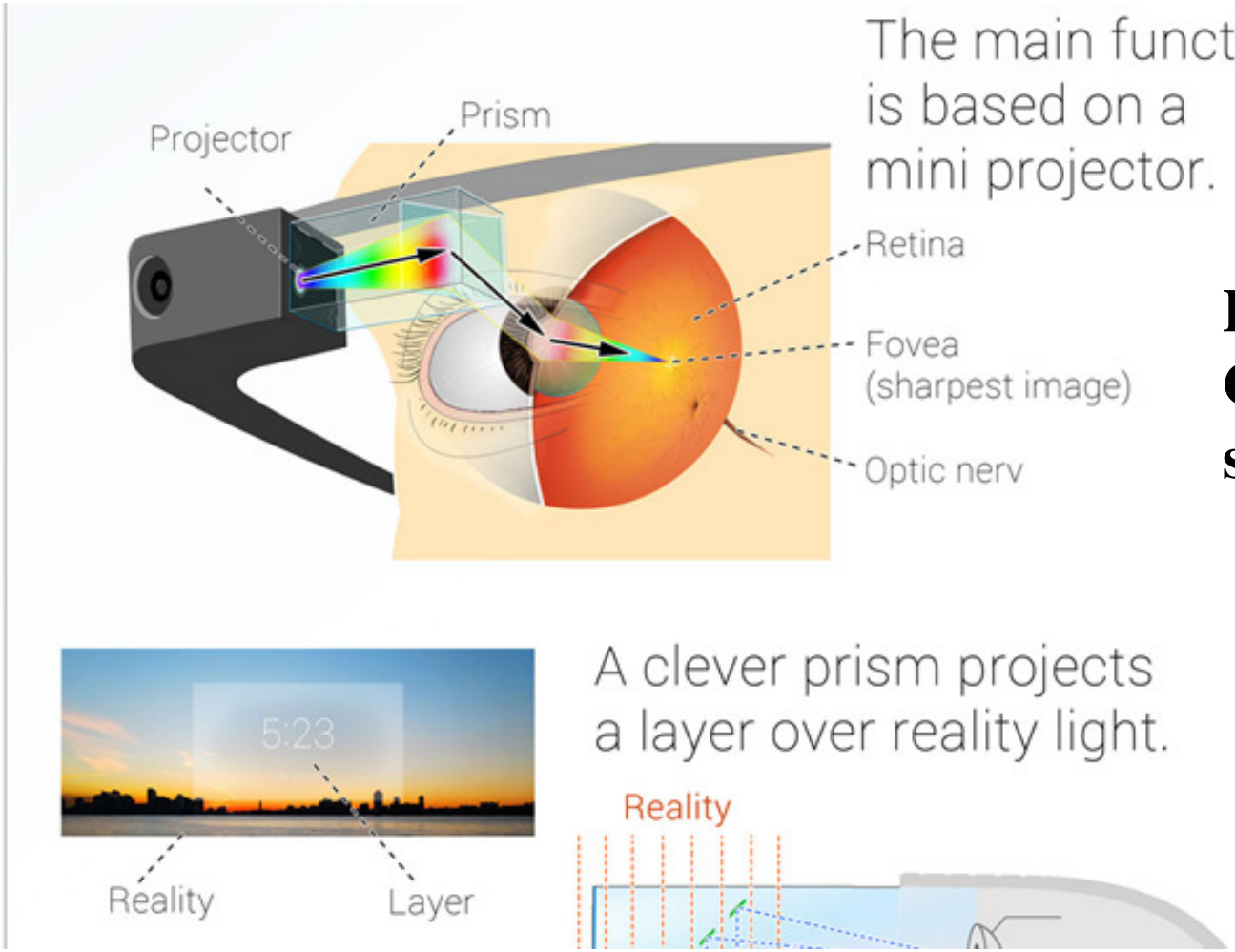
We created macros that let other stakeholders "look over the BME's shoulder" during an EVA Prebreathe.



Benefits of the new tool:

- Improves safety by ensuring all calculations are performed correctly and assumptions are shared with all users.
- Streamlines communication and reinforces BME's ownership of the prebreathe clock.
- Reduces training required for inexperienced operators to execute prebreathes with the same confidence as experienced operators.

Challenge Calls – Google Glass



Proof of concept of Glass in medical scenarios.

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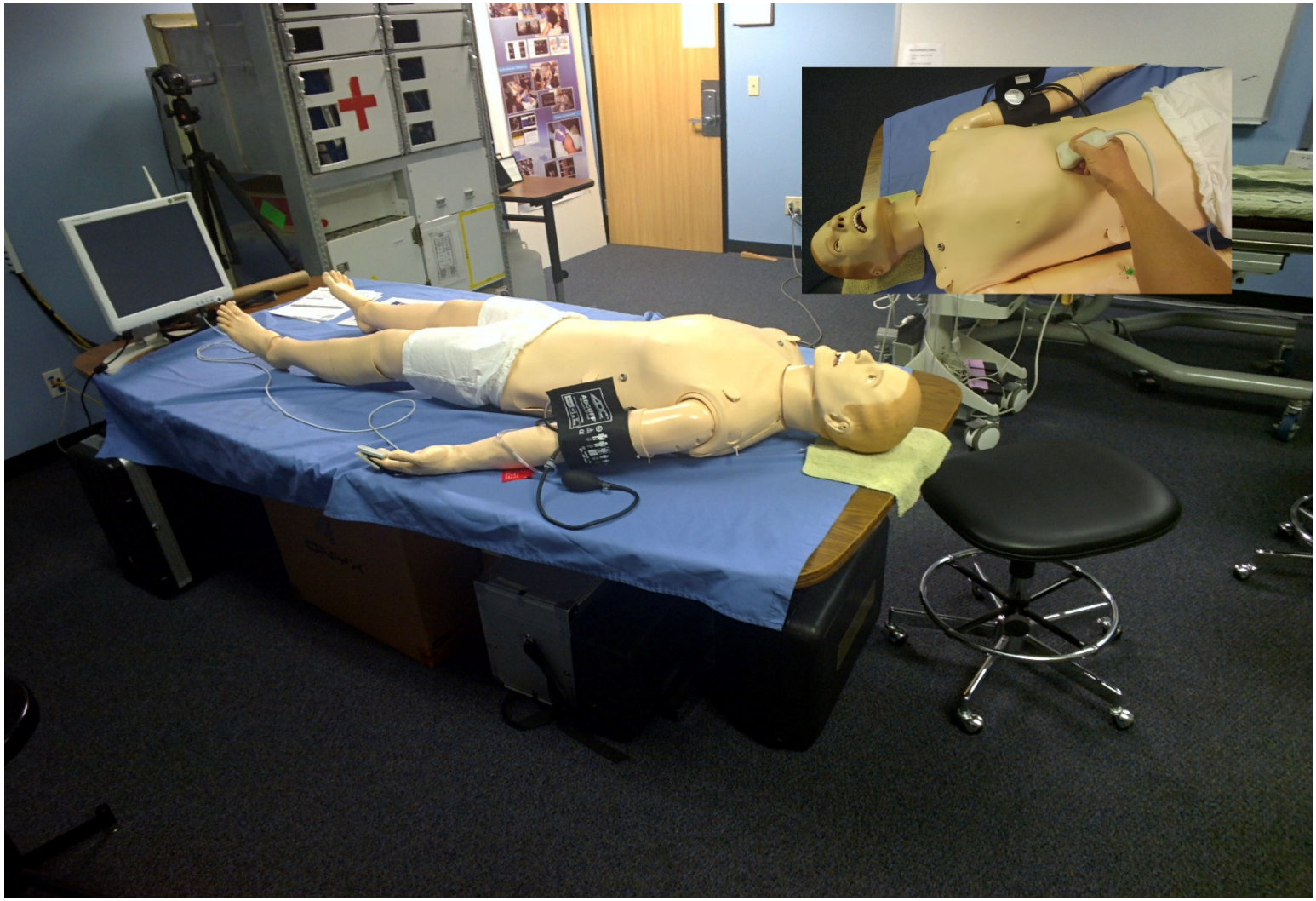
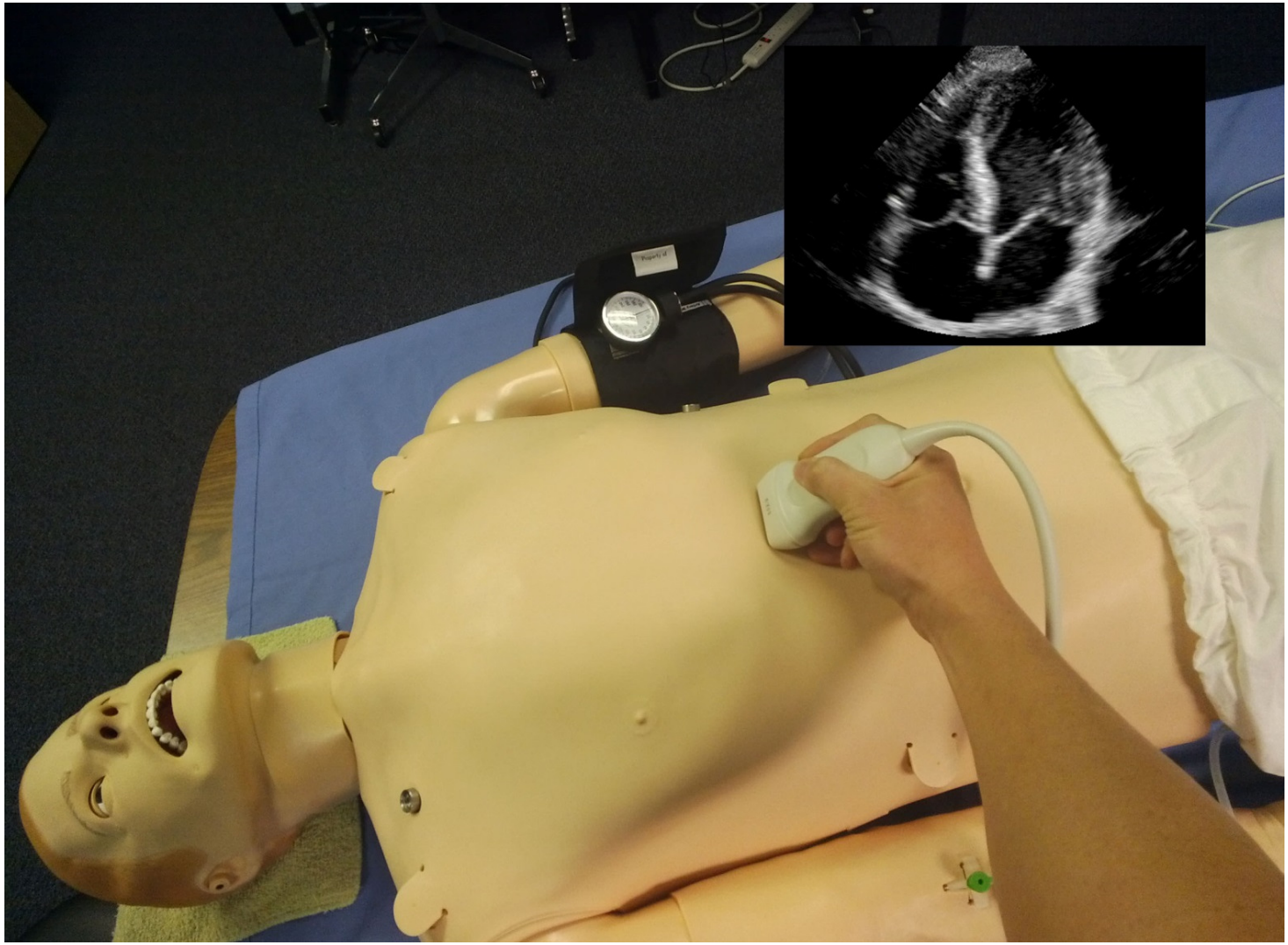
Challenge Calls – Google Glass



Challenge Calls – Google Glass

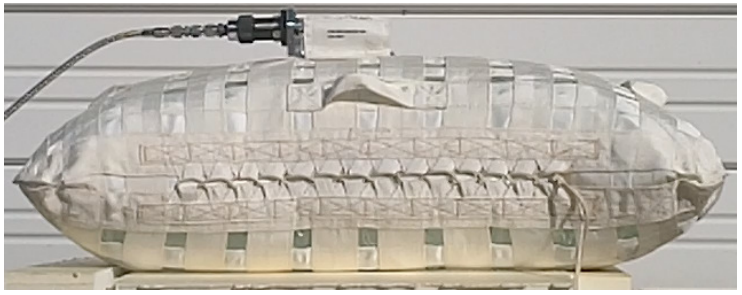


Challenge Calls – Google Glass

Challenge Calls – Collapsible H_2O Container

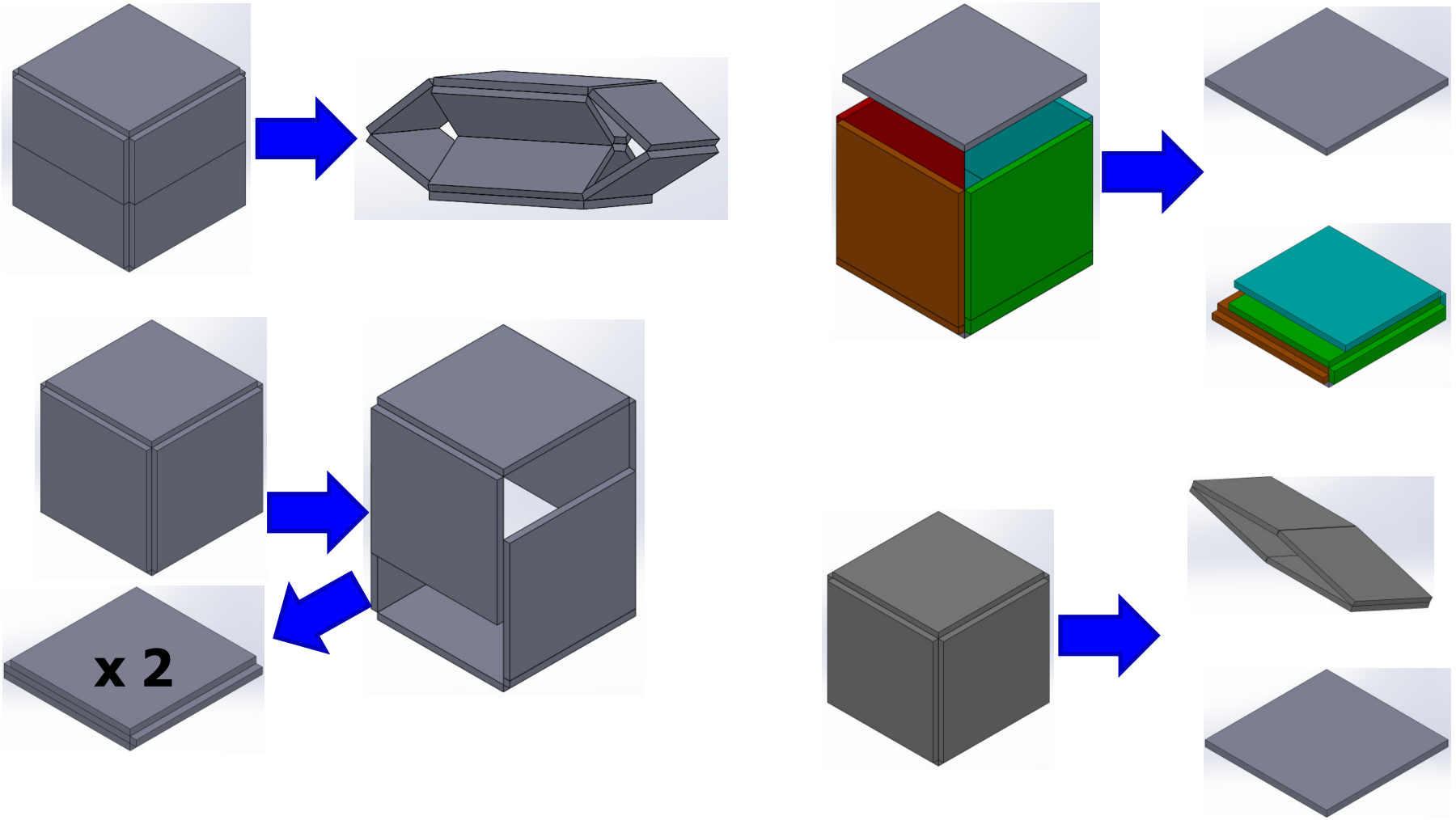
- Shuttle and ISS have a history of using soft-sided collapsible bags, which have several disadvantages:
  - Limit to strength (pressure rating) as structural component consists of Nomex Fabric and Webbing
  - Filled bags create a storage problem due to their irregular shape and limitations on what can be stored nearby
    - » Accounting for Keep–out Zones and irregular shape the water in ICWCs accounts for ~50% of the space allocated for storage
  - Bladders are prone to leakage due to fold and creases that develop overtime
  - ❖ISS program is currently funding the development of a hard-sided COTs tank

Iodine Compatible Water Container (ICWC)

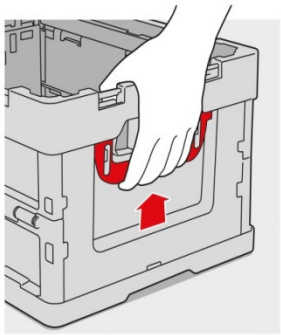


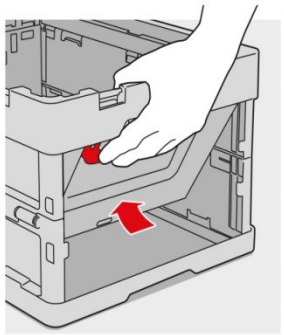
Temporary Urine and Brine Stowage System (TUBSS)

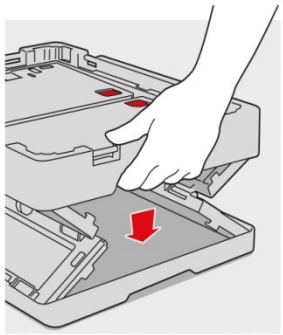
Challenge Calls – Collapsible H_2O Container



Challenge Calls – Collapsible H_2O Container

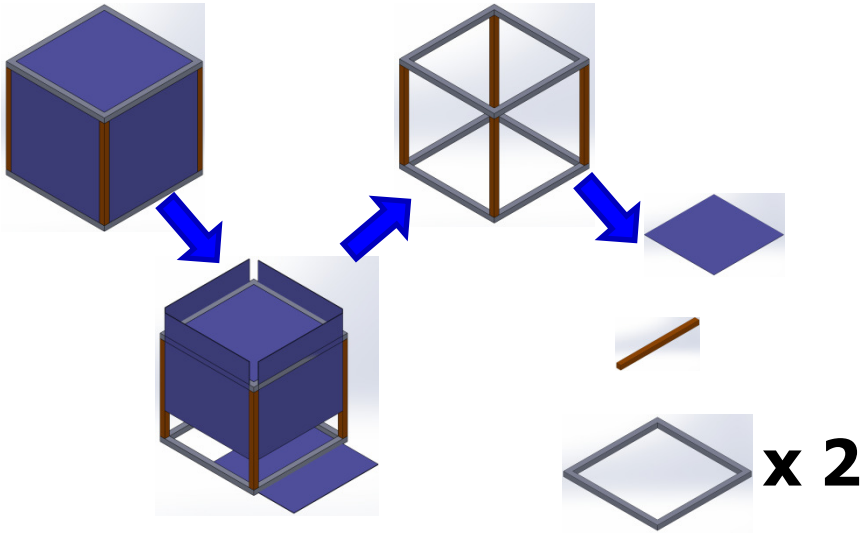


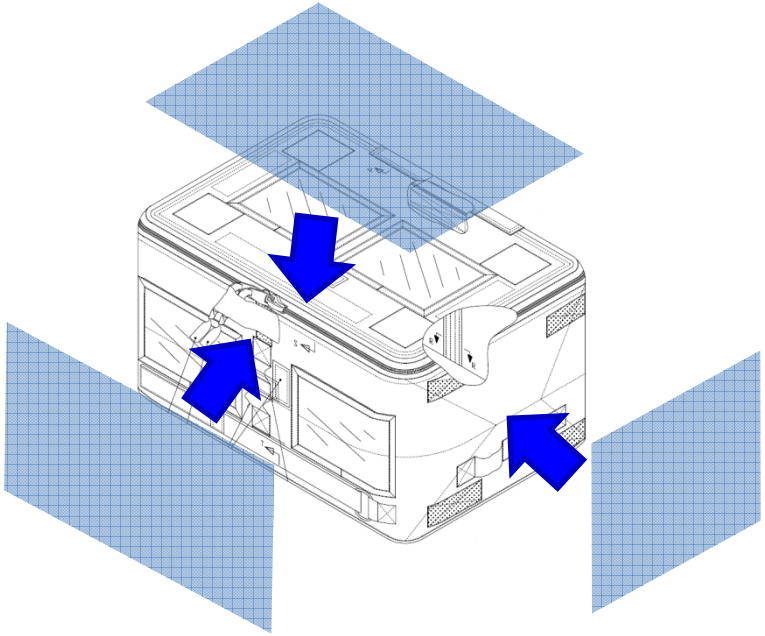




EDV storage on ISS

COTs Storage Crates





Challenge Calls – Collapsible H_2O Container

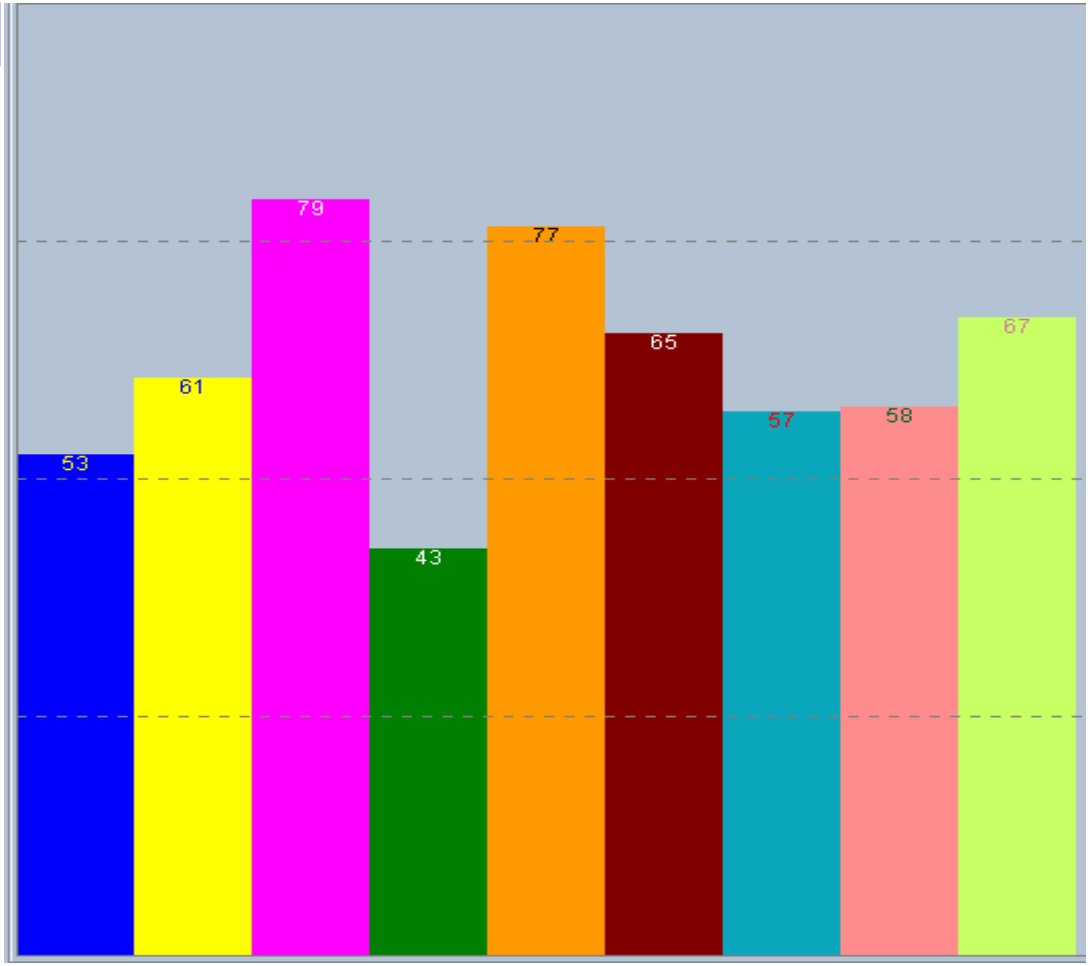
- Design Concepts Evaluated based on the following measures

Measure	Weight	Baseline (ICWC) Info / Notes
Development cost (NRE)	24%	Given current funding climate deemed key measure. Any viable option needs to have low NRE with high assurance of success.
Stowage Efficiency – Full (volume of water contained ÷ allocated ISS stowage volume)	22%	Accounting for irregular shape and keep-out-zones ICWC stowage efficiency when full is ~50%. Most designs have near 100% stowage efficiency due to regular shape.
Stowage Efficiency – Empty	13%	Measure of "wasted" space when container is in empty storage configuration. Empty ICWCs, while malleable for most part, have rigid plumbing line that prevents perfect (no wasted space) packing.
Ease of use (on-orbit)	13%	ICWC ranks highest needing no crew interactions to assembly/deploy.
Production cost	9%	ICWC ~ $16k/unit
Mass (empty)	6%	ICWC – 2.4 lbs empty
Robustness	6%	ICWC ranks low on robustness due to nomex restraint offering significantly less bladder protection compared to a hard sided container.
Service Life	6%	ICWC service life is limited by wetted life of bladder. Many of the designs have removable bladders/top panels such that the bladder could be replaced without trashing the entire assembly.

Challenge Calls – Collapsible H_2O Container

1. Self contained
2. Collapsible box (~COTS-like)
3. Half & Half
4. Penta box
5. Exterior frame
6. Tapered Polyhedron
7. Penta flap
8. Reinforced softgoods

Baseline *(ICWC)*



Functioning prototypes of highest ranked in work.

Future Outlook

- Continued focus on culture shaping
- Organization-wide innovation methodology training
- Extended use of open innovation concepts
- Broader collaboration