Uh-Oh…

Learning from Adverse Events
Using RE and HRO Methods

*24th ANNUAL HUMAN PERFORMANCE
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Learning from Adverse Events Using RE and HRO Methods

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- Two events: a near-fatal extra-vehicular activity (EVA) at the International Space Station, and a U.S Navy ship collision at sea

- We will ask what method(s) you would use to learn about them

- Provide a RE and a HRO perspective.

- Compare your own views on the value of the two approaches we discuss.

Track: ☒ Human Performance and Observations
Focus: ☒ Organizational/Human Factors and Safety Culture

Uh-Oh…

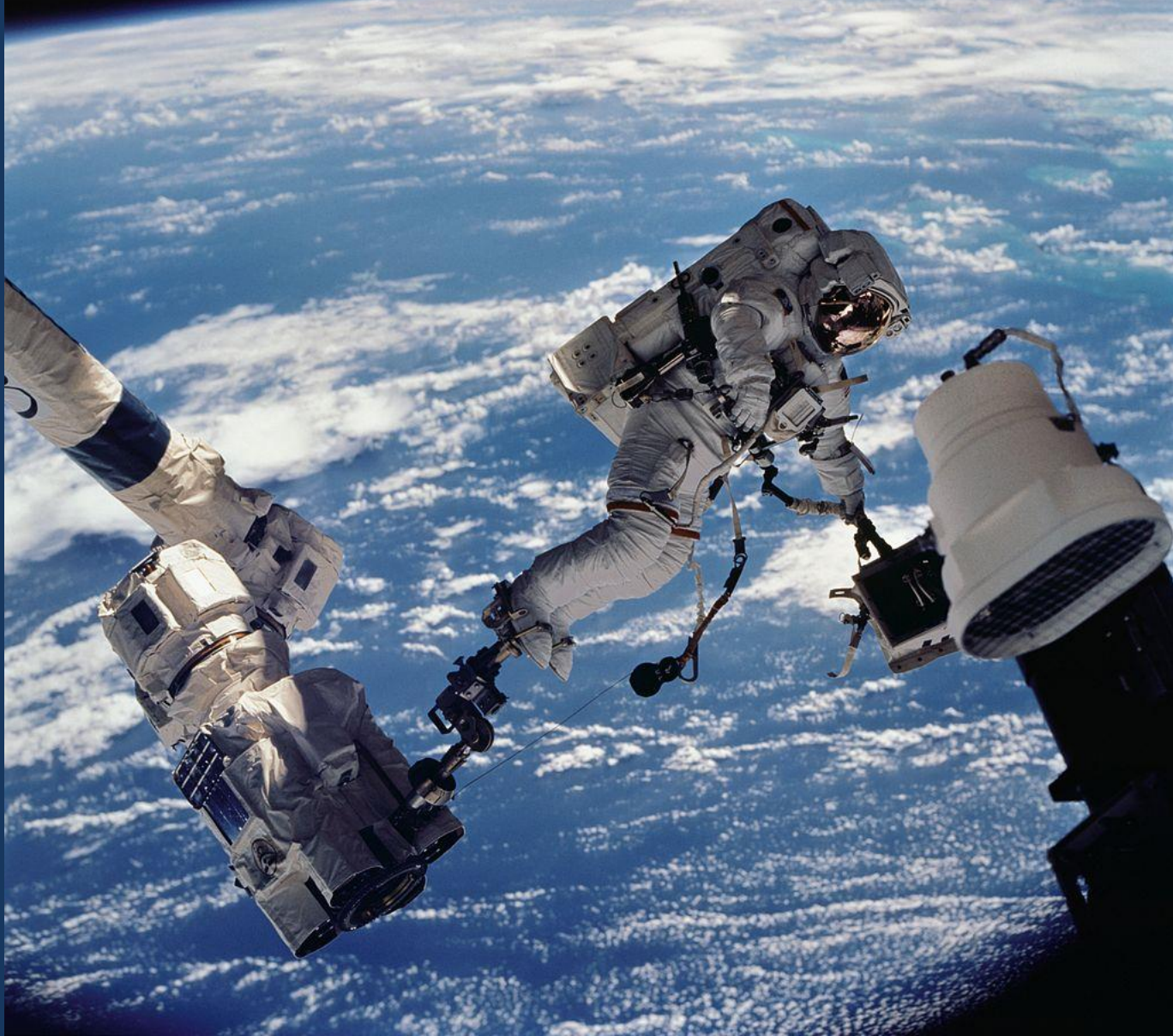Near-fatal extra-vehicular activity (EVA) at the International Space Station

"…why do we keep having these tragedies and not learning the lessons they are teaching us?"

Chris Hansen, Chair, EVA23 Mishap Investigation Board

Used Resilience Analysis Grid (RAG) cornerstones: Anticipate, Monitor, Respond, Learn

...to asses ISS organizational resilience through three methods:
- structured interviews (17)
- observation
- artifact analysis

Data collection

Systematic data review and coding

Review and interpretation of coded data

Synthesis and integration

Findings and recommendations

RE Perspective

How does ISS handle weak signals that indicate potential safety threats?

How does ISS balance ongoing resource constraints with production pressures?

Develop Your Questions
(5 minutes)

Uh-Oh...

USS FITZGERALD – ACX CRYSTAL collision at sea

Relative vessel sizes

USS FITZGERALD (DDG-62)

Motor Vessel ACX CRYSTAL

Bridge

Lookout

CIC

Lookout

Approximate ship tracks before collision

INTERNATIONAL
Crossing Situation

Stand-on
Vessel   CRYSTAL

Give-way
Vessel
FITZGERALD

The give-way vessel is
required to maneuver to
avoid crossing ahead of
the stand-on vessel.
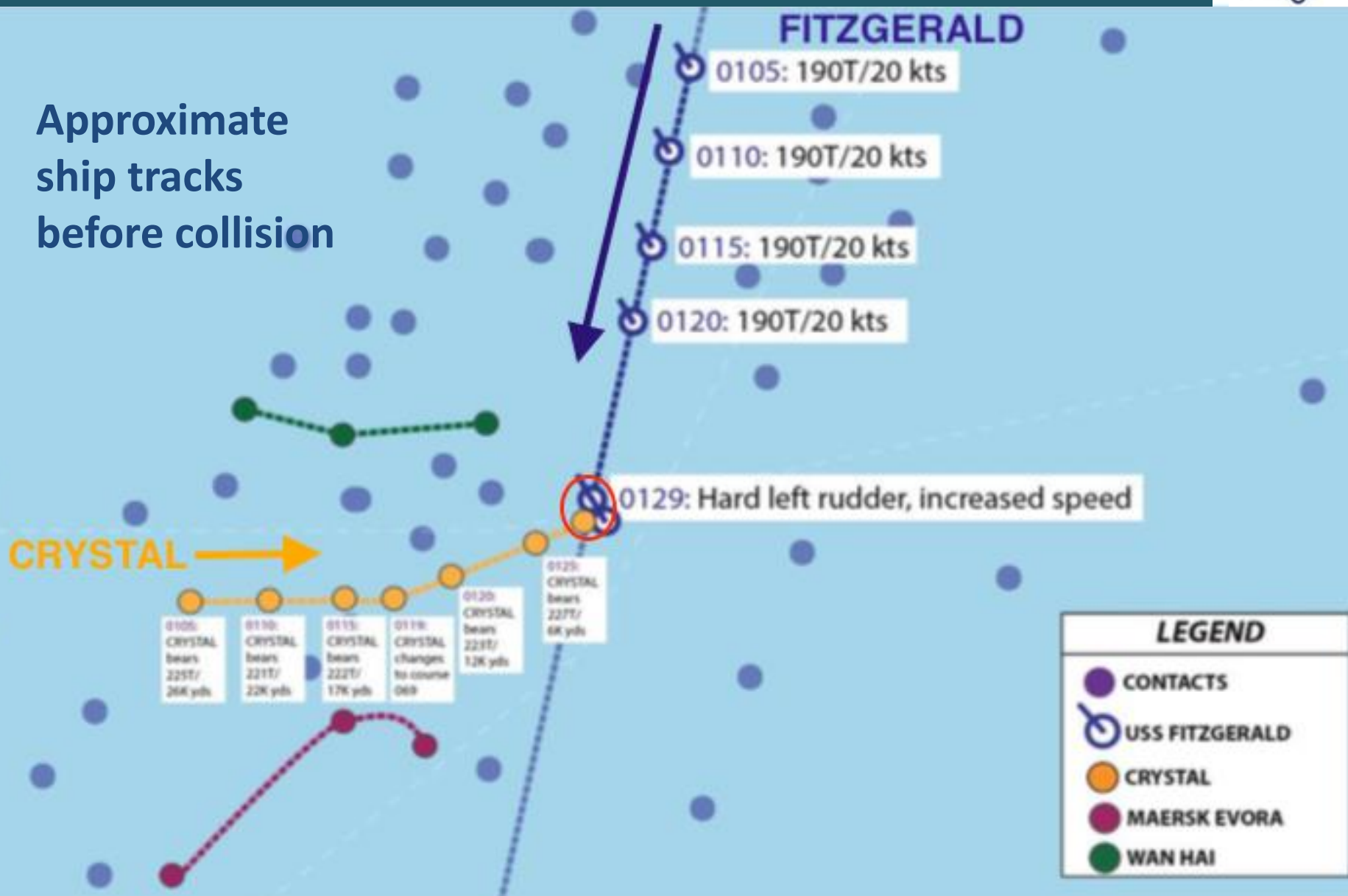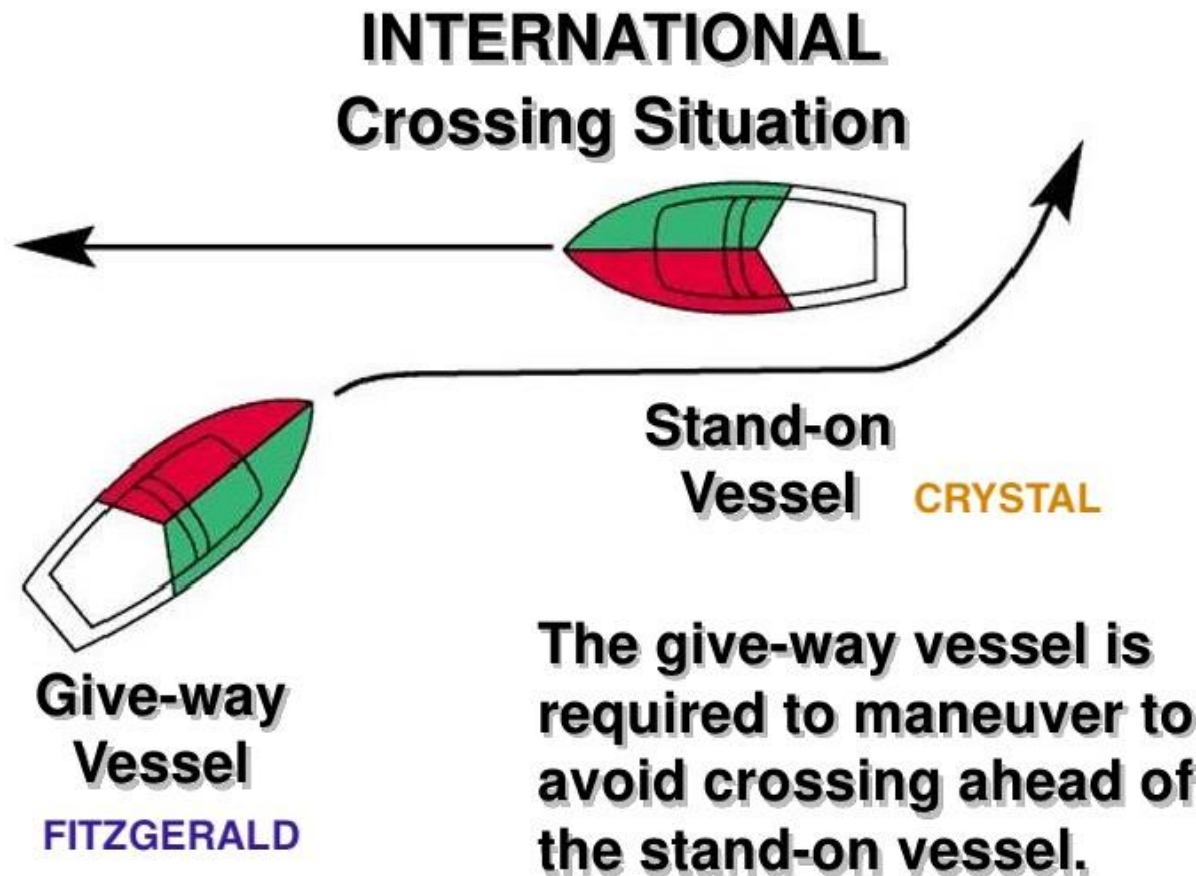
Approximate Collision Geometry
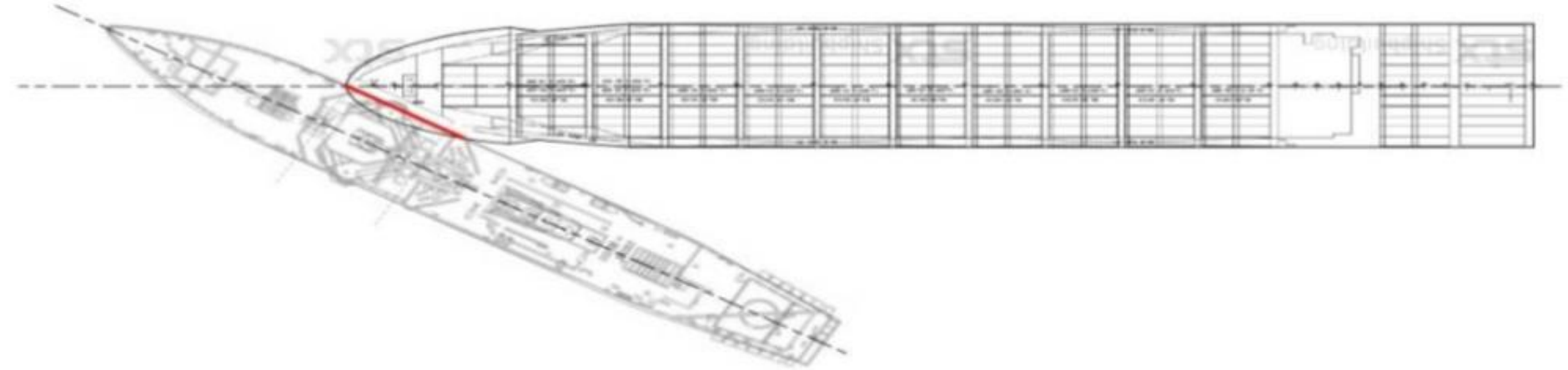
An HRO Mindset for Investigations

1. Human error the starting point.

2. Simplistic post-accident assessments teach nothing.

3. How did the situation make sense at the time to those who were involved?

An HRO Mindset for Questions

Focus on what went wrong instead of placing blame.

Guiding ideas:

- What could have worked, but didn't?

- What was different this time?

- How might problem indicators have been detected earlier?

- What information was shared or not shared?

Develop Your Questions
(5 minutes)

High Reliability (Weick & Roberts, 1993)

"…organizations concerned with reliability enact aggregate mental processes that are more fully developed than those found in organizations concerned with efficiency."

"…These intensified efforts enable people to understand more of the complexity they face, which enables them to respond with fewer errors. Reliable systems are smart systems"

Resilience Engineering (Hollnagel, 2006)

"…the intrinsic ability of an organization (system) to maintain or regain a dynamically stable state, which allows it to continue operations after a major mishap and/or in the presence of a continuous stress."

Karl E. Weick and Karlene H. Roberts (1993, Sep). Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly* . 38(3):357-381

Hollnagel, E. (2006). Resilience--The challenge of the unstable. In E. Hollnagel, D. Woods & N. Leveson (Eds.). Resilience Engineering: Concepts and Precepts. Aldershot, UK: Ashgate Publishing. 16.

Question Review

Learning from Adverse Events Using RE and HRO Methods

Type of finding	Traditional Risk Management	Resilience Engineering
Share lessons learned from failures "in a way that people take them to heart and can find them faster."	Document lessons in databases. Require staff to periodically read and study.	Learn from what goes well. Find similar events where things went well, ask "*why* did this go well?"
Informal pressure and deference to rank inhibit speaking up.	Encourage front line workers to speak-up (e.g., "If you see something, say something.")	Practices that increase speaking up and collaboration: change format of meetings such that leaders speak last, round robin, train leaders to ask open ended questions, invite cross-checks, leave rank at the door.
Failure in responding to unexpected situation.	Create rules to specify expected response.	Develop drill and simulation scenarios that include surprising branches, subtle cues. Assess how collaboration, social influences, affect response to weak signals

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Type of finding	Traditional Responses	High Reliability Approach
Failure (people or machines) means the system was not as robust as people thought.	Retrain those who are to blame. Replace equipment.	Failure can result from detection lapses: someone did not anticipate what/how things could go wrong, a deviation was undetected, or people brushed off unexpected events without investigating deeper.
People in the organization were blind to the emerging problem (blind spots)	Attributions of lost situational awareness or failure to pay attention. People should be careful.	*Blind spots* represent inability to recognize emerging problems. Look for dismissing problems, past simplified root causes, priority for authority over expertise, and failure to attend to current operations and training.
People failed to "connect the dots."	Third-party assessments and prescriptions for change with the false clarity of hindsight.	Look for ways of working so that it is easier for people to share thinking about small disruptions, question their interpretations, understand what they're currently doing, enhance their options, and identify the expertise that needed to cope.

Understanding the systems we develop and operate relies on well-considered methods

RE and HRO are complimentary approaches to reliable operations and learning from what went wrong.

Conscientious application of what we learn after problems, big or small, can: increase our appreciation for what goes right, and minimize the potential for adverse outcomes