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Applying a Systems Thinking Approach to Understanding Military Aviation Maintenance Complexity

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Overview:

- Introduction
- Aviation Accidents
- Complex Systems and Complexity
- Systems Thinking Approach
- Influence Diagrams
- Take-Away Thoughts

Introduction:

Golf “System”

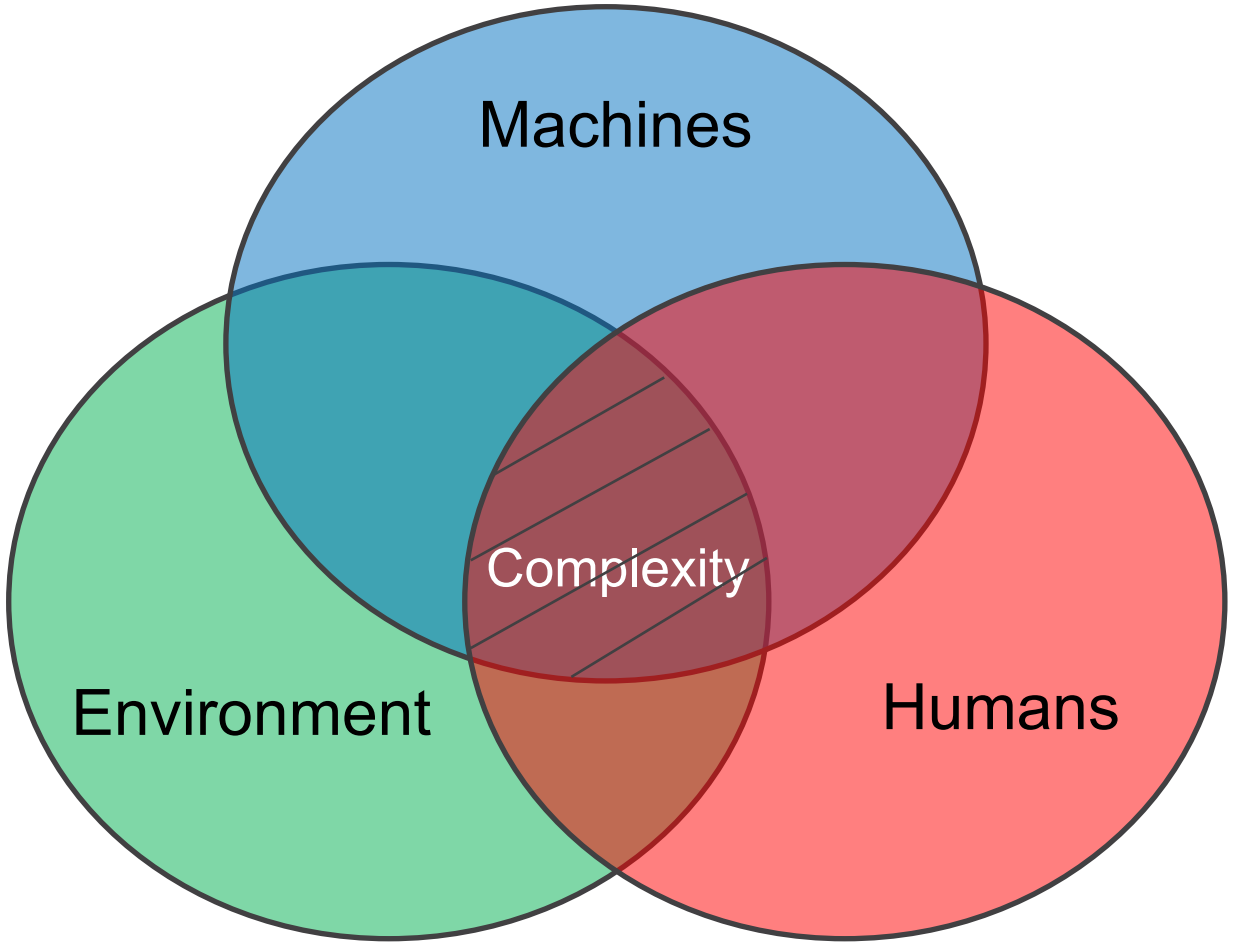
Could these accidents have been prevented?

- April 2018
  - An Air Force pilot died when his F-16 crashed during a training mission at Nellis Air Force Base in Nevada
  - 4 Marines died when their CH-53E Super Stallion helicopter crashed during a training mission at Twenty-Nine Palms, California
  - 2 Soldiers died when their AH-64 Apache helicopter crashed during a training mission at Ft. Campbell, Kentucky

Why are these accidents occurring?

- High OPTEMPO
- Scheduled Maintenance
- System Complexity

What do we mean by complexity?



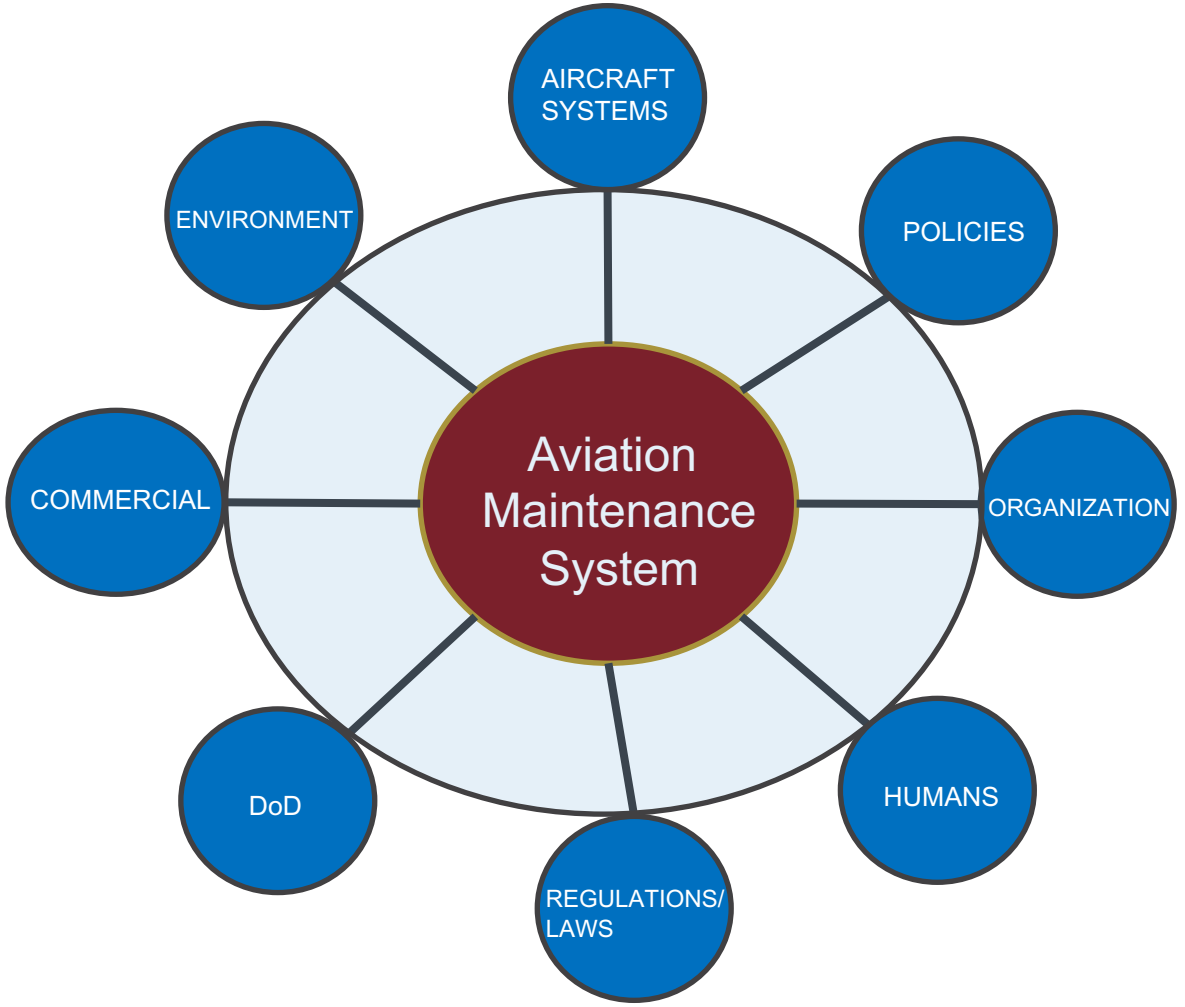
How do we understand complex systems?

- Application of system modeling techniques
  - Provides a conceptual model that describes and represents a system
  - Identifies linkages, interdependencies, and interactions to help understand the behavior of the system

What is *Systems* Thinking?

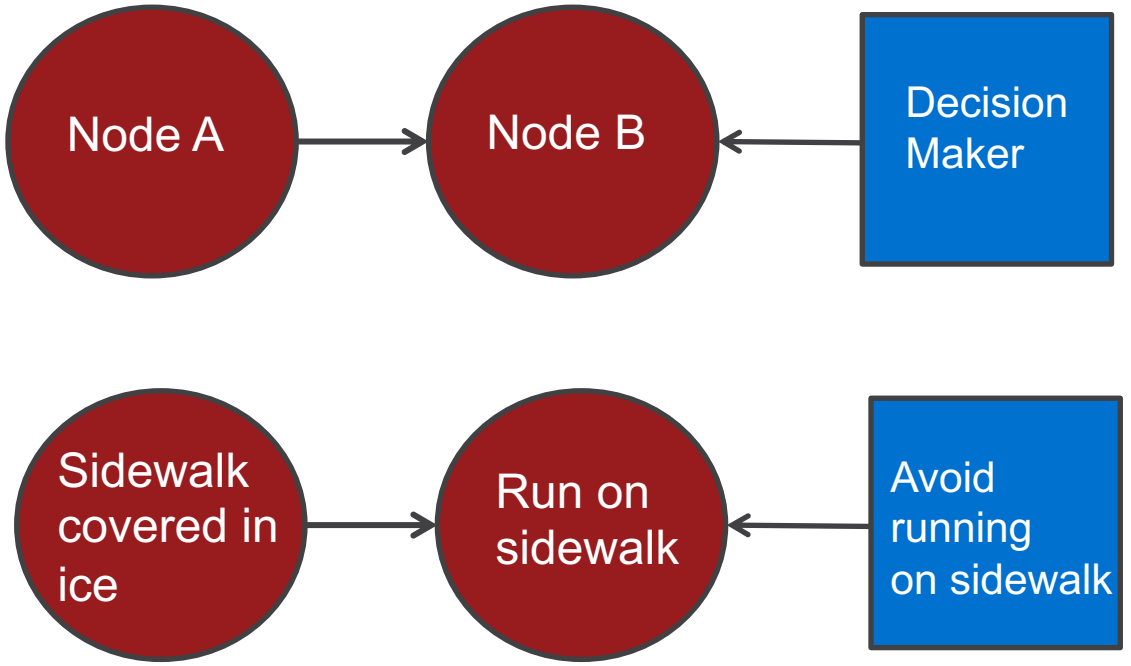
- A *holistic* approach to an analysis of complexity
- Looks at the system as a whole and within the context of *larger* systems
- Attempts to understand the system by analyzing the *linkages, relationships, and interactions* between the components that comprise the entirety of that defined system of interest
- Include both *physical and non-physical* systems

Aviation Maintenance as a *Complex System*:



Application of influencing diagrams to model aviation maintenance complexity:

- Model that analyzes risks and uncertainties
  - A directed graph with arrows or "influences" connecting related events or "nodes"
  - Depicts influences and interrelationships
- Represented as ovals and rectangles
  - Ovals represent uncertain circumstances or "states of the system"
  - Rectangles represent choices made by a "decision maker"
  - Arrows between two nodes means that the node at the arrow's tail exerts some "influence" on the node at the arrow's head
- Supports with predictability



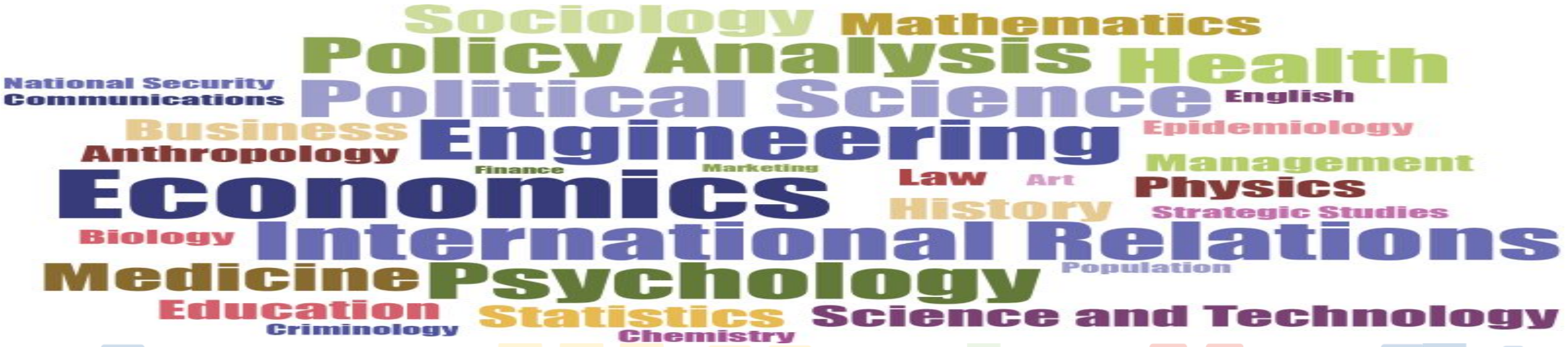
Influence Diagrams Assist in Understanding Aviation Maintenance Complexity:

- Maps uncertainties that affect aviation safety, readiness, and costs
- Maps decision points to better manage uncertainties
  - An expert model – what the "system" ought to operate based on subject matter experts
  - A status quo model – how the "system" currently operates in practice
- Identify and analyze differences between the expert and status quo model

Applying a systems thinking approach to aviation maintenance provides a holistic understanding of aviation maintenance complexity.

Take-Away Thoughts:

- Complex Systems and Complexity
- Systems Thinking Approach
  - ➢ Treat Problem Sets as “Systems”
  - ➢ View Systems in a Holistic Perspective
  - ➢ Think Holistically Across all Domains



Thank You!