Research, Engineering, and Development Advisory Committee (REDAC) Meeting

Subcommittee on Airports
March 3, 2020
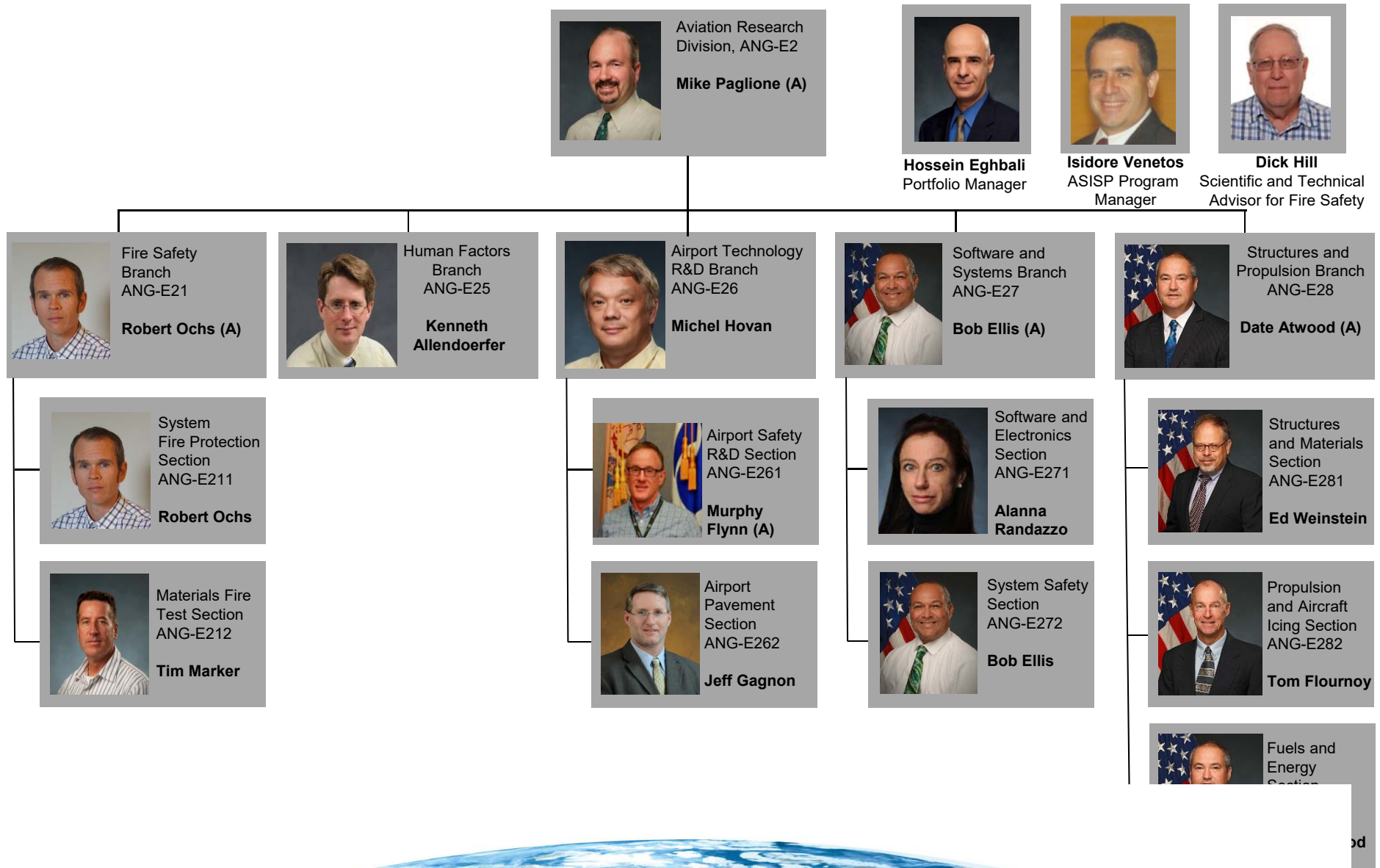
Mike Paglione
Manager (Acting)
Aviation Research Division, ANG-E2

Aviation Research Division: Mission, Vision, and Values

- <u>Mission</u> - Develop scientific solutions to current and future air transportation challenges by conducting applied research and development in collaboration with industry, academia, and government.

- <u>Vision</u> - Extend the Wright brother's legacy of research and development to ensure maximal safety, efficiency, and environmental stewardship for the air transportation system.

- <u>Values</u>
  - **Agility.** Expeditiously conduct and apply research to provide solutions to safety, efficiency, and environmental challenges.
  - **Strategy.** Develop and pursue a strategic research vision to identify and resolve issues before they emerge.
  - **Leadership.** Lead the world in applied research and development for air transportation system evolution.
  - **Learning.** Invest in employee growth and future generations of researchers and practitioners.
  - **Integrity and Stewardship.** Act as stewards for scientific integrity and rigor for the National Airspace System.

Aviation Research Division

Aviation Research Division, ANG-E2
Mike Paglione (A)

Hossein Eghbali
Portfolio Manager

Isidore Venetos
ASISP Program Manager

Dick Hill
Scientific and Technical Advisor for Fire Safety

Fire Safety Branch ANG-E21
Robert Ochs (A)

Human Factors Branch ANG-E25
Kenneth Allendoerfer

Airport Technology R&D Branch ANG-E26
Michel Hovan

Software and Systems Branch ANG-E27
Bob Ellis (A)

Structures and Propulsion Branch ANG-E28
Date Atwood (A)

System Fire Protection Section ANG-E211
Robert Ochs

Materials Fire Test Section ANG-E212
Tim Marker

Airport Safety R&D Section ANG-E261
Murphy Flynn (A)

Airport Pavement Section ANG-E262
Jeff Gagnon

Software and Electronics Section ANG-E271
Alanna Randazzo

System Safety Section ANG-E272
Bob Ellis

Structures and Materials Section ANG-E281
Ed Weinstein

Propulsion and Aircraft Icing Section ANG-E282
Tom Flournoy

Fuels and Energy Section

Laboratories (more than 25)

Full-scale Fire Test Facility

Full-scale Aircraft Structural Test Evaluation & Research (FASTER)

National Airport Pavement Test Facility

Aviation Fuel Research Lab
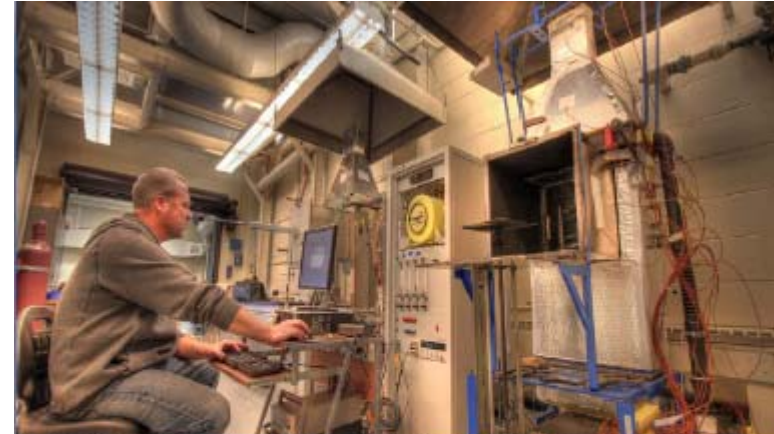

Research Development Human Factors Lab

Fire Safety

The Fire Safety Aircraft Pad is a 29,000 sq/ft concrete pad that hosts a fully functioning Boeing 747SP and a Boeing 737-275 aircraft. The aircraft are used to support FAA research projects and training exercises.

Technician prepares to conduct a rate of heat release test on a transport aircraft interior material. FAA flammability requirements limit the amount of heat produced by interior surfaces to delay "flashover" conditions inside an aircraft cabin during a postcrash fire accident.

The Adiabatic expansion nozzle is a simple replacement of existing CO_2 fire extinguisher nozzles which more effectively puts out fires. Standard discharge nozzle (left) and the Adiabatic expansion nozzle (right).

A 5 lb. CO_2 fire extinguisher with Adiabatic expansion nozzle being tested against a 12 ½ sq/ft, Heptane fueled pan fire.

Human Factors

The Tower Operations Digital Display System (TODDS) provides a world-class environment for human-in-the-loop research in the airport traffic control tower domain.

A simulation participant a realistic air traffic control scenario while wearing a Functional Near-Infrared Spectroscopy (fNIRS) headband that measures his cognitive activity.

Air traffic controllers participate in a variety of human-in-the-loop simulations and user-centered design activities.

A human factors researcher uses electroencephalography (EEG) to measure the cognitive activity of a participant in an air traffic control simulation.
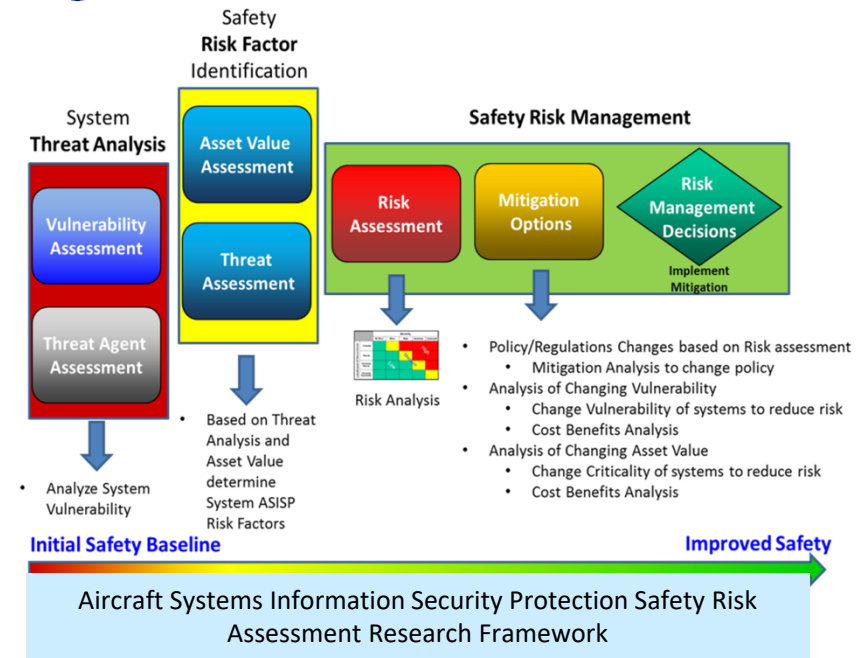
Software and Systems

FAA Flight Simulator Used for Terminal Area Safety Research

Helicopter Research through Flight Data Monitoring and Safety Reporting

Aircraft Systems Information Security Protection Safety Risk Assessment Research Framework

Arc Fault Evaluation Lab

High Performance Computer and Big Data

Structures and Propulsion

Engine showing glowing hot twin turbochargers during extreme testing of alternative fuels

Test engineers reviewing live engine test data during fuels testing

Fuel chemistry engineer performs two-dimensional compositional analyses of alternate fuel

Installing of full-scale fuselage panel in the FASTER fixture – viewed from exterior surface

FAA licensed Airframe and Power Plant technicians connecting test cell sensor wiring and controls in preparation for testing

Researchers performing final test cell instrumentation checks in preparation for testing

Safety R,E,&D Infrastructure Very Supportive of Airport Technology R&D

- Safety R,E,&D Portfolio - leverage of 4 other branches personnel, labs, and capabilities

Examples:

- Local Computing Infrastructure ~ CASSIE

- FAA Cloud Services ~ EIM Platform

- Big Data Analytics Workforce Development ~ Big DAWG

Local FAA Computing Services: Computing and Analytics Shared Services Integrated Environment (CASSIE)

- A collaborative environment for conducting research, developing and testing across all research programs, sponsors and WJHTC organizations

- CASSIE enables a flexible environment to conduct research by bringing all FAA organizations, partners and sponsors together in a shared services environment consisting of DATA, COMPUTE POWER and ANALYTICAL TOOLS

- Provides Big Data Platform along with FAA NAS data sources to support programs in the development of new capabilities and transition of capabilities.

Computing and Analytics Shared Services Integrated Environment (CASSIE)
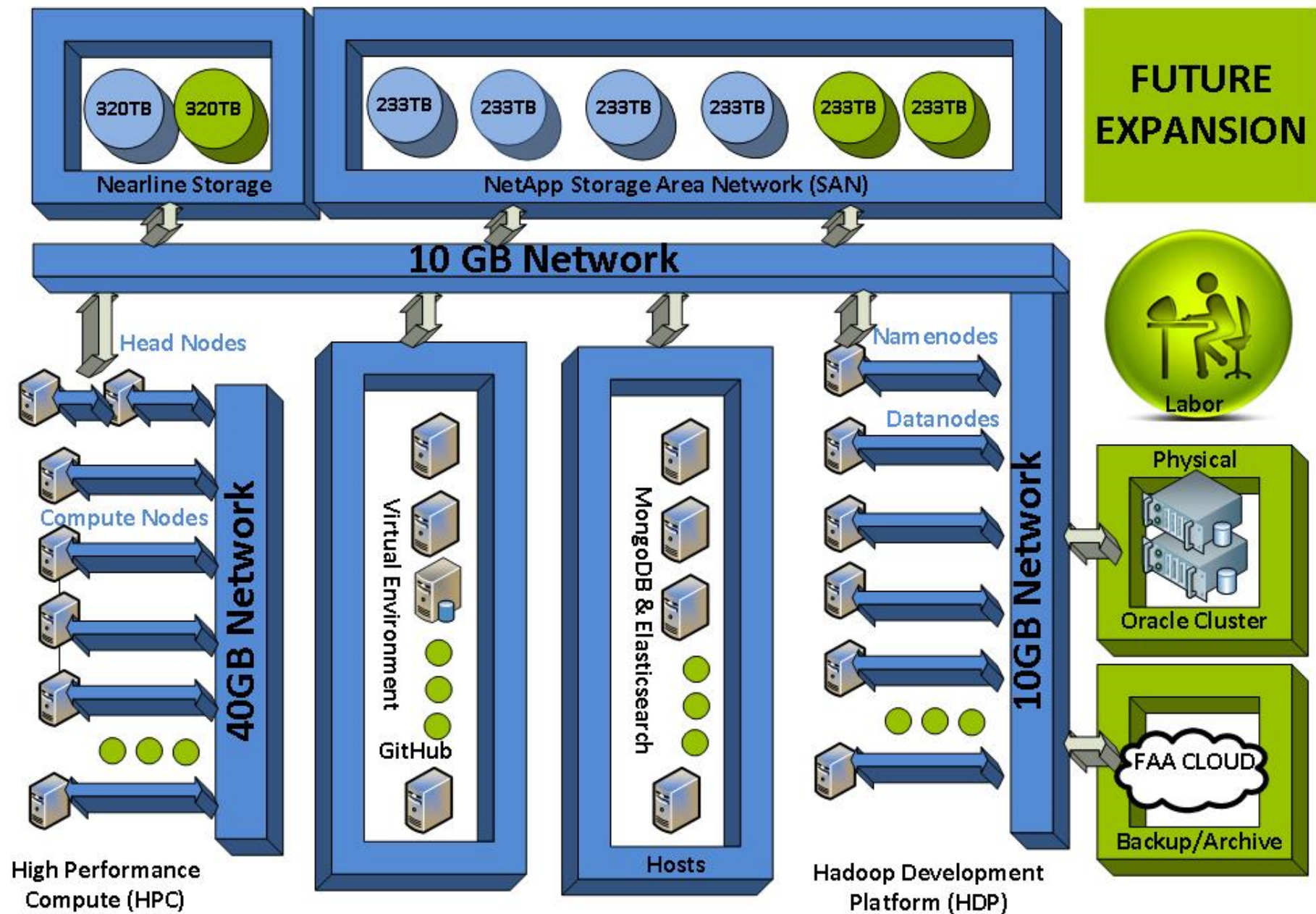
FAA Cloud Services: Enterprise Information Management (EIM)

- Research Purpose:
  - Deploy NAS data sources (i.e. Track/Flight, Weather, Aeronautical, Adaptation, CommNav) to EIM Platform for use across all FAA LOBs and integration with new Mission Support Acquisitions (i.e. DVARS, OARS, OPNET-R, E-IDS). Transition existing project from on-prem to Cloud-based EIM Platform

- Sponsor:
  - ADO/AIT, Natesh Manikoth, ANG-C Paul Fontaine

- Performers/Partners:
  - ATAC, GDIT, LSTech

- Milestones:
  - Deployed initial 35 NAS data sources to EIM Platform

FAA Cloud Services: Support for EIM Platform

- **Primary focus is ingestion of NAS data onto the EIM Platform**

- **35 sources made available to the Platform including Flight Track, Adaptation, Aeronautical, Safety and Weather and various project data.**
  https://wiki.faa.gov/display/EPDS/EIM+Platform+Data

- **Transitioning active ANG Big Data projects and supporting large Mission Support acquisition programs (i.e. DVARS, OARS, E-IDS, OPSNET-R)**
  https://wiki.faa.gov/display/EPDS/Project+Overview+Sheets

- **Managing data sources and projects using JIRA KANBAN**
  https://jira.faa.gov/projects/EIMPDI/summary

- **Developing plans for ANG Labs use of EIM Platform (Data, Concepts, Governance, Processes/Procedures)**

- **Supporting multiple organizations in use of EIM Platform (i.e. AVP, AIT,AJI, AJR, AJV, AJW and ANG)**

Big DAWG Approach

- Implement employee training on the technology

- Facilitate technical interchange with leading experts

- Exercise hands-on experimentation and prototyping for employee selected use cases

- Leverage opportunities with students (e.g. GA Tech MS dissertations, Rowan Univ. clinics, FAA interns)

WG Mission: *Empower WJHTC and MMAC workforce to develop and pioneer innovation and opportunities in big data analytics to improve safety and efficiency of the NAS.*
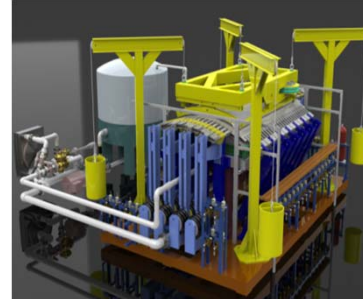
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Aviation Research Division Summation

Fire

Fuels

FASTER

Factors (Human)

THANK YOU!

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