Confined Space Monitoring System (CSMS)

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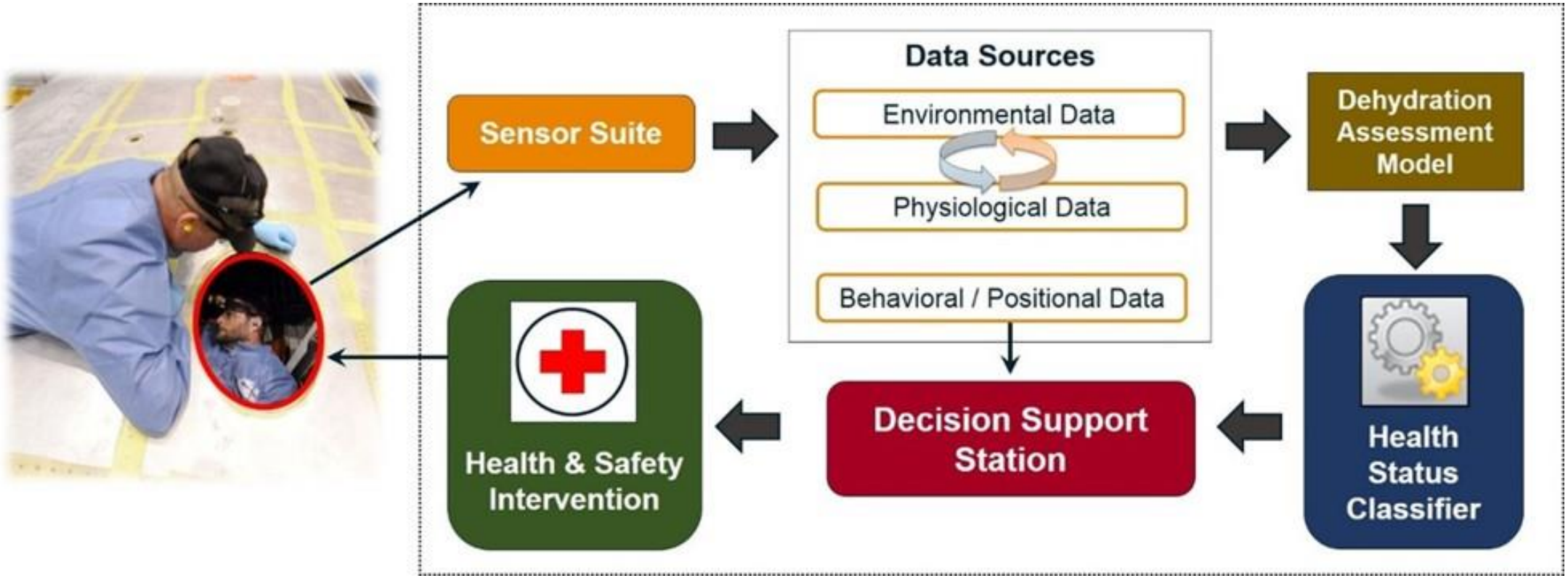
Problem Statement

- Confined space monitoring is an important practice mandated by OSHA to protect worker health & safety
  - Adds workload & manpower demands – requires manual oversight, often 1:1 ratio, & frequent radio communication
  - Estimated 50,000 man hrs/year to monitor confined space work at an Air Logistics Complex (ALC)
  - While effective overall, improvement opportunities exist to better protect workers in confined spaces

Technical Approach

- **Unobtrusive sensor suite** to remotely monitor maintainer health signals, hydration, location, & atmospheric hazards in confined spaces
- **Integrated decision support** for alerting & intervention
  - Single person can monitor many confined spaces concurrently
  - Continuously assess dehydration & overall health status
  - Preventative action & accelerated emergency response

Technical Approach



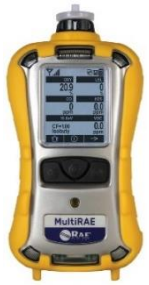
Technical Approach

Portable Sensors

Location

Vital Signs

Atmospheric Hazards



Data Networks

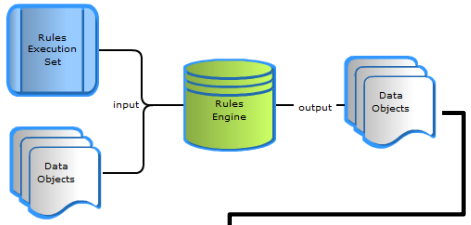
Monitoring Station

GeoView

Roster Status

Drill-down

Alerting & Intervention



Overall Benefits

- **Greater Reliability to Ensure Worker Safety**
  - Early warnings of degrading health or atmospheric hazards
  - Awareness of worker locations across all confined spaces
- **Improved Work Efficiency and Cost Savings**
  - Reallocate standby attendants to maintenance work
  - Reduce radio exchanges when entering/exiting spaces

Technology Deployment

- **Baseline system** implemented by Lockheed Martin Aeronautics collaborators for remote monitoring of C-5 confined spaces
  - Monitors breathing & atmospheric hazards to improve worker safety
  - Improves safety, saves thousands of man hours per year
- **R&D efforts** are to develop system improvements
  - Post R&D system rollout planned for Warner Robins Air Logistics Complex (WR-ALC) initially
  - Pending success at WR-ALC, proceed to Tinker & Hill ALCs

Project Team Participants

- Aptima, Inc. (SBIR Prime)
- Air Force Sustainment Center (AFSC) – SBIR sponsoring agency
- Air Force Research Laboratory (AFRL) – Technical collaborator
- Lockheed Martin Aeronautics (LM-Aero)
- The Design Knowledge Company (TDKC)
- The University of Toledo, Dept of Bioengineering