



**Raytheon
Technologies**

Human Machine Interactions (HMI)

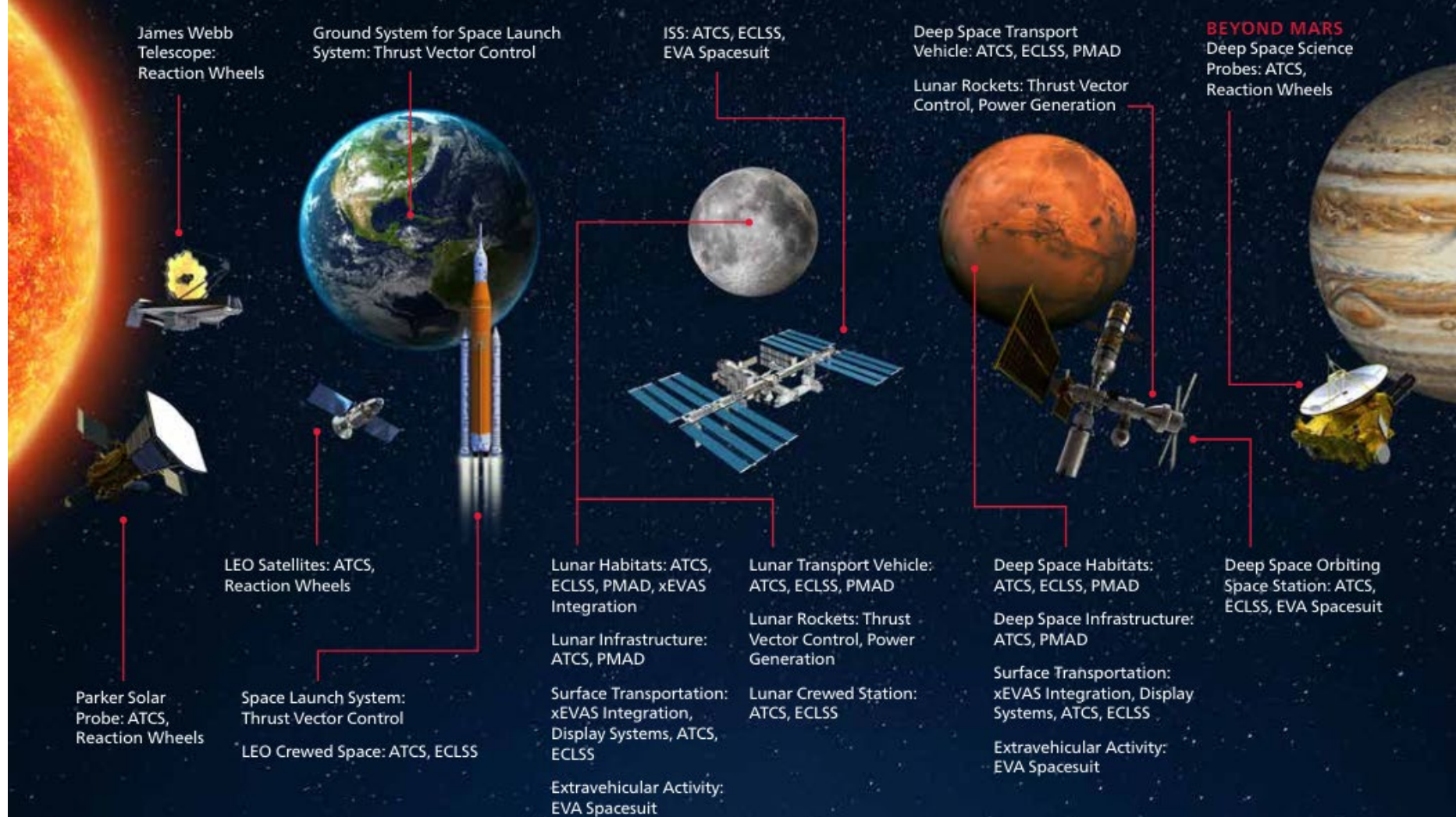
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WE EMPOWER EXTRAORDINARY MISSIONS

From spacesuits to space wheels, life support systems to power generation, thermal controls and more, our innovative solutions are equipping the next generation of space exploration.



LEGEND

- ATCS** Active Thermal Control System
- ECLSS** Environmental Control & Life Support System
- PMAD** Power Management and Distribution
- EVA** Extravehicular Activity
- xEVAS** Refers to NASA's Exploration Extravehicular Activity Services Contract



Crewed Missions



Lunar Terrain Vehicle EVA Integration



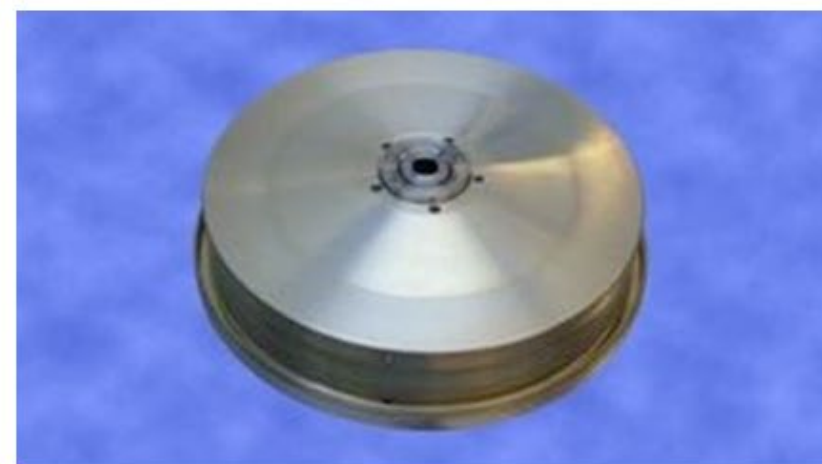
Optical Expertise



Space Sensors



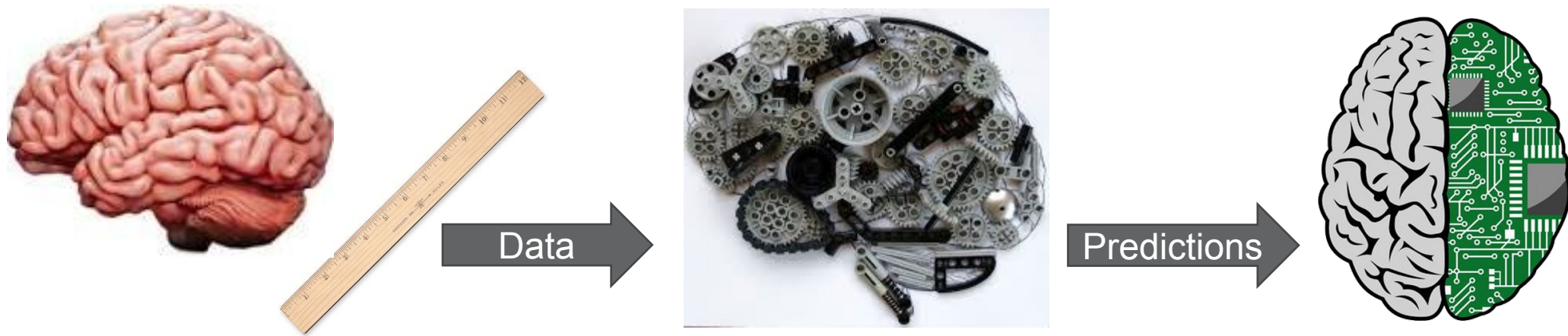
Spacesuits



Space Wheels

Create Human-Interpretable Mathematical Models of Human Cognition for Integration with AI/ML

Analogous to Physics-informed models, create Cognition-informed models and apply to Human+Machine Systems



Measure difficult to measure human cognitive states:

- Experiment design to solicit desired states and behaviors
- Physiological + Behavioral measures beyond surveys for **~RT measures**
- Examples: Cognitive Processes, Biases, Workload, Situational Awareness, trust, training effectiveness, ethical reasoning

Model of human decision making to create predictions:

- Leverage psychological theories to create computationally tractable models to **predict human state or behavior**
- Cognitive Task Analysis to model tasks
- Example: predict operator beliefs about world state

Use model to assist or exploit :

- Use models to select **what information and when** to help human gain knowledge and insight
- Example: Identify operator intent to cognitively aid when needed
- Counter example: Identify operator uncertainty and further sow confusion

Identify what information and when machine can provide to human to augment performance