Algorithm & Simulation Directorate
Agenda

• How the Algorithm & Simulation (A&S) Directorate fits into Engineering

• The individual disciplines within A&S

• How you fit into A&S: The matrix organizational structure

• Q&A
The Algorithm & Simulation (A&S) Directorate
Raytheon Missiles & Defense: By the Numbers

Raytheon Missiles & Defense brings customers the industry’s most advanced end-to-end solutions, delivering the advantage of one innovative partner to detect, track and defeat threats.

We are here to create a safer future

Global headquarters: Tucson, Arizona

$16B annual revenue
30K employees
30 states
28 countries

Raytheon Missiles & Defense provides the industry’s most advanced end-to-end solutions to detect, track and engage threats.
What we do

Air Power
Achieving air dominance depends on what aircraft carry and the technology that powers them.

Counter-UAS
Defending against drones requires a range of systems, including sensors and effectors.

Hypersonics
Facing global threats of the future requires hypersonic weapons that travel at incredible speeds.

Land Warfare & Air Defense
Overpowering adversaries requires equipping ground forces with integrated, proven precision weapons and more.

Strategic Missile Defense
Making the world a safer place requires technologies that see farther, process data faster and precisely guide interceptors to targets.

Naval Power
Maintaining freedom of the seas calls for innovative sensors, command and control and precision weapons.
# Raytheon Missiles & Defense: Engineering

## Cross Product Team
Define overall system solutions and integrate subsystems and products to deliver comprehensive layered-defense capabilities, with 5 focus areas:

- Algorithm & Simulation
- System Design & Architecture
- Systems Modeling & Architecture
- Systems Integration & Test
- Whole Life Engineering

## Integrated Product Team
Design, implement, and test software and hardware subsystems and products

- Electrical Products
- Mechanical Products
- Software Products

## Engineering Execution
Support engineering efficiency, operations, and services

- Configuration & Data Management
- Engineering Excellence
- Modular Technologies
- Technology & Strategic Partnerships

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RMD Engineering has three focus areas

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A&S’s vision is to be our customer’s first choice for product solutions through world-class people, leading-edge technology, and capability they have confidence in.
The Systems Engineering “V” Chart Ties Things Together

Legend

- Modeling and Simulation
- Guidance, Navigation, and Control & Signal Processing

Raytheon - Unrestricted Content
Individual Disciplines
Modeling and Simulation (M&S)

Responsibilities
• Integrated flight simulations
• Animation & visualization
• Computer-in-loop test environments
• Mission level analysis & concept development
• Detailed performance analysis
• Component modeling and Interoperability
• Scene generation and sensor modeling
• Pre- and Post-flight analysis

A&S Context
• Provide simulation environment to host and demonstrate performance of algorithms
• System performance assessment/analysis
• Analysis and verification of Concept of Operations and system design

Typical Background
• Degrees in Computer Science, Applied Math, Physics, Statistics, Operations Research, Engineering disciplines, ...
• Software Skills in C/C++, Matlab, Python, Linux, Fortran, Java, Perl, Distributed Computing, …
# Guidance, Navigation, and Control (GNC)

## Responsibilities
- Guidance, target tracking, target state estimate
- Navigation, trajectory optimization
- Control actuation system algorithm design and hardware integration, autopilot
- Aerodynamic design and analysis, computational fluid dynamics, wind tunnel testing, flight sciences
- Autonomy

## A&S Context
- Receive & process target track information from Signal Processing
- Provide algorithms for flight software and simulations
- Gather and analyze telemetry data to assess algorithms and validate simulation
- Establish hardware errors & confidence levels

## Typical Background
- Degrees in Aerospace Engineering, Electrical Engineering, Mechanical Engineering, Physics, Math, …
- Software Skills in C/C++, Matlab, Python, Linux, …
Signal Processing (SP)

Responsibilities

- Work with radar frequency (RF), visible electro-optic (EO), and infrared (IR) sensor data
- Convert raw sensor data into usable data, including calibration and de-noising
- Design and develop algorithms for fusion, object detection, tracking, classification, countermeasure rejection, & terminal aimpoint
- Apply Machine Learning

A&S Context

- Provide target track information to Guidance, Navigation, and Control
- Provide algorithms for flight software and simulations
- Gather and analyze telemetry data to assess algorithms and validate simulation

Typical Background

- Degrees in Electrical Engineering, Computer Engineering, Applied Math, Computer Science, Physics, …
- Software Skills in C/C++, Matlab, Python, Linux, …
Matrix Organizational Structure
Product and Functional Structures

Product Line
- Product Line
- Program
- Integrated Product Team (IPT)
- Team

Functional Management
- Directorate
- Center
- Department
- Section

YOU
Responsibility Comparison

Product Line

- Day-to-Day Tasking
- Charge Numbers
- Customer Interface
- Program Schedule
- Financial Reporting
- Capturing New Business
- Risks & Opportunities Management

Functional Management

- Provide Staffing to Programs
- Career Development
- Performance Development
- Timecard Approval
- Travel Approval
- Digital Technology Assets
- Talent Recruitment
Example Program Organization Chart

Program Manager

Tech Lead / Chief Engineer

Business Development

Electrical IPT

Program Support
  Administrative
  Configuration Mgmt
  Contracts
  Data Mgmt
  Finance
  Program Integrator
  Quality
  Safety
  Security
  Supply Chain

Performance IPT

Systems IPT

Life Cycle IPT

Electrical IPT

Mechanical IPT

Integration & Test IPT

GNC Team

M&S Team

SP Team

SW Team

Subcontractor
  PM
  Tech Lead

Purchase Order
Technical / Leadership “Lattice” for Career Growth

Enter: New Hire

- Chief Engineer
- PL Chief Engineer
- Senior Fellow
- Fellow
- Technologist
- Systems Architect
- Systems Engineer
- Discipline SME
- Advanced Program Support

Function:
- Center Manager
- Dept. Manager
- Section Head
- Systems Test
- Manufacturing Eng. Operations
- Factory Manager
- Factory Process Manager
- Factory Systems Manager
- Integrated Program Support
- MTC Operations

Program:
- Development Program Manager
- Production Program Manager
- Capture Lead
- IPT (Large)
- Program Manager (Medium)
- Program Manager (Small)
- Supply Chain Program Manager
- MPM
- Supply Chain
- IT
- IPT (Small)

Organization:
- Technical
- Leadership

Team:
- Individual
- Team

Highest growth level without dual-track experience
Vertical career paths, advancement limits without lateral moves and experience
Security Clearance

• A&S engineering & science positions typically require a security clearance

• Raytheon Missiles & Defense does not make the clearance decision
  – The DoD Defense Counterintelligence & Security Agency conducts the background investigation, and the DoD Consolidated Adjudications Facility determines eligibility for a Personnel Clearance
  – https://www.state.gov/m/ds/clearances

• How long does it take to get a security clearance?
  – According to state.gov, the time it takes for each case will vary depending on the person’s specific circumstances
Questions?