Conducting an Exploration Focused Astronaut Job Analysis

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Disclosure Information

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We have no financial relationships to disclose.
Project Drivers

• NASA now embarking on multiple, one-year missions on ISS
  – 5 one-year missions currently on the books through 2024
• Addition of short (30-45d) missions to ISS likely with advent of US commercial crewed vehicles.
• ISS operations are approved through 2024
• Post-ISS, the potential mission profiles are diverse & uncertain
  – Near-Earth asteroids, Moon, Lagrangian points
  – Mars is the eventual exploration target
Project Drivers

• In ISS era, NASA must be able to man 1mo, 4-6mo, and 12mo missions in real-time communications

• Post-ISS, potential missions are up to 12mo real-time comm and up to 36mo lagged comm

• Behavioral selection and training guidelines for new astronauts must be updated to accommodate new and potential mission profiles
  – Prior guidelines developed in 1996 and 2003 for shorter-duration ISS and Shuttle missions

• Large pool of flyers with long-duration experience available now to be SMEs
Participants

• Internal Behavioral Team
  – Al Holland/NASA
  – Jamie Barrett / Wyle Life Sciences
  – Brandon Vessey / EASI
• Astronaut Core Panel (assigned by Astronaut Office)
  – 6 veteran US astronauts
  – Sounding board for behavioral team
• 23 prior ISS astronauts and 3 veteran behavioral specialists from the operational group
• External Technical Advisors
  – Edward Levine / University of Southern Florida
  – Fred Morgeson / Michigan State University
Objectives

• Identify, define and weight the behavioral competencies (knowledge, skills, abilities and characteristics) for upcoming space mission profiles
  – Utilize a systematic, best-practices job analysis procedure
• Increase the accuracy of the competencies by utilizing the large number of veteran US ISS flyers as SMEs
• Deliver a reference document useful to operational selection, training and to research
Competencies

• Describe the knowledge, skills, abilities and other behavioral characteristics desired in order to maximize the likelihood of mission success
  – E.g., teamwork, group living skills, independence, mechanical inclination

• Vary somewhat or may be prioritized differently according to the mission profile (duration, habitable volume, lagged comm, etc.)

• Guide the choice of tools and methods used in selection
Method

• Review of the new ISS 12mo and post-ISS potential missions led to 4 general ‘types’ of missions:
  – A: up to 6mo duration, RT comm, larger vol
  – B: up to 12mo duration, RT comm, larger vol
  – C: up to 12mo duration, lagged comm, small vol
  – D: up to 36mo duration, lagged comm, small vol

• Core Panel of 6 veteran astronauts formed and reviewed mission types A-D; group-generated initial competencies for A-D.
Method

• Individual 1.5h interviews with 26 SMEs:
  – Reviewed & discussed the 4 classes of missions and their characteristics
  – SME gave best judgment on competencies needed for each class A-D; discussed each competency and why important; how mission demands similar and different A-D
  – Reviewed previously-contributed competencies A-D, discussed them, added/modified them
Method

• Detailed behavioral descriptors and competency suggestions were grouped by similarity into:
  – 18 final competencies
  – 3 general types (Mission-related, social, and personal competencies)
• For each final competency, key descriptors were identified and a definition was formed, based upon interview results
Method

• A second Core Panel meeting:
  – Reviewed the competency list in detail
  – Suggested edits regarding definitions, key descriptors, and operational examples
  – Advised regarding upcoming survey design

• External job analysis experts periodically reviewed and advised on the process and the structure of the competencies
Sample of Competencies

• **Operations Orientation**
  
  • Definition: *Maintains a pragmatic focus on mission goals and constraints*

  • Descriptors: **Scanning, forecasting, backs away from details as needed**, awareness of priorities and able to execute, compartmentalizes tasks, **outcome oriented, pragmatic**, **shifts with changing goals**, maintains situational awareness, anticipatory thinking to better coordinate with ground activity, **problem-solving mindset**, keeps tools and work materials clean and organized, **appropriately balances action with analysis**
Sample Competencies

- Autonomous Worker
- Situational Leadership and Followership
- Small Group Living
- Teamwork
- Adaptability/Stress Tolerance
Method

• Now implementing a web-based exercise for previous SMEs and previously-unavailable veteran flyers to:
  – Assign weights/priorities to the competencies, based on frequency and criticality, for each mission type
  – Provide rationale for weightings
Method

• Analyze the ratings and rankings

• Identify the most critical competencies for each mission profile
  – Importance relative to one another, with rationale, examples, constraints, and definitional nuances

• Final Core Panel Meeting to review findings

• Publish a document describing the process, analyses, findings and recommendations
Questions?
Project Plan

- 12/13 Management input and approval
- 12/13 Initial Core Panel Meeting
  - Generate initial list of competencies for 4 mission types
- 01-03/14 Individual Interviews with Previous ISS Flyers
  - Discuss the 4 mission types, independently generate critical competencies for each, review and add/delete as needed
  - How do their definitions change across mission profiles?
- 04/14 Second Core Panel Meeting
  - Review and edit competencies from interviews, generate behavioral examples
- 05/14 Individual, web-based Survey (all prior SMEs and any others previously unavailable)
  - How prioritize/weight the competencies by mission type?
  - Criticality, frequency, additional comments
- 06/14 Final Core Panel Meeting
  - Finalize list, definitions, weights