IDENTIFYING THE "RIGHT STUFF": AN EXPLORATION-FOCUSED ASTRONAUT JOB ANALYSIS

J.D. Barrett
Wyle Science, Technology, and Engineering Group
A.W. Holland
National Aeronautics and Space Administration
W.B. Vessey
Enterprise Advisory Services, Inc.

Background

Industrial and organizational (I/O) psychologists play a key role in NASA astronaut candidate selection through the identification of the competencies necessary to successfully engage in the astronaut job. A set of psychosocial competencies, developed by I/O psychologists during a prior job analysis conducted in 1996 and updated in 2003, were identified as necessary for individuals working and living in the space shuttle and on the International Space Station (ISS). This set of competencies applied to the space shuttle and applies to current ISS missions, but may not apply to longer-duration or long-distance exploration missions. With the 2015 launch of the first 12-month ISS mission and the shift in the 2020s to missions beyond low earth orbit, the type of missions that astronauts will conduct and the environment in which they do their work will change dramatically, leading to new challenges for these crews.

To support future astronaut selection, training, and research, I/O psychologists in NASA's Behavioral Health and Performance (BHP) Operations and Research groups engaged in a joint effort to conduct an updated analysis of the astronaut job for current and future operations. This project will result in the identification of behavioral competencies critical to performing the astronaut job, along with relative weights for each of the identified competencies, through the application of job analysis techniques. While this job analysis is being conducted according to job analysis best practices, the project poses a number of novel challenges. These challenges include the need to identify competencies for multiple mission types simultaneously, to evaluate jobs that have no incumbents as they have never before been conducted, and working with a very limited population of subject matter experts. Given these challenges, under the guidance of job analysis experts, we used the following methods to conduct the job analysis and identify the key competencies for current and potential future missions.

Method

Mission Types

Because the astronaut job is dynamic and determination of future mission profiles is uncertain, the job analysis was conducted with consideration given to several options for future human spaceflight missions. As such, the missions included in the job analysis were organized into four categories encompassing current missions, near future missions, and two categories of potential exploration missions. These missions vary in length, communication delays, crew size, and vehicle size.

Job Analysis Procedures

When determining how to go about conducting this job analysis, the challenges we faced, namely the lack of incumbents for possible future exploration missions and the small number of SMEs, limited our options. As such, we did our best to follow procedures based on job analysis best practices and recommendations from external job analysis experts. First, we assembled a Core Panel (CP) of veteran NASA astronauts to serve as a sounding board for the project. In the initial CP meeting, the panel reviewed the 4 mission types to provide their initial thoughts about these missions and to generate a list of characteristics needed for success for each type. This list of characteristics by mission was reviewed by the job analysis team and grouped into competencies. These aggregated lists served as our initial competency list.

Following the initial CP meeting, we then conducted structured interviews with 26 Subject Matter Experts (SMEs), 21 ISS astronauts, 2 shuttle astronauts, and 3 behavioral health professionals with extensive knowledge and experience supporting long-duration flyers. These interviews took approximately 1.5 hours each and were facilitated by the job analysis project team. From these interviews, a final list of 18 competencies was generated for 4 mission types, along with behavior descriptors of each competency.

Following a second CP meeting to review the interview results, a web-based survey was provided to 28 SMEs, including those who participated in the interviews. Of the 28 SMEs contacted, surveys were completed by 15 SMEs, a 54% response rate. This survey included questions on basic demographics, ratings of competencies on importance and trainability, and relative rankings of the competencies across the four mission types. For the rating component, SMEs were asked to rate the importance of each competency for each mission type on a scale of 0-100. For each rating, survey respondents were also asked to indicate whether the competency needed to be present at hiring or if it could be trained on the job. The ranking component consisted of a visual ranking task, during which the SMEs were asked to rank each competency from 1 (most critical) to 18 (least critical) for each of the four mission types. Survey respondents were also asked to provide any additional thoughts regarding their ratings or additional competencies that may not have been represented in the survey.

Due to the small sample size, analyses were limited. Descriptive statistics on the ratings indicated that, on average, all of the competencies were rated fairly high. A general trend of increasing importance in the ratings was identified as competencies moved from current mission profiles to future exploration missions, with the largest jump (~10 points) occurring with the introduction of a smaller vehicle and a space to ground communication delay . This finding is consistent with qualitative descriptions drawn from the interviews describing the shift in the importance of competencies across mission types. Descriptive statistics on the rankings indicated that the most important competencies were somewhat stable across the 4 mission types. Results also indicated that some competencies were considered to be more trainable than others. The methods applied and results of these analyses will be further discussed during this presentation.