Behavioral Components of NASA’s 2017 Astronaut Selection

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Disclosure Information
87th Annual Scientific Meeting

I have no financial relationships to disclose.

I will not discuss off-label use and/or investigational use in my presentation.
JSC’s Behavioral Health and Performance Operations Group (BHP)

- BHP Operations is a component of the JSC Space Medicine Operations Division
  - ISS mission psychological/behavioral health support (primary mission)
  - Astronaut applicant psychological and psychiatric screening
  - Clinical evaluation and care of astronauts and their dependents
  - Occupational mental health evaluation of NASA divers, pilots and flight controllers
  - Consultants to the NASA Human Research Program
  - Consultants to NASA flight surgeons, ISS crew surgeons, the Astronaut Office, and JSC management
  - Consultants to the JSC Employee Assistance Program Office
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- NASA’s Mercury 7
  - Alan Shepard USN
  - Gus Grissom USAF
  - John Glenn USMC
  - Scott Carpenter USN
  - Wally Schirra USN
  - Gordon Cooper USAF
  - Deke Slayton USAF

Requirements – experienced military test pilots; 5’11” or less in height and 180 lbs. maximum

- 500 applications
  - 110 qualified
  - 18 finalists
  - 7 selected
  (1.4% selection rate)
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• Project Mercury astronaut candidate selection committee (1959)
  – 1 senior management engineer
  – 1 test pilot engineer
  – 2 flight surgeons
  – 2 psychologists: Allen O. Gamble (NASA HQ) and Robert Voas (US Navy)
  – 2 psychiatrists: George E. Ruff and Edwin Z. Levy (both active duty USAF physicians)
• 22 Astronaut Classes from 1959 to 2017
• 359 astronaut candidates selected in 59 years
• 1996 largest class: 44
  (height of Space Shuttle Program era)
• Current active astronauts: 44
• 6200 Applications for class of 2013
  – 49 finalist candidates for class of 2013
  – 8 astronaut candidates selected in 2013
    (0.13% selection rate)
• Over 18,300 applications for the 22nd astronaut class of 2017
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2017 Astronaut Selection Schedule

Feb 2016

- 18,357 Applicants
- 11,886 Qualified
- 439 Highly Qualified
- 120 Semi-Finalists
- 50 Finalists
- 12 ASCANs

June 7, 2017

0.065% selection rate (all applicants)
0.10 % selection rate (qualified applicants)
2.7% selection rate (highly qualified applicants)

Additional factors that drove up application interest included the movie The Martian and NASA’s use of social media to advertise the job opening.
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- Planning for the 2017 astronaut selection cycle began in 2015
- Comprised approximately 50% of workload over two years for those on the team directing and planning the selection process
- NASA Psychologist Albert Holland, PhD led the overall team
  - NASA psychiatrist Gary Beven, MD led the psychiatric evaluation component
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Two complementary but different processes:

- **Psychiatric qualification**
  - According to current NASA medical standards
  - Diagnosis/No Diagnosis
  - Recommendation made to Aerospace Medical Board (AMB)
  - Historically a 2% disqualification rate

- **Psychological suitability for space missions**
  - Mission demands of ISS and deep space exploration up to 12 months
  - Based on desired behavioral competencies specific for spaceflight
  - Advisory information to Astronaut Selection Board (ASB) with a suitability rating provided
BHP Astronaut Selection
Select-In Suitability Proficiencies 2009 and 2013

- Family Issues and ability to cope with prolonged family separations
- Ability to perform under stressful conditions
- Group living skills
- Teamwork skills
- Self-Regulation
- Motivation
- Judgment and Decision Making

- Conscientiousness
- Communication Skills
- Leadership Skills
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- BHP Astronaut Selection Select-In Suitability Proficiencies 2017
- Target competencies were identified and prioritized via a systematic analysis of future mission profiles, conducted in 2014 by BHP and using veteran ISS astronauts as SMEs
  - Self-regulation
  - Resilience
  - Teamwork
  - Small Group Living
  - Operational Problem Solving
  - Leadership-Followership

Note: Suitability sub-competencies not shown to protect integrity of the selection process.
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- Multiple different methods look at each suitability competency (e.g., psych testing, team tasks, groups tasks, individual tasks, structured interviews, peer ratings)

- Multiple different assessors observe each applicant
  - Use of DoD-experienced psychologists and psychiatrists with aerospace psychiatry/psychology and operational experience
  - Investment in the orientation and calibration of raters
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- Team of external consultant psychologist and psychiatrist examiners with vast experience
  - USAF Aeromedical Consultation Service Neuropsychiatry Branch Chief and staff psychiatrists
  - Naval Aerospace Medical Institute Chief of Psychiatry
  - Mayo Clinic aerospace medicine fellowship psychiatrists
  - Active duty and retired military operational psychologists with many years of special forces selection and consultation expertise
  - Several external examiners have decades of prior astronaut selection experience
- Valued professional attributes include
  - military service as a psychiatrist and flight surgeon or as an operational psychologist in deployed setting
  - prior selection program work
  - aerospace psychiatry and psychology training and experience
  - forensic psychiatry training
  - provision of psychological and psychiatric services in deployed environments
  - prior astronaut selection experience
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• Round 1 semi finalists (n =120)
  – Psychological testing
  – Structured observations in Astronaut Selection Board (ASB) Phase 1 Interview
  – No suitability assessment or psychiatric diagnostic screening occurs

• Round 2 finalists (n=50)
  – 5 weeks; 10 applicants each week
  – Individual Exercise
  – Team Simulation Exercise
  – Team Reaction Exercise
  – Behavioral and psychiatric interviews
  – Peer ratings
  – Psychologist consultation to the ASB with a suitability rating
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- Psychological testing
  - General personality, cognitive and situational judgment tests
- Inform/direct the Behavioral and Psychiatric Interview
  - Areas to explore in more detail
  - Relative strengths/weaknesses
  - Potential psychopathology noted
- Norms for general population, applicants, and selected astronauts
- Test battery kept confidential to preserve integrity of the selection process
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- Psychological Testing
  - Approximately 6 hours
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• Applicant Individual Exercise
  ― Suitability competency driven
  ― Individual tasks performed under time pressure
  ― Observed by psychologist rater
  ― Debrief with applicant afterward
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- Applicant Team Simulation Exercise
  - Suitability competency driven
  - Team tasks with very high cognitive load
  - Observed by psychologist raters
  - Debrief with each applicant afterward
Behavioral Components of NASA’s 2017 Astronaut Selection

• Team Reaction Exercise
  — Suitability competency driven
  — Observed by psychologist raters
  — Debrief with each applicant afterward
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• Behavioral and psychiatric interviews:
  – Psychologists and psychiatrists undergo a day of training and also applicant record reviews
  – 3.5 hour interviews (five interviews in am/five in pm)
  – 2 interviewers per applicant (psychologist and psychiatrist)
  – 3 NASA floaters move from room to room and spend 30 min observing each interview (2 NASA psychologists and 1 NASA psychiatrist) – for calibration and consistency
  – Any psychologist or psychiatrist in training observes the process in the am interview and then conducts the interview in the pm
  – Combination of structured interview components covering all behavioral spaceflight competencies and a structured psychiatric diagnostic interview covering a major DSM 5/ICD-11 diagnostic criteria
  – Psychologist and psychiatrist form a consensus opinion regarding a suitability rating and psychiatric diagnosis
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- Behavioral and psychiatric interviews (continued):
  - Psychiatrist presents the applicant to the entire group and provides a psychiatric diagnostic opinion
  - Psychologist presents the suitability assessment information and recommended suitability rating
  - Entire group of psychiatrists and psychologists discuss the applicant in depth and a group consensus opinion is formed
  - NASA psychologists discuss the suitability rating with the Astronaut Selection Board
  - NASA psychiatrists present the applicant’s case to the Aerospace Medical Board
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- Summary of lessons learned/recommendations
  - Early initiation of the planning process (i.e., two years prior)
  - Adequate staffing and budget plus administrative and organizational support
  - Leads of selection process with significant astronaut selection experience
  - Alignment of the process with spaceflight job analysis derived suitability competencies
  - Use of current medical standards and psychiatric diagnostic classifications and diagnostic methods
  - Multistage process with variety of applicant views and raters
  - External consultants with appropriate training and experience
  - Understanding and acceptance of fact that the Board makes the final decision
Behavioral Components of NASA’s 2017 Astronaut Selection

NASA Astronaut Class of 2017—”The Turtles”
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Astronaut Classes from 2017 (#22) and 1959 (#1)
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Class of 2017 Physician Astronauts

Jonny Kim, MD
Navy SEAL

Frank Rubio, MD
Army Blackhawk Pilot
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2017 Astronaut Selection BHP Team
### Behavioral Components of NASA’s 2017 Astronaut Selection

#### 48 Total Support Personnel

<table>
<thead>
<tr>
<th>BHP/KBRwyle</th>
<th>BHP NASA</th>
<th>KBRwyle Logistical Support</th>
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<tbody>
<tr>
<td>Karen Adkins</td>
<td>Al Holland</td>
<td>Group Sim Joe Whitney</td>
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<tr>
<td>Gabrielle Cole</td>
<td>Gary Beven</td>
<td>Group Sim Larry Genzer</td>
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<td>Kelley Slack</td>
<td>Tom Williams</td>
<td>Group Sim Facility Jerry Swain</td>
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<td>Jim Picano</td>
<td>Rebekah Reed</td>
<td>Group Sim Facility Marilyn Simmons</td>
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<td>Ron Moomaw</td>
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<td>Group Sim Video Matt McGee</td>
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<tr>
<td>Pam Baskin</td>
<td></td>
<td>Mowing &amp; Dumpster Yong Yi</td>
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<tr>
<td>Monica Travis</td>
<td>Anne Roemer</td>
<td>SD IT Carmen Hollins</td>
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<tr>
<td>Kim Seaton</td>
<td>Shelia Collins</td>
<td>iPads - ACES Ray Kennerson</td>
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<tr>
<td>Brooke Loofboro</td>
<td>Brandy Braunsdorf</td>
<td>Survey Crafter Susan Curry</td>
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<tr>
<td>Jessica Hughlett</td>
<td>Sam Henry</td>
<td>Survey Crafter Michael Meeks</td>
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<tr>
<td>Beth Turner</td>
<td>Bill Kerneckel</td>
<td>Survey Crafter Mike Peri</td>
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<tr>
<td>Kelly Curtis</td>
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<td>Building 35 Manager Bill McCormick</td>
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<tr>
<td>Steve Vander Ark</td>
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<td>IE – Training/Procedures Elisca Hicks</td>
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<tr>
<td>Brandon Vessey</td>
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<td>IE - CSA-CP Christine Dubbert</td>
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<tr>
<td>Lauren Landon</td>
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<td>Weather Angel Plaza</td>
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<td></td>
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<td>Weather Tim Garner</td>
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<td>TRE - tires Tim Taylor</td>
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<td>Kubotas &amp; Connex Randy Redford</td>
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<td>Flight Doc Bill Tarver</td>
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<td>Mars Sim Rater Therese Huning</td>
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<td>Mars Sim Facilitator Dan Nelson</td>
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<td>SAIT - tablet &amp; laptop support Roger Tigner</td>
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</tbody>
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#### NASA JSC HR

- Anne Roemer
- Shelia Collins
- Brandy Braunsdorf
- Sam Henry
- Bill Kerneckel