Behavioral Components of NASA's 2021 Astronaut Selection

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Disclosure Information
92nd Annual Scientific Meeting

I have no financial relationships to disclose.

I will not discuss off-label use and/or investigational use in my presentation.

Behavioral Components of NASA's 2021 Astronaut Selection

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

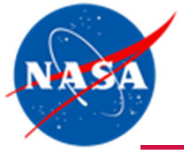
Behavioral Components of NASA's 2021 Astronaut Selection

- 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

Credit: NASA

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)



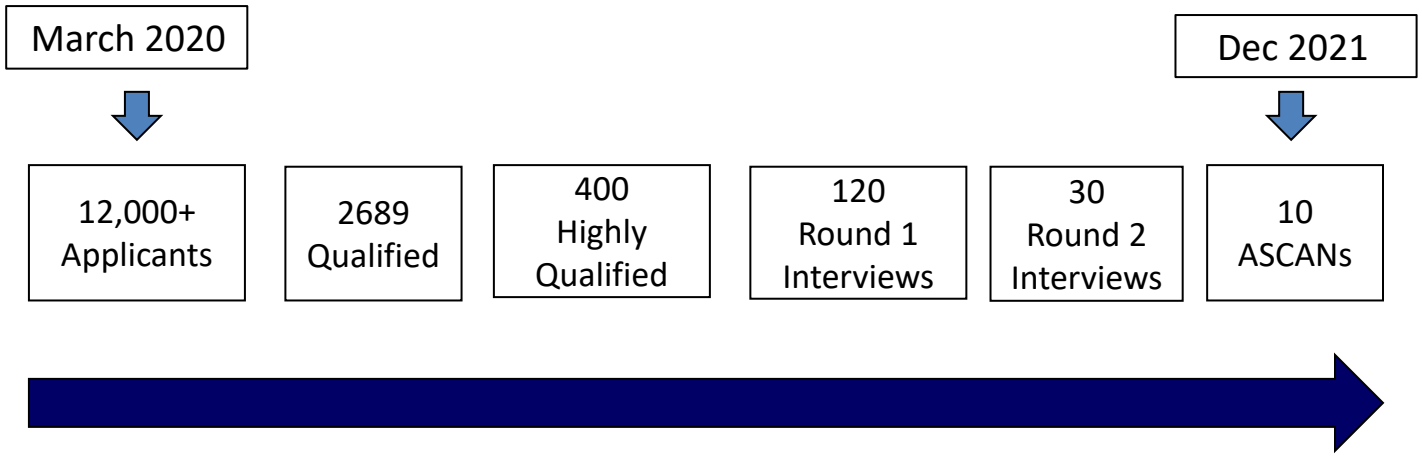
Behavioral Components of NASA's 2021 Astronaut Selection

- 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)

Behavioral Components of NASA's 2021 Astronaut Selection

- 23 Astronaut Classes from 1959 to 2021
- 359 astronaut candidates selected in 63 years
- 1996 largest class: 44 (height of Space Shuttle Program era)
- Current active astronauts: 44
- Over 12,000 Applications for class of 2021
- Current NASA astronaut candidates (ASCANS): 10

2021 Astronaut Selection Schedule



0.083% selection rate (all applicants)
0.37% selection rate (qualified applicants)
2.5% selection rate (highly qualified applicants)

Behavioral Components of NASA's 2012 Astronaut Selection

- Planning for the 2021 astronaut selection cycle began in 2018
- Comprised approximately 50% of workload over two years for those on the team directing and planning the selection process
- Significant delays and challenges due to the COVID-19 pandemic
- Close coordination with JSC Human Resources, Astronaut Office, Facilities Management, and Space Medicine Operations Division Management
- NASA Psychologist James Picano, PhD led the overall team effort
  - NASA psychiatrist Gary Beven, MD led the psychiatric evaluation component

Behavioral Components of NASA's 2021 Astronaut Selection

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 including ISS and STS Programs

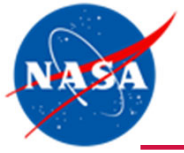
- Psychological suitability for spaceflight missions
  - Mission demands of ISS missions up to 12 months
  - Suitability for shorter duration Artemis missions
  - Based on desired behavioral competencies specific for spaceflight
  - Advisory information to Astronaut Selection Board (ASB) with a suitability rating provided

Behavioral Components of NASA's 2021 Astronaut Selection

- BHP Astronaut Selection Select-In Suitability Proficiencies 2021

- Primary suitability 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



Behavioral Components of NASA's 2021 Astronaut Selection

- Team of external consultant psychologist and psychiatrist examiners with significant selection and assessment experience were utilized
  - USAF Aeromedical Consultation Service Neuropsychiatry Branch Chief and staff psychiatrists as well as others with similar experience
  - Active duty and retired military operational psychologists with many years of special forces selection and flight operations consultation expertise
  - Valued professional attributes include
    - military service as a psychiatrist and flight surgeon or as an operational/aerospace psychologist in deployed setting
    - prior personnel selection work
    - prior astronaut selection experience
    - forensic psychiatry training beneficial

Behavioral Components of NASA's 2021 Astronaut Selection

- Round 1 (n =120)
  - Psychological testing
  - Structured observations in Astronaut Selection Board (ASB) Phase 1 Interview
  - No suitability assessment or psychiatric diagnostic screening occurs at this stage

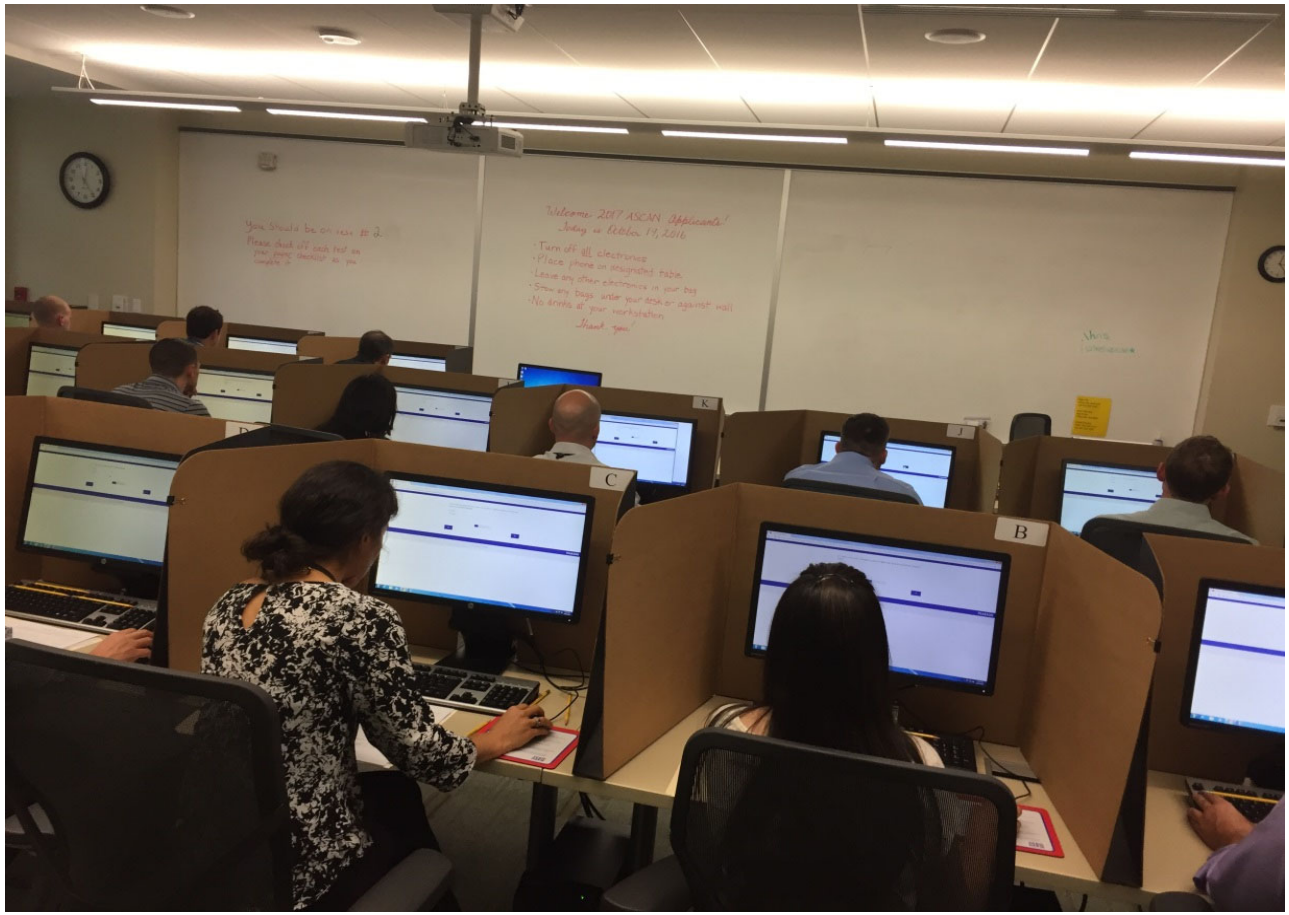
- Round 2 (n=30)
  - 10 applicants per week
  - Individual Exercise
  - Team Simulation Exercise
  - Team Reaction Exercise
  - Behavioral and psychiatric interviews
  - Peer ratings
  - Psychologist consultation to the astronaut selection board with a suitability rating
  - Psychiatrist opinion to Aerospace Medical Board

Behavioral Components of NASA's 2021 Astronaut Selection

- 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 confidential to preserve integrity of the selection process

Behavioral Components of NASA's 2021 Astronaut Selection

- Psychological Testing
  - Approximately 6 hours



Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

- Applicant Individual Exercise
  - Suitability competency driven
  - Individual tasks performed under time pressure
  - Observed by psychologist rater
  - Debrief with each applicant afterward

Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

- Applicant Team Simulation Exercise
  - Suitability competency driven
  - Team tasks with very high cognitive load
  - Observed by psychologist raters
  - Debrief with each applicant afterward

Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

- Team Reaction Exercise
  - Suitability competency driven
  - Observed by psychologist raters
  - Debrief with each applicant afterward

Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

- Behavioral and psychiatric interviews:
  - 3.5 hour behavioral/psychiatric interviews
  - 2 interviewers per applicant (psychologist and psychiatrist)
  - NASA psychologist/psychiatrist floaters move from room to room—for calibration and consistency
  - Structured interview components covering spaceflight suitability competencies
  - Structured psychiatric diagnostic interview covering all major DSM 5/ ICD-11 diagnostic criteria
  - Psychologist and psychiatrist form a consensus opinion regarding applicant's suitability rating and presence of current or prior psychiatric diagnosis

Behavioral Components of NASA's 2021 Astronaut Selection

- Behavioral and psychiatric interviews (cont):
  - Psychiatrist presents the applicant to the entire group and provides a psychiatric diagnostic opinion
  - Psychologist presents the suitability assessment information and recommended suitability rating
  - Psychiatrists and psychologists discuss the applicant and form a consensus opinion
  - NASA psychologists discuss the suitability rating with the Astronaut Selection Board
  - NASA psychiatrists present the applicant to the Aerospace Medical Board if a disqualifying condition is noted

- Summary of lessons learned/recommendations
  - Early initiation of the selection planning process (i.e., two years prior)
  - Adequate staffing and budget plus administrative and organizational support
  - Leads of selection process with significant aerospace personnel selection experience and aerospace psychiatry experience
  - Alignment of the process with spaceflight job analysis derived suitability competencies
  - Use of current medical standards and psychiatric diagnostic classification and diagnostic methods
  - Multistage process with variety of applicant views and raters

Behavioral Components of NASA's 2021 Astronaut Selection

NASA Astronaut Class of 2021—"The Flies"

Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

NICHOLE "VAPOR" Ayers
- Colorado Springs, CO
- F-22,T-38A Pilot Instructor
- MS Applied Math, Rice
  BS Math, USAFA
- US Air Force, Major

CHRISTINA Birch
- Gilbert, Arizona
- US Track Cyclist &
  Prof UCR & CalTech
- PhD BioEng, MIT
  BS Math, Uni of Arizona

LUKE Delaney
- Debary, Florida
- Pilot NASA Langley
- MS AeroE, U of North FL
  BS MechE, NPGS
- Marine Corp Major, Ret

ANDRE Douglas
- Chesapeake, Virginia
- Engr John Hopkins APL
- PhD SysE, GWU
  MS Eng, Michigan/JHop
- US Coast Guard

DENIZ Burnham
- Wasilla, AK
- Drilling Ops/Energy Proj
- MS MechE, USC
  BS ChemE, UCSD
- US Navy, Lieutenant

MARCOS Berríos
- Guaynabo, Puerto Rico
- Helicopter/Test Pilot Cmdr
- PhD AeroE, Stanford
  BS MechE, MIT
- US Air Force, Major

JACK Hathaway
- South Windsor, CT
- Test Pilot/Commander
- MS Flt Dyn., Cranfield
  BS Physics, USNA
- US Navy, Commander

CHRISTOPHER Williams
- Potomac, Maryland
- Med Physicist & Prof
  Harvard
- Med Physics, Harvard
  PhD Physics, MIT

MOHAMMAD Al Mulla
- Dubai, UAE (MBRSC)
- Police Helicopter Pilot &
  Instructor
- MS Public Admin
  BS Law/Economics

NORA Al Matrooshi
- Sharjah, UAE (MBRSC)
- Piping Engr National
  Petroleum Construction
- BS MechE, UAE
  University

JESSICA Wittner
- Clovis, California
- Test Pilot/Project Officer
- MS AeroE, NPGS
  BS AeroE, Arizona
- US Navy Lieutenant Cmdr

ANIL Menon
- Minneapolis, MN
- SpaceX/NASA Flt Doc
- MD Aero/Emer, UTMB
  MS MechE, Stanford
- USAF, Lieutenant Colonel

Credit: NASA

Class of 2021 Physician Astronaut

Anil Menon, MD
Former NASA and SpaceX Flight Surgeon
UTMB Aerospace Medicine Residency Graduate

Credit: NASA

Astronaut Classes from 2021 (#23) and 1959 (#1)

Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

2021 Astronaut Selection BHP Team

Credit: NASA

Behavioral Components of NASA's 2021 Astronaut Selection

BHP Team

- Al Holland
- Gary Beven
- Jim Picano
- Suzanne Bell
- Karen Adkins
- Pam Baskin
- Isabel Bilotta
- Gabrielle Cole
- Alexa Doerr
- Charles Dukes
- Heather Dunnbier
- Terry Guess
- Jessica Hughlett
- Brooke Loofboro
- Carmen Pulido
- Ashley Rapson
- Kim Seaton
- Jana Tran
- Monica Travis
- Beth Turner
- Steve Vander Ark

Technical and Logistical Support

IE Support:

- Lawrence ("LT") Trammel
- Cruz Torres
- Ronnie Dean
- Bob Martel
- Wright, Dwight D.
- Barnett, Gail
- Fitzgerald, Travis
- Colton Peabody
- Amy Holloway-Margiolos
- Tori Palmer
- Steve Beck

TRE Equipment support:

- Woody Hoburg
- Ronnie Dean

Records:

- Tamara Bradley

IT and IT Security

- Kerneckel, Bill
- Blevins, Aaron D.
- Drake, Rodrick
- Tanner, Frank {Pete}
- Quadri, Zeeaa
- Williams, Stephen
- Graham, Cathy D
- Kieschnick, Olga
- Bieri, Pamela A.

A.R.T. integration database, production server for TRE

- Stevens, Michael A.
- Henry, Samuel
- Barker, John

Center Ops

- Watkins, Syreeta N. (JSC-JB711) – Kubotas
- Garner, Tim (JSC-WS8)[NOAA] – Weather notices
- Ward, Susan D. (JSC-EA13) – Rock yard