



NASA Astronaut Medical Selection

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Speaker Background



- ❖ Flight Surgeon at NASA Johnson Space Center (JSC) since 2016.
- ❖ Board-certified in Aerospace Medicine and Internal Medicine.
- ❖ Chair of NASA Aerospace Medicine Board (AMB).
- ❖ Lead Selection Physician for 2021 Astronaut Class.
- ❖ Supporting Selection Physician for 2017 Astronaut Class.
- ❖ Prior Lead Physician for the JSC Flight Medicine Clinic (FMC) from 2018-2022.



Overview



- ❖ Goal of NASA astronaut medical selection = Select candidates who are able to successfully complete physically and mentally challenging missions while placing minimal demands upon the limited medical resources inherent in present day spaceflight.
- ❖ Key principles of the medical selection process:
 - (1) Good overall health and fitness.
 - (2) Low risk of sudden or subtle incapacitation.
 - (3) Low risk of developing a medical condition that could negatively impact astronaut duties or tax the limited in-mission medical resources.



History



- ❖ NASA astronaut selection process has evolved over time to meet varying mission profiles and advancing medical knowledge and capabilities.
- ❖ Medical selection has been in place since the Mercury Program.
- ❖ Early astronaut selections did not utilize written medical standards and were instead designed to find the best-qualified candidates.
- ❖ Written medical standards were first employed for the candidates examined in 1977.



Medical Standards – Overview



- ❖ NASA utilizes two categories of medical standards:
 - Agency-specific:
 - Unique to each agency (CSA/ESA/JAXA/NASA/Roscosmos).
 - Set the core requirements for that space agency's astronauts/cosmonauts.
 - Applicable for selection and retention of astronauts/cosmonauts in each agency's corps.
 - For NASA, this is [OCHMO-STD-100.1](#) "NASA Astronaut Medical Standards, Selection And Annual Recertification".
 - Multilateral:
 - Agreed upon by all International Partners (IPs).
 - Share many similarities with agency-specific standards.
 - Applicable to all IP astronauts/cosmonauts who fly a specific mission (e.g. ISS or Artemis).
 - For ISS, these are known as the Medical Evaluation Documents (MED).
 - For Artemis, these are known as the Artemis Certification Medical Evaluation Requirements Document (ACMERD).



Medical Standards – NASA



- ❖ Similar to those used by the U.S. military.
- ❖ Delineate medical conditions considered to be disqualifying.
- ❖ Major revisions every 5-10 years.
- ❖ Evolve over time with mission profiles and medical advancements.
 - e.g. Vision standards have relaxed over time. Bone density has become more important due to long duration missions in microgravity.
- ❖ More strict for career astronauts than spaceflight participants (or Shuttle-era payload specialists).
- ❖ Apply for both selection and retention of astronauts, but waivers are not sought during selection.
- ❖ Waivers considered for experienced astronauts if the disqualifying medical condition can be treated, mitigated, or demonstrated not to interfere with the performance of duties.



Medical Standards – NASA



7G CARDIOVASCULAR
1. Any condition of the cardiovascular system that interferes with the performance of duties.
2. Cardiomyopathy such as hypertrophic or right ventricular cardiomyopathy (other than physiologic heart changes). History of acquired cardiomyopathy if recovered and left ventricular ejection fraction is > 50% requires specialist evaluation.
3. Hypertension, as defined by sustained systolic blood pressure of 140 mmHg or greater or diastolic of 90 mmHg or greater.
4. Recurrent syncope or symptomatic orthostatic intolerance (e.g., medication-induced, autonomic dysfunction, or other causes not otherwise specified), excepting post-space flight orthostasis. Recurrent neurally mediated syncope with clear precipitating factors requires specialist evaluation.
5. History of pericarditis, myocarditis, and endocarditis without residual dysfunction requires specialist evaluation.
6. Congenital abnormalities: A. History or findings of major congenital abnormalities of the heart and vessels. B. History of atrial septal defect (ASD), ventricular septal defect (VSD), or patent ductus arteriosus (PDA), that has been surgically repaired requires specialist evaluation. C. A patent foramen ovale (PFO) requires specialist evaluation.
7. Clinical evidence (angiographic, imaging, symptoms, history of prior event) of coronary artery disease.



Astronaut Selection Process



- ❖ Caveat – This process varies for each selection cycle.
- ❖ Multi-step process:
 - USAJOBS announcement opens.
 - OPM/NASA review applications for qualifications.
 - Rating panel review.
 - Astronaut Selection Board review.
 - Round 1 interviews (~100-120 candidates over 4-6 weeks).
 - Round 2 interviews (~30-50 candidates over 3-5 weeks).
 - Astronaut candidate class selected and announced.
 - Post-selection medical testing.
- ❖ Medical is not involved in application review.
- ❖ Medical evaluation begins at Round 1.



Medical Evaluations



- ❖ Low-cost in-house evaluations occur in Round 1.
 - e.g. H&P, in-house labs, basic vision testing, audiometry.
- ❖ High-cost and lower-yield tests are in Round 2 or post-selection.
 - e.g. send-out labs, exercise stress tests, ultrasounds, colonoscopies, MRIs, mammograms.
- ❖ After evaluation, each candidate is presented to the AMB for final disposition of “Medically Qualified” (MQ) or “Not Medically Qualified” (NMQ).
- ❖ MQ or NMQ reported to Astronaut Selection Board.
- ❖ Historically, ~15-25% of applicants are “NMQ”.



Summary



- ❖ Goal = Select candidates who are able to successfully complete physically and mentally challenging missions while placing minimal demands upon the limited medical resources inherent in present day space flight.
- ❖ Evolves over time to meet varying mission profiles and advancing medical knowledge and capabilities.
- ❖ Multiple levels of medical standards (agency-specific and multilateral) that are applied at various time points for astronaut selection or retention.



Questions?



References



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