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**Subject: Private Astronaut and Sub-Orbital Spaceflight Participant Medical Procedural Requirements**

**Responsible Office: Office of the Chief Health & Medical Officer**

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## **Preface**

### **P.1 Purpose**

a. NASA is committed to ensuring the safety of the public, health of Government Astronauts, as defined by Commercial Space Launch Activities, 51 U.S.C. § 509, success of the NASA mission, and protection of the Agency. To this end, NASA has established medical requirements for Government Astronauts and levies these requirements on Private Astronauts and NASA Sub-Orbital Spaceflight Participants, as defined in Appendix A, when they are engaged in NASA missions, docked with NASA vehicles, or participating in NASA sponsored research.

b. This NID describes the responsibilities and implementing requirements to verify that NASA medical requirements have been met by Private Astronauts and NASA Sub-Orbital Spaceflight Participants.

### **P.2 Applicability**

a. This NID is applicable to NASA Headquarters and Centers, including Component Facilities and Technical and Service Support Centers. This language applies to commercial entities, contractors, recipients of grants, cooperative agreements, or other agreements only to the extent specified or referenced in the applicable contracts, grants, or agreements.

b. This NID is applicable to Private Astronauts who are part of a NASA flight mission that effects NASA medical requirement objectives delineated in Section 1.3 and includes one or both of the following:

(1) A commercial vehicle docking to or in proximity of a NASA vehicle in orbit.

(2) Private Astronauts occupying the same physical area with Government Astronauts during a NASA flight mission, including pre- and post-mission activities.

c. This NID is applicable to human research conducted on the ISS or utilizing NASA facilities and resources, including Private Astronauts. Protection of Human Research Subjects, NPR 7100.1, details the implementing procedures and requirements to conduct and support research involving human subjects.

d. This NID is applicable to NASA Sub-Orbital Spaceflight Participants who are part of a mission that includes them conducting NASA research on commercial entity vehicles. NPR 7100.1 details the implementing procedures and requirements to conduct and support research involving human subjects.

e. In this directive, all mandatory actions (i.e. requirements) are denoted by statements containing the term “shall”. The terms “may” or “can” denote discretionary privilege or permission, “should” denotes a good practice and is recommended, but not required, “will” denotes expected outcome, and “are/is” denotes descriptive material.

f. In this directive, all document citations are assumed to be the latest version unless otherwise noted.

### **P.3 Authority**

- a. Health Services Programs, 5 U.S.C. § 7901.
- b. The National Aeronautics and Space Act, 51 U.S.C. § 20113 (a).
- c. NPD 1000.3, The NASA Organization.

### **P.4 Applicable Documents and Forms**

- a. Privacy Act of 1974, as amended, 5 U.S.C. § 552(a).
- b. Commercial Space Launch Amendments Act of 2004, 49 U.S.C. § 701.
- c. Commercial Space Launch Activities, 51 U.S.C. § 509.
- d. Commercial Space Transportation, Federal Aviation Administration, Department of Transportation, 14 CFR pt. 401.
- e. Human Space Flight Requirements, 14 CFR pt. 460
- f. Medicare Advantage Program, 42 CFR § 422.204 (b).
- g. NID 8600.121, Use of the International Space Station for Commercial and Marketing Activities.
- h. NPR 1441.1, NASA Records Management Program Requirements.
- i. NPR 2810.1, Security of Information Technology.
- j. NPR 7100.1, Protection of Human Research Subjects.
- k. SSP 50667, Medical Evaluation Documents.
- l. JSC 22538, Flight Crew Health Stabilization Program.

### **P.5 Measurement/Verification**

The Chief Health and Medical Officer (CHMO) will measure and verify compliance with this directive by assessing records associated with the Aerospace Medicine Board (AMB) and Multilateral Space Medicine Board (MSMB) pertaining to the flight of Private Astronauts and Sub-Orbital Spaceflight Participants.

### **P.6 Cancellation**

None.

## **Chapter 1: Introduction**

1.1 As commercial spaceflight becomes more mature, commercial entities are developing plans for their own space and sub-orbital vehicles and partnering with NASA to enable them to access space more readily. These commercial entities may have their own astronauts, called Private Astronauts, who are sponsored by a private company to accomplish commercial objectives. In addition, private companies and spacecraft may be used as platforms to perform NASA research investigations, with this research conducted by Sub-Orbital Spaceflight Participants. The health and wellbeing of these Private Astronauts and Sub-Orbital Spaceflight Participants are the responsibility of the commercial or government entity sponsoring or certifying the individual. However, when a commercial entity vehicle docks, or otherwise engages, with a NASA vehicle and/or Private Astronauts engage with Government Astronauts, that vehicle and its Private Astronauts are now part of the overall NASA mission with inherent advantages as well as potential risk and consequence to that mission. Specifically, for missions to the International Space Station (ISS), NASA has Agency policy, NID 8600.121, Use of the International Space Station for Commercial and Marketing Activities as its guiding document.

Note: The Federal Aviation Administration (FAA) defines commercial entity astronauts as crew (those responsible for flight of the commercial entity vehicle) and spaceflight participants (passengers on the commercial entity vehicle). In this document, all commercial entity astronauts are called Private Astronauts, unless otherwise specified.

1.2 Congress enacted the Commercial Space Launch Amendments Act of 2004, 49 U.S.C. § 701, to promote the development of the emerging commercial human spaceflight industry. The FAA, a regulatory Agency, codified this act in 51 USC 509, and promulgated it in Human Space Flight Requirements, 14 CFR 460. The FAA is the certifying body for commercial spaceflight launch and landing phases and is responsible for ensuring protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation.

1.3 NASA medical requirements are established to ensure the safety of the public, the short-term and long-term health of Government Astronauts, the success of and risk to the NASA mission, and protection of the Agency.

1.4 Commercial entities are regulated by the provisions of 14 CFR 460 and will also adhere to NASA specific requirements, including medical requirements, through a contract or agreement between NASA and the commercial entity, when participating in NASA missions. Adherence to NASA medical requirements is necessary to assess the risk to all crewmembers and to ensure the success of the NASA mission. This document defines the NASA process to verify that NASA medical requirements have been met by Private Astronauts and Sub-Orbital Spaceflight Participants.

## **Chapter 2: Responsibilities**

### 2.1 Chief Health and Medical Officer

2.1.1 The CHMO **shall** accept or deny, on behalf of the Agency, the risk that the medical status of a Private Astronaut will impart to the Government Astronauts or NASA mission; or that the medical status of the NASA Sub-Orbital Spaceflight Participant will impart to the NASA mission. The CHMO will inform the NASA Administrator and the Multilateral Crew Operations Panel (MCOP) of this decision.

### 2.2 Aerospace Medicine Board Chair

2.2.1 The AMB Chair **shall** make a recommendation, to the CHMO, to accept or deny the risk that the medical status of a Private Astronaut will impart to the Government Astronauts or NASA mission; or that the medical status of the NASA Sub-Orbital Spaceflight Participant will impart to the NASA mission.

### 2.3 Multilateral Space Medicine Board

2.3.1 The MSMB shall review the CHMO decision, including any medical standard waivers, to accept the risk that the medical status of a Private Astronaut will impart to the Government Astronauts or NASA mission. The MSMB Chair and the CHMO will address any concerns or dissensions raised by the MSMB members.

### 2.4 Commercial Entities

2.4.1 Commercial entities, per contract with NASA, **shall** comply with NASA medical requirements for Private Astronauts.

### 2.5 NASA Sub-Orbital Spaceflight Participant Physician

2.5.1 The NASA Sub-Orbital Spaceflight Participant physician shall comply with NASA medical requirements for NASA Sub-orbital Spaceflight Participants.

### **Chapter 3: FAA Requirements and Certification**

3.1 The FAA has issued regulation 14 CFR 460 establishing requirements for crew and spaceflight participants involved in private human spaceflight. FAA regulations protect the safety of the uninformed public and calls for measures that enable Private Astronauts to make informed decisions about their personal safety. The FAA regulations require commercial entities to:

- a. Provide certain safety-related information and identify what a commercial entity must do to conduct a licensed launch with a human onboard.
- b. Inform Private Astronauts of the risks of space travel generally and the risks of space travel in the commercial entity's vehicle in particular. These regulations also include training and general security requirements.
- c. Meet requirements for Private Astronaut qualifications, including medical qualification and training. This includes requiring each crew member with a safety-critical role to possess and carry a FAA second-class airman medical certificate issued no more than 12 months prior to the month of launch and reentry.
- d. Meet requirements governing environmental control and life support systems, smoke detection and fire suppression, and human factors.
- e. Verify the integrated performance of a vehicles' hardware and any software in an operational flight environment. Verification must include flight testing.

## Chapter 4: NASA Requirements for Private Astronaut Missions to the ISS and Sub-Orbital Spaceflight Participants

4.1 NASA has implemented a Health Stabilization Program and issued SSP 50667, Medical Evaluation Documents, defining medical certification standards for astronauts flying on the ISS. SSP 50667 has two volumes relevant to Private Astronauts. These are:

- a. Volume A, Medical Standard for ISS Crewmembers, contains the medical standards for the selection and periodic evaluation of crew members for long-duration spaceflight on ISS missions.
- b. Volume A, Appendix F, MDC2 Minimal Medical Evaluations for ISS Spaceflight Certification for Short Duration Commercial Crewmembers, contains the medical standards for the selection of commercial crewmembers for short-duration spaceflight on ISS missions.

Note: Long-duration missions are greater than 30 days. Short-duration missions are 30 days or less.

- c. Volume B, Pre-Flight, In-Flight, and Post-Flight Medical Evaluation Requirements for Long-Duration ISS Crewmembers, contains elements of examination of ISS crewmembers assigned to long-duration space flights.

4.2 The commercial entity **shall**, for missions involving Private Astronauts (see Table A, NASA Medical Requirements and Acceptance Process for Private Astronauts and Sub-Orbital Spaceflight Participant), per contract with NASA:

- a. Comply with JSC 22538, Flight Crew Health Stabilization Program, to develop and maintain a Health Stabilization Program for their Private Astronauts to prevent infectious disease from being carried aboard a NASA vehicle.

- b. Comply with SSP 50667, Volume A, medical requirements for Private Astronauts:

- (1) Participating as an active crewmember of the ISS crew.

- (2) **Not** participating as an active crewmember of the ISS crew, but remaining onboard the NASA vehicle for longer than 30 days.

- c. Comply with SSP 50667, Volume A, Appendix F, MDC2 Minimal Medical Evaluations for ISS Spaceflight Certification for Short Duration Commercial Crewmembers, medical requirements for Private Astronauts **not** participating as an active crewmember of the ISS crew, and remaining onboard the NASA vehicle for 30 days or less.

4.3 Although not levied as a requirement, Commercial entities would benefit from implementing SSP 50667, Volume B standards for their Private Astronauts to decrease the risk of long-term medical effects due to spaceflight.

4.4 The government entity associated with the NASA or NASA contracted personnel Sub-Orbital Spaceflight Participant **shall**, for missions involving Sub-Orbital Spaceflight Participants (see Table



A, NASA Medical Requirements and Acceptance Process for Private Astronauts and Sub-Orbital Spaceflight Participant), ensure NASA Sub-Orbital Spaceflight Participants:

- a. Carry a FAA third-class airman medical certificate, or equivalent clearance.
- b. Have a satisfactory EKG, within a year of flight.
- c. Have a satisfactory (meets FAA standards) standard blood and urine assessment to include Complete Blood Count (CBC) and Basic Metabolic Panel (BMP) and urine analysis, within a year of flight.

4.5 The research organization associated with a Non-NASA Sub-Orbital Spaceflight Participant **shall**, for missions involving NASA research, per grant or agreement with NASA, ensure the Non-NASA Sub-Orbital Spaceflight Participant is healthy enough to execute the research in the sub-orbital environment, and that appropriate mitigations for neurovestibular provocations/nausea are in place.

**Table A NASA Medical Requirements and Acceptance Process for Private Astronauts and Sub-Orbital Spaceflight Participants**

	<b>Private Astronaut Crew</b> (as defined by FAA) FAA cert for pilot	<b>Private Astronaut Space Flight Participant</b> (as defined by FAA)	<b>NASA Sub-Orbital Spaceflight Participant</b>
<b>Role</b>	Active Crewmember (performs hazardous tasks or tasks that include use of high criticality hardware on the NASA vehicle (piloting/docking, EVAs, robotics)	Not Active Crewmember (No hazardous tasks or tasks that include use of high criticality hardware on the NASA vehicle) May perform research activities	Not Active Crewmember (No hazardous tasks or tasks that include use of high criticality hardware on the NASA vehicle) Performs research activities
<b>NASA Medical Requirements</b>			
<b>Health Stabilization Program</b>	Commercial Entity provided		None
<b>Medical Requirements</b>	SSP 50667, Volume A	SSP 50667, Volume A, Appendix F for short-duration mission (≤ 30 days)  SSP 50667 Volume A for long-duration mission (> 30 days)	FAA Class III plus: EKG, Standard Blood (CBC, BMP) & Urine Analysis, Valid for 1 year
<b>Medical Recommendations</b>	SSP 50667, Volume B		None
<b>NASA Acceptance Process</b>			
<b>FAA/ Commercial Entity</b>	Medical Certification (Risk to Public)		n/a
<b>AMB Chair</b>	Recommendation to accept or deny the risk that the medical status of the Private Astronaut will impart to the Government Astronauts or the NASA mission		Recommendation to accept or deny the risk that the medical status of the NASA Sub-Orbital Spaceflight Participant will impart to the NASA mission
<b>CHMO</b>	Acceptance or denial on behalf of the Agency the risk that the medical status of the Private Astronaut will impart to the Government Astronauts or the NASA mission		Acceptance or denial on behalf of the Agency the risk that the medical status of the NASA Sub-Orbital Spaceflight Participant will impart to the NASA mission
<b>MSMB Chair</b>	Recommendation to accept or deny the risk that the medical status of the Private Astronaut will impart to the International Partner astronauts		n/a

4.6 NASA **may** assist in finding appropriate referrals and resources for mitigation of Private Astronaut or Sub-Orbital Spaceflight Participant medical conditions so they can meet NASA requirements.

4.7 Unless granted special privileges, only Federal employees may practice medicine on Federal property. Private Astronaut physicians are not Federal employees and may not be licensed to practice medicine in the State where the Federal facility is located. Therefore, NASA **shall** implement procedures to enable the Private Astronaut physician to practice medicine on the Federal facility, assuming that practice is limited to the Private Astronaut, their families, or the supporting members of the commercial spaceflight company.

4.7.1 The CHMO **may** grant privileges to the Private Astronaut physician who holds an active unrestricted medical license in one of the 50 U.S. States, to practice medicine on federal property for the purposes of rendering care to their Private Astronaut, their families, or the supporting members of the commercial spaceflight company.

4.8 Commercial entities **shall** provide medical care for their Private Astronauts during a mission, including pre- and post-mission activities, either via the commercial entity's treating physician or, through a contract with the Government, may acquire the services of a NASA Flight Surgeon, Astronaut Strength, Conditioning and Rehabilitation, or other health and medical services.

4.9 NASA Flight Surgeons, NASA Contractor Flight Surgeons, as directed by the NASA Flight Surgeon, and Government and International Partner astronauts, **may** in the course of an emergency medical situation, including contingencies or off-nominal situations that could affect the NASA mission, render medical aid to Private Astronauts when the Private Astronaut physician is unavailable or needs assistance, but such care may be reimbursable.

## Chapter 5: NASA Acceptance Process for Private Astronaut Missions to the ISS and Sub-Orbital Spaceflight Participants

5.1 This chapter details the acceptance process for Private Astronaut missions to the ISS and for NASA Sub-Orbital Spaceflight Participants. Table A, NASA Medical Requirements and Acceptance Process for Private Astronauts and Sub-Orbital Spaceflight Participants, summarizes the process.

5.2 Commercial entities **shall** submit, to the AMB, medical evaluations of their Private Astronauts, to include results of studies, laboratory analysis and examination data, as well as a formal letter from the commercial entity's treating physician stating that the Private Astronaut has been fully evaluated, noting any disqualifying conditions, and has been certified by the FAA. This evaluation can be provided to the AMB via their treating physician or, through a contract with the Government, a NASA Flight Surgeon, who will chaperone the Private Astronaut through the process. The commercial entity certifies the Private Astronaut meets the applicable standards or presents the case for acceptance or remediation of risk to the AMB. If the Private Astronaut does not meet the SSP 50667, Volume A or Volume A, Appendix F, depending on Private Astronaut activities on the NASA vehicle standards, the commercial entity **may** ask the AMB to recommend acceptance of the risk to the CHMO, if the condition is able to be mitigated or the risk is manageable.

*5.3 Note: NASA cannot waive FAA regulations for a private astronaut, nor accept waiver responsibility, but rather will make recommendations to acceptance or denial of the risk, or recommendations for further care or treatment to remediate the risk, back to the Private Astronaut's physician.*

5.4 Commercial entities **will** ensure Private Astronaut crew pilots maintain their FAA second-class airman medical certificate throughout a mission. Should a mission be delayed once in progress, this may require commercial entities to develop and implement a plan with the FAA for FAA recertification before and, perhaps, while the pilot is on-orbit.

5.5 The physician for the NASA Sub-Orbital Spaceflight Participants **shall** submit, to the AMB, medical evaluations of their NASA Sub-Orbital Spaceflight Participants, to include their FAA medical certificate (or equivalent clearance), laboratory analysis and examination data, as well as a formal letter from the physician stating that the individual has been fully evaluated, noting any disqualifying conditions. The NASA Sub-Orbital Spaceflight Participant physician certifies the individual meets the applicable standards or presents the case for acceptance or remediation of risk to the AMB. If the individual does not meet NASA requirements as stated in Chapter 4, the NASA Sub-Orbital Spaceflight Participant physician **may** ask the AMB to recommend acceptance of the risk to the CHMO, if the condition is able to be mitigated or the risk is manageable.

*Note: For Non-NASA Sub-Orbital Spaceflight Participants who are operating or performing tasks on a NASA research payload, the research organization bears the responsibility to ensure that the spaceflight participant is healthy enough to perform the task and that mitigation strategies for neurovestibular provocation/nausea are in place.*

5.6 When a commercial entity associated with the individual contracts with NASA to provide treating physician services via a NASA Flight Surgeon, Private Astronaut's and Sub-Orbital Spaceflight Participant's medical information will be maintained by NASA and is subject to the Privacy Act of 1974, 5 U.S.C. § 552a as well as NPR 2810.1, Security of Information Technology and NPR 1441.1, NASA Records Management Program Requirements.

5.7 NASA will maintain deliberation of the Private Astronaut's and Sub-Orbital Spaceflight Participant's medical information as part of the AMB records in the Health Information Management System, 10HIMS, in accordance with 5 U.S.C. § 552a and as well as NPR 2810.1 and NPR 1441.1.

5.8 NASA **will not** evaluate Private Astronaut crew pilots, as defined by the FAA, who do not possess a FAA second-class airman medical certificate.

*Note: Other Private Astronaut crew and spaceflight participants as defined by the FAA, are not required by the FAA to pass the FAA second-class airman medical certificate.*

5.9 The AMB **shall** assess any potential increased risk to Government Astronauts and the NASA mission incurred due to the addition of the Private Astronaut. This assessment uses SSP 50667, Volume A, or Volume A, Appendix F, depending on the Private Astronaut activities on the NASA vehicle, which details unique physiologic hazards and incurs additional risk over and above that evaluated by the FAA Second-Class Airman Medical Certificate.

*Note: Whereas the AMB normally assesses the risk a medical malady imparts to the individual and the NASA mission, in this case, the commercial entity and its evaluating physician is taking on the responsibility of assessing risk to the individual. The AMB is assessing the risk to the NASA mission and potential risk to Government and International Partner astronauts.*

5.10 The AMB **shall** assess any potential increased risk to the NASA mission incurred due to the NASA Sub-Orbital Spaceflight Participant. This assessment is based on the medical information submitted by the commercial entity per the requirements in Chapter 4.

5.11 The AMB Chair **shall** make a recommendation, to the CHMO, to accept or deny the risk that the medical status of the Private Astronaut will impart to the Government Astronauts or the NASA mission, or that the NASA Sub-Orbital Spaceflight Participant will impart to the NASA mission.

*Note: The AMB is **not** making a recommendation for certification as it does with Government Astronauts. The AMB is not responsible for certification of the commercial entity's Private Astronaut, but rather they are making a recommendation that the Private Astronaut meets NASA medical standards and could be approved for flight and that the associated risk is acceptable to NASA.*

5.12 The CHMO **shall**

a. After receiving the recommendation of the AMB Chair, accept or deny, on behalf of the Agency, the risk that the medical status of the Private Astronaut will impart to the Government Astronauts or the NASA mission or the medical status of the NASA Sub-Orbital Spaceflight Participant will impart to the NASA mission if that risk is not properly mitigated, treated, or may result in potential harm to the individual, others, or impart untoward risk to the government.

b. Inform the AMB Chair and the commercial entity's treating physician representing the Private Astronaut or Sub-Orbital Spaceflight Participant in writing.

c. Convey this opinion to the Program Manager, AA, HEOMD, and NASA Associate Administrator so the agency can discuss the potential impacts to the mission, how the risks could be mitigated, or if the risk should be accepted.

5.13 Upon certification by the FAA and completion of the review and recommendation of the NASA AMB and decision of the CHMO, the Private Astronaut will be presented to the MSMB. Any medical concerns identified by the International Partners will be addressed by NASA with the commercial entity.

5.14 The MSMB **shall** assess any potential increased risk to International Partner astronauts incurred due to the addition of the Private Astronaut.

5.15 The MSMB Chair **shall** make a recommendation, to the MCOP, to accept or deny the risk that the medical status of the Private Astronaut will impart to the International Partner astronauts.

## Chapter 6: Medical Risk Acceptance for Private Astronaut Missions to the ISS

6.1 NASA standards address both the short-term health of the Government Astronaut to allow success of the NASA mission, as well as the life-time risk to the health of the Government Astronaut. The Agency takes on the responsibility for medical treatment, coverage, and liability for medical maladies incurred in the service as Government Astronauts, however, the commercial entity is responsible for ensuring adequate protections for its Private Astronauts.

6.2 NASA defines three categories of medical standards (see Table A-1, Medical Standard Categories).

Table A-1 Medical Standard Categories

Category of Medical Standard	Indicator
Mandatory	Shall
Some Flexibility Depending on Risk	Should
Performance is in the Best Interest of Individual	Strongly Recommended

6.3 For commercial spaceflight not sponsored by the Government, there is a shared responsibility for some standards and commercial entity responsibility for other standards (see Table A-2, Examples of Medical Standard Categories).

6.4 The NASA SSP 50667, Volume A standards are mandatory. These standards decrease the medical risk to the individual, the NASA mission, and the other crewmembers.

6.5 The SSP 50667, Volume B contains additional tests which address the long-term health, as well as health and safety and functional competence of an astronaut in the spaceflight environment. The operational medical monitoring requirements for preflight, inflight, and post flight phases are used to establish flight readiness and baselines, effectively guide inflight countermeasures and assessments, and guide rehabilitation of crewmembers to their baseline health status following spaceflight. Data derived from standardized testing procedures, used in a pooled, non-attributable fashion, is also essential to assess the effects of spaceflight on human health. These tests which are in keeping with the good practice of medicine, in addition to maintaining the health and welfare of the Private Astronaut, may decrease the commercial entity's overall risk of long-term medical effects due to spaceflight. The AMB, CHMO, and MSMB **may** recommend these additional tests be done in the course of preparing for training or human spaceflight as they would either reduce risk ("should") or would be in the best interest of the individual ("strongly recommended"). In these recommendations, there is no imparted risk to the NASA crew or NASA mission, but the Private Astronaut could be uncomfortable or have adverse complications if not followed. These are aimed at having the commercial entity learn from NASA's experience having treated astronauts on-orbit for over 50 years.

Table A-2, Examples of Medical Standard Categories

<b>Requirement</b>	<b>Example</b>
Mandatory	<p>Private Astronauts <b>shall</b> be tested for H. Pylori and fully treated if positive.</p> <p>Rationale: H.Pylori (the bacteria that causes stomach ulcers) can be passed person to person in an enclosed environment. There is a risk the Private Astronaut, if positive, could infect NASA or International Partner crew, thereby posing a health risk to the entire crew. Therefore, medical standards in which the health of NASA or International Partner crew could be negatively impacted are mandatory standards.</p>
Some Flexibility Depending on Risk	<p>Private Astronauts <b>should</b> have a baseline radiation dose calculation made pre-flight and personal dosimetry measurements during the mission.</p> <p>Rationale: The long-term health of the Private Astronaut can be impacted by radiation and radiation dosages. Cancer, cataracts, and other medical maladies have been attributed to the radiation environment. The lack of a baseline radiation calculation or personal dosimetry will not impart risk to the NASA crew, nor will it impact the NASA mission, but should be done by the commercial entity in the interest of the long-term health of the Private Astronaut.</p>
Performance is in the Best Interest of Individual	<p>NASA <b>strongly recommends</b> Private Astronauts be vaccinated with the Shingrix vaccine, two shots, six months apart prior to flight.</p> <p>Rationale: If Private Astronauts have shingles, they do not pose a health risk to NASA or International Partner crew, who are vaccinated, and may or may not pose a risk to NASA's mission. However, we know the herpes virus titer counts increase in long duration spaceflight and if Private Astronauts get shingles it could impact their mission and individual health.</p>



## **Appendix A. Definitions**

**Active Crewmember.** A Private Astronaut who performs hazardous tasks or tasks that include use of high criticality hardware on the NASA vehicle (e.g., piloting/docking, EVAs, robotics).

**Private Astronaut.** An individual who is sponsored to fly by a commercial entity and who is not employed by a Government entity. Private Astronauts can be either crew or spaceflight participants of the commercial entity, as defined by the FAA.

Note: NID 8600.121 defines Private Astronaut as an ISS Crew Member who is not a U. S. Government Astronaut or an ISS International Partner Astronaut. This NID expands that definition to account for Private Astronauts participating in any NASA flight mission.

**Private Astronaut Mission.** A Commercial mission conducted by a Private U.S. Entity on the ISS consisting of commercial activities consistent with NID 8600.121 conducted by Private Astronauts.

**NASA Sub-Orbital Spaceflight Participant** – An individual who is carried within a commercial sub-orbital vehicle as a Spaceflight Participant, as defined in 51 U.S.C. § 509, and who is employed by NASA or contracted by NASA.

**Non-NASA Sub-Orbital Spaceflight Participant** – An individual who is carried within a commercial sub-orbital vehicle as a Spaceflight Participant, as defined in 51 U.S.C. § 509, and who is not employed by NASA or contracted by NASA.

## **Appendix B. Acronyms**

AMB	Aerospace Medicine Board
BMP	Basic Metabolic Panel
CBC	Complete Blood Count
CHMO	Chief Health and Medical Officer
FAA	Federal Aviation Administration
ISS	International Space Station
MCOP	Multilateral Crew Operations Panel
MSMB	Multilateral Space Medicine Board