DSSR.POP – Payloads and Orbital Permit Regulations (*** WITH GM & AMC ***)

POP.100: General Information

POP.110 Payloads and Orbital Permit

(a) This DSSR Part establishes the requirements for the issue of a Payloads and Orbital Permit (POP) and establishes the obligations of the applicant for, and holder of, that permit. ►**GM1** ►**GM2**

GM1 POP.110(a) – POP Scope
1. **Purpose**. General Requirement (GR) GR.110(b) states that Defence payloads and orbital operations are within the scope of the DSSR. GR.210(a) and GR.210(b)(3) collectively require a Payload and Orbital Permit (POP) to be achieved before commencing the space activity. The purpose of this regulation is to expand on the GR to identify which payloads and orbital operations require a POP. **Satellites and payloads** 2. A satellite is a spacecraft with a bus and one or more payloads that orbits around a body in space. A payload refers to an object carried by a spacecraft that travels over, or returns from over, 100 km above mean sea level. DSSR.POP identifies two types of payload: a. a satellite payload (ie a set of instruments or equipment on a satellite which performs a user mission), b. a launch vehicle payload (ie an object that a person undertakes to place in outer space by means of a launch vehicle, including components of the vehicle specifically designed or adapted for that object). **Requirement for a POP** 3. A POP is normally required when: a. a satellite is partially or fully owned by Defence b. a satellite payload is partially or fully owned by Defence c. Defence operates or issues instructions to operate a satellite d. Defence controls or issues instructions to control a potentially hazardous function of a satellite payload, e. Defence sponsors or conducts the design, construction or

maintenance of a satellite, satellite payload or satellite element.

4. A POP is not normally required when:

a. Defence is only acquiring data from a satellite or satellite payload

b. Defence controls, or instructs the control of, User Segment elements that do not affect the safety of a satellite or satellite payload

c. Defence designs spacecraft equipment, structure or a system for developmental or prototyping projects, but they are not used in space,

d. Defence Ground Segment elements or Link Segment elements are used by a non-Defence entity to control a non-Defence satellite or non-Defence satellite payload.

5. Where a satellite and/or satellite payload includes Defence and non-Defence (eg civil or foreign military) elements, only the Defence elements are within the scope of the DSSR. For atypical arrangements, the Regulator will determine the applicability of the DSSR.

GM2 POP.110(a) – Definitions

1. DSSR.POP employs the following definitions:

a. **Accident.** An accident involving a space object occurs if a person dies or suffers serious injury as a result of the operation of the space object.

b. **CubeSat.** A class of nanosatellites that use a standard size and form factor. The standard CubeSat size uses a 'one unit' (or 1U) measuring 10x10x10 cms and is extendable to larger sizes.

c. **Design for demise.** Design philosophy that aims to minimise the number of components likely to survive re-entry at the end of the spacecraft's life.

d. **Ephemeris.** A tabulation of computed positions and velocities (and/or various derived quantities such as right ascension and declination) of an orbiting body at specific times.

e. **Geosynchronous Orbit (GEO).** An orbit around Earth at an average altitude of 35,785 km.

f. **Ground Segment.** The Ground Segment comprises ground-based infrastructure and associated services or support mechanisms critical for the functioning of the space system.

g. **Launch Service Provider.** A company or organization that provides the launch vehicle, associated systems, and services to deliver a spacecraft or other payload into space or a specific orbit.

h. **Launch Vehicle Payload.** A launch vehicle payload is an object that a person undertakes to place in outer space by means of a launch vehicle, including components of the vehicle specifically designed or adapted for the object.

i. **Link Segment.** The Link Segment connects the Ground and Space Segments.

j. **Low Earth Orbit (LEO).** An orbit around Earth at an altitude between 100 km and 2,000 km.

k. **Mission-Related Object.** An object intentionally released from a spacecraft or rocket body during the course of a mission.

l. **Occurrence.** An incident, malfunction, defect, technical defect or exceedance of limitations that endangers or could endanger the safe operation of a space object.

m. **Orbital Manoeuvre.** The use of on-board systems to change the orbit of a spacecraft.

n. **Outer Space Treaty.** Means: *Treaty on Principles Governing the Activities of States in the Exploration and Used of Outer Space, including Moon and Other Celestial Bodies* 1967.

o. **Passivation.** Refers to permanently depleting, irreversibly deactivating, or making safe all on-board sources of stored energy on the payload capable of causing a break-up.

p. **Payload.** A payload refers to an object carried by a spacecraft that travels over, or returns from over, 100 km above mean sea level.

q. **Parking orbit.** A temporary orbit used by a spacecraft.

r. **Qualification Testing.** Testing performed to provide evidence that the Space Segment element or equipment performs in accordance with its specifications in the intended environments with the specified qualification margins.

s. **Radio Regulations.** Means: the International Telecommunications Union (ITU) Radio Regulations, established under the *Convention and Constitution of the International Telecommunications Union*

1994.

t. **Registration Convention.** Means: *Convention on Registration of Objects Launched into Outer Space* 1972.

u. **Satellite.** A satellite is a spacecraft with a bus and one or more payloads that orbits around a body in space.

v. **Satellite payload.** A set of instruments or equipment which performs a user mission.

w. **Spacecraft.** Crewed or uncrewed vehicle designed to orbit or travel in space.

x. **Space debris.** All non-functional, artificial objects, including fragments and elements thereof, in Earth orbit or re-entering into Earth's atmosphere.

y. **Space Object.** Means: (a) an object the whole or a part of which is to go into or come back from an area beyond the distance of 100 km above mean sea level; or (b) any part of such an object, even if the part is to go only some of the way towards or back from an area beyond the distance of 100 km above mean sea level.

z. **Space Segment.** The Space Segment consists of on-orbit elements including spacecraft, either individual or in constellations.

aa. **Space System.** A space system is composed of four functional segments (Space Segment, Link Segment, Ground Segment, and User Segment) that provide space-derived services and products.

bb. **Telecommand link.** Communication link from ground to space by which a spacecraft is commanded.

cc. **Telemetry link.** Communication link from spacecraft to ground over which data generated on the spacecraft is provided to ground.

dd. **User Segment.** The User Segment consists of users and equipment that receive space-derived services and products directly from assets in the Space Segment or via a mission operations centre.

2. Further definitions can be found in the DSSP Glossary.

POP.120 Demonstration of Compliance

(a) The application for a POP must demonstrate compliance with the requirements of the DSSR.POP regulations. ►**GM**

GM POP.120(a) – Demonstration of compliance
1. **Purpose**. The purpose of this regulation is to ensure the applicant for a POP understands that their application package must demonstrate compliance with DSSR.POP. 2. GM1 to GR.210(f)(1) provides guidance on demonstrating compliance, while GM to GR.210(f) identifies who can apply (as 'the applicant') for a POP. 3. The Regulator does not prescribe a particular format or template for a POP application. Early consultation with the Regulator will assist in achieving an application that minimises effort by the applicant while still providing sufficient information for the Regulator to assess whether a POP is warranted.

(b) The application for a POP may use an authorisation granted by another national or international space authority to demonstrate full or partial compliance with the DSSR.POP regulations. **►GM ►AMC1**

GM POP.120(b) – Recognition
1. **Purpose**. The purpose of this regulation is to allow a formal authorisation (eg a licence, permit, or similar approval instrument issued by another national or international space authority) to contribute to partial or full demonstration of compliance with DSSR.POP regulations, as permitted by GR.210(g)(1). 2. Leveraging off an extant authorisation (termed 'recognition') can assist in an application for a POP, through reducing the need to produce DSSR compliance evidence, on the basis that a recognised authority has already assessed that evidence. It may also assist the Regulator, through avoiding the repetition of credible independent safety assurance.

AMC1 POP.120(b) – Recognition
1. GM to GR.210(g)(1) lists the government agencies whose authorisations may be accepted by the Defence Space Safety Regulator as contributing to partial or full demonstration of compliance with DSSR.POP. Should an applicant wish to leverage off an issuing agency not included in that list, the Regulator will evaluate the experience and performance of that agency. 2. GM to GR.210(g)(1) identifies four prerequisites that must be satisfied for the Regulator to conclude that an extant authorisation is suitable. Assessing these prerequisites will often be a collaborative effort between the applicant and the Regulator; while the applicant may have access to some of the information, other information may be sourced direct from the other government agency by the Regulator. The Regulator's

specialist knowledge may also contribute to identifying any deltas between the requirements employed by the other agency and the requirements of DSSR.POP.

3. Exploring these four prerequisites should be completed early in the POP application process, so that any identified gaps can be addressed. Once the prerequisites are met (or the gaps addressed) the applicant may leverage that authorisation to provide partial or full relief from producing their own evidence to show compliance with requirements of DSSR, as follows:

a. Full relief - where the extant authorisation covers the full scope of a particular DSSR.POP requirement,

b. Partial relief - where the extant authorisation covers only part of a DSSR.POP requirement, does not fully encompass Defence's unique context, and/or is underpinned by risk treatments that require re-assessment in Australia's legislated context.

4. Where only partial relief can be justified, additional evidence must be developed to demonstrate full compliance with the particular DSSR.POP requirement.

POP.130 Duties of the SSA Holder

(a) The Space Safety Authorisation (SSA) Holder must, for the duration of the space activity: ►**GM** ►**AMC1**

(1) sustain, and where necessary improve, the safety controls submitted as part of the application for the POP

(2) ensure continued compliance with all DSSR.POP requirements.

GM POP.130(a) – Duties of the SSA Holder

1. **Purpose**. The purpose of this regulation is to ensure that the SSA Holder understands their duties in holding a POP issued by the Regulator.

2. As noted in GR.210(h), the Regulator will issue the POP to a person in a role with the authority and resources to fulfil the SSA Holder duties.

AMC1 POP.130(a) – Duties of the SSA Holder

1. The Regulator will issue a POP when satisfied, at a point in time, that the safety controls and other requirements of DSSR.POP have been implemented. Since orbital operations are often a protracted space activity, the Regulator requires ongoing assurance that the integrity of these safety controls are being maintained (and where necessary improved) and of future compliance with the DSSR (both DSSR.POP and the GR). These responsibilities are assigned to the SSA Holder.

2. The SSA Holder must provide evidence of:

a. how the SSA Holder will implement the POP regulations that directly levy requirements on the SSA, including:

  i. POP.130(a)(1) – sustaining, and where necessary improving, the safety controls submitted as part of the application for the POP

  ii. POP.350(b) – updating registration details for the space object

  iii. POP.510(a) – establishing and maintaining a safety management system

  iv. POP.520(a) – occurrence investigation and resolution,

  v. POP.520(b) – occurrence reporting.

b. how the SSA Holder will ensure future design activities will meet the requirements of POP.210(a) and POP.220(a)

c. the SSA Holder agreeing to execute the following duties imposed under the GR (noting that the SSA Holder is not required to present evidence of how compliance will be achieved):

  i. meet all Conditions and/or Limitations on the SSA imposed by the Regulator, as described in the GM to GR.210(g)(2)

  ii. promote a generative safety culture to complement the regulatory requirements (see GR.210(i)(3))

  iii. meet any additional SSA Holder duties that are may be levied under the SSA (see GR.210(i)(4))

  iv. advise the Regulator of any change or development that might affect or invalidate the SSA (see GR.210(i)(5))

  v. upon vacating the role, ensure their successor understands and accepts the SSA Holder responsibilities (see GR.210(i)(6))

  vi. recognise that the Regulator may suspend, modify or revoke the SSA (see GR.210(i)(7))

  vii. cooperate with an independent accident investigation (see GR.320(b))

viii. cooperate with the Regulator to support space safety assurance (see GR.410(a))

ix. implement actions as necessary after the receipt of notification for a Level 1 or 2 finding (see GR.430(a)) or Level 3 finding (see GR.430(b)).

3. If the SSA Holder will rely on external agencies to execute the SSA Holder duties, the evidence must demonstrate how the SSA Holder will:

a. maintain the relationships within Defence and with other organisations that are required to fulfil the SSA Holder duties

b. verify that Defence procedures and external contracts related to activities permitted by the SSA support effective implementation of DSSR.POP requirements,

c. establish a system to ensure compliance with DSSR.POP requirements, including monitoring that contracted tasks/functions are carried out in accordance with the contract/task order.

(b) The SSA Holder must maintain an exposition that describes how the SSA Holder duties will be executed. ►**AMC1**

AMC1 POP.130(b) – SSA Holder exposition

1. AMC to POP.130(a) identifies the evidence that the SSA Holder must present, to demonstrate compliance with POP.130(a). This evidence must be submitted as an SSA Holder exposition, as required by GR.210(f)(3).

2. GR.210(f)(3) does not mandate a title or format for this exposition. It could be a single document presenting all relevant arrangements and processes, or it could present an index to extant processes that already document these duties, or something in between. Importantly, the documentation must identify all other positions or organisations that will execute particular SSA Holder duties, including acceptance of those duties where acceptance is not implicit through a direct chain of command.

POP.140 Liability

(a) The application for a POP must demonstrate that the assignment of liability for the space activity is understood and accepted by Defence. ►**GM** ►**AMC1**

GM POP.140(a) – Acceptance of liability

1. **Purpose**. An understanding of Defence's international liabilities for its space activities can provide useful insight into Defence's safety duties, as explained in GM3 to GR.110(a). The purpose of this regulation is to

ensure Defence understands their international liability obligations associated with the ownership and/or operation of a satellite and/or satellite payload.

2. Liability assignment for the launch and operation of satellites and payloads can be complex. Issues such as joint liability between States, commercial contracts that purport to remove liability from Defence, and so on, may require expert advice. An absence of clarity on Defence's liabilities may result in a safety risk remaining unmanaged because Defence has assumed another party is responsible.

AMC1 POP.140(a) – Acceptance of liability
1. The application for a POP must provide evidence that Defence understands and acknowledges its liabilities for the space activity, and that a suitably authorised person has agreed to the retention of that liability.

POP.200: Technical Integrity

POP.210 Engineering Management

(a) The application for a POP must demonstrate that organisations associated with the design, construction and maintenance of the satellite and/or satellite payload systems employ sound engineering management practices. ►**GM** ►**AMC1**

GM POP.210(a) – Engineering management

1. **Purpose**. The Space Segment, Link Segment and Ground Segment of a satellite and/or payload may contain components and systems whose correct function contributes to space safety. This regulation requires the use of sound engineering management practices in the design, construction and maintenance of those systems.

2. The Space Segment, Link Segment and/or Ground Segment of a satellite and/or payload system may contain components and systems whose correct function contributes to space safety. Engineering management practices must be implemented to identify, implement and preserve those safety functions. Inadequate design, construction and maintenance/update can result in space safety hazards such as malfunctions that lead to orbital collisions, the discharge of stored energy that damages another satellite, the release of debris from a collision that may harm people in orbit or on the ground, and so on.

3. A design management system integrates system safety and design assurance elements to provide a structured framework using engineering and management principles to identify hazards, assess risks, and implement mitigation measures during the design and development phases. Implementing a design management system helps prevent unsafe design features or characteristics from being introduced into the final

product.

4. Construction and maintenance management systems provide a structured framework for ensuring the integrity of the design is preserved.

AMC1 POP.210(a) – Engineering Management

1. This regulation is applicable to the satellite and/or satellite payload development phase including, but not limited to, the initial design of satellite and/or payload systems.

2. This regulation is also applicable to the operational phase of satellite and/or payload system lifecycle including, but not limited to, Space Segment maintenance and system updates (eg cyber security event recovery, software updates, in-orbit servicing) and the maintenance and update of the Link and Ground Segments.

Development phase

3. The application for a POP must present evidence that a suitable design management system was established and maintained throughout the development lifecycle for the satellite and/or satellite payload. It must include a system safety element and a design assurance element. The Regulator expects the implemented systematic approach will be proportionate to the magnitude and complexity of the safety hazards that need to be identified and managed.

4. **System safety.** The application for a POP must present evidence of an established and maintained system safety process that includes:

a. identification of safety hazards associated with satellite and/or satellite payload and the planned scope of operations

b. assessment of the risks tied to identified hazards

c. identification of safety risk mitigation measures

d. selection and implementation of the mitigation measures

e. verification and validation of the safety risk reduction controls after construction,

f. identification of operational controls to address safety risks not eliminated by the design.

5. **Design assurance.** The application for a POP must present evidence of addressing safety in the following elements:

a. a design plan that outlines the overall strategy, objectives, and activities/milestones of the design process

b. a system for capturing, documenting, and managing requirements (eg safety controls, functionality and operating limits) during design processes

c. a control process to manage changes to design elements and to maintain version control of design documentation

d. design reviews at key milestones based on the design plan, to assess the progress of the design process and identify potential issues

e. a quality assurance system to ensure products meet predefined specifications and standards

f. a management process to systematically control and implement changes to products, systems, or processes

g. processes for the verification and validation of design outputs to confirm that the design meets the specified requirements (eg safety and performance) and intended functionality

h. processes and systems to maintain all records, data and other material necessary to verify design assurance

i. an established, maintained, and utilised independent checking function to assess the design assurance system compliance demonstration evidence prior to submission to the Regulator. Independent checking functions must include:

   i. verification of the compliance evidence by a person who did not develop the data, but may work in conjunction with those who did develop/prepare the data,

   ii. signing of compliance documents, including test programmes and data as demonstration of independent verification.

j. the specified manner in which the design management system accounts for the acceptability of the designed products and/or parts and the acceptability of the tasks performed by subcontractors and/or partners.

Operational phase

6. **Design management.** The application for a POP must present

evidence of a systematic approach to controlling and implementing engineering changes to the satellite and/or satellite payload systems (inclusive of the Space Segment, Link Segment and Ground Segment) that may affect safety. This includes changes to form, fit, or function throughout the service life. The Regulator expects the systematic approach will be proportionate to the safety risks and complexity of engineering changes envisioned throughout the operational lifecycle. Simple Space Segment elements such as CubeSats, or those with a short operating life, may not be subject to any in-service changes or engineering changes, so this AMC may not be applicable.

7. In addition to implementing the relevant elements from paragraphs 4 to 6 above, the application for a POP must contain evidence of processes to:

a. initiate, evaluate, and notify appropriate personnel of change requests

b. plan change requests and complete impact analysis of potential safety risks, dependencies, and implications on existing systems, products, or processes

c. assure adequate propagation to other systems, testing of change, documentation updates, and system release when implementing change requests

d. review, verify implementation, and closeout of change requests,

e. maintain all records, data, and other material associated with engineering changes throughout the service life of the satellite and/or satellite payload.

8. **Maintenance management.** The application for a POP must present evidence that a management system has been implemented for the maintenance of the Space Segment, Link Segment and Ground Segment that will preserve the integrity of their design.

9. The SSA Holder is responsible for ensuring future design and maintenance activities meet the requirements of POP.210(a).

POP.220 Design

(a) The application for a POP must demonstrate that all satellite and/or satellite payload systems for which correct operation is critical to safety have been designed to an appropriate level of technical integrity. ►**GM** ►**AMC1**

GM POP.220(a) – Design
1. **Purpose.** The Space Segment, Link Segment and Ground

Segment of a satellite and/or payload may contain components and systems whose correct function contributes to space safety. This may include Space Segment hardware (eg structural system and on board functional systems), Space Segment and Ground Segment software (eg communication protocols and languages, functional element programs), and Link Segment functions and operating systems. This regulation requires these systems to be designed to a level of technical integrity commensurate with the safety consequences of their failure.

2. Implementing designs of appropriate technical integrity is an important contributor to reducing the risk of space safety hazards such as collisions in orbit, damaging other satellites or people in orbit with emissions from the satellite, and the uncontrolled release of energy stored on the satellite.

3. The applicant should consider any applicable security classification and ITAR requirements when submitting evidence for AMC1 POP.220(a). Any concerns should be raised with the Regulator.

AMC1 POP.220(a) – Design

1. The application for a POP must:

a. provide evidence that appropriate specifications and standards were used during the design of safety-critical systems and components for the satellite and/or satellite payload,

b. include the approved Function and Performance Specification (FPS) and System Specifications, or equivalent documents, used to set design requirements.

2. **Design Specifications and Standards.** The DSSP Manual of Standards (MOS) Section 4 presents the specifications and/or standards that must be used to demonstrate effective design of systems and components for which correct operation is required for safety.

3. **Function and Performance Specification or equivalent document(s).** The FPS or equivalent document(s) must present:

a. function and performance requirements for the identified safety-critical systems and components, including cyber security

b. the proposed operating characteristics and potential limitations

c. the intended use of the Space Segment, Ground Segment and Link Segment elements and the operations for which a POP is requested

d. the environments to which the satellite and/or satellite payload will be subjected

e. launch vehicle integration requirements for the satellite as defined by the Launch Service Provider

f. integration requirements for the payload(s) on the satellite,

g. the verification and validation matrix against which the identified safety-critical systems and components was/will be assessed.

4. **System Specifications.** The System Specifications must present, at minimum:

a. a list of safety-critical systems or components that may credibly leave the satellite and/or satellite payload inoperable or increase the risk to safe operations if failure occurs

b. a description of the satellite and/or satellite payload design, including all potential configurations

c. descriptions of designs covering mechanical, structural, electronics, software, thermal, and radiation hardness with cross-discipline considerations included

d. a description of each satellite payload and how it integrates into the satellite,

e. descriptions of the Ground Segment and Link Segment.

(b) The application for a POP must identify all components whose failure or unsafe operation could damage other satellites or harm people, and demonstrate that safety risks have been eliminated or otherwise minimised SFARP. **►GM ►AMC1**

GM POP.220(b) – High safety consequence components

1. **Purpose**. This regulation is applicable to the design of satellites and/or satellite payloads that contain high safety consequence components (eg pressurised tanks, lasers and nuclear energy) which are inherently hazardous and can present an elevated safety risk that requires special consideration.

Common requirements

2. The implementation of additional engineering controls for high safety consequence components can reduce space safety hazards such as damaging another satellite after an accidental release of stored energy or

harming people in orbit with an inadvertent release of radiation (ionising and non-ionising). The use of engineering controls (eg structural reinforcement or safety interlocks) reduce the chance of failure in these components during launch, operations and return of the satellite and/or satellite payload.

3. The identification of high safety consequence components followed by safety risk assessments and the implementation of associated mitigation strategies is part of the process used to ensure safety risks are eliminated or otherwise minimised SFARP. After these steps have been completed, managing any residual risks in the Safety Management System ensures that appropriate controls for high safety consequence components are sustained and updated as required for the life of the satellite and/or satellite payload.

4. Approvals from regulators and/or authorities that are outside that scope of the DSSP may be required for high safety consequence components.

Powerful electromagnetic emitting devices

5. Powerful electromagnetic emitting devices (eg lasers) require special consideration because accidental illumination or standard in-orbit operation can interfere with another satellite or harm people in orbit. Where Defence intends to use such devices, safety controls are used to ensure the safety risks are eliminated or otherwise minimised SFARP.

Nuclear energy

6. Inadvertent emissions from nuclear power sources may affect other satellites and/or be released into the atmosphere. The Space (Launches and Return) Act 2018 (SLR Act) states that Ministerial approval is needed before nuclear power sources can be launched from, or returned to, Australia. Since this SLR Act requirement may be applicable to Defence, clarification on the Minister’s role may be warranted at the beginning of a satellite and/or satellite payload project involving a nuclear energy.

7. The use of a nuclear energy on a satellite and/or satellite payload requires a detailed analysis to ensure that safety risks are eliminated or otherwise minimised SFARP.

8. The Australian government has signed the Outer Space Treaty, which prohibits the deployment of nuclear weapons or weapons of mass destruction into space.

AMC1 POP.220(b) – High safety consequence components
1. The application for a POP must detail any equipment or materials

that is contained within, or comprises a part of, the satellite and/or satellite payload that may pose an elevated risk to safe operation or require approvals from regulators and/or authorities that are outside the scope of the DSSP. This includes, but is not limited to:

a. pressurised tanks (containing gas or liquid)

b. powerful electromagnetic emitting devices

c. nuclear energy.

2. For items identified as high safety consequence components, the application for a POP must:

a. identify the type of equipment or materials

b. identify the engineering and other safety risk controls that have been implemented

c. produce a safety analysis that demonstrates risks have been eliminated or otherwise minimised SFARP

d. disclose the details of any additional approvals that have been received or have been sought (if applicable),

e. confirm any residual safety risks have been transferred to the Safety Management System for monitoring and further risk reduction (where applicable).

3. The safety analysis at paragraph 2c must be approved by a person with relevant qualifications and competency. Where Defence intends to employ a nuclear power source in outer space, the application for a POP must also present evidence of Ministerial approval (if applicable).

4. The DSSP MOS Section 4 presents specifications and/or standards that must be used to demonstrate that appropriate engineering safety controls have been implemented for high safety consequence components.

POP.230 Verification and Validation

(a) The application for a POP must demonstrate that the satellite and/or satellite payload system passed all verification and validation requirements for safe launch and operation. ►**GM** ►**AMC1**

GM POP.230(a) – Verification and validation
1. **Purpose**. The purpose of this regulation is to confirm the Space Segment, Link Segment and Ground Segment elements of the satellite and/or satellite payload system meet the FPS (or equivalent documents)

verification and validation requirements for safe launch and operation. Verification testing confirms a product is built according to specified design requirements. Validation testing ensures the built product meets the intended purpose.

2. Verification and validation are important processes in the development and construction cycles to reduce the risk of space safety hazards such as collisions in orbit, damaging other satellites or people in orbit with emissions from the spacecraft, and the uncontrolled release of energy stored on the spacecraft. Successful completion of verification and validation through qualification, integration and end-to-end system testing demonstrates that the final product meets the safety-critical design requirements, applicable Launch Service Provider (LSP) requirements, and can fulfil the intended purpose.

Flight Heritage

3. Flight heritage is documented evidence that a component, subsystem, or system has previously operated successfully under comparable conditions on prior missions. When adequately supported, flight heritage may reduce the need for additional testing, provided the applicant demonstrates equivalence and addresses any identified differences.

AMC1 POP.230(a) – Verification and validation testing

1. The application for a POP must demonstrate that:

a. the satellite and/or satellite payload has passed the qualification testing required for safe launch and operation in the intended space environment

b. the satellite and/or satellite payload has passed integration testing as related to functions where a safety link can be made

c. end-to-end testing of the Space Segment, Ground Segment and Link Segment elements was successful as related to functions where a safety link can be made,

d. test results for paragraphs 1.a, 1.b and 1.c have been approved by a person with the relevant qualifications and competency.

Qualification testing

2. Qualification testing of the satellite and/or satellite payload must include:

a. vibration (random and sinusoidal) testing

b. shock testing, including pyro-shock (where applicable)

c. thermal vacuum testing, including:

   i. thermal cycling, and

   ii. thermal bakeout testing (where applicable).

d. electromagnetic compatibility testing

e. mass properties measurements

f. radiation testing (total ionising dose or single event effect) (where applicable)

g. magnetic dipole testing (where applicable),

h. functional testing pre-launch.

Note: Where a test was not performed on the final article, the applicant is to state why it wasn't and justify their confidence in the final article's qualification test compliance.

Integration testing

3. Integration testing must show, at minimum, that:

a. the Space System configuration related to safety is consistent with the satellite and/or satellite payload design requirements

b. the Space System elements related to safety functions match the satellite and/or satellite payload design requirements

c. the satellite and/or satellite payload structure complies with the design requirements

d. the satellite and/or satellite payload software and installation complies with the design requirements,

e. the satellite is capable of safe integration into the launch vehicle and launch vehicle systems, or the satellite payload is capable of safe integration into the satellite and satellite systems.

End-to-end system testing

4. End-to-end system testing must include:

a. verification of all safety-critical requirements of the Space Segment, Ground Segment and Link Segment

b. interoperability testing

c. space-to-ground (downlink/telemetry link) compatibility testing

d. ground-to-space (uplink/telecommand link) compatibility testing

e. link margin analysis review

f. data flow tests to validate the safety-related communications interfaces

g. mission readiness tests to validate the readiness of the ground stations and mission operations system/centre to support the safety-critical functions,

h. simulations and rehearsals to validate the mission operation centre's readiness to execute nominal and contingency operational management procedures related to safety management.

5. The DSSP MOS Section 4 presents the specifications and/or standards that must be used to demonstrate compliance with qualification testing, integration testing and end-to-end testing.

6. Applicants may submit to the Regulator, for review and approval, a proposal to use flight heritage data as an alternative to certain verification and validation tests. Any such proposal must:

a. identify the heritage system or component and provide evidence of its prior successful operation under comparable conditions

b. demonstrate similarity between the heritage system and the current application, including design, materials, manufacturing processes, and operational environment

c. justify that the heritage data is sufficient to meet all applicable safety and performance requirements

d. address differences between the heritage system and the current application, including an assessment of potential impacts on safety and reliability,

e. document the rationale for substituting flight heritage for testing.

POP.240 Cyber Security

(a) The application for a POP must demonstrate that cyber security controls protecting systems critical to safety have been implemented into the satellite and/or satellite payload system. ►GM ►AMC1

GM POP.240(a) – Cyber security
1. **Purpose**. The purpose of this regulation is to confirm the implementation of appropriate measures to protect safety-critical systems from cyber threats for the lifecycle of the satellite and/or satellite payload. 2. Cyberattacks such as disruption of Telemetry, Tracking and Communications (TT&C) can result in the loss of control or unauthorised movement of the satellite and have the potential to create safety hazards such as collisions with another satellite. Implementation of a cyber security strategy, that includes a security risk assessment and associated mitigation strategies, is a means of reducing the risk of cyberattacks leading to a safety occurrence. 3. Completion of a cyber security assessment addresses the safety risks from Intentional Unauthorised Electronic Interactions (IUEI), which are the deliberate emission of electronic/electromagnetic signals intended to spoof, intercept, or disrupt communications or other cyber systems. 4. Establishing cyber security measures compliant with relevant requirements of the Defence Security Principles Framework (DSPF) is one way to implement cyber security measures appropriate for Defence platforms.

AMC1 POP.240(a) – Cyber security controls
1. The application for a POP must include evidence that a cyber security strategy has been developed and implemented to address potential safety hazards across the Space Segment, Link Segment and Ground Segment. 2. This evidence will normally be in the form of a declaration by a person with the relevant qualifications and competency (or an authorised person, if applicable), that the security risk assessment and mitigation strategies have been satisfactorily completed. Provided the person making the declaration is assessed as suitable, access to the evidence will not normally be required by the Regulator. 3. Compliance against this regulation requires demonstration of: a. a cyber security risk assessment that: i. determines the security environment for the information security of the Space Segment, Ground Segment and Link

Segment

ii. identifies Intentional Unauthorised Electronic Interactions (IUEI) attack paths

iii. assesses the safety consequences of the threats

iv. evaluates, by considering the existing security protection means, the level of threat that would impact safety,

v. determines whether the risks, which are the result of the combination of the severities and the potentiality to attack (or, inversely, the difficulty of attacking), are acceptable.

b. the mitigation strategies having been implemented

c. meeting cyber security design requirements related to threats affecting safety, including IUEI,

d. confirmation that the cyber security measures and controls comply with the DSPF.

POP.300: Orbital Safety

POP.310 Orbital Parameters

(a) The application for a POP must demonstrate that the intended orbit(s) for the satellite are suitable for safe operations. ►GM ►AMC1

GM POP.310(a) – Intended orbital parameters

1. **Purpose**. The purpose of this regulation is to confirm that planned orbits(s) have been assessed for potential safety hazards related to the position of the satellite or operations of the satellite payload(s) and to confirm that appropriate risk mitigations have been implemented.

2. Earth orbits have progressively become more congested due to the growth in active satellites and an increase in orbital debris. Operating in this environment presents space safety hazards that include collision with another satellite or debris within orbit and the resulting release of debris into space or the Earth's atmosphere. The release of debris can damage other satellites, or harm people that are in orbit, in the air or on the earth's surface.

3. Orbital safety assessments are part of the process used to ensure that the intended satellite orbit is safe for operations. The safety assessment includes orbital requirement planning, orbit selection and substantiation of the assumed conditions in orbit. This assessment helps confirm the suitability of the intended orbit and reduces the risk of a safety

incident occurring. Additionally, the assessment must explicitly consider propellant reserves allocated for orbital manoeuvres to support collision avoidance protocols. This includes both proactive trajectory adjustments to avoid known space debris and reactive manoeuvres in response to conjunction alerts, ensuring sufficient fuel margins without compromising primary mission objectives.

Note: Where a space object has an operational requirement to dynamically change orbit at short notice, the Regulator will instead agree to the "system" employed by the operator to manage orbital changes. This agreement will inherently include provisions regarding if and what information must be reported to the UN to satisfy POP.350(a) and POP.350(b) requirements.

AMC1 POP.310(a) – Intended orbital parameters

1. The application for a POP must include:

a. details of the intended orbit(s),

b. an assessment of orbital suitability.

2. **Intended orbit(s).** Details for the intended orbit(s) must include, at minimum:

a. means of attaining the orbit

b. means of maintaining the orbit

c. extent of the range and capability of the satellite operator's control

d. if undertaking orbital manoeuvres to reach the intended operating orbit:

i. parameters for parking orbit

ii. parameters for transfer orbit

iii. parameters for the final operating orbit.

3. **Orbit suitability.** Evidence must be provided of addressing safety during planning, selection, and substantiation of orbital parameters. The evidence must include orbital analyses and substantiation that includes analysing potential conjunctions to determine a range of suitable orbital slots. Proof of licences held, where applicable, must also be provided.

4. The DSSP MOS Section 4 presents the specifications and/or standards that must be used to demonstrate orbit suitability.

(b) The applicant for a POP must notify the Defence Space Safety Regulator if changes to the orbital parameters are proposed after submission of the application. **►GM ►AMC1**

GM POP.310(b) – Proposed orbital parameter changes
1. **Purpose**. Orbital parameters may be changed by the Launch Service Provider or others late in the launch lifecycle, after an application for a POP has been submitted. The purpose of this regulation is to require the applicant to evaluate the safety of the new orbital parameters and inform the Regulator of the change, so the Regulator can determine whether the proposed changes still meet safety requirements inherent in the POP application. 2. While this regulation is targeted at the applicant, if the POP has already been issued then the analysis and notification could equally be completed by the SSA Holder under GR.210(i)(5), which requires the SSA Holder to advise the Regulator of any change or development that might affect or invalidate the SSA.

AMC1 POP.310(b) – Proposed orbital parameter changes
1. In the event that orbital parameter changes are proposed after the POP application has been submitted, the applicant must: a. notify the Regulator with the proposed change to the orbital parameters, b. provide the methods used to confirm that the proposed changes will still meet safety requirements baselined in the existing application. Where compliance with safety requirements cannot be met, the applicant is to provide the Regulator with the deficiency details to facilitate a suitability assessment of the existing application.

POP.320 Spectrum Authorisation

(a) The application for a POP must demonstrate appropriate radiofrequency spectrum authorisation(s) have been obtained as required to facilitate safe operations. **►GM ►AMC1**

GM POP.320(a) – Spectrum Authorisation
1. **Purpose**. The purpose of this regulation is to confirm that radiofrequency (RF) spectrum authorisation has been granted for frequencies utilised for safety-related functions such as control systems, telemetry and communication with the satellite and/or satellite payload. Gaining RF spectrum authorisation is one means of reducing the risk of space safety hazards during operations such as collisions that damage another satellite due to loss of control, and planned RF emissions that

inadvertently interfere with or cause damage to another satellite.

2. Internationally, the RF spectrum is regulated by the International Telecommunications Union (ITU). The ITU has several mechanisms to regulate access to the RF spectrum, and to mitigate interference while managing users' access. The higher-level instruments are the Radio Regulations, which is a treaty-level agreed document that approximately 180 countries, including Australia, are signatories to.

3. Within Defence, the Defence Spectrum Office (DSO) manages Defence RF spectrum access. This extends to activities that are undertaken on behalf of Defence under contract. DSO is the direct point of contact prior to any emissions being undertaken. Early contact with DSO will ensure that informed decisions around RF spectrum choice and location assessment can be undertaken.

AMC1 POP.320(a) – Spectrum Authorisation

1. The application for a POP must provide evidence of spectrum authorisation covering radiofrequencies utilised for safety-related functions covering:

a. all transmitting and receiving devices on the satellite and/or satellite payload,

b. all ground segment transmitting and receiving devices.

Note: DSO should be contacted to confirm suitability of a non-DSO authorisation.

POP.330 Launch Service Provider

(a) The application for a POP must demonstrate that the Launch Service Provider has demonstrated a capability to safely deliver the satellite to the specified orbit. ►**GM1** ►**GM2** ►**AMC1**

GM1 POP.330(a) – Applicability

1. The requirements of POP.330(a) are not applicable to launches that are:

a. authorised by the Australian Space Agency, or

b. subject to the DSSR.LRP regulations.

GM2 POP.330(a) – Launch Service Provider

1. **Purpose**. The purpose of this regulation is to confirm that launch safety performance history and launch safety management strategies of the Launch Service Provider (LSP) have been assessed. Beyond the hazards associated with flight safety and catastrophic launch failures, there

is a risk of accidental collision with another satellite or space object during orbital insertion of a satellite. Selection of a competent and capable LSP can minimise the launch risks tied to Defence Space Segment elements and improve the likelihood for safe delivery of the satellite to the specified orbit.

2. The implementation of selection criteria that covers LSP safety controls and LSP safety performance data provides a basis for critical assessment of the LSP's capability to safely deliver the satellite into orbit.

3. The inclusion of specific provisions for DSSR.POP requirements (eg conduct of pre-launch conjunction assessment) within launch contract(s), where appropriate, should be considered in order to bind the LSP to delivering products and/or services that support DSSR.POP compliance. This might include launch vehicle interface requirements, verification testing to be met before launch, management of volatile/explosive materials and notifications of proposed changes to orbital parameters.

AMC1 POP.330(a) – Launch Service Provider

1. The application for a POP must present evidence that the LSP has demonstrated a capability to safely deliver the satellite to the specified orbit. Three options for demonstrating this requirement are as follows:

a. The launch is covered by an authorisation that has been issued by a recognised government space authority

b. Safety-related selection criteria have been developed for LSP selection, and demonstration of the LSP's compliance with this criteria has been completed, or

c. An alternative approach has been approved by the Regulator.

Note: This AMC intentionally does not define a benchmark for what constitutes a demonstrated capability. Instead, it acknowledges that such determinations are a balance between Defence's operational imperatives and the safety hazards that must be managed.

Option 1: LSP assessment via an international authorisation

2. The GM to GR.210(g)(1) lists several international government authorities whose space authorisations are currently recognised by the Regulator. Provided the authority has issued an authorisation for the intended launch, and the authorisation employs their normal approval approach (eg it is not an experimental permit, or a bespoke authorisation, or an abbreviated assessment applied for foreign customers, etc), this will

provide Defence with confidence in the LSP's competence and capability.

3. To leverage an international launch authorisation, the application for a POP must provide all of the following:

a. confirmation that the issuing authority is listed in GM to GR.210(g)(1)

b. evidence that a launch authorisation has been issued, or will be issued, for the particular launch,

c. justification for the applicant's confidence that the launch authorisation will employ the authority's normal approval approach.

Option 2: Developing LSP selection criteria and demonstrating compliance

4. Under this option, safety-related LSP selection criteria are to be developed, and compliance with the criteria demonstrated. Selection criteria must include, at minimum:

a. a list of LSP requirements and the LSP compliance against each requirement

b. how LSP operations are planned to minimise the risk to human life and potential impacts on the safety of other objects in orbit, including debris minimisation controls and completion of a pre-launch conjunction assessment

c. the LSP's safety record over the past five years, including all launches and attempted launches. This is to include publicly available information and any supplementary information provided by the LSP

d. details of any comparative analyses of LSP's utilised (if applicable)

e. other safety considerations utilised to inform selection of the LSP,

f. the final justification for the LSP selected.

Option 3: An alternative approach that is approved by the Regulator

5. Space launch is a rapidly evolving field, and opportunities for launching Defence satellites or payloads may emerge where option 1 is not possible and option 2 is not practicable. Option 3 echoes the flexibility provisions available through GR.130(a) and GR.130(b), to confirm that the Regulator is open to different methods of demonstrating compliance.

POP.340 Debris Mitigation

(a) The application for a POP must demonstrate that space debris minimisation controls have been implemented. ►GM ►AMC1 ►AMC2

GM POP.340(a) – Space debris mitigation
1. **Purpose**. The purpose of this regulation is to confirm that planned operations and the end-of-life satellite disposal plan have been assessed for potential safety hazards related to orbital debris and to confirm that appropriate risk mitigations have been implemented. This regulation requires the creation of a mitigation strategy early in the development lifecycle, and a mitigation report that is updated throughout the system lifecycle. *Note: The European Space Agency (ESA) reports that since the start of the space age in 1957, humankind has launched almost 50 thousand tonnes of material into space. Some of that has returned; however, as of 2023, approximately 10 thousand tonnes remain in orbit and on average one object returns to Earth every week, uncontrolled. This has led to an international trend towards space sustainability and in particular, the formation of, for example, the ESA's 'Zero Debris approach'.* 2. A significant increase in launches and active satellites has led to Earth orbits becoming an increasingly congested and hazardous environment to navigate. This congestion in orbit is a space safety hazard to satellites during insertion, operations and disposal. During operations, the generation of new debris, either directly or indirectly, can lead to collisions that damage another satellite. During disposal, a collision with orbital debris whilst deorbiting could result in the satellite failing to completely burn up upon re-entry, potentially harming people in the air and on the ground. 3. Implementing a Space Debris Mitigation Strategy (SDMS) establishes preventative measures to mitigate risks that have been identified through orbital debris assessments, and utilises responsible practices to limit the creation of orbital debris. Effective use of a SDMS reduces the likelihood of a safety incident from orbital debris related-hazards during operations and disposal. 4. A Space Debris Mitigation Report (SDMR) systematically outlines how a satellite and/or satellite payload has been designed, constructed, and will be operated to minimise debris creation. The SDMR is updated during reviews, validation and verification testing, flight readiness reviews and at other times throughout service life such that safety risks associated with the generation of orbital debris are eliminated or otherwise minimised SFARP.

AMC1 POP.340(a) – Space debris mitigation strategy

1. The application for a POP must present a Space Debris Mitigation Strategy (SDMS) for the satellite and/or satellite payload. The SDMS must:

a. describe any mitigation measures planned to avoid orbital debris, including reference to debris minimisation controls associated with AMC2 to POP.340(a)

b. include an orbital debris assessment, which contains:

i. identification of through-life debris hazards, including disposal

ii. assessment of the impact of all potential debris hazards within the planned operation,

iii. analysis of the results of paragraphs 1b(i) and 1b(ii) with specific consideration to the influence/impact on the generation of space debris.

2. The application must include a safe disposal strategy for the satellite and/or satellite payload. The disposal strategy must:

a. identify the proposed disposal method:

i. graveyard (supersynchronus) orbit, or

ii. atmospheric burn up, or

iii. return (retrieval) of satellite.

Note: A Defence Launches and Returns Permit under DSSR.LRP is required when Defence intends to return a space object to the Earth's surface.

b. contain, at a minimum, the following information regarding the disposal method:

i. the anticipated life span of the satellite and/or satellite payload

ii. a list of resources required to complete the disposal

iii. procedures to:

(1) assess the health status of the critical functions of the satellite and/or satellite payload for disposal operations,

(2) update the probability of successful disposal based on in-flight data.

iv. for disposals to graveyard orbits:

(1) the preliminary concept including any known orbital parameters, such as timing, transfer orbit(s), parking orbits(s), and final orbit, required to complete disposal.

v. for atmospheric burn ups:

(1) any known information on the predicted trajectory of the satellite and/or satellite payload.

vi. for satellite returns:

(1) any known information on the predicted trajectory of the satellite,

(2) the intended location of the return site.

c. demonstrate how the satellite and/or satellite payload will be disposed of safely, including, at a minimum:

i. a process to conduct conjunction assessments prior to disposal

ii. a demisability analysis

iii. analysis and establishment of procedures for conducting disposal orbital manoeuvres (where fitted with trajectory manoeuvre functionality)

iv. disposal hazard identification and analysis,

v. a risk assessment with mitigation strategies for the proposed disposal activity.

3. The DSSP MOS Section 4 presents the specifications and/or standards that must be used to demonstrate compliance with the above requirements.

AMC2 POP.340(a) – Space debris minimisation controls and report
1. The application for a POP must present a Space Debris Mitigation Report (SDMR), approved by a person with relevant qualifications and competency.

2. The SDMR must include, at a minimum:

a. a compliance and verification matrix, which includes:

i. identification of Space Debris Mitigation (SDM) requirements

ii. status of the compliance with the SDM requirements,

iii. details as to why SDM requirements are not being met, or are not applicable, including justification for why it does not pose a safety risk.

b. details of how satellite and/or satellite payload and all appendages were designed to minimise debris:

Note: Example of appendages are solar arrays, antennas, instruments booms, attitude control booms, etc.

i. mass budget at launch and intended mass budget at end of service life, including all propellants and fluids

ii. description of the propulsion system (if applicable)

iii. description of the power system

iv. description of the Attitude and Orbit Control System

v. description of the Guidance, Navigation and Control system,

vi. identification of items that have not been designed with debris minimisation controls.

c. details of how Mission-Related Objects (MROs) were designed to minimise debris:

Note: Examples of MROs are nozzle closures, lens caps, cooler covers, tethers, dummy masses, etc.

i. confirmation by design that MROs are not released

ii. a list of MROs, if released at any time after launch, including their characteristics:

(1) type

(2) dry mass and fuel or fluid mass

(3) materials

(4) dimensions,

(5) drawings.

iii. rationale for release of each MRO and possible effects on debris generation

iv. time of release of each MRO with respect to launch time

v. release or ejection velocity of each MRO

vi. expected orbital parameters, apogee, perigee, and inclination of each MRO after release,

vii. analysis used to determine the trajectory propagation and expected presence in orbit of each MRO.

d. for small particle release:

i. review-of-design or test to verify that all engines (if fitted) do not release particles larger than 1 mm

ii. review-of-design or test to verify that pyrotechnics (if fitted) do not release particles larger than 1 mm

iii. review-of-design or test to verify that environment-induced degradation in Geosynchronous Orbit (GEO) does not lead to the release of particles larger than 1 mm,

iv. assessment of the type and quantity of small particles larger than 1 mm expected for release during normal operations, including:

(1) type of particles

(2) size, mass and density ranges of the particles,

(3) conditions and orbit where released.

e. for on-orbit break-up risk caused by the satellite payload:

i. identification of credible potential causes of break-up during orbital insertion and operations

ii. accidental on-orbit break-up risk analysis, including:

(1) failure modes, and effects analysis for all credible failure modes which can lead to an accidental explosion or fragmentation,

(2) satellite accidental on-orbit break-up probability through to end of service life.

f. for on-orbit break-up and vulnerability risk caused by impacts:

i. analysis to determine the probability of collisions with objects or debris over the orbital insertion, operation, and disposal phases

Note: It is accepted that analyses to determine the probability of debris collisions become increasingly less certain for spacecraft with longer lifespans, as environmental uncertainty will increase across the epoch.

ii. analysis to determine the probability of damage or failure due to collisions over the orbital insertion, operation, and disposal phases,

iii. assessment of the on-orbit break-up and vulnerability risk for tether systems (if fitted).

g. for on-orbit collision risk:

i. review of design to ensure that adequate resources, Delta-v, propellant mass are allocated for collision avoidance manoeuvres (where fitted with trajectory manoeuvre functionality),

ii. information on space surveillance and trackability, and an assessment of trackability identification and state accuracy.

h. for disposal:

i. description of Design for Removal (D4R) implementations and associated analyses.

i. for passivation:

i. component type, subsystem, and number of items

ii. design measures allowing passivation

iii. residual type and quantity of energy after the passivation operations

iv. rationale if design measures or operational procedures do not allow full passivation,

v. explosion risk and potential effects on debris generation, if passivation is not fully accomplished.

j. for re-entry:

i. design for demise practices and how the payload will achieve ablation of elements, equipment, parts, and components, or

ii. design for containment methods through reducing the number of impacting fragments by grouping them together.

3. The DSSP MOS Section 4 presents the specifications and/or standards that must be used to demonstrate compliance with the above requirements.

POP.350 Compliance with the Registration Convention

(a) The application for a POP must provide registration information to the Defence Space Safety Regulator. ►GM ►AMC1

GM POP.350(a) – Compliance with the Registration Convention

1. **Purpose**. The purpose of this regulation is to ensure other space users can access information on the location of the satellite to reduce the safety risk of an inadvertent collision with another satellite or space object.

2. Furthermore, this regulation serves as a means for Australia to maintain its compliance as a signed party to the Outer Space Treaty and the Registration Convention. Article IV of the Registration Convention provides a mechanism to assist in the identification of space objects, ultimately holding State parties accountable for issues regarding their assets.

3. The SSA Holder should consider any applicable security classification requirements and, where necessary, obtain the appropriate approvals before submitting registration information to the Regulator.

AMC1 POP.350(a) – Registration

1. The application for a POP must present one of the following to the Regulator:

a. registration information, or

b. information on how the space object will be registered through another responsible party.

2. **Registration information.** Where Defence coordinates registration of the space object, the following space object information is required by the UN:

a. name of launching State(s)

b. expected date and territory or location of launch

c. basic orbital parameters, including:

i. nodal period

ii. inclination

iii. apogee,

iv. perigee.

d. general function of the space object.

3. The Regulator will submit registration information to the UN. Should any of the information in paragraph 2 present a security concern to Defence, the applicant for the POP must raise the concern to the Regulator.

(b) The SSA Holder must provide details of any change in orbit or general function to the Regulator that require a registration update. ►GM ►AMC1

GM POP.350(b) – Registration update

1. **Purpose**. The purpose of this regulation is to facilitate the notification to other space users when a change in location (orbit) or function of a Defence space object occurs. This notification is provided to reduce the safety risk of an inadvertent collision with another satellite or space object.

2. A change in function could include variation in lifecycle stages, such as transition from operational to inoperable or decommissioning. A change in function may also include major operational changes or re-tasking. Examples of a major operational change include changing from active communications to data collection.

3. The SSA Holder should consider any applicable security classification requirements and, where necessary, obtain the appropriate approvals before submitting updated registration information to the

Regulator.

AMC1 POP.350(b) – Registration update

1. Upon change of orbit or function, the SSA Holder must submit one of the following:

a. updated registration information, or

b. evidence of updated registration through another responsible party.

2. **Registration information.** Where Defence coordinates registration, the following space object information must be provided for United Nations (UN) registration update:

a. if changed, the new orbital parameters, including:

i. nodal period

ii. inclination

iii. apogee,

iv. perigee.

b. if changed, departure from Earth orbit, or

c. if changed, the new function of the space object.

3. The Regulator will submit updated registration information to the UN where required. Should any of the information in paragraph 2 present a security concern to Defence, the applicant for the POP must raise the concern to the Regulator.

POP.400: Operations

POP.410 Operations Management

(a) The application for a POP must demonstrate that a system for managing safe satellite and/or satellite payload operations has been implemented. **►GM ►AMC1 ►AMC2**

GM POP.410(a) – Operations Management

1. **Purpose**. The purpose of this regulation is to confirm that planned operations have been assessed for potential safety hazards related to operating the satellite and/or satellite payload, and that appropriate risk mitigations have been implemented.

2. Space operations pose space safety hazards such as orbital

collisions that can damage another satellite or cause an uncontrolled deorbit, emissions from powerful electromagnetic emitting devices (eg lasers) that inadvertently interfere with or damage another satellite, and the accidental release of stored energy that can directly or indirectly damage another satellite.

3. Implementation of effective administrative controls, such as practical rules, processes, management procedures, and operational (nominal and contingency) procedures for conducting operations is a way to reduce the likelihood of an in-orbit safety occurrence.

4. Some space operations elements covered by DSSR.POP regulations may be executed by contractors. The inclusion of specific provisions addressing DSSR.POP requirements should be considered during the setup of space operations contracts. These provisions may be used to ensure that contractors implement appropriate safety controls during hazardous operations such as conjunction assessments and any associated collision avoidance operations.

AMC1 POP.410(a) – Operations Management

1. The application for a POP must include:

a. evidence that potentially hazardous operations have been identified, and safety controls are implemented through operations documentation

b. evidence that operations documents have been approved by a person with relevant qualifications and competency,

c. evidence that any contracts associated with orbital operations bind the contractor(s) to the requirements of the DSSR.POP regulations, when applicable.

Operations documentation

2. Operations documentation such as plans, procedures, processes, or internal instructions must implement safety controls, where applicable, through:

a. operations rules

b. operations management processes

c. mission phase operations processes

d. operations procedures,

e. procedures for handover between different authorities and their responsibilities.

3. **Operations rules**. The operations rules should include, at minimum:

a. rules and criteria for emergencies and anomalies not covered by existing contingency procedures detailed at paragraph 6.a

b. safety-related mission termination criteria

c. rules and criteria for safety critical components (see paragraph 7) (if applicable),

d. rules to inform the Regulator on/when/if:

i. communication with the satellite and/or satellite payload is first established

ii. communication with the satellite and/or satellite payload is subsequently lost

iii. end of service life manoeuvres, as identified in the satellite and/or satellite payload end-of-life strategy (see AMC1 to POP.340(a)), are commenced.

4. **Operations management processes.** The operations management processes should include, at minimum:

a. organisation, responsibilities, and the location of teams involved in the operations during each mission phase, including system maintenance specialists

b. mechanisms for confirming readiness to proceed with operations and reviewing process of operations execution

c. reporting channels

d. mechanisms deployed for anomaly reporting,

e. interfaces with external operations entities (eg Space Domain Awareness networks and Space Weather Networks).

5. **Mission phase operations processes.** The mission phase operations processes should include, at minimum:

a. a description of each mission phase including major events, timings, and operations implementation strategy,

b. timelines of operations.

6. **Operations procedures.** The operations procedures should include, at minimum:

a. nominal and contingency operational procedures (see AMC2 to POP.410(a))

b. controls based on a safety risk assessment for operations involving high safety consequence components,

c. a matrix indicating the mission phases to which procedures are applicable and their authorisation status.

High safety consequence components

7. Where Defence intends to operate high safety consequence components (eg pressurised tanks, lasers and nuclear energy), the application for a POP must provide a safety risk assessment, approved by a person with relevant qualifications and competency, which:

a. describes operational procedures and mitigation strategies that incorporate design management system outcomes (see AMC1 to POP.230(a))

b. lists the device components and their mission roles, including safety-critical roles if relevant,

c. assess the likelihood that the operation of the device will cause damage to or interfere with another satellite, or causing harm.

Note: See AMC1 to POP.220(b) for information on high safety consequence components.

Orbital Operations contracts

8. Operations contracts may include, but are not limited to:

a. contracts with the person or organisation undertaking satellite and/or satellite payload operations,

b. contracts for the use or lease of operations facilities (if applicable).

9. The application for a POP is to present to the Regulator, at minimum:

a. the person or organisation the contract is with

b. the purpose of the contract,

c. the contract provision(s) to meet DSSR.POP requirements.

Note: Examples of DSSR.POP requirements include, but are not limited to, conjunction services and processes, orbital debris assessments, and Telemetry, Tracking and Communication (TT&C) services.

AMC2 POP.410(a) – Nominal and contingency operational procedures

1. The application for a POP must provide evidence of nominal and contingency operational procedures for safety-related operations.

Nominal operating procedures

2. The application must demonstrate how operations during the Launch and Early Orbit Phase (LEOP), in-orbit phase, and disposal phase, will be conducted safely. This must include demonstration of how tracking, health monitoring, conjunction assessments, and responsible use of the radiofrequency (RF) spectrum will be performed during each operational phase.

3. **Tracking**. The tracking procedures must include, at minimum:

a. for LEOPs, procedures for how the satellite will be identified within one day of in-orbit insertion

b. for nominal operations:

i. procedures for how the position and velocity of the satellite will be accurately identified and provided at least once every orbital revolution and forecast seven days ahead

ii. procedures for how, for space objects potentially crossing the orbit of the satellite, daily updated ephemeris data (including position and velocity accuracy estimation) will be provided for up to seven days,

iii. procedures for how on-demand ephemeris screening will be provided.

c. for collision avoidance in nominal and disposal operations, explanations for how the position precision of the tracking system will be within 100 m (all spatial directions) in Low Earth Orbit (LEO) and 1000 m (all spatial directions) in GEO on along at least one orbital revolution outside of manoeuvre period,

d. if the satellite is fitted with trajectory manoeuvre functionality, procedures for informing the space system network of possible anomalies affecting the satellite and/or satellite payload.

4. **Health monitoring.** The health monitoring procedures must include monitoring of the satellite's and/or satellite payload's condition during flight, detecting on-board anomalies, and predicting its reliability, availability, and maintainability. This should be linked to the satellite end-of-life strategy (see AMC1 to POP.330(a)) as health data collected in-flight will be used to update the probability of successful disposal.

5. At least one of the following methods for collecting health data/failure prognostics must be outlined in the health monitoring procedures:

a. data collected in-flight (telemetry)

b. experience (lessons learnt) from failures and anomalies, to reassess component failure rates and their impact on the mission and disposal

c. stochastic models, to statistically predict the future status of components and their Remaining Useful Lifetime (RUL)

d. engineering models, to quantitatively predict the future status of components and their RUL,

e. data trends, to identify degradation trends and telemetry variations with respect to nominal conditions.

6. **Conjunction assessments.** Conjunction assessment refers to predicting the close approach of two space objects. Applicable procedures must demonstrate how the mission operations centre will:

a. screen current and planned trajectories of the satellite and relevant other space objects for potential collisions

b. determine the risk of collision and, if the satellite is fitted with trajectory manoeuvre functionality, whether an adjustment of trajectory is required to reduce the risk of collision,

c. share information on the proper interpretation and usage of the conjunction assessment results, as appropriate.

7. **Use of the RF Spectrum.** Procedures for RF spectrum use must outline the mission operating centre's responsibilities for:

a. conducting space activities in such a manner as not to cause harmful interference with the reception and transmission of radio signals related to the activities of other space users

b. promptly resolving identified harmful RF interference,

c. implementing the Radio Regulation procedures for space radio links established by the ITU (see GM to POP.420(a) paragraph 3).

Note: RF spectrum authorisation is required prior to any emission being undertaken (see POP.420(a)).

Contingency operating procedures

8. The application must demonstrate how anomalous operations during the LEOP, in-orbit phase, and disposal phase, will be conducted as safely as possible, and how the satellite will be recovered into a safe condition after anomalous conditions.

9. The contingency operating procedures must include:

a. actions on anomalous external events (eg solar weather forecast, conjunction forecast, or collision)

b. actions on malicious events (eg intentional RF spectrum interference, cyberattack or physical attack),

c. actions on on-board failures (eg lower power state or increasing tumble rate).

10. Applicable contingency events, for which contingency procedures will be developed, should be determined through structured hazard analysis or a failure modes, effects, and criticality analysis at the mission development stage.

POP.420 Personnel Competency

(a) The application for a POP must demonstrate the establishment and control of personnel competencies necessary for safe operations. **►GM ►AMC1**

GM POP.420(a) – Personnel competency

1. **Purpose**. The purpose of this regulation is confirm that personnel employed to undertake roles in support of safe operations, such as defined safety positions or personnel performing safety-related functions, are adequately trained and authorised to provide that particular service.

2. Establishing and controlling the competency of personnel is a means to reduce the risk of space safety hazards during operations including orbital collisions whilst undertaking operational movements that could cause damage to another satellite, inhibiting satellites due to inadvertent interference or damage from radiated emissions, and the uncontrolled release of stored energy that could, directly or indirectly, damage a satellite.

3. Ensuring that the operation is being led by and supported by competent and qualified professionals decreases the risk of a space safety accident.

AMC1 POP.420(a) – Personnel competency

1. The application for a POP must provide evidence of an established process to ensure personnel in roles with identified safety links are competent, qualified and have sufficient experience to undertake and perform their duties. This evidence is to include:

a. an established process and syllabus for the training and assessment of personnel to perform their duties, and for any appropriate remedial actions where required

b. clearly defined training objectives with direct linkage to operation and safety objectives

c. assessment criteria for personnel to display competency,

d. maintenance of a training record.

POP.500: Safety Management

POP.510 Safety Management System

(a) The SSA Holder must establish and maintain a Safety Management System (SMS). ►**GM** ►**AMC1**

GM POP.510(a) – Safety Management System

1. **Purpose**. The purpose of this regulation is to confirm that an SMS is established and maintained throughout the service life of the satellite and/or satellite payload. Implementing an SMS provides a structured approach that is continuous and iterative to managing safety risks within an organisation. The primary purpose of the SMS is to proactively identify, assess and control safety hazards, ultimately preventing accidents and incidents. An effective SMS helps the SSA Holder manage the safety risks associated with their intended operations.

Generative safety culture

2. A key element of the SMS is continuous improvement of safety management throughout the service life of the satellite and/or satellite payload, which requires and embodies a generative approach to space safety.

3. A generative safety culture involves an organisation's proactive, voluntary commitment to space safety that goes beyond mere rule-following to embed safety into daily thinking and behaviours. It aims to prevent harm through continuous improvement of the safety management strategies and open communication on safety rather than just meeting minimum requirements.

4. A generative culture builds upon compliance, using safety requirements as a structure while fostering a proactive, engaged approach to space safety. Importantly, a generative culture must be underpinned by a ‘just’ culture that does not focus on apportioning blame, but is still intolerant of actions that are negligent or cause deliberate harm.

AMC1 POP.510(a) – Safety Management System

1. The SSA Holder must establish and maintain an SMS throughout the service life of the satellite and/or satellite payload.

Note: Coverage of the SMS is to include all parties that contribute to managing safety hazards throughout the service life of the satellite and/or satellite payload. This may include, but is not limited to, the Space Segment elements design organisations, the satellite and/or satellite payload operators, and subcontractors and other partner organisations.

2. The SMS is to be developed such that it is proportionate to the safety hazards being managed under the POP. Where Defence operates a complex satellite capable of orbital manoeuvres and has the ability to control all associated safety hazards, demonstration against paragraphs 3 to 8 is appropriate and required. Where Defence operates a simple CubeSat or a payload with benign safety hazards, a dedicated SMS is not appropriate or required. For operations that are within these two extremes, the SSA Holder is to propose a proportionate SMS to the Regulator for approval.

Full SMS implementation

3. The SMS for a satellite with complex and significant safety hazards must cover the following elements:

a. the necessary organisational structures, accountabilities, policies, procedures, training, and feedback loops to ensure safety controls are continuously improved

b. hazard identification

c. safety risk assessment and management

d. management of change,

e. continuous improvement of the SMS.

4. **Hazard identification.** A process to identify hazards must be developed and documented. As part of this process the SSA Holder must be able to demonstrate the following, at minimum:

a. that all reasonably foreseeable safety hazards have been identified

b. hazard identification is an ongoing process, involving key personnel and appropriate stakeholders

c. hazards are documented and kept available for regular reviews and future reference

d. a reporting system has been established that:

   i. can be used to identify hazards from a variety of sources,

   ii. provides feedback to the reporter (and organisation where appropriate) of actions taken or not taken.

e. the conduct for safety investigations that:

   i. establish causal and contributing factors

   ii. identify underlying potential hazards for existing and future operations,

   iii. produce investigation reports.

5. **Safety risk assessment and management**. A process to assess and manage safety risks must be developed and documented. As part of this process the SSA Holder must be able to demonstrate the following, at minimum:

a. safety risks are eliminated or otherwise minimised SFARP

b. safety risk assessments take into account and weigh up all relevant matter including:

i. the likelihood of the hazard or the risk concerned occurring

ii. the degree of harm that might result from the hazard or the risk

iii. what the person concerned knows, or ought reasonably know, about:

(1) the hazard or the risk,

(2) ways of eliminating or minimising the risk.

iv. the availability and suitability of ways to eliminate or otherwise minimise the risk,

v. after completing items (i) – (iv) in this paragraph, the cost associated with available ways of eliminating or otherwise minimising the risk, including whether the cost is grossly disproportionate to the risk.

c. utilisation of a hierarchy of control measures to minimise the safety risk (where it is not reasonably practicable to eliminate it), by:

i. doing one or more of the following:

(1) substituting (wholly or partly) the hazard with something of lesser risk

(2) isolating the hazard from any person exposed to it,

(3) implementing engineering controls.

ii. if a risk then remains, implementing administrative controls,

iii. if a risk then remains, ensuring the provision and use of suitable personal protective equipment.

Note: a combination of the controls may be used to minimise risk, SFARP, if a single control is not sufficient for the purpose.

d. control measures are maintained and effective, including by ensuring they are and remain:

i. fit for purpose

ii. suitable for the nature and duration of the work,

iii. installed, set up and used correctly.

e. control measures are reviewed and revised:

i. when the control measure is ineffective

ii. before a change (eg update to a process or procedure) that is likely to give rise to a new of different safety risk that the measure may not effectively control

iii. when a new relevant hazard or risk is identified

iv. when the results of consultation indicate that a review is necessary,

v. when a safety representative requests a review because they reasonably believe that:

(1) a circumstance referred to in (i), (ii), (iii) or (iv) of this paragraph affects or may affect a member of the work group represented by the safety representative,

(2) a control measure has not been adequately reviewed in response to the circumstance.

6. **Management of change.** A process to identify and treat new or different safety risks that may arise from changes during operations must be developed and documented. As part of this process the SSA Holder must, at minimum, be able to demonstrate the following:

a. an established process to conduct hazard analyses and risk assessments of major operational changes, major organisational changes and changes in key personnel

b. key stakeholders are identified and involved in the management of change process,

c. previous risk assessments and existing hazards are reviewed for possible impacts on change requirements.

7. **Continuous improvement of the SMS**. A process to ensure continuous improvement of SMS performance must be developed and documented. As part of this process the SSA Holder must be able to demonstrate the following:

a. a Safety Committee has been established and has the authority to make decisions related to the improvement and effectiveness of the SMS,

b. the SMS is periodically reviewed such that improvements in safety performance can be demonstrated.

8. The DSSP MOS Section 4 presents specifications and/or standards that must be used to demonstrate compliance of a SMS.

9. The SSA Holder must provide details of the SMS in the SSA Holder's exposition (see POP.130(a)).

Tailored SMS implementation

10. The SMS components presented in paragraphs 3-8 is suited for a satellite that presents complex and significant hazards. However, for some Defence payloads and orbital operations, the safety benefits of such an expansive SMS may not be justified. The Regulator encourages applicants for a POP, in consultation with the prospective SSA Holder, to propose a tailored SMS that is proportionate to the safety risks.

11. If the Regulator agrees that a tailored SMS is suitable for compliance against this regulation, the documented minimum benchmark will be included as a Condition on the POP certificate.

No SMS

12. A tailored SMS will probably be justified for most Defence payloads and orbital operations. However, the applicant may present an argument that the payload and orbital operations hazards are trivial and/or the SMS would provide minimal safety benefit. If satisfied, the Regulator may provide an exemption against this regulation.

POP.520 Safety Occurrences and Reporting

(a) The SSA Holder must investigate safety Occurrences and take action to address any identified issues. **►GM ►AMC1**

GM POP.520(a) – Occurrence investigation and resolution
1. **Purpose**. The purpose of this regulation is to confirm that the SSA Holder has established processes to investigate and analyse safety Occurrences, and take action to address any identified issues in accordance with GR.310(a). 2. The identification, investigation and local resolution of safety Occurrences is a key element of implementing a generative approach to space safety. Determining what occurred and why it occurred reduces the

likelihood of similar Occurrences in the future.

3. Effective investigation and resolution of safety occurrences ensures that appropriate controls are implemented throughout the service life of the satellite and/or satellite payload and that safety risks are eliminated or otherwise minimised SFARP.

4. A safety Occurrence is any incident, malfunction, defect, technical defect or exceedance of limitations that endangers or could endanger the safe operation of the satellite and/or payload. They include:

a. **Operational incidents**. Examples include, but are not limited to, near misses/conjunctions, collisions with other space objects (including debris), breakups, unintentional departure from operating orbit, and cyber security incidents.

b. **Technical failures.** Examples include, but are not limited to, communication malfunctions, design defects, failure of Attitude Determination and Control System (ADCS) and software malfunctions.

c. **Accidents.** Examples include, but are not limited to, collisions between a satellite, satellite debris or a mission-related object and an astronaut that result in serious injury.

AMC1 POP.520(a) – Occurrence investigation and resolution

1. The SSA Holder must establish a process to investigate and analyse reports of, and information related to, Occurrences associated with operations authorised by the POP. This process must include a method of implementing corrective action if warranted.

2. Further, the SSA Holder must commit to:

a. taking immediate action to eliminate or otherwise minimise the risks associated with the Occurrence

b. conducting an investigation that is proportionate to the seriousness of the Occurrence and the likelihood of its recurrence,

c. initiating appropriate levels of investigation to determine what and why (root cause) it occurred, and how a similar Occurrence can be prevented in the future.

Note: Original Equipment Manufacturer assistance may be required as part of the investigation.

3. The SSA Holder must provide details of the Occurrence investigation and analysis processes in the SSA Holder exposition (see

POP.130(a)).

(b) The SSA Holder must report any safety Occurrence to the Defence Space Safety Regulator. ►**GM** ►**AMC1**

GM POP.520(b) – Occurrence reporting
1. **Purpose**. The purpose of this regulation is to confirm that the SSA Holder has an established Occurrence reporting process. 2. The aim of Occurrence reporting is not to attribute blame or take other enforcement actions. Full, open, timely and accurate reporting of information related to safety Occurrences allows Defence to respond and apply corrections to prevent future reoccurrence of such events. 3. A positive reporting culture through established processes is an enabler for the generative safety approach and contributes to the Regulator's safety assurance as required through the DSSP. 4. In view of the expected low frequency of reportable space safety Occurrences, the Regulator does not intend to prescribe a standardised report format.

AMC1 POP.520(b) – Occurrence reporting
1. The SSA Holder must commit to reporting Occurrences to the Regulator. Accidents or serious incidents require immediate notification. Otherwise, notification is nominally required within 72 hours after the identification of the reportable Occurrence. 2. Occurrence reports are to be submitted to dasa.dspace@defence.gov.au and must include, at minimum: a. date and time if relevant b. location c. details of the Occurrence d. the results of any investigation to date e. any actions undertaken or proposed to be taken in order to correct the deficiency along with the submission of relevant data to support the actions, f. any other relevant information. 3. The SSA Holder must provide details of the Occurrence reporting process, content and format in the SSA Holder exposition (see

POP.130(a)).

(c) Lack of reporting safety Occurrences may be grounds for Space Safety Authorisation suspension.

(d) Reporting must align with a non-punitive generative safety culture.