Structural Integrity Management - Aircraft Usage Validation Process (AUVP)

Military Aviation Authority

MAA

Guidance Document

Version 5.0, 22 July 2014

►Note: The content of this document is currently limited to the review of the SOIU. In due course, it will be updated to include guidance on the wider AUVP aspects including continued validation of IAT data.◄

Abbreviations

The following is a list of all abbreviations that appear within this document:

AAR	-	Air-to-Air Refuelling
AOA	-	Aircraft Operating Authority
ASI	-	Aircraft Structural Integrity
AUVP	-	Aircraft Usage Validation Process
CAMO	-	Continuing Airworthiness Management Organisation
DEC	-	Directorate of Equipment Support
DH	-	Duty Holder
DMA	-	Data Management Agency
DO	-	Design Organization
DUS	-	Design Usage Spectrum
ESVRE	-	Establishing, Sustaining, Validating, Recovering, Exploiting
FTR	-	Fatigue Type Record
GARP	-	Generic Aircraft Release Process
IAT	-	Individual Aircraft Tracking
LITS	-	Logistic Information Technology System
LOAA	-	Letter of Airworthiness Authority
LoD	-	Letter of Delegation
MAA	-	Military Aviation Authority
MDRE	-	Manual Data Recording Exercise
MDS	-	Maintenance Data System
MOD	-	Ministry Of Defence
OCU	-	Operational Conversion Unit
ODR	-	Operational Data Recording
OLM	-	Operational Loads Measurement
PO	-	Publication Organization
PT	-	Project Team
PTL	-	Project Team Leader
RAF	-	Royal Air Force
RN	-	Royal Navy
RTS	-	Release to Service
RTSA	-	Release to Service Authority
S and ADS	-	Structures and Aircraft Design Standards
SD	-	Service Deviation
SI	-	Structural Integrity
SIWG	-	Structural Integrity Working Group
SME	-	Subject Matter Expert
SOI	-	Statement of Operating Intent
SOIU	-	Statement of Operating Intent and Usage
SPC	-	Sortie Profile Code
TAA	-	Type Airworthiness Authority
TI	-	Technical Information
WRAM	-	Work Recording and Asset Management

A list of commonly used abbreviations, along with common terminology definitions, is contained in MAA 02 (Ref. A) which can be found at www.maa.mod.uk

Chapter 1 - Introduction

This document provides additional guidance to the stakeholders on the conduct of the Aircraft Usage Validation Process (AUVP) in support of Structural Integrity (SI) management regulation (MRP RA 5720).

1 SI Management

1.1 MOD SI Management

The activities required to manage SI of MOD aircraft throughout its service life are detailed in MRP RA 5720.

1.2 Applicability

A key part of SI management, IAW the ESVRE principles, is the validation of SI assurance measures. To support this validation activity the MOD undertakes to regularly validate the aircraft usage for each aircraft type and significant mark.

1.2.1 During the fatigue safe life substantiation and/or determination of damage tolerance inspection regimes of any platform, the DO must make assumptions on how the aircraft will be used in service. The generic term for these assumptions is the Design Usage Spectrum (DUS). As fatigue lives and crack propagation rates can be significantly altered by relatively small changes in usage, such as number or severity of manoeuvres, or increased mass, it is important that the DO is advised of the actual, recorded in-service usage to enable the validation of the DUS assumptions and to underwrite the continued airworthiness of the aircraft.

1.2.2 The purpose of the AUVP is to compare the actual usage against the DUS to ensure continued structural airworthiness.

1.2.3 For aircraft in-service this includes periodic reviews of the aircraft usage, together with identification of likely future changes. For aircraft not yet in-service, validation activities are likely to be limited until a sufficient amount of data is collected to support the DUS, but can include read-across from current platforms where possible.

1.2.4 The basic principle of the AUVP is that there is a regular, periodic review of aircraft usage throughout the life of the aircraft. **The output of this review process is the Statement of Operating Intent and Usage (SOIU)**. The SOIU is a key part of this process as it is the vehicle whereby the MOD formally provides information on intended usage and actual aircraft usage to the DO. The DO should then be contracted to compare the usage to the DUS and subsequently provide to the MOD with a statement of acceptance or advice on the continuing SI of the aircraft.

1.3 Statement of Operating Intent (SOI)

1.3.1 The SOI is published as the Topic 15S within the ADS.

1.3.2 The SOI provides essential information for producing the FTR or equivalent fatigue evidence document. Alternatively, for off-the-shelf or multinational projects where the DUS is not based on the SOI, the DO may use the SOI to identify any gross deviation between design assumptions and expected future Service usage and its effect on airworthiness clearances and component lives or expected inspection thresholds and periodicities.

1.3.3 The SOI/SOIU must be owned by the platform operator (appropriate DH). It is a descriptive, rather than prescriptive, document that is updated periodically throughout the life of the platform. The Technical Information sponsor for the SOI, and the subsequent SOIU, is the aircraft PT.

1.3.4 For fixed-wing aircraft and some helicopters, the SOI contains a breakdown of the typical Sortie Profile Codes (SPCs) for the aircraft type in each of its roles and at each typical operating location. SPCs are typically expressed in terms of height, time, speed, mass and configuration data that is derived from predicted sortie information, aircrew knowledge and the Concept of Operations (CONOPs) for the aircraft type.

1.3.5 For helicopters, usage may also be expressed in terms of low and high-cycle loading usage spectra for each typical role and environment. For aircraft that are subject to surface (land/sea) transportation methods, additional surface movement profile codes may be required. The initial issue of the SOI must be produced as early as possible in the project life cycle. The SOI must be reviewed annually by the Requirements Manager and any change must be reviewed by the DO. Once in-service usage data becomes available the SOI is converted into an SOIU

- SOI to be drafted using as much detail as is available.
- Obtain data from the MOD requirements and existing legacy aircraft.
- There should be information relevant to the SOI within the MOD's requirement and/or the industry bid for the aircraft platform. This information should be extracted and included within the SOI.
- Read-across from other aircraft types. In the absence of data relating to SPC’s and usage because the platform isn’t mature enough to provide that information, either in scope or depth, within the requirements, it is possible to get a good idea of intended use by considering the usage of similar, or replaced platforms.

1.4 Statement of Operating Intent and Usage (SOIU)

1.4.1 SI can be highly sensitive to changes in aircraft usage. Continued airworthiness assurance therefore requires regular reviews of aircraft usage throughout the life of UK MOD aircraft fleets. The output of this review process is the SOIU. Each aircraft type and significant mark has its own SOIU.

1.4.2 The SOIU describes and quantifies actual usage over a period of time and describes intended future aircraft use. The SOIU formally conveys this data to the DO so that it can be analysed in comparison with original or extant usage

assumptions and the implications fed into revised fatigue and damage-tolerance inspection thresholds.

1.4.3 The SOIU is also the sole authoritative source of descriptions of the SPCs that will be recorded by pilots in their post-sortie feedback declaration. The IAT system employed in the fleet, including pilots' post-sortie feedback, is the source of data for the SOIU. Where this is insufficiently detailed, IAT data is supplemented by data gathered during a Manual Data Recording Exercise (MDRE) or data collected from on-board monitoring systems such as HUMS, FDR, ADR, OLM or ODR.

1.4.4 Since usage inevitably changes over the life of an aircraft type, it is necessary to ensure that the SOIU continues to represent actual usage by means of a programme of review and update.

1.4.5 An SOIU template is available and is being maintained by the MAA-Cert-S and ADS branch.

1.5 Fatigue Life

1.5.1 The computed Fatigue Index (FI) of service aircraft are valid only if the aircraft are flown strictly in accordance with the usage described in the SOIU. Changes in operational use can inadvertently have a profound effect on fleet life and SI. There is no intention that the SOIU limits the operational use of an aircraft. However, if at any time the operational usage is thought to differ from the SOIU, the person or organization perceiving the change in usage must report their concern to: the RTSA, PT and MAA-Cert-S and ADS. When such a report is made, the RTSA, in conjunction with the PT and DO, must consider the effect on the Safety Case and the associated releases, and amend them as necessary. Fatigue life can be estimated using a range of metrics such as FI, GAG cycles, flying hours, pressurisation cycles, etc.

1.6 SOIU Review Cycle

1.6.1 The SOIU must be reviewed annually to check its continued validity and triennially to carry out a quantitative update, including fleet fatigue and usage data derived from IAT (incl. MDRE, HUMS, FDR, ADR etc.). As owner of the SOIU the appropriate DH can delegate technical information sponsorship and management of the document to the PT. As Technical Information (TI) Sponsor of the SOIU, the PT must plan and allocate resources for these reviews and initiate them through the SI Working Group (SIWG) or equivalent. The PT must appoint a PO to coordinate the results of these reviews and issue amendments as required.

1.6.2 The appropriate DH conducts the annual review of sortie profiles and/or (for helicopters) high and low cycle spectra which could include sortie changes and operational changes, plus the descriptive content of the SOIU, normally in conjunction with the operating Stns/Ships/Units. This may include interviews with aircrew, reviewing the usage and mission profiles for the platform. For the triennial review, the PT may appoint another competent organization, in addition to the PO, to perform the usage data analysis and to coordinate inputs from other

stakeholders. MAA-Cert-S and ADS, may provide regulation, advice, technical clarification and assurance to the PT for SOIUs.

1.6.3 The SOIU annual review is a ‘table-top’ staff review of the fleet usage carried out by the relevant operational staff (in association with the appropriate DH). The objective of this review is to ensure the continuing relevance of the information presented and detect any significant changes since the SOIU was last updated. The review should consider the continued accuracy of usage profiles and any known update on roles, operational use or deployment.

1.6.4 The SOIU quantitative review is carried out at regular 3-yearly intervals. This review is the responsibility of the appropriate DH who can delegate the technical information sponsorship and management to the PT, with the PT appointing a PO to co-ordinate the results of the review The review is carried out with support from other stakeholders including the platform operators and the DO.

1.6.5 The objective of the quantitative review is to provide an accurate presentation of the data for the actual aircraft usage since the previous quantitative review and should aim to confirm that the SPCs are current, including the percentage of time spent in each of them. The source of data and the level of details within the data will vary between aircraft types. Data sources may include, but should not be limited to: OLM/ODR, LITS, WRAM, MDS, HUMS, aircraft specific data systems, MOD Forms 724 and 725, and aircrew interviews

1.6.6 It is advisable that planning is initiated in advance of the quantitative review to ensure that the data can be compiled and analysed and the SOIU draft then reviewed by stakeholders to ensure that all current information has been checked and agreed in advance of the review.

1.7 SOIU Update

1.7.1 The triennial review will normally result in publication of a new version of the SOIU. In addition to the annual and triennial reviews, any significant changes in operation must be brought to the attention of the SIWG by the appropriate DH as and when they arise. The appropriate DH must confirm to the PT the accuracy and validity of the content and the RTSA must confirm that the statistics and descriptions of operations confirm that the usage is within the RTS limits, this doesn’t mean that if the statistics prove the platform is operated within the RTS limits that the usage isn’t more severe then the usage assumed in the DUS. Severe usage could exceed the DUS, this could be as a result of operational changes that require more time spent at high mass, including but not restricted to, the clearance to fit external fuel tanks or weapons systems and all discrepancies must be investigated. In all cases, the appropriate DH must approve amendments and reissues of the SOIU. If amendments or reissues of the SOIU arise from significant changes to usage and/or intent, the PT must task the DO to assess the fatigue and damage tolerance and structural integrity implications introduced by changes such as increased undercarriage functional that require more frequent jacking operations than originally assumed. Previous issues of the SOIU must be retained by the DO iaw MRP RA 5720 (4) to maintain the full historical record of

usage and to understand the implications and significance of recent changes. Other SI stakeholders may also keep previous issues of the SOIU as required.

1.8 References

A. MAA 02 Master Glossary, accessible online at www.maa.mod.uk

B. MAA Regulatory Publication, RA 5720, Structural Integrity Management

C. SOIU Template

Chapter 2 - Stakeholders & Responsibilities

2 AUVP Stakeholders & Responsibilities

2.1 AUVP Stakeholders

2.1.1 The AUVP stakeholders include, but are not limited to:

- Duty Holder (DH);
- Release to Service Authority (RTSA);
- Project Team (PT);
- Design Organisation (DO);
- Operational Units;
- Continuing Airworthiness Management Organisation (CAMO);
- Independent Structural Airworthiness Advisor (ISAA);
- Data Management Agency (DMA); and
- Publication Organization (PO).

2.2 Stakeholder Roles and Responsibilities:

2.2.1 Within the AUVP the stakeholders have specific roles and responsibilities (as per Ref. B). The details given below are generic in character and may vary in detail between aircraft types.

2.2.2 Duty Holder. As the owner of the SOIU and Subject Matter Expert (SME) for aircraft operations, the DH is responsible to:

- Review its descriptive content during annual and triennial reviews, and propose amendments when necessary;
- Alert the SI Working Group (SIWG) to significant operating changes that **should** be reflected in the SOIU at other times;
- Confirm to the PT that the content of the SOIU, as regards operations, is valid and accurate, following revision or amendment;

2.2.3 Through the Continuing Airworthiness Management Organisation (CAMO), provide assurance that the type-specific SOIU fulfils its essential SI functions;

- Ensure that aircrew are familiar with the SOIU so that any deviations can be brought to the attention of the PT; and
- Authorize amendments or new issues of the SOIU for release and publication.

2.2.4 The RTSA **should** review the SOIU and its amendments, including usage data to confirm that fleet aircraft are being operated within the limitations of the RTS. He is to investigate any suspected conflicts.

2.2.5 Project Team (PT). As technical information sponsor and manager of the SOIU, the PT is responsible for the following:

- Initiate annual and triennial reviews through the SIWG or equivalent;
- Appoint a Publication Organization (PO);
- Ensure that processes are in place to provide validated Individual Aircraft Tracking (IAT) data for triennial reviews, this can take the form of Pilot Sortie Feedback which can be supplemented with data gathered through an MDRE, the information used must be gathered from official sources which will provide assurance that the data is complete and correct;
- Task a competent organization to carry out the SOIU review, including an audit trail to the source of all changes; the definition and responsibilities of a competent organisation can be found in MRP RA 1005.
- Task the DO to compare the usage to the DUS and subsequently provide to the MOD a statement of acceptance or advice on the continuing SI of the aircraft;
- Ensure the applicability and accuracy of SPCs and/or Mission Codes, any changes may result in the reissue of the DUS.

2.2.6 Designer/Design Organisation (DO). The DO is responsible for:

- At the outset, advising the PT what data is required for the review and the format in which it is to be presented;
- Analysing the implications of SOIU changes upon component/airframe lives, fatigue test spectra, individual aircraft tracking, maintenance schedules and airworthiness;
- Specifying what data could usefully be included within the SOIU and may be tasked with compiling the usage data for triennial reviews; and
- Comparing actual usage as presented within the SOIU with the usage assumed in the DUS.

2.2.7 Operational Units. The aircraft's operators (flying aircrew, Squadron, Standards and Headquarters staff) are stakeholders within the AUVP. Throughout the period of aircraft operation, the operators are responsible for:

- Accurate data recording (post sortie feedback etc);
- Correct recording of SPCs and mixes of SPCs; and
- Ensuring that all profiles flown are included in the SOIU and accurately described.
- Standards staff may also make other aircrew aware of the SOIU and its intended use. The SOIU is the single source of all Sortie Profile Code breakdown percentages.

2.2.8 Data Source/Data Management Agency (DMA). The Data Management Agency (DMA) is the person or body who, for a specific aircraft type or SOIU review, is responsible for the collection and analysis of usage data. The DMA could be any of the following, the designer/DO, a contractor or the Independent Advisor. During the Annual Review a DMA would not normally be required. During the Quantitative (3 year) Review a DMA should be appointed by the PT who is responsible for:

- Collating the data necessary to undertake the analysis of current usage
- Performing a validation exercise to provide confidence that the data is free from errors/inaccuracies
- Process the data to produce relevant statistics in a suitable format for presentation in the SOIU. These statistics may include tables based on the aircraft Sortie Profile Codes. Maintain an audit trail of the data source.

2.2.9 An ISAA should be involved in the stakeholder meeting to assist in the scoping of the content of the SOIU. During both the Annual and Quantitative Review, the Independent Advisor is responsible for providing independent comment and a review of any changes to the SOIU.

2.2.10 The PO should coordinate the SOIU review by acquiring all relevant up to date information to print and distribute the SOI/SOIU, whilst maintaining an audit trail of content source.

Chapter 3 - Aircraft Usage Validation Process

The following is a detailed breakdown of the AUVP activities. This chapter provides detailed guidance to the stakeholder on specific elements of the usage validation process. A representation of this process is shown in Figure 1, on page 16, below.

3 Scope of Activities

3.1 SOIU Annual Review

3.1.1 Initiate the annual review

- The annual review is normally initiated at the SIWG and should include the identification of the stakeholders. This may include holding subsequent meeting(s) to define the roles and responsibilities of the stakeholders that will plan and/or complete the review.

3.1.2 Stakeholder Roles and Responsibilities

- Stakeholders (normally the PT and DH) to consider any known or anticipated changes to the operations of the aircraft. Factors to be considered include, but are not limited to:
- Operational Deployments;
- New roles or equipment (weapon) fits;
- Significant changes in percentages of profiles/SPCs being flown or to be flown; and
- Significant changes to maintenance practices or procedures.
- The information obtained should be considered to determine if a revision (amendment) to the SOIU content is required.

3.2 Triennial Review

3.2.1 Initiate the triennial review

- The initiation of a triennial (quantitative) review needs to be well ahead of when the SOIU revision would need to be issued.
- The requirement for a quantitative review will normally be the approaching of the 3-year anniversary of the issue of the current version of the SOIU.
- A view must be taken as to how long the SOIU review process is likely to take, and therefore how far in advance the quantitative review need to be initiated. It is not unreasonable to initiate the quantitative review at the completion of the annual review one year ahead of the 3 year anniversary of SOIU issue.
- The initiation would normally be discussed and be formally agreed at the SIWG or relevant PT SI meeting.
- The requirement for a quantitative review will normally be the approach of the 3-year anniversary of the issue of the current version of the SOIU. A

view must be taken as to how long the SOIU review process is likely to take and therefore how far in advance the quantitative review needs to be initiated. It would not be unreasonable to initiate the quantitative review at the completion of the annual review a year ahead of the 3 year anniversary of SOIU issue.

- The initiation would normally be discussed and be formally agreed at the relevant PT SI meeting, which should normally be held every 6-months.
- Consideration may be given by the PT to allow some quantitative reviews to be extended beyond the 3-year point. The likely considerations for extending the review could be the maturity of aircraft platform, the stability of use and usage profile and any associated risks.

3.3 Stakeholder Roles and Responsibilities

- The PT, appropriate DH, DO and ISAA should normally be actively involved with the triennial review of the SOIU.
- The stakeholders should identify who is going to act as the Reviewing Officer on behalf of the appropriate DH. This could be the appropiate DH or RTSA staff, Group or Headquarters staff, Standards staff, Major (only) Squadron aircrew.
- Data Management Agency. The selection of the 'Data Management Agency' who will actually undertake most of the data manipulation will depend upon a number of factors such as, but not limited to:
- Availability of data, in what form (electronic or hard copy);
- Source of data (MDS, LITS, WRAM, Designer, other IT system);
- Extent and complication of analysis task;
- Capacity of Stakeholders to undertake the data analysis task;
- Stability of use and usage profile; and
- Assessment of risk.
- To be clear as to their responsibilities during the quantitative review, each stakeholder should be briefed on their responsibilities and the details of the triennial review for the specific aircraft type and Mark.The responsibilities are outlined in Chapter 2 of this document. If necessary, hold a Stakeholders meeting to ensure all stakeholders are clear as to their respective commitments.

3.4 Data acquisition, validation and analysis

3.4.1 Data acquisition. The data to be used for the Quantitative Review could come from a number of sources. The handling of the data will often depend upon its source.

- LITS. There are a number of major aircraft platforms for which the usage data is collected via the LITS system.

- MDS. Many of the older aircraft types have much of their usage data recorded on the MDS. This data is a transcription of the data from the aircraft's F725 forms.
- DO/Designer Data. Several of the newer aircraft have all usage data collected by the Designer's Organisation. In this case data should not be a problem, provided the Designer has been correctly tasked with extracting the SOIU data.
- Operator Interview. AOA and/or aircrew review and interviews should be carried out.
- Other Data. There are several other potential data sources, including the Royal Navy's WRAM system. In each case the PT will need to ensure that the correct data can be extracted for use by the data management agency.
- Data Validation. No matter where the data is sourced, it is important that the data has an assurance level commensurate with the importance to which it will be put. Therefore it is essential that some form of data validation be carried out.
- Data Analysis. The plan for the data analysis should consider whether any stage reviews of the analysis are required.
- When the analysis has been completed, but is in the 'raw' state, it is advisable to have the main stakeholders (e.g. PT, DO, DH, ISAA, etc) review the outcome to determine it there are any unexpected results.
- It is often useful to provide a presentation of data, which shows the current SOIU usage, plus the minimum, average and maximum value from the analysis. This can be used to highlight any anomalous data, or unexpected results (incl. usage trends), which can be investigated further if required.

3.5 SOIU Changes

3.5.1 The stakeholders (e.g. DH, appointed aircrew operator, PT) should be given the opportunity to review the draft SOIU.

3.5.2 The proposed changes should be clearly identified i.e. it should be easy to compare the content and data of the current SOIU with the content and data of the new (draft) SOIU.

3.5.3 The stakeholders should have the opportunity to comment on the proposed changes to ensure they reflect reality.

3.5.4 There should be a clear documentation audit trail of all comments and amendments that are applicable to the revised SOIU.

3.5.5 If the stakeholders review/comments results in significant changes, the PO should re-issue the draft SOIU for a second review.

3.6 Issue and distribution of the SOIU

- Obtain signed appropriate DH endorsement.

- Airworthiness LoAA holder to sign-off SOIU iaw the PT procedures.
- The signed documents should be returned to PO.
- The appropriate DH and PT should confirm the distribution list. This list will vary for each type and Mark of aircraft but would typically include all squadrons operating the type, the user Command(s), the PT (Engineering and Safety Staff), the Designer/DO Structures team, the ISAA and the MAA Cert Div relevant SI desk officer.
- PO to distribute the revised SOIU to the stakeholders.
- On issue of SOIU the AUVP review cycle timeline will be reset.

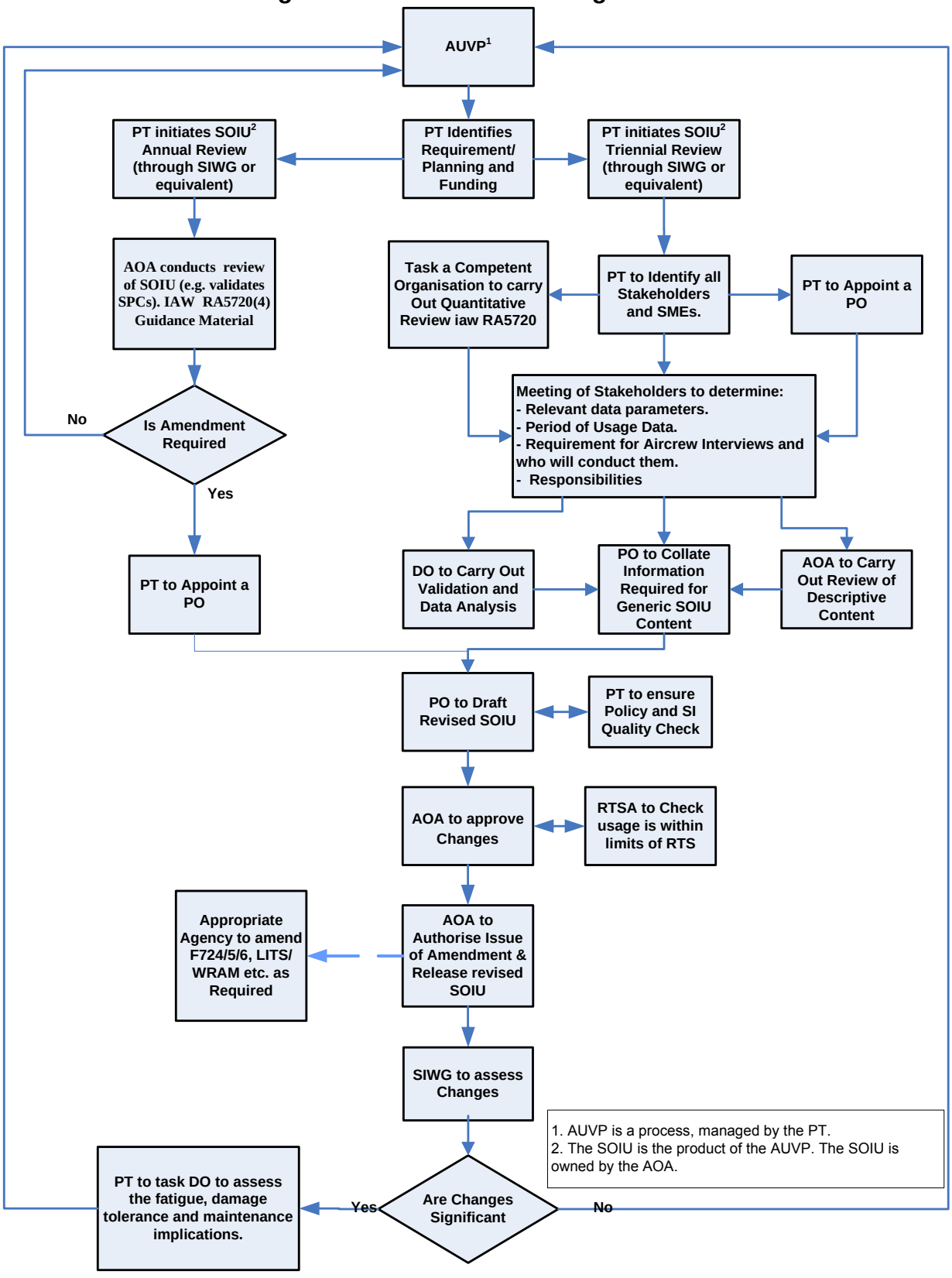
3.7 DO Review

3.7.1 The PT should task the DO to review the new issue of SOIU. This review should include, but not be limited to:

- Comparing the usage presented in SOIU with the DUS and associated assumptions; and
- Reviewing all information within the SOIU to identify any aspect that may affect continued SI or Airworthiness.

3.7.2 Upon completion of its review the DO should issue a formal statement on the continued SI, including airworthiness, of the aircraft type to the PT. Any issues identified by the DO must be considered at the appropriate aircraft's SI forum.

Figure 1 - AUVP Process Diagram



3.8 Quantitative Review Stakeholder Meeting

3.8.1 Purpose of Meeting. The aim of the meeting should be to ensure that all stakeholders are clear as to what is expected of them in support of the Quantitative Review. In addition, this meeting provides an opportunity to plan the review and get agreement on tasks, timescales, and review meetings.

3.8.2 If the aims defined above can be adequately covered without the need for a physical meeting then a Stakeholder Meeting is not required. However, consideration should be given to the fact that many of the stakeholders may not have undertaken a Quantitative Review before, and hence a group briefing may be the most effective way of achieving the above aims.

3.8.3 Agenda Items. Possible Agenda Items could include:

- Introduction
- Overview of ESVRE & AUVP
- Why a Quantitative Review is required
- Who are the Stakeholders
- Any known issues
    - Changes in usage to be analysed
    - Input or specific need from Designer
- Plannin
- What are the overall timescales
- What are the constraints?
- Detailed plan for who will do what, by when

3.8.4 Data Management

- What is the requirement for data
- Where is the data stored
- Is there more than one data source
- What timescale is data available for
- Aim would be 3 years since last Quantitative Review
- Validation of data - Who is going to analyse the data
- Is there going to be review/validation of output of the analysis, if so:
- By whom
- When was the MDS/LITS data validation rules last reviewed (It is recommended that validation rules should be reviewed during the Quantitative Review).

3.8.5 SOIU Review & Issue. Brief review of the adequacy of current SOIU to identify possible areas for improvement in both content and presentation

3.8.6 Identify who is to review Draft SOIU

- MAA-Cert-S and ADS (Platform Desk Officer
- For AOA / Aircrew
- PT
- Ensure there is a plan for PT authorisation
- AOB
- Discuss requirement for further progress meetings.

3.8.7 LITS Data. Data Collection. There is a lot of useful data on LITS, but there can be problems in extracting that data from the system in a usable form that can be used by the DMA for the analysis of flying to create the SOIU data tables.

3.8.8 The contact for obtaining LITS data is to be specified by the PT for the specific platform.

3.8.9 For LITS aircraft, considerations during planning should include:

- Scope of data. There will be a need to be very clear as to what data elements are needed in order to derive the SOIU tables.
- Need to be clear as to what dates the data is to be extracted for.
- The format of the LITS output can be an issue. LITS should be able to provide a comma-separated-variable (.csv) file, which can be imported into Excel or Access.
- The data file itself can be very large. This can cause issues with simply moving it about (email or CD). Moreover, Excel has row and column limits that could be breached for big data files. Consider asking for separate files for each Mark or aircraft for each year.

3.8.10 MDS Data

- The usage data on MDS has been gathered from the aircraft's F724/ F725 forms. This is a largely manual process, which can result in data taking a long time to be available electronically, as delays can occur in sending completed forms to MDS (particularly from operational theatres) and the high workload of the MDS in transcribing the data.
- There is a lot of useful data on MDS, but it can be difficult to extract the information due to the timescales required to produce the data as well as the time required to validate and assure the data’s origin.
- The contact for obtaining MDS data is to be specified by the PT for the specific platform.
- For MDS aircraft, considerations during planning should include:
- Scope of data. There will be a need to be very clear as to what data elements are needed in order to derive the SOIU tables.

- Need to be clear as to what dates to be covered, and an assurance that all sorties within the required timeframe have been entered into the MDS.
- MDS should be able to provide Excel files.
- The data file itself can be very large. This can cause issues with simply moving it about (email or CD). Moreover, Excel has row and column limits that could be breached for big data files. Consider asking for separate files for each Mark or aircraft for each year.

3.9 Data Validation, Data Quality

3.9.1 The primary checks that need to be undertaken are those aimed at ensuring that the data as presented is correct. Consideration should be given to undertaking some or all of the following:

- Check all data for sorties is in the required range
- Are there any unexpected missing or corrupt data rows or cells
- Are the minimum and maximum values of all data elements within expected ranges. If any data is outside the values or range further investigation should be carried out to try and ascertain the reason, ie is it corrupt or did the aircraft fly outside the range.
- What validation was carried out on data input (electronic or manual)
- Additional validation checks can be carried out specific to the aircraft type and mark. This could include checks such as:
- Are sorties over a certain duration also listed as Air-to-Air Refuelling (AAR) sorties
- Is takeoff mass consistent with sortie type/duration
- Check to ensure the correct all Sortie Profiles have been recorded, investigate any missing data.

3.9.2 Other issues

- In collecting the data for analysis, it is important to make sure that all the data necessary for the SOIU is output from the data source. At the time of requesting data it is worth constructing a matrix of data required (SOIU table entry) versus data available (data element from source database or F725).
- In addition to 'basic' sortie derived data, there may well be the requirement for other data in order to calculate data in SOIU. This could include
- Mass data for basic aircraft
- Mass data for stores/weapons
- Definition of sortie time (from engine start, taxi, or takeoff)

3.9.3 AOA/Aircrew Review of SOIU. The purpose of the AOA/aircrew review of the SOIU is to ensure that it accurately reflects the operational use of the aircraft type and Mark and future intent.

3.9.10 Review Requirements. The review should consider the following:

- The operational profiles are an accurate reflection of current operations.
- The SPCs graphs (if any) are reasonable averages for the sortie type.
- The heights and speeds detailed are valid.
- The mass data (where given) is a reasonable average for current flying.
- The detailed operational techniques (such as take-off, climb, cruise, in-flight manoeuvres, etc) are a fair and accurate reflection of current operational use.
- Do all other operational aspects within the SOIU seem reasonable
- Aircrew to consider all future, or potential, changes in operational use of aircraft. To include:
- New or amended operating methods or techniques.
- Changes to operating locations.
- Knowledge of any likely future changes to aircraft operations.
- Review and update as necessary to determine the continued accuracy and relevance of the descriptive content and operating data of the SOIU including:
- Operating locations and conditions.
- Speeds, ‘g’ levels, altitudes and other parameters quoted in manoeuvre descriptions.
- Frequency of occurrence or percentage breakdown of events.
- Stores carriage reflects only those in current/planned usage.
- Update the table of planned SPC usage by sqn type.
- Identify any future plans to change roles, sortie profiles, deployments, or major equipment modifications and stores configurations. Include all known developments that will affect usage over the next 5 years. Any stated developments that have become current activities should be moved into the preceding chapters.

3.9.11 The data on usage (percentages and averages) has been derived from actual data. It is not the purpose of the review to change these figures. If it is considered that figures are misrepresenting real operation, this should be discussed amongst the stakeholders.

3.9.12 Appointed PO:

- Check format and layout are in accordance with the latest SOIU template.
- Reformat as required.

- Seek additional information, if required.
- Conduct in-depth review of the main Chapters.
- Consult with PT for detail. To include:
- New or changed maintenance or engineering schedules or practices.
- New locations or agencies for undertaking maintenance.
- Knowledge of any likely future changes in maintenance activities.
- Consult with AOA and Operators (Aircrew & Ground crew).
- Update and redraft SOIU main document.
- Draft Usage Annexes:
- Add or amend Usage/SPC information to reflect current or authorised usage profiles
- Using data from analysis phase, present new figures within annexes to reflect real usage.

Intentionally blank for print pagination