

# **STRUCTURAL INTEGRITY**

## **CHECK - LIST & WORK - FLOWS**

*I.A.W. ICAO Doc 9769  
Airworthiness Manual*



# DISCLAIMER:

Sofema Aviation Services (SAS) is focused on providing our customers with the best possible training experience. It is our goal to ensure this training material remains fully compliant.

To focus on the essential elements of the relevant regulatory rule or requirement SAS provides redacted regulatory material intended for training purposes.

Please note It is quite possible that :-

- a) Existing regulations consider additional or further requirements to those in the training material.
- b) References may be at small variance between the training material and the related regulatory training material.

**At all times please use the Current Applicable Regulation as a measure against your Company Process & Procedures**



# ABOUT THIS GUIDANCE DOCUMENT

*This guidance document accompanies a detailed white-paper that assists both the operator and the state of registry of the concerned aircraft with ensuring structural integrity for those aircraft that are approaching, have reached or exceeded LOV or DSG.*

## Check-lists & Workflows discussed:

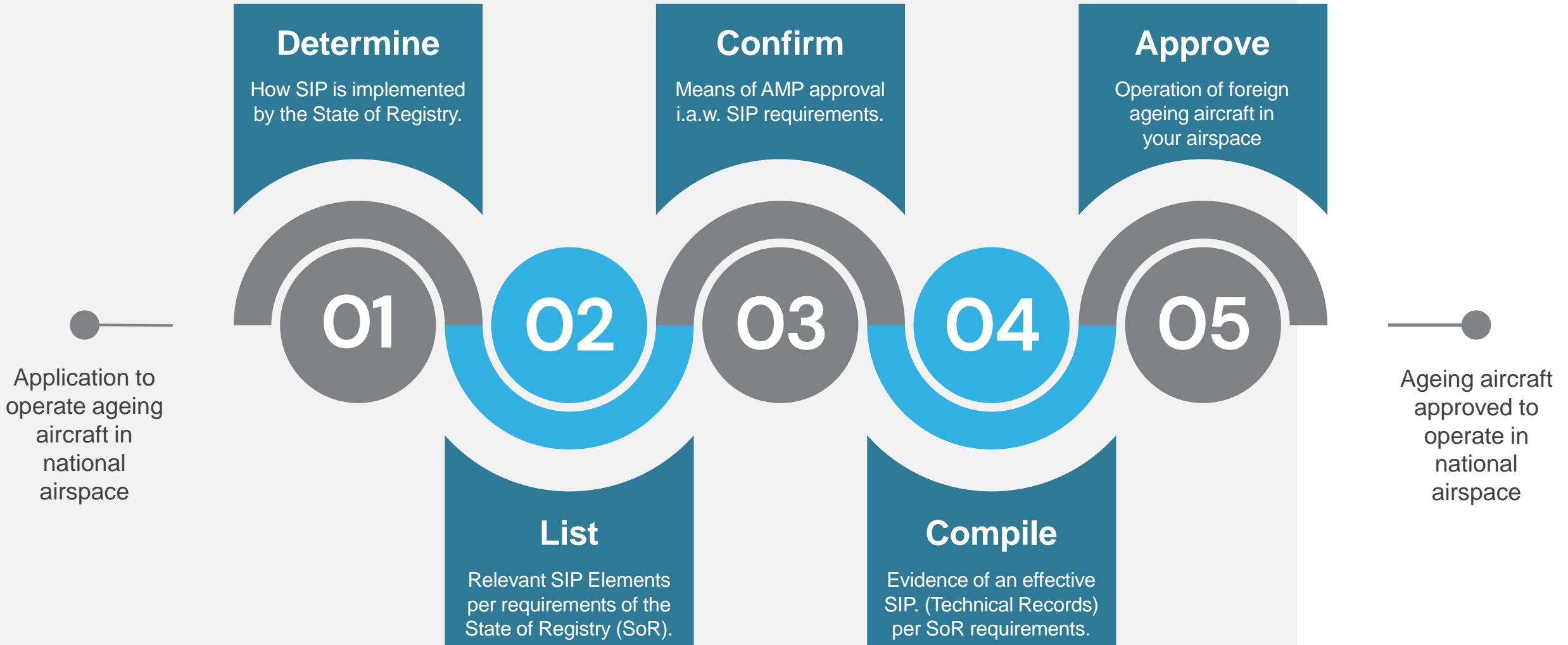
1. Implementation of the SIP;
2. Structural Integrity Programme Elements;
3. AMP Approval Incorporating the SIP;
4. Provision of Evidence.

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# PROCESS WORKFLOW APPLICATION TO APPROVAL

*A logical Process*

# APPLICATION TO APPROVAL



# THE USE OF DESK-TOP EXERCISES WITHOUT VERIFICATION THRU' AUDIT.

## Author's Opinion

The use of check-lists as a means of verifying that aircraft remain compliant with ICAO Annex 6 or Annex 8 without extensive review of technical records data, is in the considered opinion of the operator a very dangerous thing to do, especially where competent authorities seek to justify the (re-)entry of operators of ageing aircraft or those that have flown beyond their respective LOV or DSG into their own national airspace.

**The problem with desk-top exercises and check-lists, is that they are limited to confirming that supposed evidence exists.**

Limited responses on the part of the operator &/or the regulator generally cannot provide the regulatory inspector with sufficient information or evidence upon which a recommendation and ultimately a decision, can be made.

Failure to review technical records for individual aircraft not least the audit of processes and procedures for compliance, may lead to safety incidents, catastrophic failures and accidents in your airspace, that could have otherwise been avoided.

**Therefore, any desk-top exercise, check-list or workflow should only serve as a reminder to compile and assess evidence** (through an audit oversight function), as part of any engineering & compliance judgement, regardless of the objective of the regulatory authority, the aircraft or operator concerned.

**Should external National Aviation Authorities only provide written assurances [without supporting evidence] stating that their operators and aircraft are safe in this regard, then this must be considered insufficient in terms of evidence, and representations to the NAA of the state of registry should be made.**

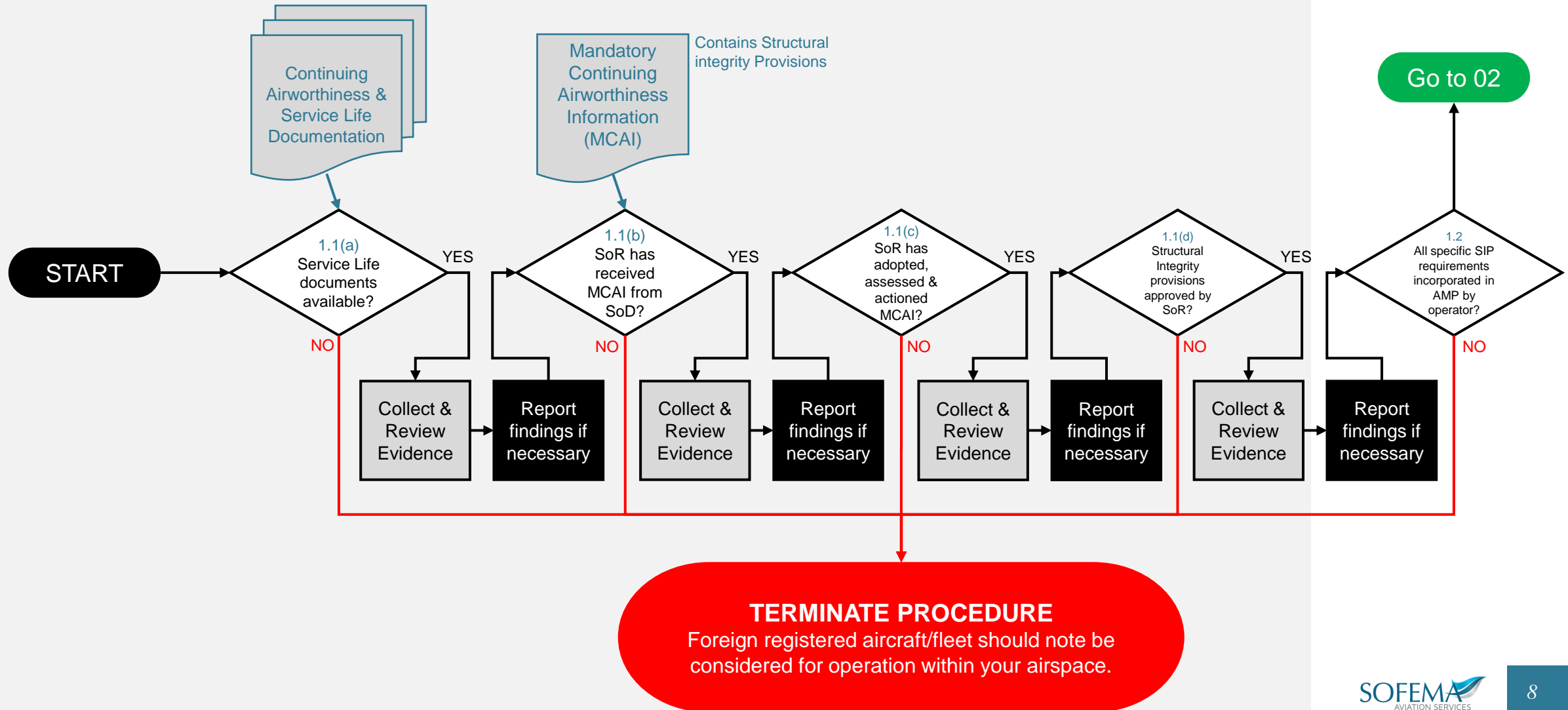
This representation should clearly state that entry of these aircraft or operators may be restricted or prevented altogether should sufficient evidence not be present for review.



# IMPLEMENTATION OF THE SIP

*The role of the State of  
Registry of the aircraft.*

# DETERMINE HOW SIP IS IMPLEMENTED BY THE STATE OF REGISTRY





# IMPLEMENTATION OF THE SIP BY THE AUTHORITY

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Responsibilities of the State of Registration when implementing SIPs.	Tick (as appropriate)
1.1(a)	Has the State of Registry developed and adopted requirements that ensure the continuing airworthiness of the concerned aircraft type during its' service-life whilst registered and operated within the state of registry?	Yes <input type="checkbox"/> No <input type="checkbox"/>
1.1(b)	Has mandatory information from the MCAI been received from the state of design for the aircraft type concerned?	Yes <input type="checkbox"/> No <input type="checkbox"/>
1.1(c)	Assuming Yes to 2.1(b) above, has the mandatory information been: - Directly adopted, or - Assessed, with - appropriate action taken	<input type="checkbox"/> Adopted <input type="checkbox"/> Assessed <input type="checkbox"/> Actioned
1.1(d)	Has the regulator of the state of registry of the concerned aircraft approved the structural integrity provisions contained in the maintenance programme?	Yes <input type="checkbox"/> No <input type="checkbox"/>

# IMPLEMENTATION OF THE SIP BY THE AUTHORITY

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Incorporation of the Key SIP Elements	Tick (as appropriate)
1.2	<p>Has the State of Registry for the concerned aircraft ensured that the operator has incorporated all specific SIP items intended as mandatory. As follows:</p> <ul style="list-style-type: none"><li>- Damage Tolerance-based supplemental inspections;</li><li>- Corrosion Prevention and Control, Structural Modifications and associated inspections</li><li>- Repair assessment</li><li>- Widespread Fatigue Damage assessment</li></ul>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>

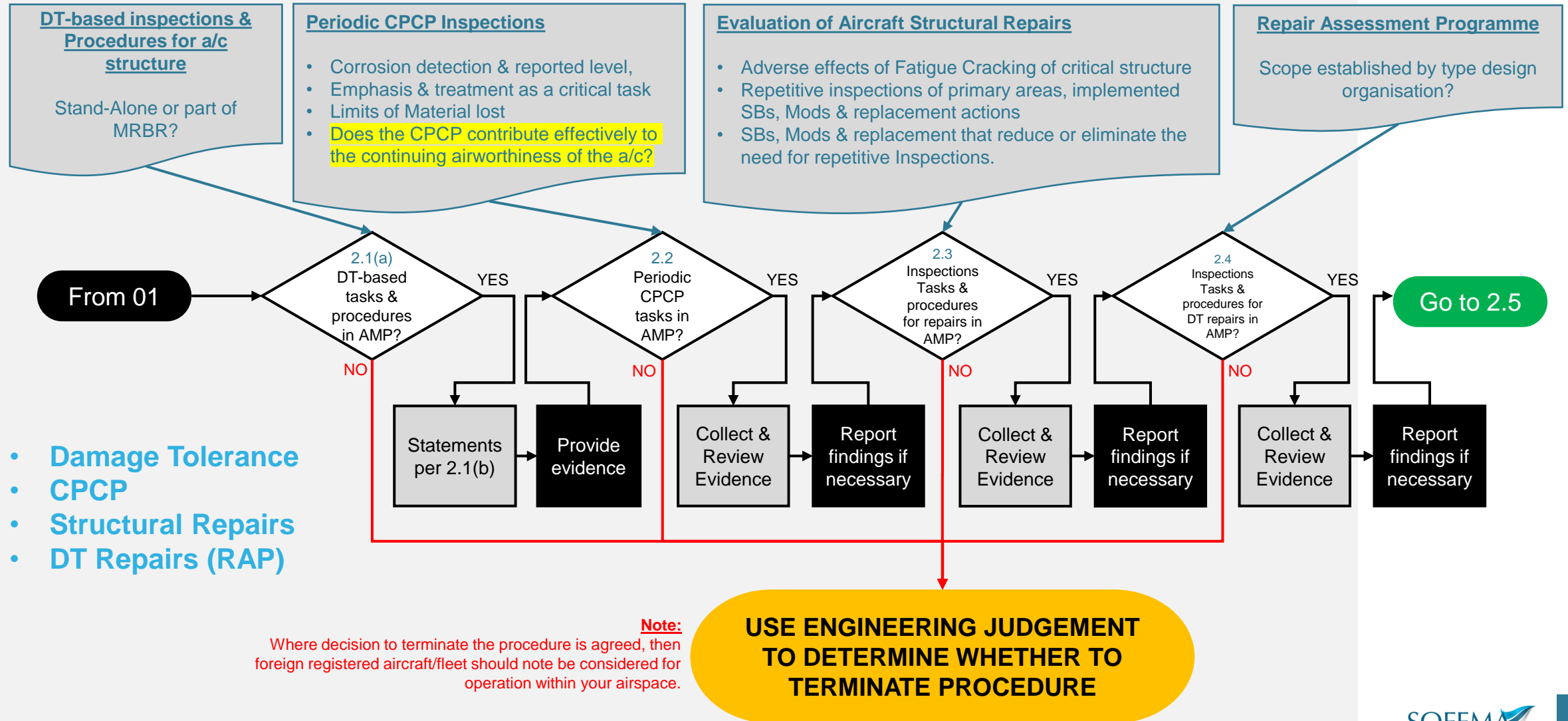
02

# STRUCTURAL INTEGRITY PROGRAMME - **ELEMENTS**

*Principle Elements*

# LIST RELEVANT SIP ELEMENTS IN THE AMP

## PER THE REQUIREMENTS OF THE STATE OF REGISTRY



- Damage Tolerance
- CPCP
- Structural Repairs
- DT Repairs (RAP)

# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. <b>DAMAGE TOLERANCE</b>	Tick to confirm element and data are present
2.1(a)	Approved damage-tolerance-based inspections and procedures for the aircraft structure	<input type="checkbox"/>
2.1(b)	The AMP States that the purpose of the is to: <ul style="list-style-type: none"><li>- Supplement the current inspection programme (as necessary)</li><li>- Ensure the continued safe operation of the aircraft type</li></ul>	<input type="checkbox"/> <input type="checkbox"/>

# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. <b>CORROSION PREVENTION &amp; CONTROL PROGRAMME (CPCP)</b>	Tick (as appropriate)
2.2(a)	Does the CPCP include periodic inspections?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.2(b)	Does the periodic task incorporated in the CPCP detect and report the level of corrosion detected, per the requirements of the operators AMP?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.2(c)	Does the CPCP emphasise the treatment of detected corrosion as a critical task?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.2(d)	Does the CPCP clearly determine the limits of material lost as a result of any remedial maintenance action called for by the corresponding Instruction for Continuing Airworthiness?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.2(e)	In the opinion of the inspector, does the CPCP contribute effectively to the maintenance of continuing airworthiness of the target aircraft or fleet?	Yes <input type="checkbox"/> No <input type="checkbox"/>

# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. Evaluation of Aircraft Structural Repairs	Tick (as appropriate)
2.3(a)	Does the AMP incorporate effective procedures that are designed to address the adverse effects of fatigue cracking of Critical Structure?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.3(b)	Do the procedures corresponding with fatigue cracking of critical structure include repetitive inspections of primary areas that must ensure structural integrity?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.3(c)	Does the programme contain repetitive inspection tasks for implemented SBs, modifications and replacement actions in areas of primary structure where there is a known history or a reported hazard of fatigue cracking?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.3(d)	Does the programme include SBs, modifications and/or replacement actions that may reduce or eliminate the need for repetitive inspections.	Yes <input type="checkbox"/> No <input type="checkbox"/>

# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. Evaluation of Aircraft Repairs – Damage Tolerance	Tick (as appropriate)
2.4(a)	Has the operator confirmed whether the scope of the Repair Assessment Programme has been established by the Type Design Organisation?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.4(b)	If Yes to 2.3(a) above, has the operator determined whether damage tolerance has been established during initial type certification.	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.4 (c)	If No to 2.3(a) above, has the operator established damage tolerance?	Yes <input type="checkbox"/> No <input type="checkbox"/>



# LIST RELEVANT SIP ELEMENTS IN THE AMP

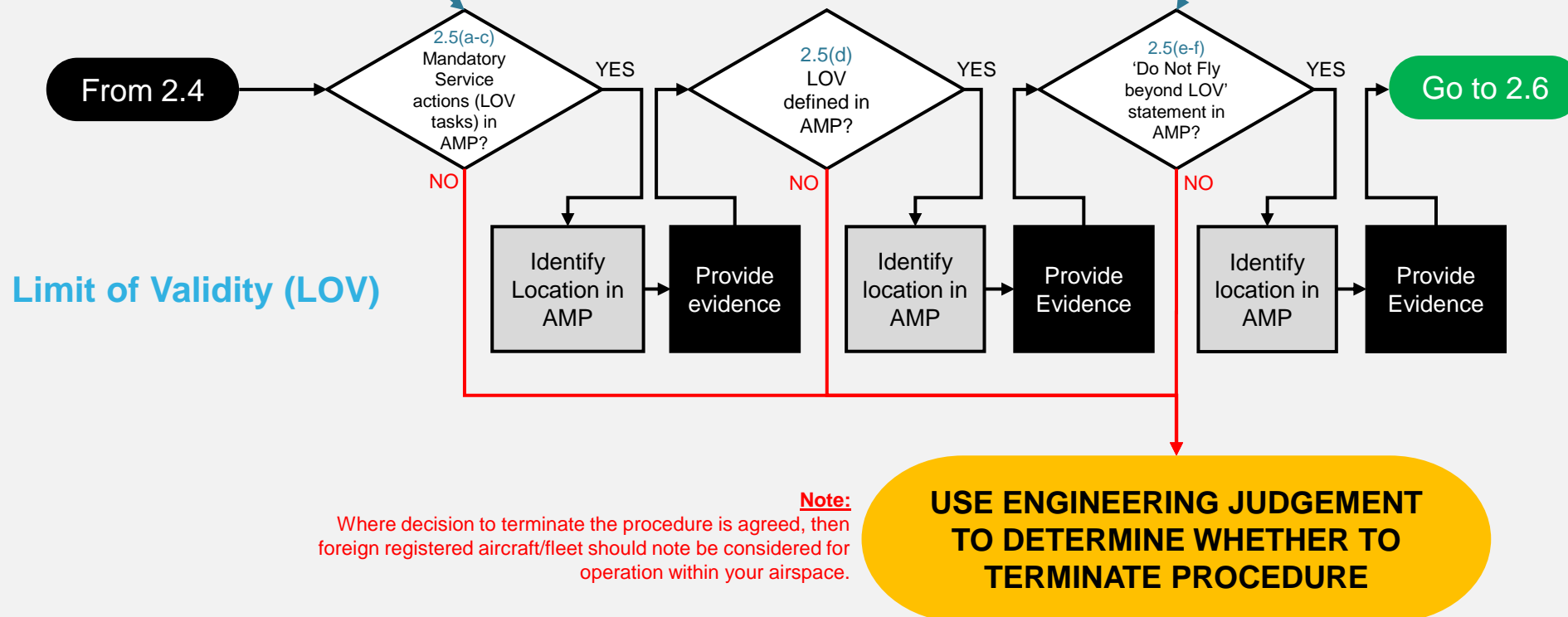
## PER THE REQUIREMENTS OF THE STATE OF REGISTRY

### LOV – Operators' Responsibility

- Manufacturer LOV values adopted by operator?
- System for identifying if LOV for an a/c:
  - Is Approaching? or
  - Exceeded?
- LOV for AMP identified?

### LOV – Operators' Responsibility

Does the AMP state that operators may not fly aeroplanes beyond the LOV specified in the AMP, unless the SIP has been reviewed and validated for an extension of the maintenance programme?



# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. Limit of Validity (LOV) – Operators Responsibility.	Tick (as appropriate)
2.5(a)	Has the operator incorporated 'Mandatory Service Actions' into the AMP? If Yes...provide supporting evidence.	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.5(b)	Has the operator adopted the LOV values provided by the manufacturer of the aircraft type under review? If Yes...provide information as to where this data is located.	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.5(c)	Has the State of Registry of the concerned aircraft or fleet ensured that a system within the operator's maintenance programme exists and functions with a view to: <ul style="list-style-type: none"> <li>- Identification that the LOV for an individual aircraft is approaching?</li> <li>- Stopping the operation of an aircraft, where the LOV has been reached?</li> </ul>	Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>

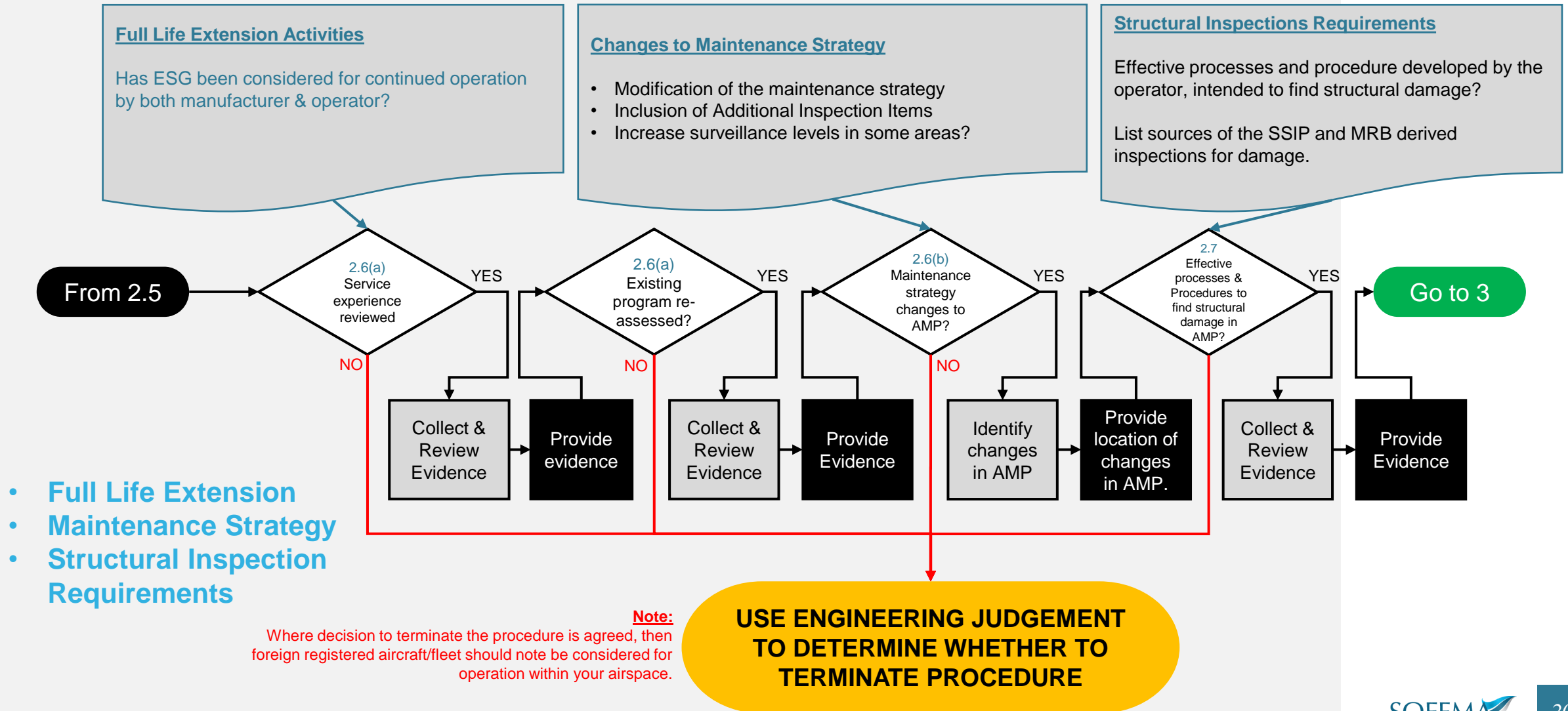
# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. Limit of Validity (LOV) – Operators Responsibility.	Tick (as appropriate)
2.5(d)	Has an LOV of the concerned AMP been identified?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.5(e)	Does the AMP state that operators may not fly aeroplanes beyond the LOV specified in the AMP, unless the SIP has been reviewed and validated for an extension of the maintenance programme?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.5(f)	In view of 2.5(d) above, has a new LOV been defined?	Yes <input type="checkbox"/> No <input type="checkbox"/>

# LIST RELEVANT SIP ELEMENTS IN THE AMP

## PER THE REQUIREMENTS OF THE STATE OF REGISTRY



# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

Ref:	Elements or information contained within the AMP. Full Life Extension Activities – Extended Service Goal	Tick (as appropriate)
2.6 (a)	<p>ESG has been consider for continued operation of the aircraft, has the manufacturer and the operator of the aircraft under consideration</p> <ul style="list-style-type: none"> <li>- reviewed service experience?</li> <li>- Re-assessed the existing inspection programme?</li> </ul> <p>If Yes to both questions...provide supporting evidence.</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>
2.6(b)	<p>If yes to 2.6(a) above, has the review and assessment resulted in:</p> <ul style="list-style-type: none"> <li>- Modification of the maintenance strategy</li> <li>- Inclusion of Additional Inspection Items</li> <li>- Increase surveillance levels in some areas?</li> </ul>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>

# SIP ELEMENTS

*Per the operator's AMP, does the SIP for the aircraft under scrutiny include information on the following principle elements?*

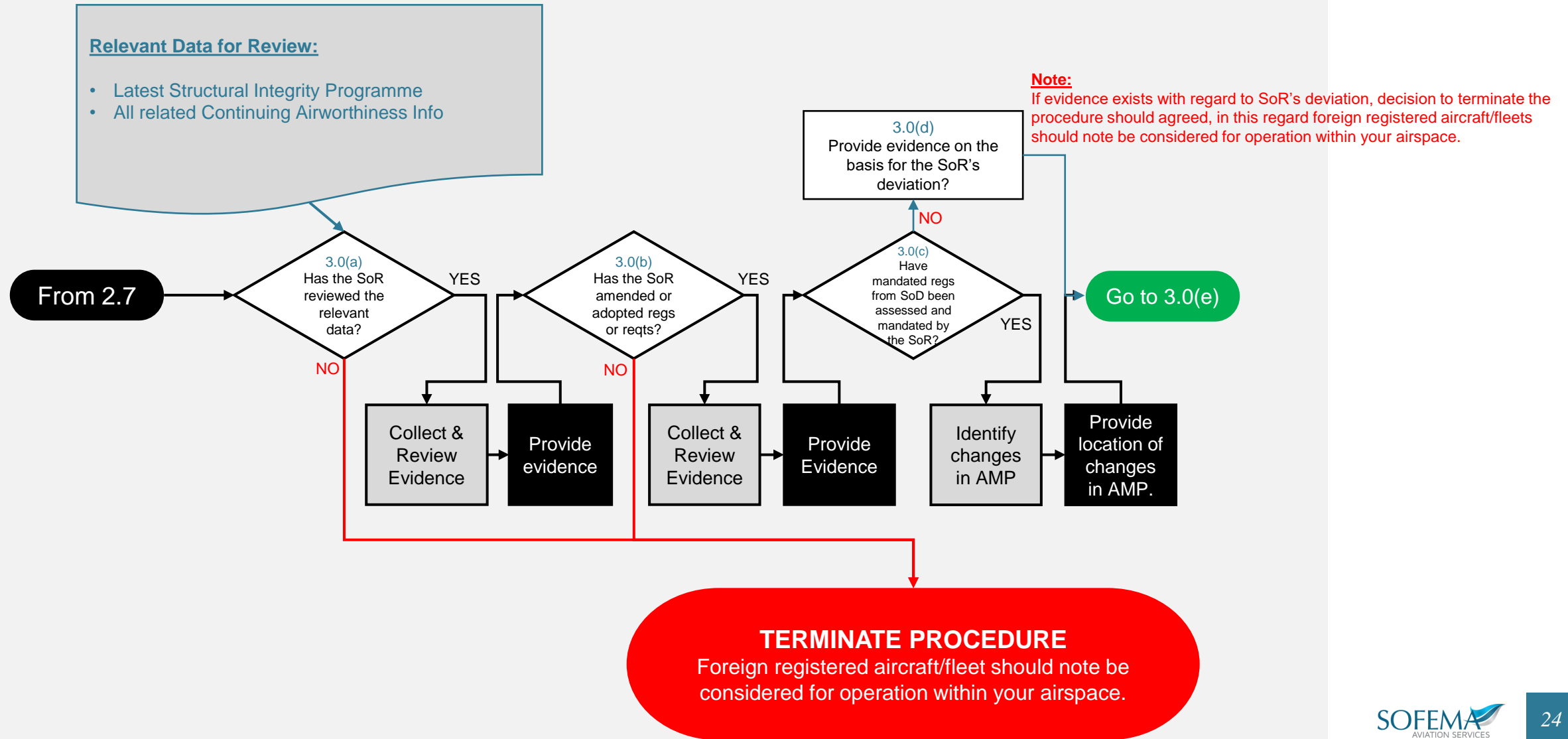
Ref:	Elements or information contained within the AMP. Sources of Structural Inspection Requirements	Tick (as appropriate)
2.7(a)	Have effective processes and procedure been developed by the operator that are intended to find structural damage before the damage becomes critical?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.7(b)	If yes to 2.7(a) above, what are the sources of the SSIP and MRB derived inspections for damage.  Provide documented evidence.	Yes <input type="checkbox"/> No <input type="checkbox"/>

# AMP APPROVAL INCORPORATING THE SIP

*Other responsibilities  
of the State of Registry  
of the aircraft.*

# LIST RELEVANT SIP ELEMENTS IN THE AMP

## PER THE REQUIREMENTS OF THE STATE OF REGISTRY





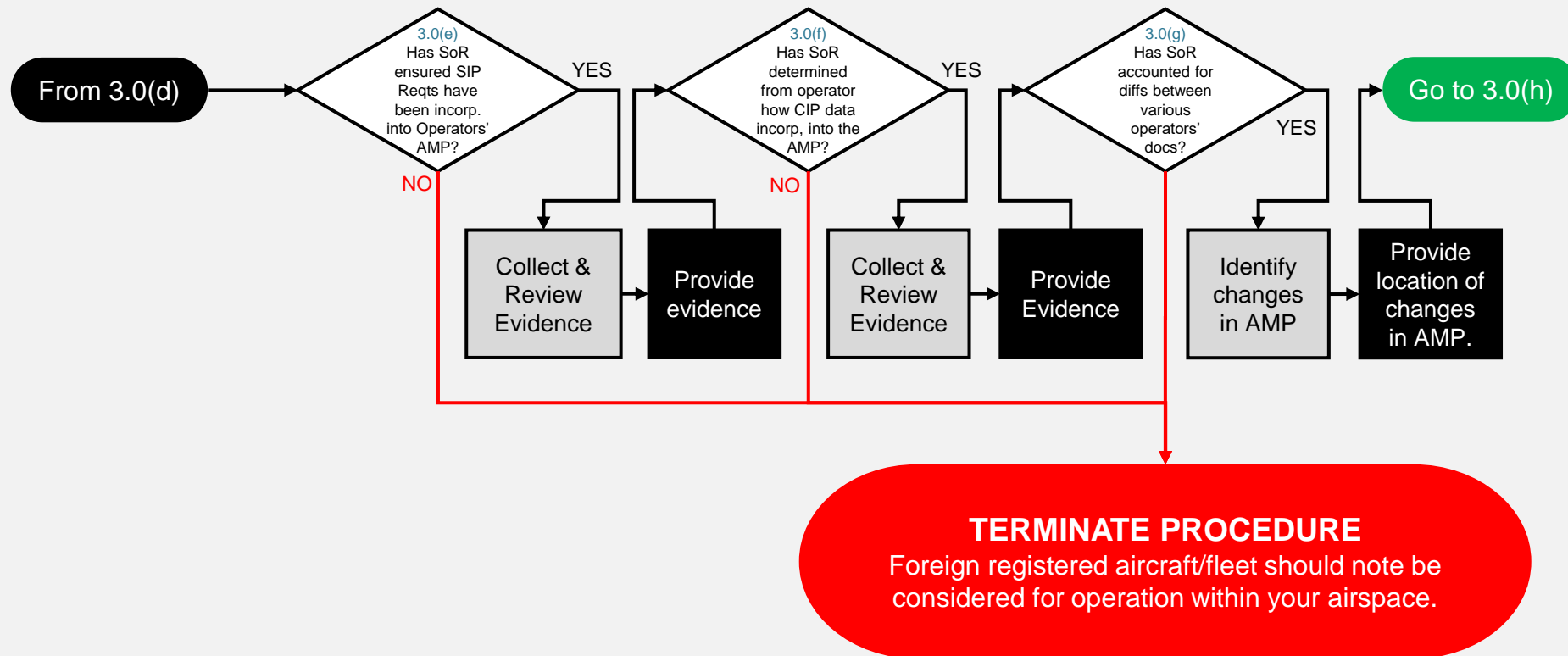
# APPROVAL OF AN AMP INCORPORATING THE SIP

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Responsibilities of the State of Registration of the concerned aircraft.	Tick (as appropriate)
3.0(a)	Has the state of registry of the concerned aircraft or fleet reviewed and assessed: <ul style="list-style-type: none"> <li>- The latest Structural Inspection Programme?</li> <li>- All related Continuing Airworthiness Information?</li> </ul>	Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(b)	Has the regulatory authority of the state of registry adopted or amended any related regulations or requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(c)	Have requirements mandated by the state of design also been assessed and made mandatory for all applicable requirements for all applicable aircraft under the State of Registry?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(d)	If No to 3(c) above, is there a strong basis for deviation in either: <ul style="list-style-type: none"> <li>- Local Operating Conditions, or</li> <li>- Operator Experience</li> </ul> <p>If yes to either of the above in 3(d), provide evidence that clearly justifies the deviation.</p>	Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>

# LIST RELEVANT SIP ELEMENTS IN THE AMP

## PER THE REQUIREMENTS OF THE STATE OF REGISTRY



# APPROVAL OF AN AMP INCORPORATING THE SIP

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

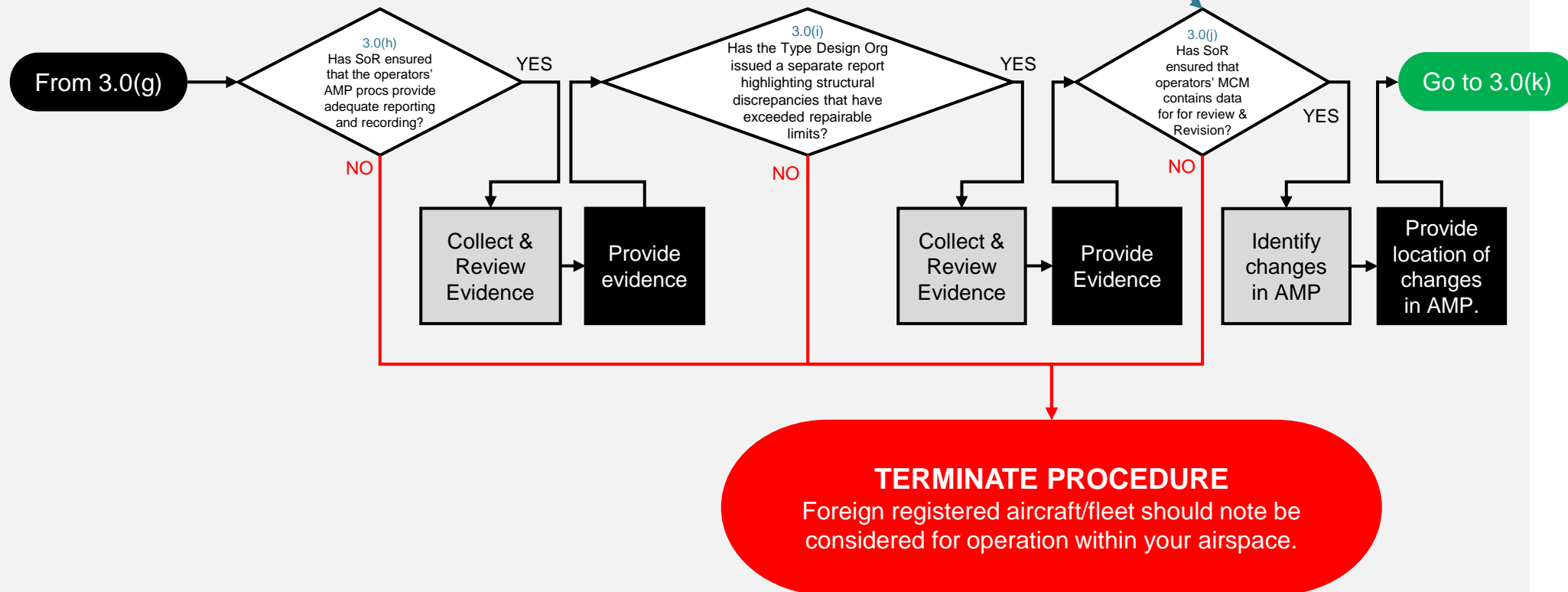
Ref:	Responsibilities of the State of Registration of the concerned aircraft.	Tick (as appropriate)
3.0(e)	Has the regulator of the state of registry ensured that all SIP requirements have been incorporated into the operators AMP prior to approval for the aircraft or fleet concerned?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(f)	Has the regulator determined from the operator, with regard to how the data in the continuing structural integrity programme has been incorporated into the AMP?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(g)	Has the regulator of the state of registry for the concerned aircraft accounted for the differences in the various operator AMPS, operating environment and fleet modification status.	Yes <input type="checkbox"/> No <input type="checkbox"/>

# LIST RELEVANT SIP ELEMENTS IN THE AMP

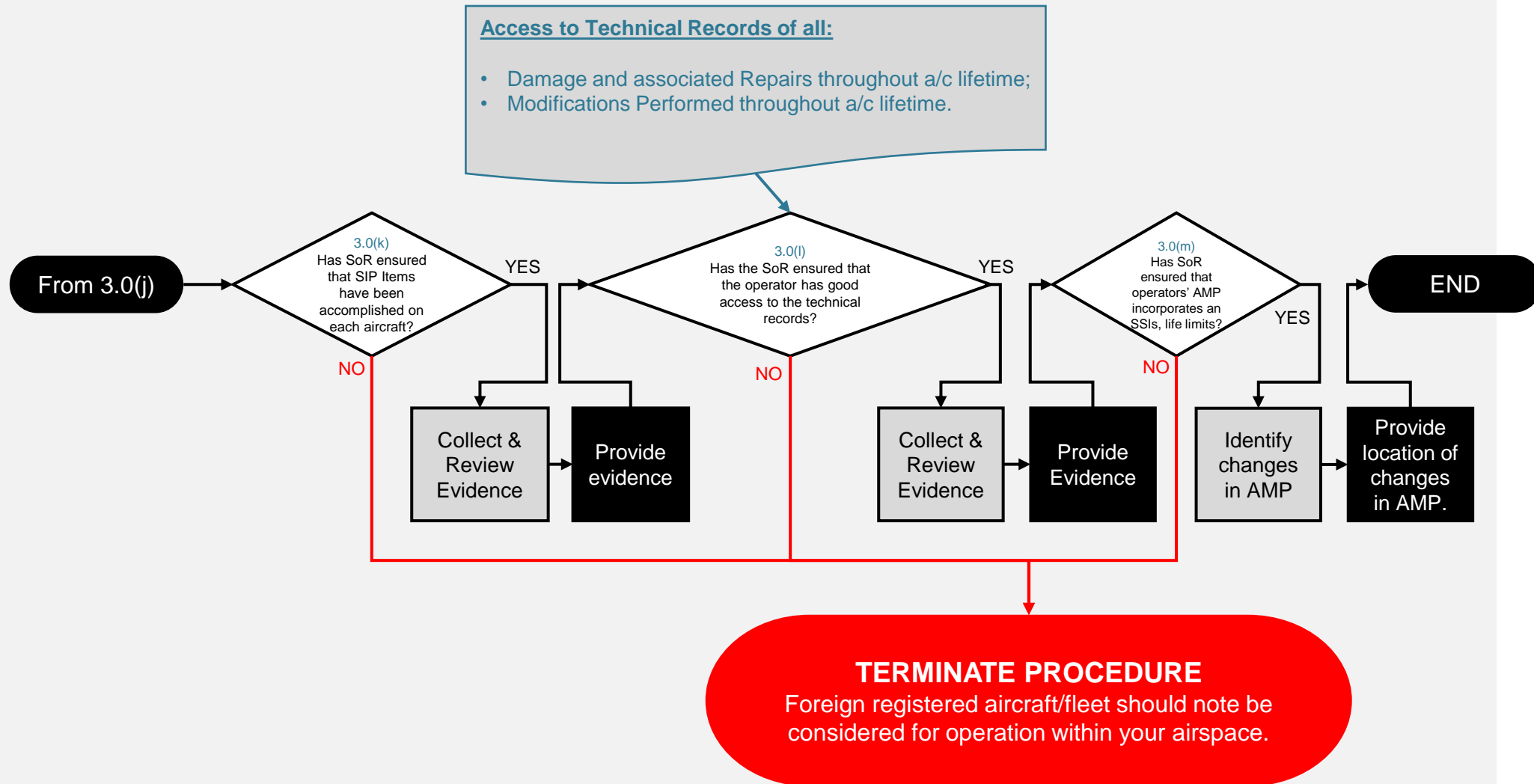
## PER THE REQUIREMENTS OF THE STATE OF REGISTRY

### Relevant Data for Review:

- All recommended or mandatory changes to the SIP.
- Maintenance Programme Revisions



# LIST RELEVANT SIP ELEMENTS IN THE AMP PER THE REQUIREMENTS OF THE STATE OF REGISTRY



# APPROVAL OF AN AMP INCORPORATING THE SIP

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Responsibilities of the State of Registration of the concerned aircraft.	Tick (as appropriate)
3.0(h)	<p>Has the regulator ensured that the operator's AMP procedures provide an adequate system for recording and reporting [in a timely way] of the following to the type design organization and to the State of Registry:</p> <ul style="list-style-type: none"> <li>- Operational Usage</li> <li>- Structural discrepancies experienced in service *</li> </ul> <p><i>* Including [but not limited to] fatigue, wear, corrosion, accidental damage and [where available] results of initial analysis.</i></p> <p><i>Is the following data on structural discrepancies present?</i></p> <ul style="list-style-type: none"> <li>- A description &amp; location of the damage</li> <li>- Identification of the aircraft</li> <li>- Relevant data on Modification status and operating history</li> <li>- Time since beginning operations</li> <li>- Time since the last maintenance check</li> <li>- The means by which the discrepancy was detected and the probable cause</li> </ul>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>

Note:

The operator's existing record-keeping requirements still apply, (e.g., aircraft inspection status together with reports of major repairs and modifications (if applicable)).

# APPROVAL OF AN AMP INCORPORATING THE SIP

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Responsibilities of the State of Registration of the concerned aircraft.	Tick (as appropriate)
3.0(i)	Does a separate report to the State of Registry highlighting structural discrepancies that exceed repairable limits established by the type design organization exist?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(j)	Has the regulator of the state of registry ensured that the operator's MCM contains procedures for the: <ul style="list-style-type: none"> <li>- Review of all recommended or mandatory changes to the SIP</li> <li>- Timely revision of the maintenance programme to include these changes</li> </ul>	Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(k)	Has the regulator of the state of registry ensured that the items in the SIP are accomplished on each aircraft for which it has issued a Certificate of Airworthiness within the time limits specified.	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(l)	Has the regulator of the state of registry ensured that for each aircraft for which it has issued a Certificate of Airworthiness, the operator has good access to the records of all damage, together with associated repairs and modifications performed throughout the lifetime of the aircraft.	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.0(m)	Has the regulatory of the state of registry ensured that the operator has incorporated into the AMP any specific structural inspections or life limits issued when the repair or modification was approved or, when the damage was assessed.	Yes <input type="checkbox"/> No <input type="checkbox"/>

# PROVISION OF EVIDENCE IN THE AMP

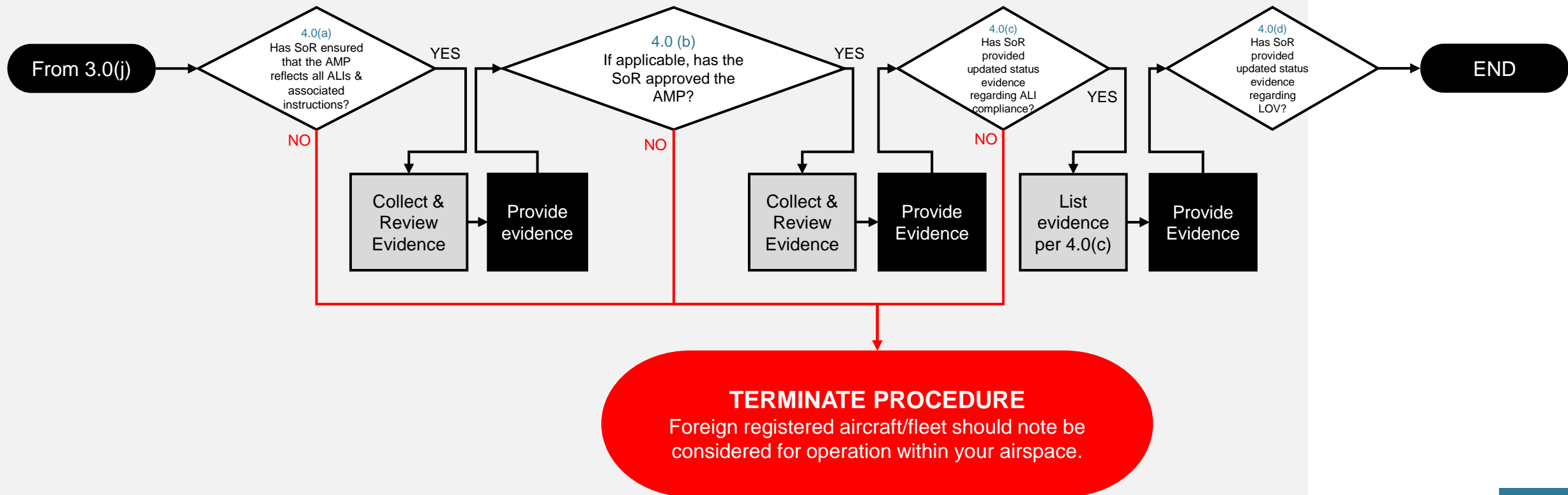
*ALI Compliance Status*

*Limit of Validity*



# PROVISION OF EVIDENCE IN THE AMP

## PER THE REQUIREMENTS OF THE STATE OF REGISTRY



# PROVISION OF EVIDENCE

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Elements or information contained within the AMP. Operator and Regulator responsibilities	Tick (as appropriate)
4.0(a)	Has both the Operator and the regulator of the state of registry of the aircraft concerned ensured that the AMP reflects all airworthiness limitations and associated instructions (standard or alternative) issued by the relevant Design Approval Holder(s)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
4.0(b)	If applicable, has the regulator of the state of registry of the aircraft concerned approved the AMP?	Yes <input type="checkbox"/> No <input type="checkbox"/>

# PROVISION OF EVIDENCE

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Provision of evidence for ALI Compliance Status	Tick (as appropriate)
4.0(c)	<p>The regulatory authority of the State of Registry of the aircraft should provide updated status evidence regarding ALI compliance with respect to:</p> <ul style="list-style-type: none"> <li>- Safe Life ALI (SL ALI)/Life-limited parts,</li> <li>- Damage Tolerant ALI (DT ALI)/Structure, including ageing aircraft structure,</li> <li>- Certification Maintenance Requirements (CMR),</li> <li>- Ageing Systems Maintenance (ASM), including Airworthiness Limitations for EWIS,</li> <li>- Fuel Tank Ignition Prevention (FTIP) / Flammability Reduction Means (FRM),</li> <li>- CDCCL, check wiring if any maintenance carried out in same area - wiring separation,</li> <li>- Ageing fleet inspections mandated through ALS or AD are included in the AMP.</li> <li>- A Corrosion Prevention Control Programme (CPCP)</li> <li>- AMP procedures which address the adverse effects of fatigue cracking on critical structure, include repetitive inspections of these areas to ensure structural integrity.</li> </ul>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>

# PROVISION OF EVIDENCE

*Per the regulatory requirements of the state of registry of the concerned aircraft:*

Ref:	Provision of evidence for Limit of Validity (LOV)	Tick (as appropriate)
4.0(d)	<p>The regulatory authority of the State of Registry of the aircraft should provide evidence regarding LOV with respect to:</p> <ul style="list-style-type: none"><li>- Incorporation of mandatory service actions into the operators' maintenance programs.</li><li>- Adoption of the LOV values provided by the manufacturer</li></ul>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>

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