Tornado MAR Safety Case

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Author: Prepared and managed by the Tornado IPTL in conjunction with the RTSA

Version: v1.0 - Baseline

Description: This Safety Case (SC) seeks to document the safety argument, supporting evidence and conditions appropriate to the extant MARs, based upon the concept of capturing and formalising the implicit safety cases for the F3 and GR4 variants. The implicit safety case reflects that deemed to exist at the agreed baseline date of the 4th TSMP (29 April 2003). All subsequent changes (post 4th TSMP), affecting the MAR, are supported by the compilation and maintenance of explicit safety cases.

Notes:

1) The MAR SC is shown within the context of the higher level RTS SC, which, at the date of issue of this Baseline SC, has been developed only to a conceptual level. Further work is planned, in conjunction with the RTSA, to analyse and document the RTS SC to an appropriate level.

2) This SC should be read in conjunction with the higher level Tornado SC, which shows how the safety of the MAR/RTS contributes to the overall safety of Tornado operations.

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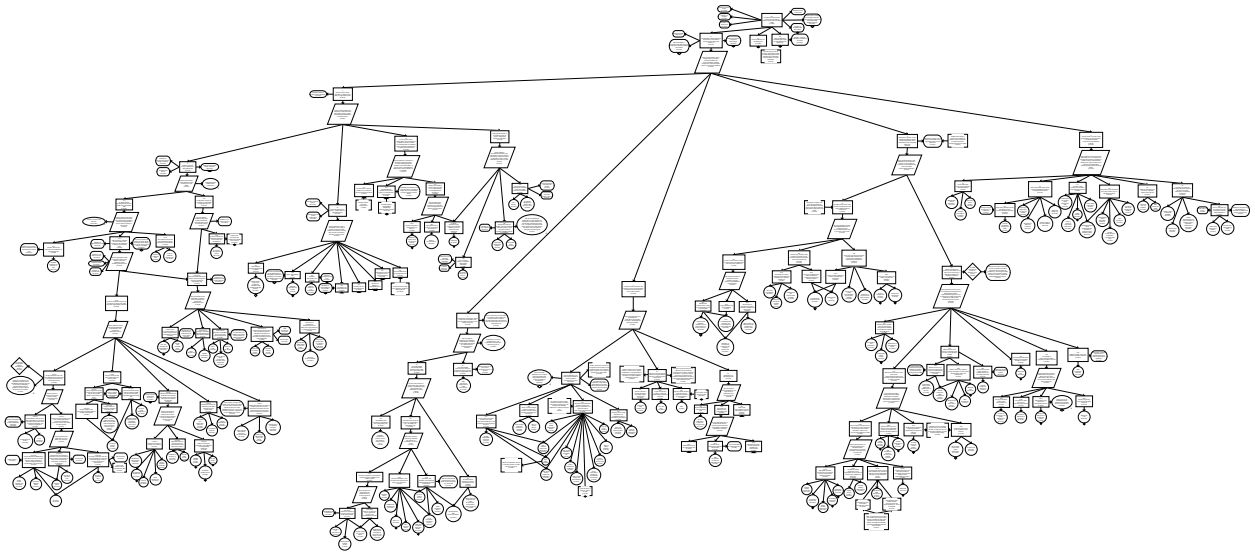
Overview of Safety Case

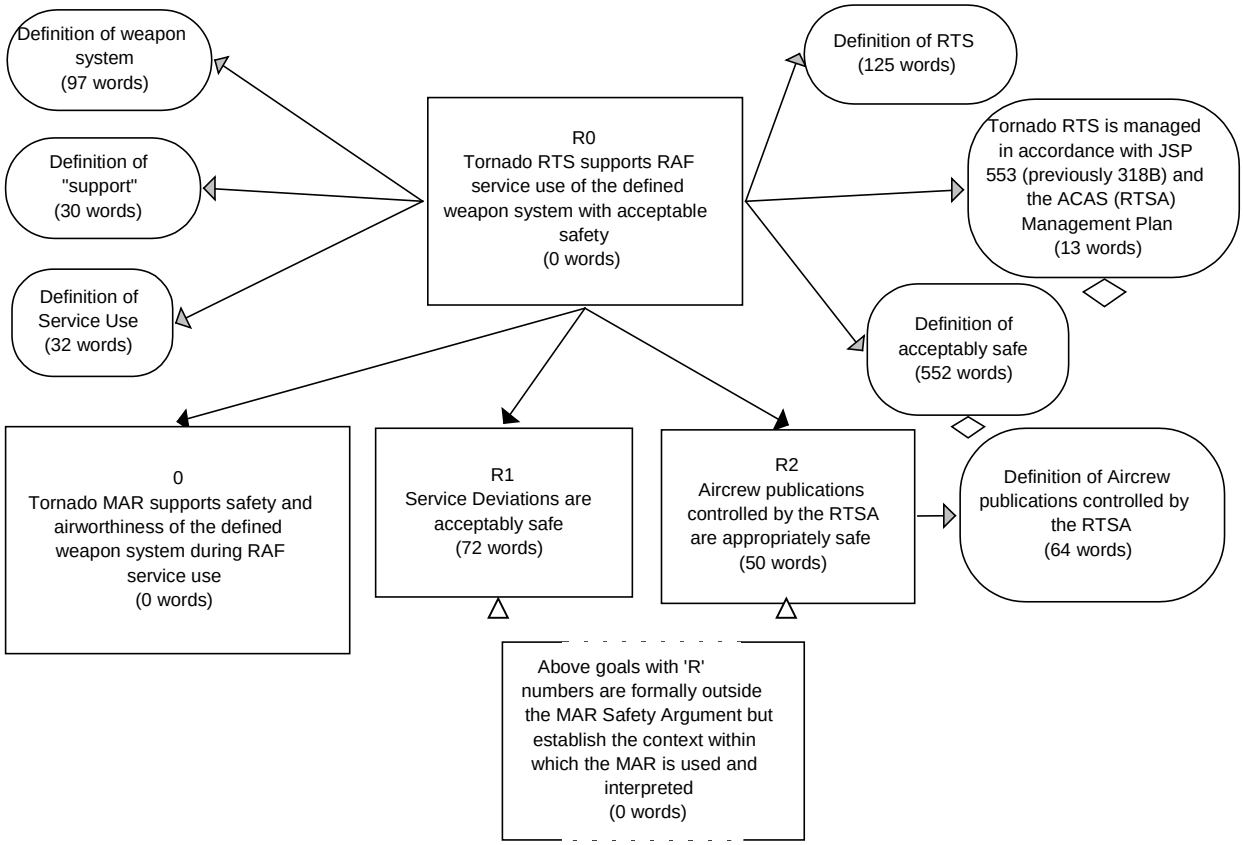
1. The overall argument is structured on the premise that satisfaction of the top-level claim that the "Tornado MAR supports safety and airworthiness of the defined weapon system during RAF service use" can be demonstrated providing that:

- Weapon system design standards are appropriately safe
- Appropriately safe weapon system clearances are recommended for inclusion in the Release to Service
- Comprehensive instructions and advice to users and support staff is maintained and promulgated
- Management systems ensure the integrity of the MAR and its supporting safety case
- In-Service safety performance is monitored, failures investigated and MAR improvements identified and actioned.

The following diagram indicates the overall shape and size of the supporting arguments and evidence. Each area is addressed in more detail in subsequent sections.



Section R: Top Level - RTS supports service use (Goal R0)



Goal R0: Tornado RTS supports RAF service use of the defined weapon system with acceptable safety

Context (Goal R0): *Definition of weapon system*

The weapon system includes:

The Tornado aircraft system (GR4/4A and F3 variants plus versions thereof, e.g Training) and its constituent systems, equipments, software and related user/maintenance/support information

All weapons, stores, role equipment, and AEA which comprise the operational weapon system,

All ground support infrastructure, AGE, GPGSE (including GPTE), and information systems necessary to support use of the weapon system.

At the standards explicitly defined and cleared for service use in the extant Release to Service and its supporting Aircraft Document Set.

NOTES:

(1) For the purposes of this RTS/MAR Safety Case representation, aircrew, ground crew and operational information and systems are excluded. These aspects are addressed as part of the higher level Tornado Safety Case

(2) The clearance for use of rigs, simulators and training aids and the management of their standards and compatibility with the RTS clearance standards and requirements are also addressed as part of the operational safety case as depicted in the companion Tornado Safety Case.

Context (Goal R0): *Definition of "support"*

Support entails the provision of effective and appropriate clearances, limitations and operating advice/instruction sufficient to enable safe use by authorised operators and maintainers having appropriate competencies, experience and training.

Context (Goal R0): *Definition of Service Use*

Service use is characterised by all approved operations (undertaken by competent staff with appropriate training) within the normal and emergency(OEC) conditions of the ADS (comprising the RTS and all supporting publications).

Context (Goal R0): *Definition of RTS*

The MoD Release to Service is the release document that authorises Service flying on behalf of the Service Chief of Staff. The RTS is derived from the MA Release and refers to the Safety Case documentation for the aircraft or equipment, including the limitations and aircraft description, and defines the as-flown standard of the aircraft. It also contains the Service Deviations for the aircraft. The limitations of the RTS are the definitive limits for the aircraft in Service regulated flying. (ref JSP 553)

The Tornado FMk3 and GR4/4A RTS are the means by which the RTSA promulgates the approved Tornado service operating clearance to the user. It embraces:

Definition of all acceptably safe weapon system configurations that are appropriate for RAF use

Clearances and limitations for the acceptably safe use of those configurations

Advice to users (aircrew, ground-crew and other support staffs) on appropriate means to ensure and maintain safety of use

Requirements for all necessary maintenance and support interventions to ensure that the weapon system remains in an acceptably safe condition

It comprises the MAR documentation as provided by the IPTL, plus:

The definition of all approved Service Deviations and their associated operating clearances and limitations.

Associated instructions and procedures for aircrew as contained in the Aircrew Manual and Flight Reference Cards/Flight Crew Checklists.

Context (Goal R0): *Tornado RTS is managed in accordance with JSP 553 (previously 318B) and the ACAS (RTSA) Management Plan*

RTSA(DAO) SMP v1.1 dated July 2003 (See IPT file reference TBD*)*

Node Status: Development required to establish controlled copy of reference plan in IPT file system

Context (Goal R0): *Definition of acceptably safe*

To Be Defined - *When completed this definition should provide the RTSA/TSMP criteria for balancing the safety risks against operational need. It should take due account of the requirements of JSP 318B (JSP 553), BP1201 and any extant guidance or direction from the DASB.*

The definition will need to take account of the risks to 1st, 2nd and 3rd parties and may take the form of loss targets based upon the in-Service (technical and non-technical causes) rate.

Background

Acceptably safe must be considered in the context of RAF service operations and requires compliance with all extant legislation and regulation e.g. JSP 375, JSP 418, JSP 550 (prev 318) and JSP 553 (prev 318B).

The risks to be addressed comprise: airworthiness, operating/operational, maintenance and environment.

The TSMP has established initial criteria for airworthiness, derived from the regulations and requirements set out in JSP 553. Whilst recognising that Tornado was not designed to JSP 553 and that the aircraft does not achieve the JSP 553 airworthiness standard in RAF operations, the TSMP has accepted that for ALARP purposes, the JSP 553 airworthiness standard of a less than 1x10-6 per flying hour probability (from technical causes) of loss of Tornado aircraft or technical failure, which could result in loss of aircrew, constitute an appropriate safety target for the project and should represent the boundary between the broadly acceptable and tolerable regions of the ALARP "carrot". Also, based upon evaluation of in-flight safety statistics from 1980 to 2001, the TSMP has accepted that the demonstrated in-Service safety safety rate for loss due to technical causes constitutes an appropriate airworthiness standard for the "as flown" design, at the boundary of the tolerable and intolerable regions of the ALARP "carrot". This constitutes a probability of loss resulting from technical causes to be less than 2x10-5 per flying hour.

TSMP consideration of other safety targets is still proceeding and decisions have not yet been reached.

Possible options are:

- *An operating/operational safety standard (non-technical loss) target (just tolerable) at a probability of loss of less than 4x10-5 per flying hour (See NOTE 1)*

- *Maintenance risks to be deemed acceptably safe providing that there are robust management systems in place to comply with the requirements set out in JSP 375 and that project safety procedures ensure all emergent risks are appropriately identified, communicated and mitigated.*

- *Environmental risks to be deemed acceptably safe providing that there are robust management systems in place to comply with the requirements set out in JSP 418 and that project safety procedures ensure all emergent risks are appropriately identified, communicated and mitigated.*

The principle of ALARP will apply to all safety considerations in accordance with the policy and direction of JSP 375, JSP 553 and JSP 418. In the event of operational needs and circumstances, the above targets and management benchmarks may be modified as appropriate by the SOB, to reflect the balance of needs and safety.

One example of such relaxation is the provision of OECs and associated operating criteria within the clearances/limitations of the MAR and RTS. These indicate aspects of operating capability where the above peacetime safety standards may not be fully achievable and where evidence suggests that the risk of accident or loss may be up to one order of magnitude greater. This increased level of risk becoming acceptable because of the operational priority and the mitigation achieved by strictly limiting the periods of exposure to that required for operational purposes.

The TSMP has directed that the airworthiness criteria of JSP 318B are to be interpreted as requiring; an in-Service cumulative probability of loss of aircraft due to technical fault, and the cumulative probability of technical failure that could result in the death of aircrew, to be less than 2x10-5 per flying hour. For application of the ALARP principle this figure is deemed to constitute the boundary between the tolerable and intolerable regions. Probabilities less than or equal to 1x10-6 per flying hour are deemed to be broadly acceptable.

Factors still to be decided by the TSMP include:

- *The acceptable levels of risk from non-technical cause*
- *The criteria for 2nd/3rd parties (including societal risk)*
- *Acceptable relaxations in risk criteria under OECs*
- *Environmental risk (This may require compliance with JSP 418)*
- *Business Risk*
- *Maintenance/Support Risk (This might be derived from the HSE target of 1 in 1000 pa or the 1 in 2000 pa that is currently perceived to be the risk to RAF maintenance personnel)*

It should be noted that:

1. *Further work is under consideration to develop additional safety targets, however, this may be held in abeyance until further guidance is promulgated by DASB or DASC.*

2. *From UK Tornado in-Service safety statistics* it can be determined that the ratio of non-technical losses to technical has been in the order of 2:1. If the current levels of flight safety achievement can be considered acceptable for fast jet operations, then it might be inferred that the acceptable levels of risk from non-technical causes are: 4x10-5 (intolerable) and 2x10-6 (broadly acceptable), such that the cumulative, "all causes" risk boundaries are 6x10-5 and 3x10-6. These may provide some interim criteria for safety assessment pending completion of TSMP deliberations.*

* *This is an interim indication based upon the in-Service data as reported in Letter Report 4 of QinetiQ/AT&E/CR00591 dated March 2002, covering RAF operations from start of service flying to the end of 2000. However, a more recent Panavia report (P1217-01-0019-270303-X issue 1) suggests that the "all causes" loss rate in-Service is now slightly greater than 4x10-5 for both the RAF and GAF and that the IAF rate is somewhat lower at 3.65x10-5. The Panavia report does not identify the period over which these rates have been achieved.*

3. *The numerical targets subsume the safe carriage, release and jettison of armament and weapons in the vicinity of the aircraft. Following release, the safety criteria for subsequent flight of the weapon/store will be as defined in the weapon or armament specification.*

4. *For definition of airworthiness, refer to JSP 553*

Node Status: Development required to develop above safety definition and project targets

Goal R1: Service Deviations are acceptably safe

Safety case to be defined by RTSA

The safety criteria for SDs are a matter for the RTSA to decide. It is envisaged that this goal will embrace:

Safety of changes cleared by SD (Cat 1) - this must cover any service engineered or other changes that are to be cleared for use by the RTSA and which are over and above the configurations defined within the MAR.

Safety of additional limitations imposed via SD (Cat 2)

Compatibility of all RTSA approved changes with IPTL baseline design

Effective management of changes in light of evolving baseline

Evidence and argument in support of this goal may include supplementary IPT safety evidence or subordinate safety cases e.g. where service engineered changes are stated as acceptably safe to fit by the IPT, but where clearance to use is granted by SD.

Node Status: Instantiation required to analyse and document the RTSA safety case for SDs

Goal R2: Aircrew publications controlled by the RTSA are appropriately safe

Safety Case to be defined by RTSA icw OC Handling Squadron

Note: This safety case can draw upon the IPT sponsored evaluation documented in QinetiQ/AT&E/CR01625/1.0 dated March 2003 and subsequent action by OC HS in the development and implementation of management processes and systems.

Node Status: Instantiation required to analyse and document the RTSA safety case for aircrew publications

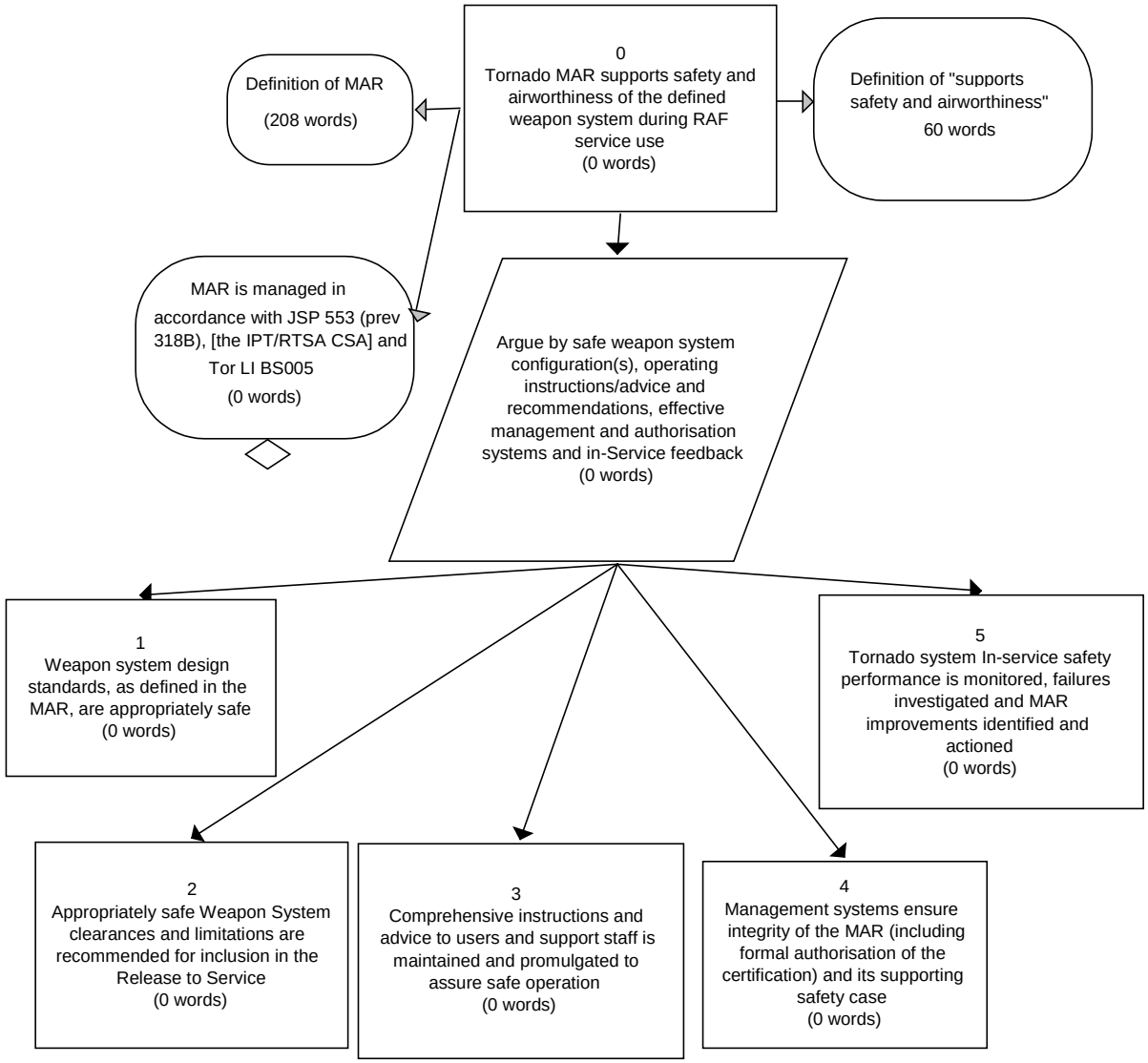
Context (Goal R2): *Definition of Aircrew publications controlled by the RTSA*

In view of the need to ensure that the primary aircrew publications are maintained in strict alignment with the RTS (comprising both the MAR and all extant Service Deviations), it has been decided by the IPT and RTSA that the ultimate responsibility for ensuring compatibility of Aircrew Manuals and Flight Reference Cards/Flight Crew Checklists with the RTS will be exercised by the RTSA. The RTSA thus controls the following publications:

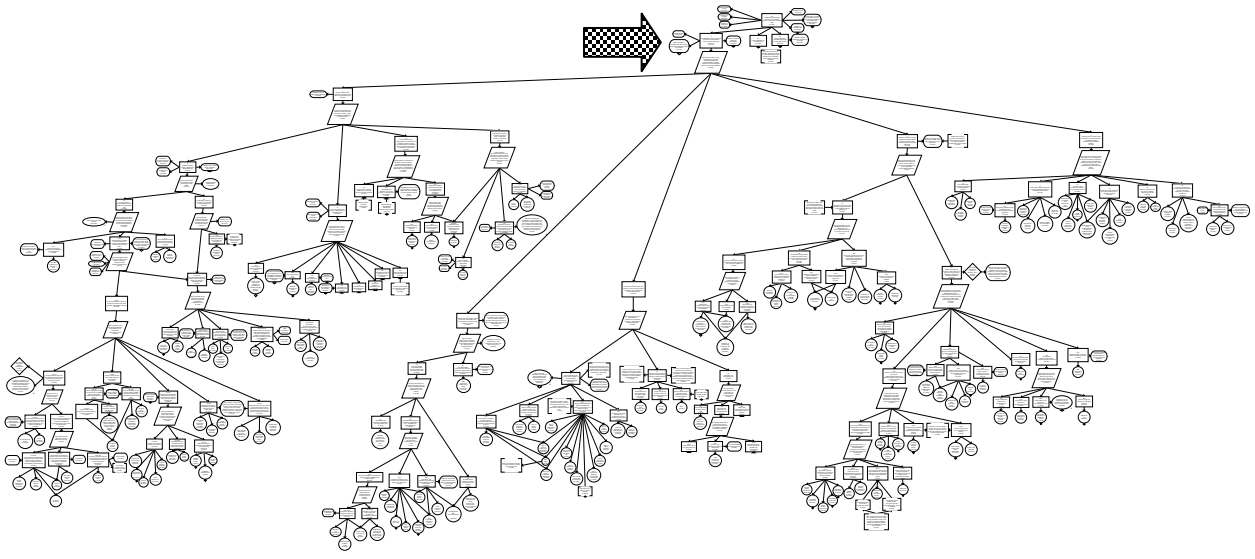
- *Tornado Aircrew Manual, F3, AP101B-4103-15(A, B - including supplement)*
- *Tornado Aircrew Manual, GR4/4A, AP101B-4104-15(A,B,C - including supplement)*
- *Tornado Flight Reference Cards, F3, AP101B-4103-14/14A/14B*
- *Tornado Flight Crew Checklists, GR4, AP101B-4104-14A/14B/14C/14D/14E/14F/14G*

Note (Goals R1 and R2): *Above goals with 'R' numbers are formally outside the MAR Safety Argument but establish the context within which the MAR is used and interpreted*

Section 0: MAR supports safety and airworthiness (Goal 0)



Location within Safety Case



Goal 0: Tornado MAR supports safety and airworthiness of the defined weapon system during RAF service use

Context (Goal 0): *Definition of MAR*

The MAR is the documented statement of the recommended safeguards to be applied in defined circumstances.

The MAR is the means by which the IPTL provides recommendations to the Service Operating Branch (RTSA and the frontline users) embracing:

Definition of all appropriately safe weapon system configurations that are suitable for RAF use

Clearances and limitations to support the use of those configurations with appropriate safety

Advice to users (aircrew and ground-crew) on appropriate means to ensure and maintain safety of use

Requirements for all necessary maintenance and support interventions to ensure that the weapon system remains in an appropriately safe condition

Once endorsed by the Tornado IPTL, or his designated signatory, the MAR is confirmation that the recommended clearances are supported by sufficient evidence to demonstrate that the airworthiness risks are acceptable for the intended In-Service operating and usage profiles (the safety case).

The Tornado MARs comprise:

For Tornado F3

The IPTL clearance certification

Military Aircraft Release Document - this contains the definition of design/build standards recommended for service use and their recommended clearances and limitations and provides the IPTL advice to the RTSA for inclusion in the RTS (Note: The document reference is subject to change as the IPT document system is updated)

AP101B-4103-15S Statement of Operating Intent and Usage

AP101B-4103-16 Operating Data Manual

The associated user instructions and procedures as contained within the engineering air publications (Topics 1, 1Z, 2, 2(R)1, 2(R)2, 3, 5, 6, 7, 9, 10, and 12)

For Tornado GR4/4A

The IPTL clearance certification

Military Aircraft Release Document - this contains the definition of design/build standards recommended for service use and their recommended clearances and limitations and provides the IPTL advice to the RTSA for inclusion in the RTS (Note: The document reference is subject to change as the IPT document system is updated)

AP101B-4104-15S Statement of Operating Intent and Usage

AP101B-4104-16 Operating Data Manual

The associated user instructions and procedures as contained within the engineering air publications (Topics 1, 1Z, 2, 2(R)1, 2(R)2, 3, 5, 6, 7, 9, 10, and 12)

Context (Goal 0): *MAR is managed in accordance with JSP 553 (prev 318B), [the IPT/RTSA CSA] and Tor LI BS005*

Node Status: Development required to complete and reference the CSA (potentially by reference to the TESMP)

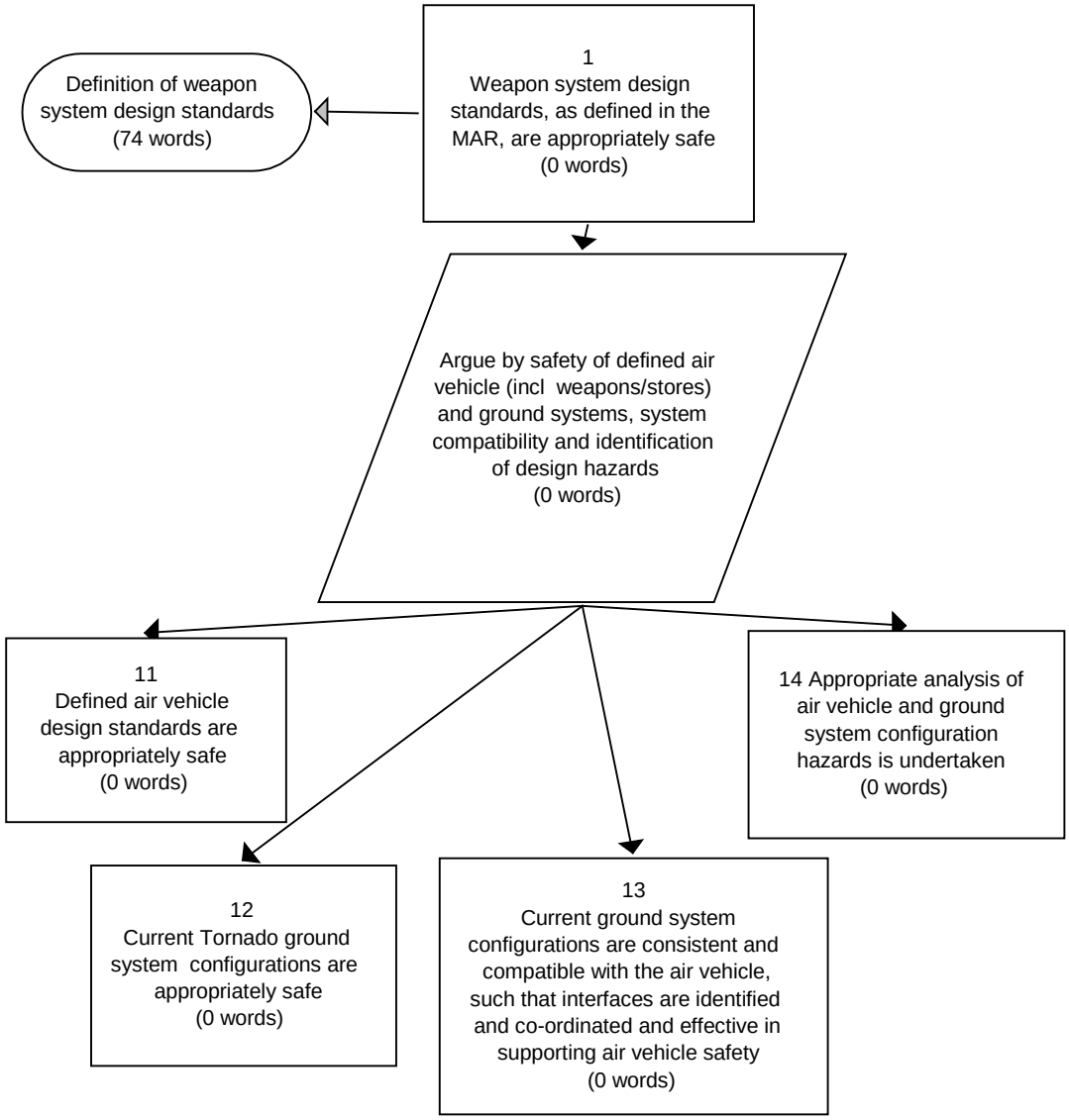
Context (Goal 0): *Definition of "supports safety and airworthiness"*

The MAR may be deemed to support safety and airworthiness when the recommended design, clearances, limitations and advice/instructions to users and maintainers achieve in-service safety standards for acceptable safety as defined by the RTSA/TSMP for all normal, peacetime flying, within the conditions of use as set out in the MAR. (See goal R0 - Definition of acceptably safe)

Node Status: Development required to ensure consistency with evolving safety targets and criteria

Strategy (Goal 0): *Argue by safe weapon system configuration(s), operating instructions/advice and recommendations, effective management and authorisation systems and in-Service feedback*

1 Section 1: Weapon system design standards safe (Goal 1)



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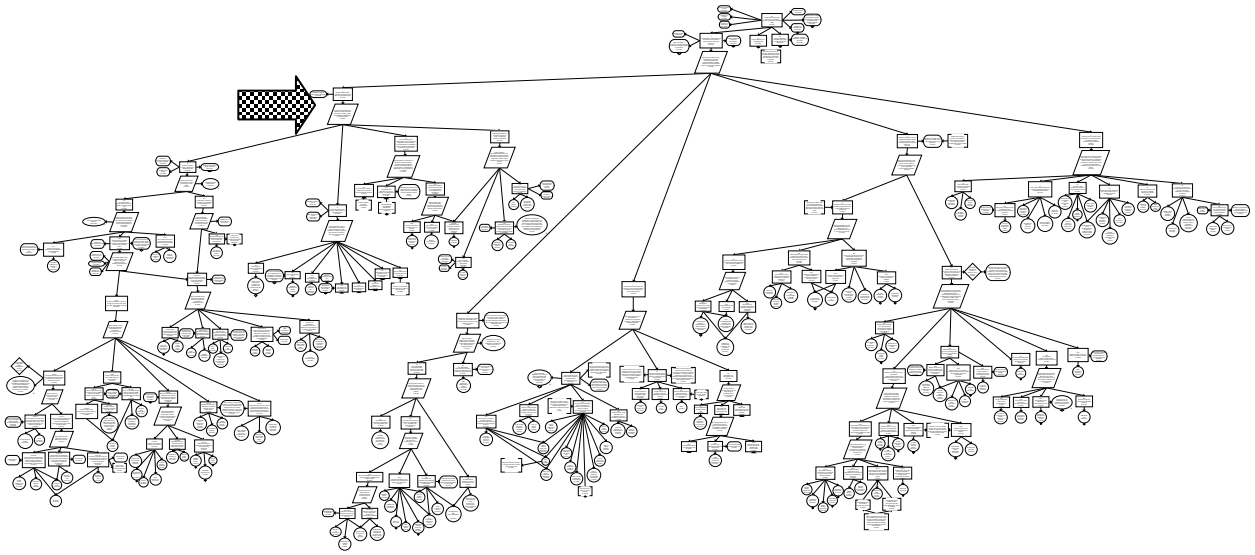


Goal 1: Weapon system design standards, as defined in the MAR, are appropriately safe

Context (Goal 1): *Definition of weapon system design standards*

The weapon system design standards are as follows:

Air Vehicle

FMk3 MAR Document (Parts 7 and 11) and Classified Supplement

GR4/4A MAR Document (Chapter 10)

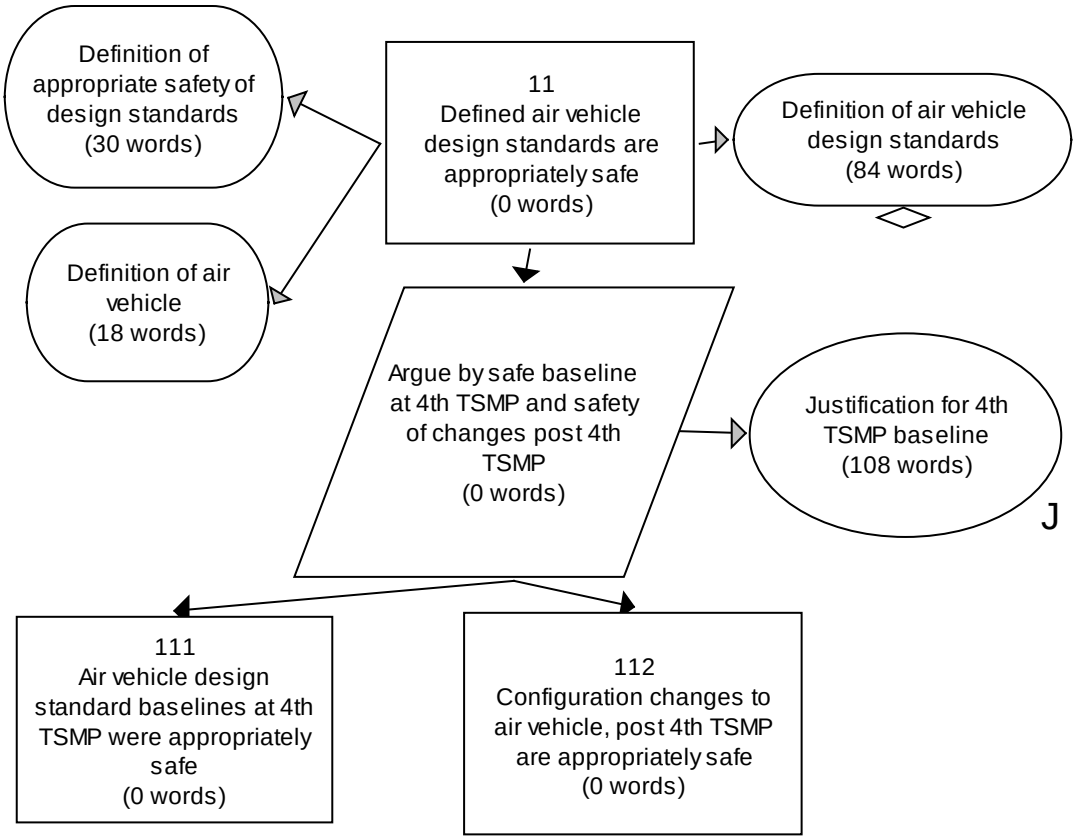
Ground System

Aircraft Document Sets (Topics 1 to 16) consistent with the air vehicle standards as defined in the MAR documents.

It should be noted that: The design standards as defined in the MAR comprise the design standards as certified by the design contractor(s) together with any service engineered changes that the IPT has established as safe and appropriate to operate within the MAR clearances and safety criteria. The implications of any in-service variations from the standards as specified within the MAR must be considered and authorised either by the RTSA or by the AOA.

Strategy (Goal 1): *Argue by safety of defined air vehicle (incl weapons/stores) and ground systems, system compatibility and identification of design hazards*

1.1 Defined air vehicle design standards safe (Goal 11)



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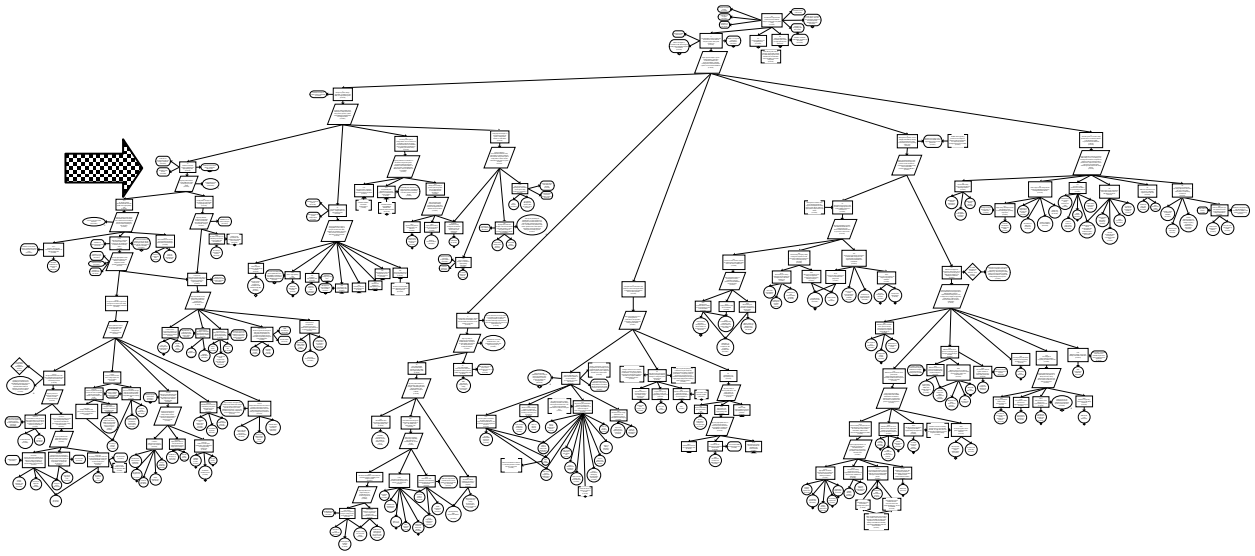


Goal 11: Defined air vehicle design standards are appropriately safe

Context (Goal 11): *Definition of appropriate safety of design standards*

Appropriately safe design standards are those that comply with safety and airworthiness requirements as set down by the RTSA/TSMP on the basis of JSP 553 and Tornado project standards.

Context (Goal 11): *Definition of air vehicle*

The air vehicle comprises the aircraft together with its engine, software, systems, equipments (including BITE), weapons and stores

Context (Goal 11): *Definition of air vehicle design standards*

Air vehicle design standards are all permissible combinations of modifications and service-engineered changes as promulgated in the Topic 2. These reflect the intended "as flown" configuration as recommended for use via the MAR and other related engineering components of the ADS e.g. The Tornado Avionic Configuration Control Document and the Tornado Avionic Modular Configuration Control Document. Once fully implemented, LITS will provide the comprehensive definition of cleared design standards for all in-service aircraft.

The design standards comprise the air vehicle production standards as accepted from the contractor together with all subsequent modifications and any service engineeered changes (STFs, SEMs, SI(T)s) that have been recommended for in-Service use by inclusion in the MAR/ADS.

The design standards also include all repair standards that are approved as ensuring that individual aircraft are restored to the appropriate functional standard and airworthiness status.

Node Status: Development may be required to reflect the method by which LITS is to be used for control of as flown and permissible design standards

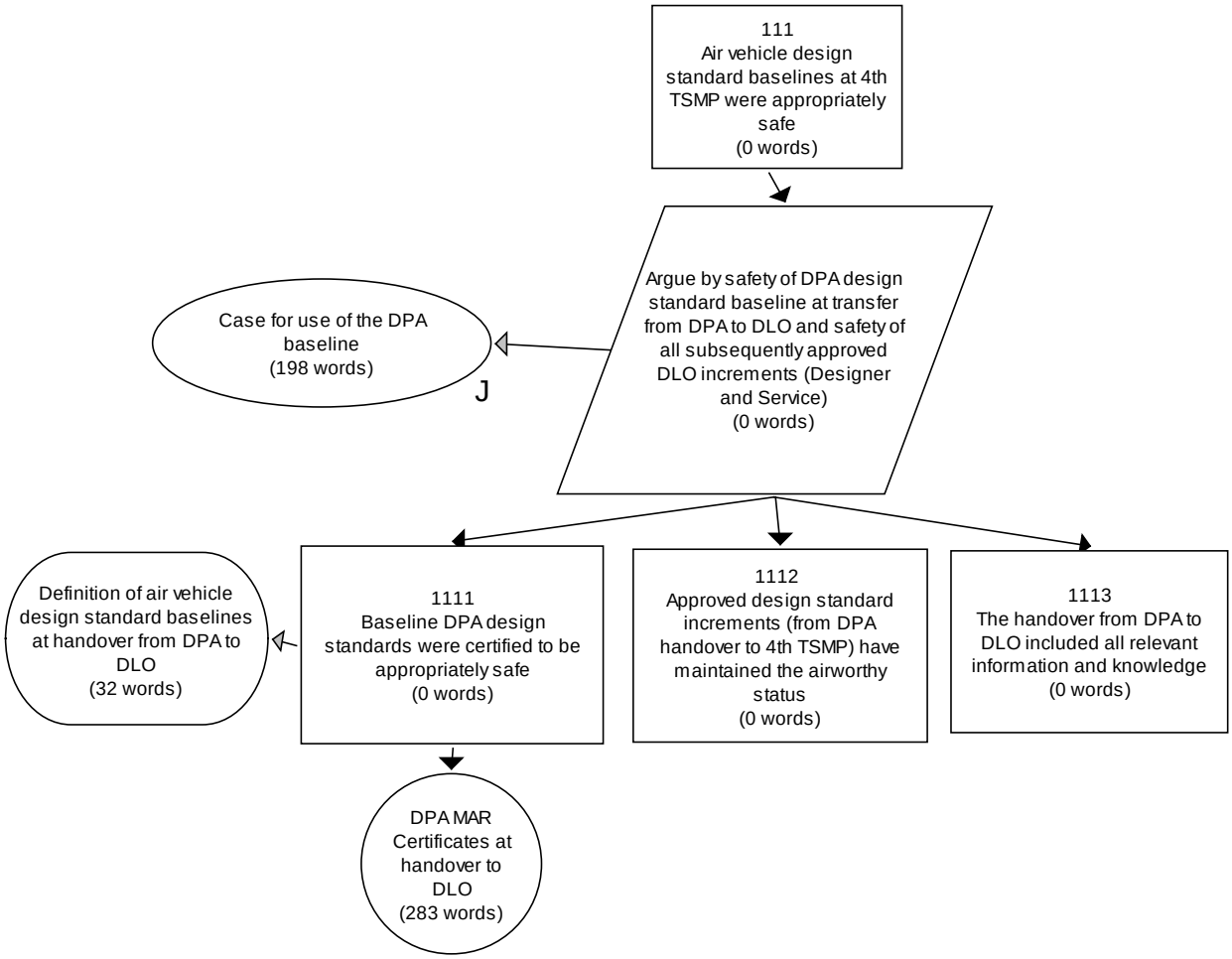
Strategy (Goal 11): *Argue by safe baseline at 4th TSMP and safety of changes post 4th TSMP*

Justification (Strategy(Goal 11)): *Justification for 4th TSMP baseline*

At the 4th TSMP the panel considered the options and implications for transitioning from implicit to explicit safety cases in support of the MAR and changes thereto. The panel acknowledged the work undertaken by the DPA and assurances given in the 1999 Type Airworthiness Assurance Review, preceding the transfer of management responsibility to the DLO. Whilst DPA had been unable to reconstruct the full audit trail underpinning the then MARs, the agency evaluation had concluded that there was no evidence to doubt the integrity of the MARs.

The panel also considered the effectiveness of the post transfer management controls within DLO and the scale of changes that had been undertaken by the DLO IPT management team. In the light of these considerations, the panel agreed that it would be neither appropriate nor resource efficient to attempt a retrospective documentation of the explicit safety case for MAR standards existing upto and including the date of the meeting (29 April 2003). The panel therefore directed that there should be an attempt, so far as was reasonably practicable, to capture and document the implicit safety case supporting the MAR standards as at 29 April 2003 and that explicit safety case were to be documented and maintained for all subsequent changes.

1.2 Air vehicle design standards at 4th TSMP safe (Goal 111)



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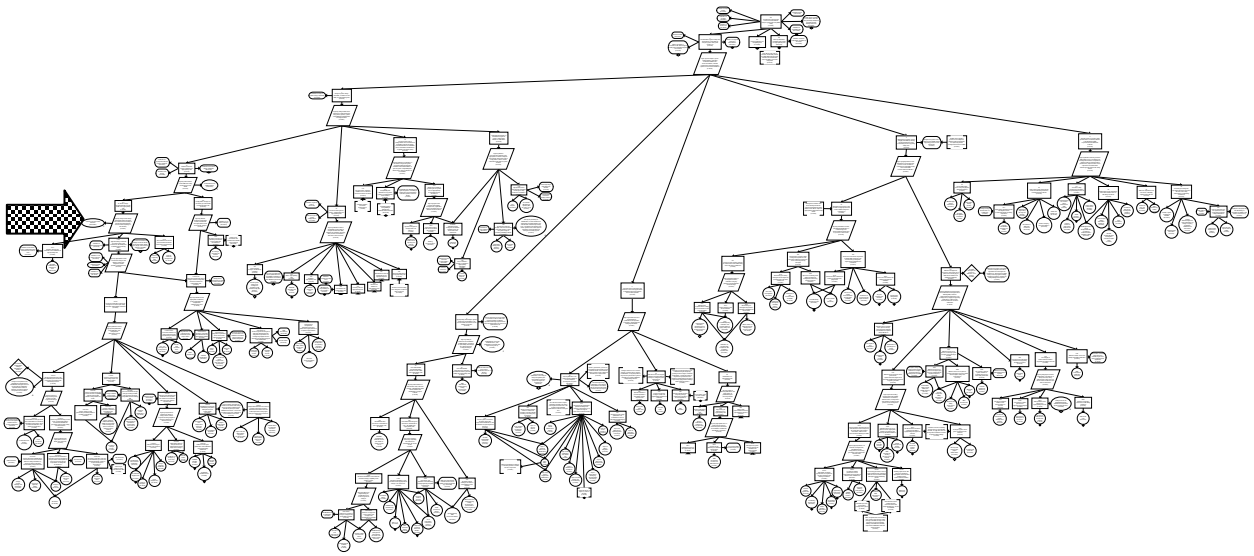


Goal 111: Air vehicle design standard baselines at 4th TSMP were appropriately safe

Strategy (Goal 111): *Argue by safety of DPA design standard baseline at transfer from DPA to DLO and safety of all subsequently approved DLO increments (Designer and Service)*

Justification (Strategy (Goal 111): *Case for use of the DPA baseline*

Prior to transfer of MAR management responsibility to the DLO, the DPA project team was the nominated UK airworthiness authority for Tornado with the expertise and competence to manage the MARs in accordance with the then extant management processes. These processes included a structured amendment and review procedure to ensure that the MARs continued to reflect safe and defensible design standards.

Evaluation of legacy DPA documentation shows that a major initiative was mounted in the mid 90's to try to reconstruct the audit trail for the MARs. However progress was frustrated because of poor data and record keeping in the initial years of the project. It was concluded that a rigorous, evidence based, demonstration of the integrity of the design baselines evolving from the initial clearance standards would not be successful. However, on the basis of evidence derived from in-Service operations the 1999 project team report to the Type Airworthiness Assurance Review concluded that "there was no reason to doubt the integrity of the MAR".

Whilst subsequent work by the DLO management team has revealed minor errors and anomalies in both the F3 and GR4 documents, no serious safety issues have been exposed in the legacy design standard clearances received from the DPA. As part of each MAR amendment, the IPT MAR manager undertakes a progressive review and update of the documents to ensure that they are purged of outdated and inaccurate statements. Work is also in hand to replace the now outdated definitions of the design clearance standards with something more suited to the needs of in-Service users.

Given the experience of the DPA in researching the early MAR records and the ongoing update and improvement action by the DLO it has been accepted by the 4th TSMP that it would be inappropriate to seek to develop and document an ab-initio safety argument for work undertaken prior to transfer of management responsibilities from the DPA to DLO. The DPA design baselines have been accepted as providing adequate bases for further development of the MARs.

All available IPT resources are thus to be directed towards the management of ongoing and future safety issues rather than the review of past decisions.

Goal 1111: Baseline DPA design standards were certified to be appropriately safe

Context (Goal 1111): *Definition of air vehicle design standard baselines at handover from DPA to DLO*

The DPA baseline clearance configurations are the aircraft and weapons configurations contained within the Tornado FMk3 and GR4/4A MARs at the date of transfer of management responsibility from DPA to DLO.

SOLUTION (GOAL 1111): DPA MAR CERTIFICATES AT HANDOVER TO DLO

References:

FMk3 MAR Issue 3, Amdt 7 dated 30 June 1999

GR4/4A MAR Issue 1, Amdt 5 dated 22 April 1999

The above MARs were managed and maintained in accordance with the extant UK requirements and DPA management procedures (e.g. Def Stan 05-123, CDPIs and project practices) and reflected the then Project Directors recommendations on clearances and limitations to be included in the Release to Service.

The MARs were derived from the NAMMO Releases to Service for IDS/ECR (issue 3, AL26, used for GR4/4A) and FMk2/FMk3 (issue 1, amdt 6 dated 26 Jan 1988 with advance amendment 32, dated 11 March 1988, this being the 1988 final baseline at cessation of the NAMMA SRP maintenance activity). Additional changes and refinements were incorporated by DPA as appropriate to UK's operational use of the aircraft and UK national assessment. UK changes were normally supported by advice from by the national partner companies of Panavia and Turbo Union and MoD agencies (e.g. DERA - previously DRA and A&AEE).

The above NAMMO Releases were in turn derived from contractor certifications, flight clearances, supporting evidence and assessments provided by the air vehicle designers and independent work by the Official Test Centres of the three participating nations, undertaken in accordance with OTC 2 "Co-ordination between the Official Test Centres on the Tornado Programme, dated Feb 1977. The Releases were maintained and approved by the national clearance authorities via the NAMMA/NETMA Service Release Panel. (Reference T/33403/3656/13756/2000/NU dated 8 May 2000 "The inclusion of clearances in the NAMMO Release to Service")

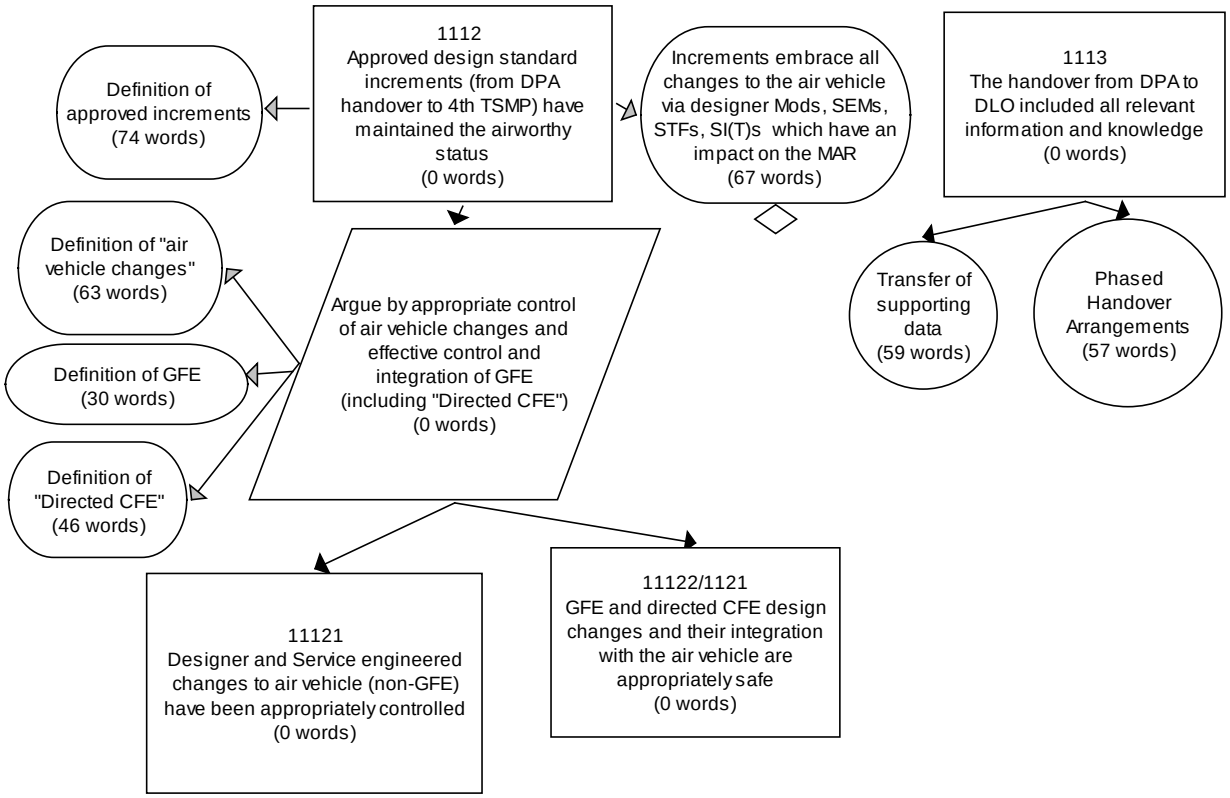
Contractor certifications comprise:

Aircraft and Equipment DDPs and Flight Limitations maintained by Panavia in accordance with the project procedures of QFN01 and QFN03 and approved by the three National Design Approval Authorities via NAMMO/NETMA Qualification or their designated national representatives.

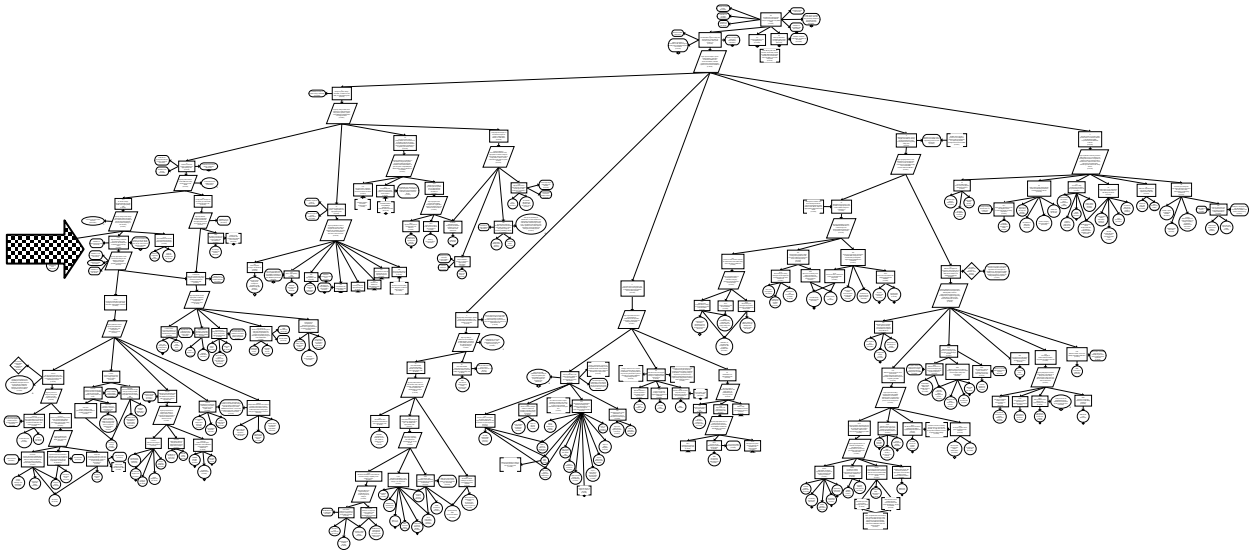
Engine Technical Certificates issued by NAMMA/NETMA in accordance with the RB 199 Qualification procedures of [reference AX/695/021 dated 30 July 1976 - *TBC*], on the basis of advice and evidence submitted by Turbo Union and approvals from the three National Design Approval Authorities via the NAMMO/NETMA Qualification Sub Group (Engines).

Contractor and OTC recommendations for the content of the NAMMO Releases are documented in Service Release Recommendation reports, prepared by the joint OTCs and submitted to NETMA. Control and husbandry of evidence in support of those recommendations is undertaken by the individual nations and industry partners. All information and data supporting the contractor and OTC recommendations is retained by the Nations and national partner companies. The project MoU (Section 2, part 5(a)) ensures that, in the event of any partner leaving the programme: "A country which withdraws from the programme will use its best endeavours to assist the countries continuing to participate in the programme in order to ensure as little disturbance to the programme as possible and in particular will continue to give the assistance specified in Section V of this MoU, if required to do so by the countries continuing to participate in the programme." See Goal 5 of Tornado SC for the arrangements discharging the UK responsibilities arising from the Tri-national working arrangements.

1.3 Design increments since DPA handover and handover data satisfactory (Goals 1112 & 1113)



Location within Safety Case



Goal 1112: Approved design standard increments (from DPA handover to 4th TSMP) have maintained the airworthy status

Context (Goal 1112): *Definition of approved increments*

These comprise:

- *All Tornado changes to the air vehicle as defined within the MAR and and its supporting ADS e.g. Topic 2*

- *All changes to GFE that have been appropriately integrated with and are authorised for use within the approved air vehicle standards as defined in the MAR/ADS.*

Details of all DLO MAR amendments and the design changes cleared therein are maintained by Tor ESM 1 as part of MAR audit trail.

***Context (Goal 1112):** Increments embrace all changes to the air vehicle via designer Mods, SEMs, STFs, SI(T)s which have an impact on the MAR*

Modifications to Tornado Configuration Controlled Items are cleared for use via the MAR Document and Topic 2

Modifications to all non-Tornado Configuration Controlled Items (primarily GFE) are controlled by the responsible IPT. The Tornado IPT retains overall responsibility for safety and integration with the weapon system.

SEMS are normally cleared for use via SD, however those meeting the MAR safety and airworthiness criteria may be cleared for use via the MAR

STFs are normally cleared via SD, but on an exceptional basis have been incorporated in the MAR. Control of release and embodiment is via the Topic 2

SI(T) are normally cleared for use by incorporation in Topic 2(R)1, which itself forms part of the MAR, being part of the associated publications

Node Status: Development may be required to establish and document the manner in which non-Tornado CCIs are controlled and co-ordinated with the Tornado baselines

***Strategy (Goal 1112):** Argue by appropriate control of air vehicle changes and effective control and integration of GFE (including "Directed CFE")*

***Context (Goal 1112):** Definition of "air vehicle changes"*

These design changes comprise:

- *all designer modifications undertaken by Panavia, Turbo Union and Mauser under the tri-national PDS and PDT contracts managed via NETMA*

- *all UK service engineered changes in the form of STFs, SEMs and SI(T)s which form part of the MAR*

- *all changes to UK GFE that is integrated with or forms part of the Tornado air vehicle*

***Context (Goal 1112):** Definition of GFE*

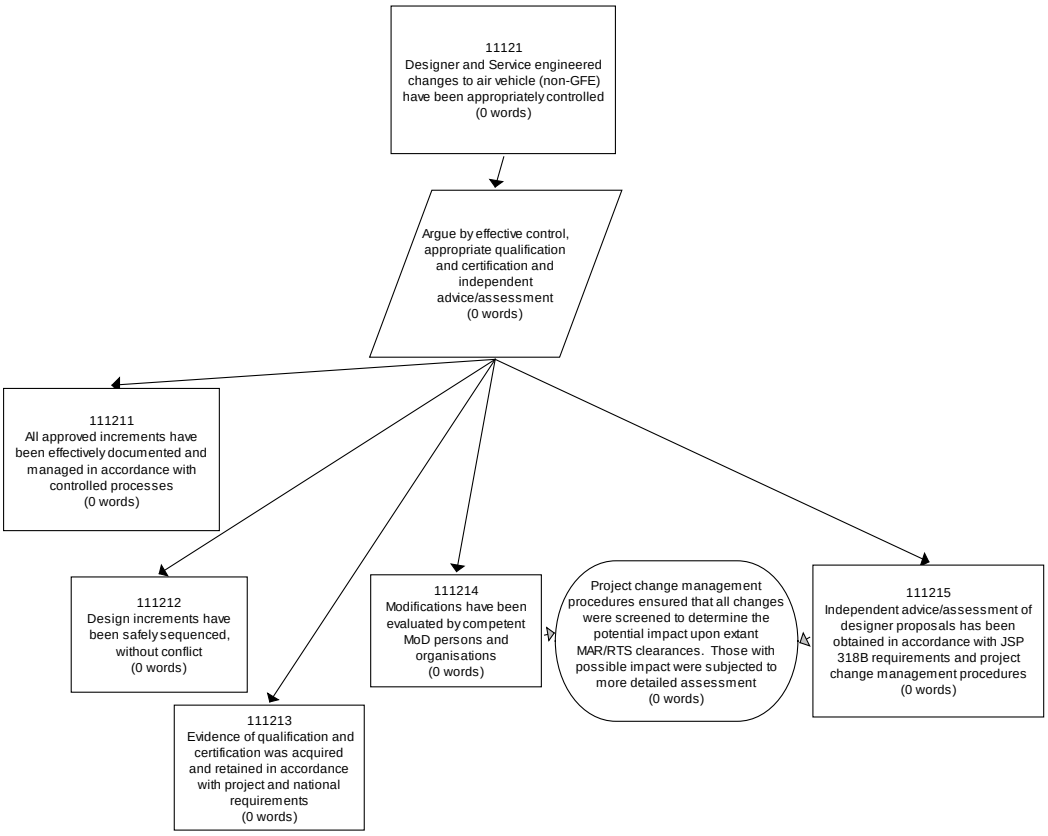
GFE comprises all items of equipment, weapons and stores that form part of the air vehicle and are procured by the UK from contractors other than Panavia and Turbo Union.

***Context (Goal 1112):** Definition of "Directed CFE"*

Directed CFE are those major items of equipment such as the ADV radar where equipment selection has been decided by the customer, but where Panavia has been required to undertake much of the procurement and management activity on behalf of the customer.

CFE = Contractor Furnished Equipment

1.4 Designer and service engineered changes controlled (Goal 11121)



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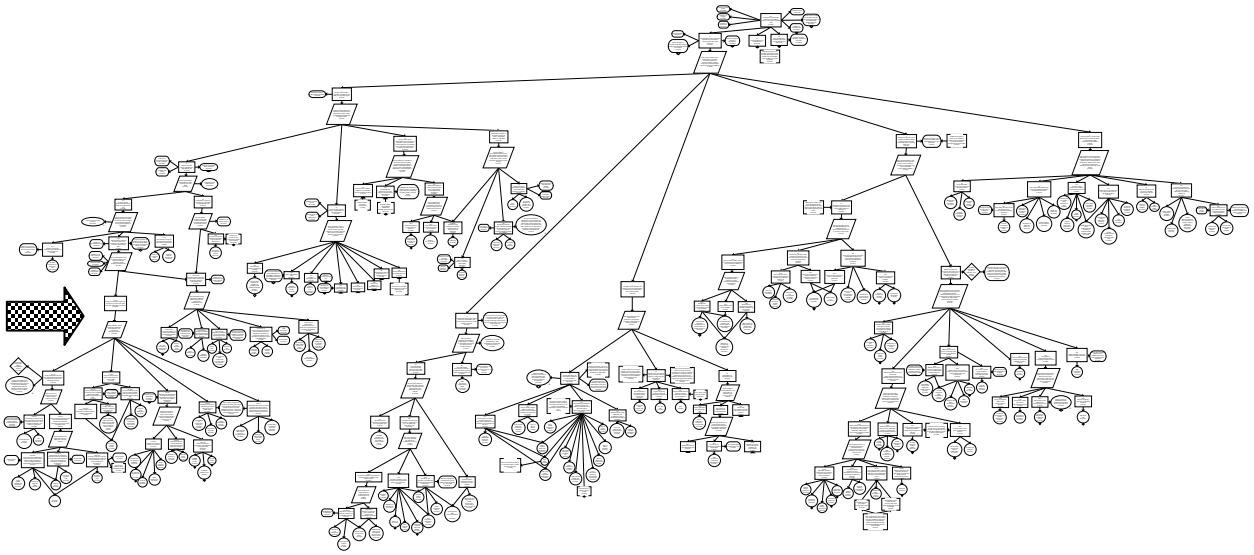
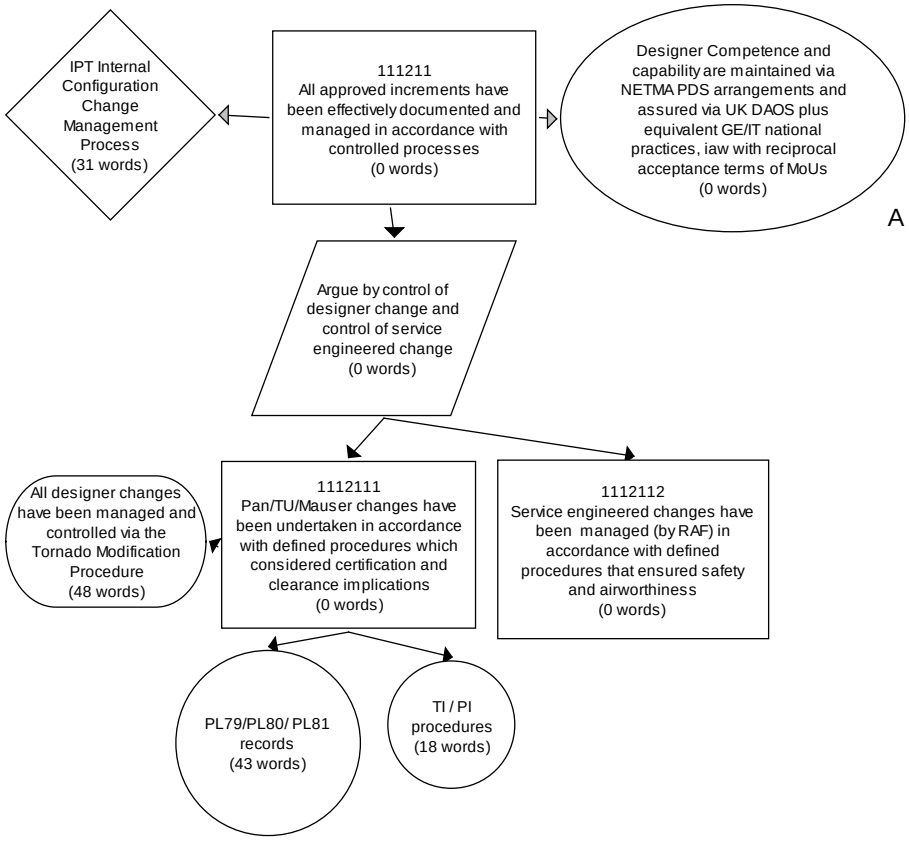


Goal 11121: Designer and Service engineered changes to air vehicle (non-GFE) have been appropriately controlled

Strategy (Goal 11121): *Argue by effective control, appropriate qualification and certification and independent advice/assessment*

1.5 Approved increments effectively managed (Goal 111211)



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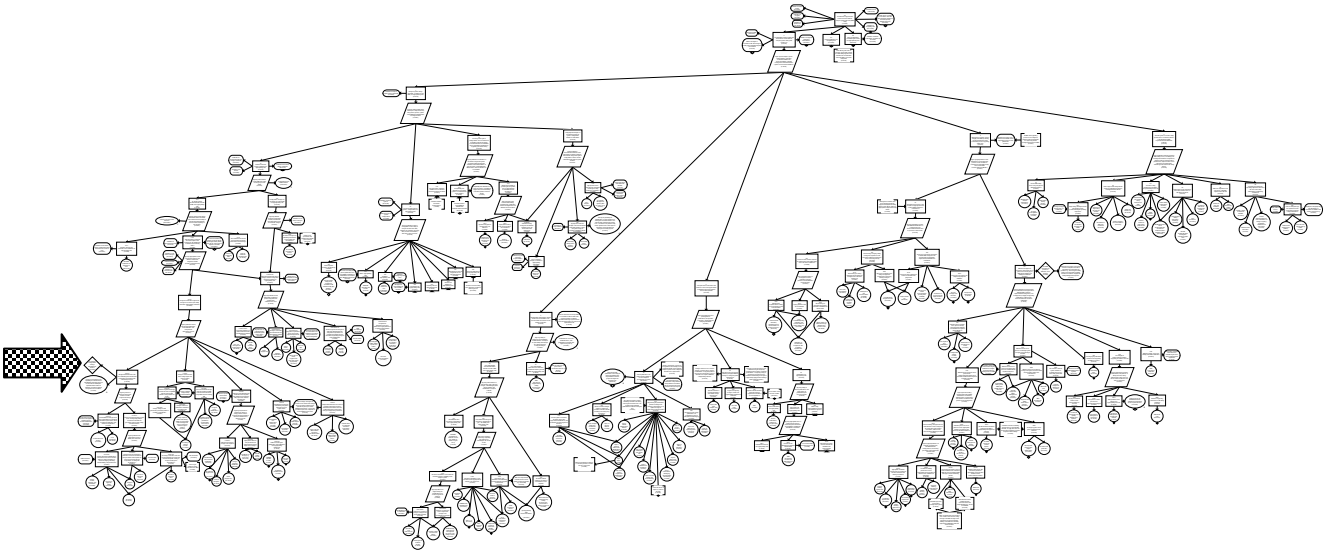


Goal 111211: All approved increments have been effectively documented and managed in accordance with controlled processes

Model (Goal 11121): *IPT Internal Configuration Change Management Process*

On transfer of responsibilities from DPA the IPT maintained the basic process and practices established and proven by the DPA. These have subsequently been captured, structured and documented in LI-BS013

Assumption (Goal 11121): *Designer Competence and capability are maintained via NETMA PDS arrangements and assured via UK DAOS plus equivalent GE/IT national practices, iaw with reciprocal acceptance terms of MoUs*

Strategy (Goal 11121): *Argue by control of designer change and control of service engineered change*

Goal 1112111: Pan/TU/Mauser changes have been undertaken in accordance with defined procedures which considered certification and clearance implications

Context (Goal 1112111): *All designer changes have been managed and controlled via the Tornado Modification Procedure*

The TMP has been maintained and operated by NAMMA/NETMA with support from national officials working via the TMB and in the roles of PONO at the Panavia Partner Company sites. This has ensured structured assessment and screening of all Panavia, Turbo Union and Mauser design change proposals.

SOLUTION (GOAL 1112111): PL79/PL80/ PL81 RECORDS

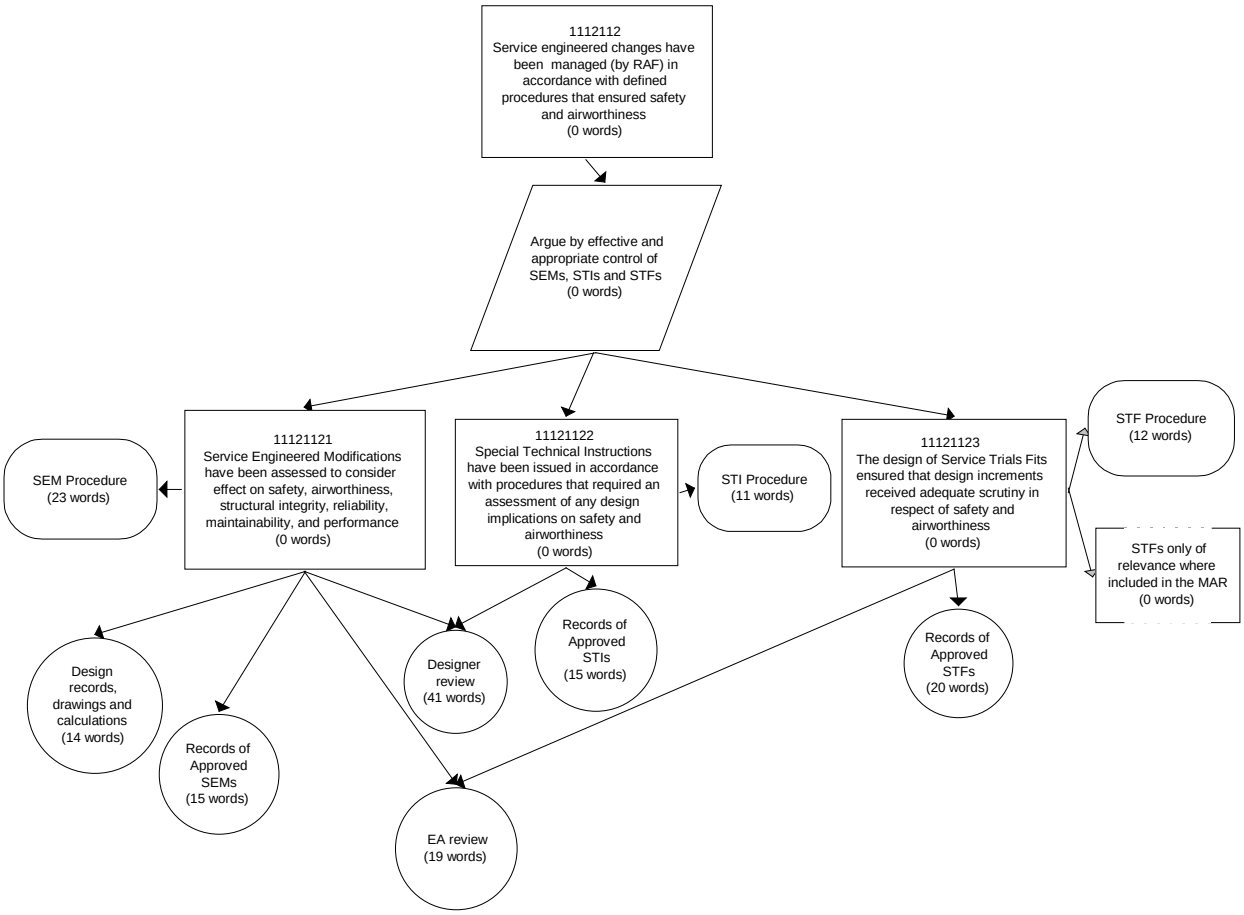
These records are prepared and managed in accordance with the TMP and provide the formal audit trail of customer change requests, contractor proposals and customer acceptance

Comprehensive records of all designer changes relating to UK aircraft standards are maintained by Tor ESM 3

SOLUTION (GOAL 1112111): TI / PI PROCEDURES

TI and PI activity is undertaken in accordance with the arrangements as defined in the Tornado Modification Procedure

1.6 Service engineered changes managed with defined procedures (Goal 1112112)



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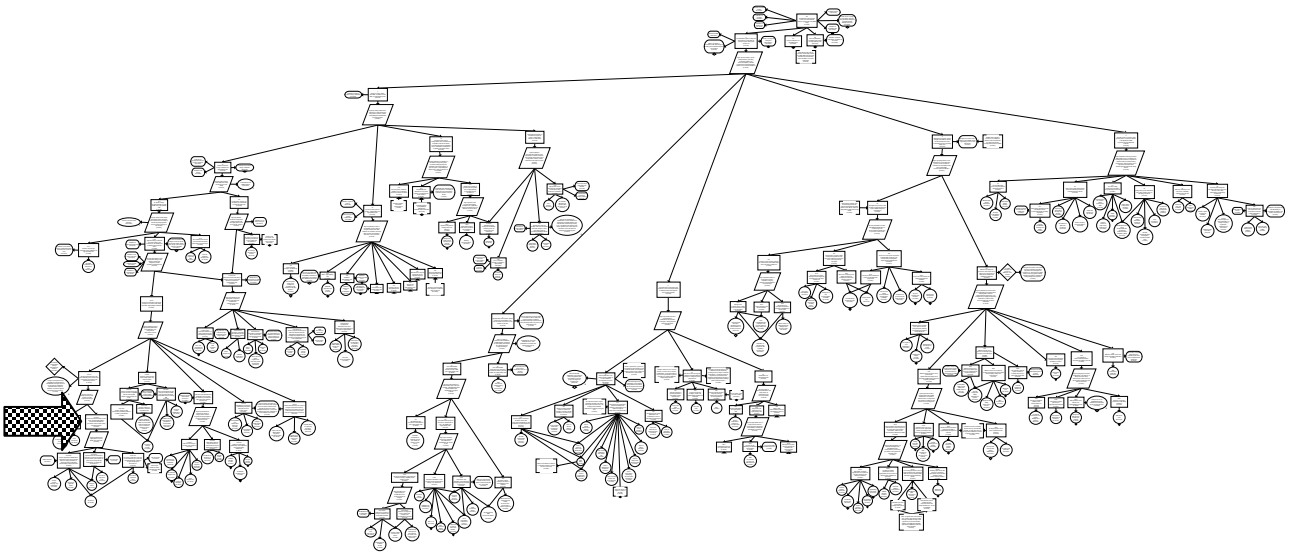


Goal 1112112: Service engineered changes have been managed (by RAF) in accordance with defined procedures that ensured safety and airworthiness

Strategy (Goal 1112112): *Argue by effective and appropriate control of SEMs, STIs and STFs*

Goal 11121121: Service Engineered Modifications have been assessed to consider effect on safety, airworthiness, structural integrity, reliability, maintainability, and performance

Context (Goal 11121121): *SEM Procedure*

SEMs have been managed in accordance with AP101B-4100-2(R), Leaflet 060 (Tornado specific) - now superseded by AP100B-04 (General RAF)

SOLUTION (GOAL 11121121): DESIGN RECORDS, DRAWINGS AND CALCULATIONS

Comprehensive records on SEMs are maintained within the Tor ESM 3 change management database.

SOLUTION (GOAL 11121121): RECORDS OF APPROVED SEMS

Records of all approved SEMs are maintained and promulgated via the Topic 2(R)2.

SOLUTION (GOAL 11121121): EA REVIEW

All Service engineered change proposals were subject to a structured evaluation by the appropriate EA holding an airworthiness delegation

SOLUTION (GOAL 11121121): DESIGNER REVIEW

This has been provided via IPT (UK) contract with BAES for provision of advice on SEMs (BAES TORC 14E/1013 - Provision of DA support for Tornado Aircraft)

NETMA ISS contract on BAES provides for advice and support on SI(T)s.

Goal 11121122: Special Technical Instructions have been issued in accordance with procedures that required an assessment of any design implications on safety and airworthiness

Context (Goal 11121122): *STI Procedure*

STIs were prepared and controlled in accordance with AP 100A-01

SOLUTION (GOAL 11121122): RECORDS OF APPROVED STIS

Record of all approved STIs are maintained and promulgated via the Topic 2(R)1.

Goal 11121123: The design of Service Trials Fits ensured that design increments received adequate scrutiny in respect of safety and airworthiness

Context (Goal 11121123): *STF Procedure*

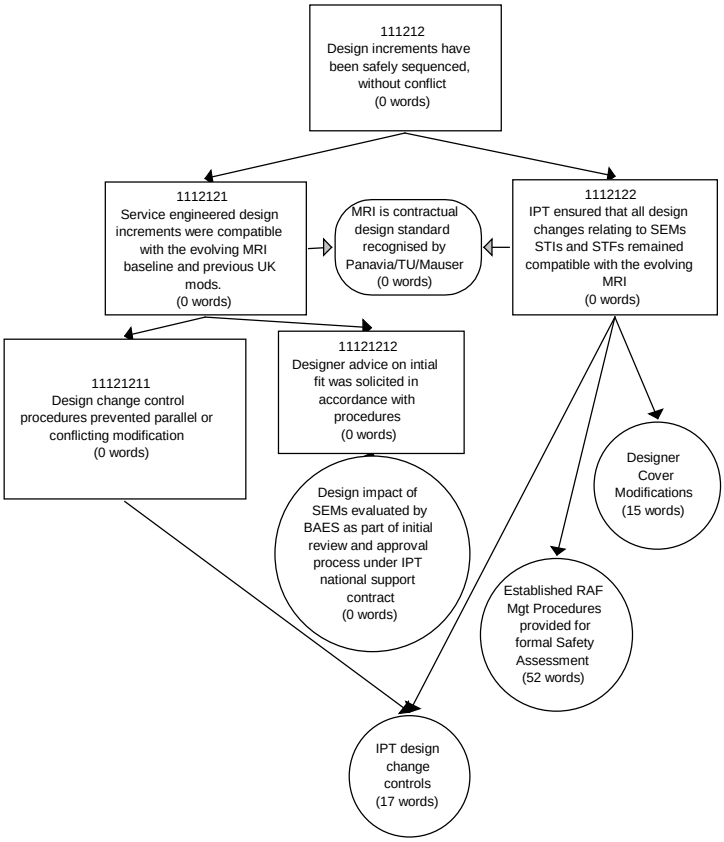
STFs have been managed in accordance with AP 100B-01, Order 1120

Notes (Goal 11121123): *STFs only of relevance where included in the MAR*

SOLUTION (GOAL 11121123): RECORDS OF APPROVED STFS

Records of all extant STFs are managed and promulgated monthly to units/FWAMG/AMDB via the Tor ESM 3 database.

1.7 Design increments safely sequenced (Goal 111212)



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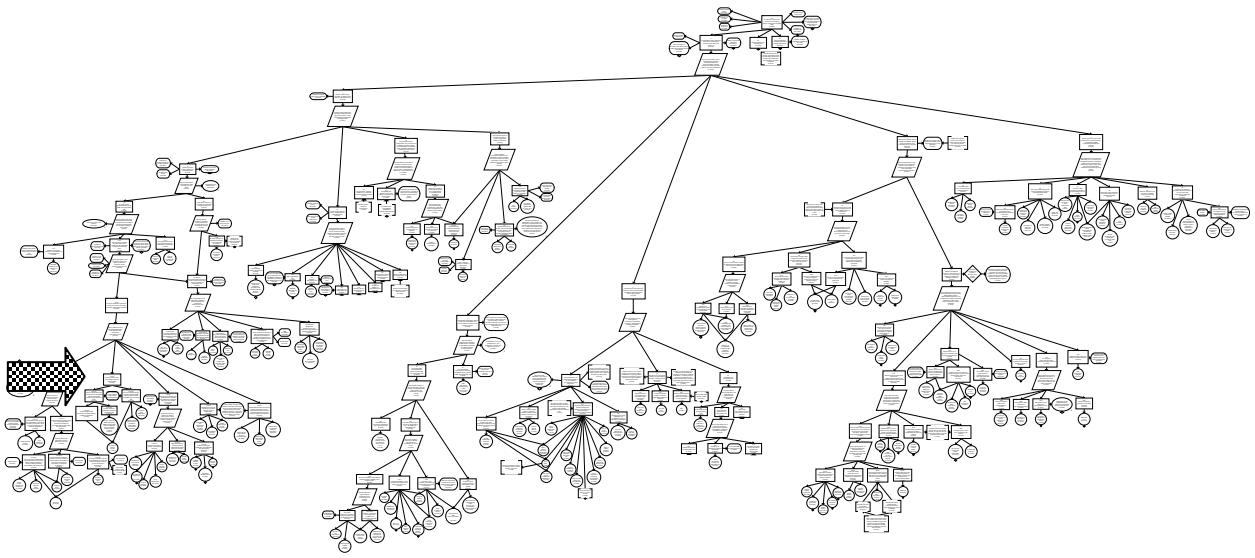


Goal 111212: Design increments have been safely sequenced, without conflict

Goal 1112121: Service engineered design increments were compatible with the evolving MRI baseline and previous UK mods.

Context (Goal 1112121): *MRI is contractual design standard recognised by Panavia/TU/Mauser*

Goal 11121211: Design change control procedures prevented parallel or conflicting modification

SOLUTION (GOAL 11121211): IPT DESIGN CHANGE CONTROLS

The IPT process provided for EA assessment of all intended changes against other existing or envisaged changes.

Goal 11121212: Designer advice on intial fit was solicited in accordance with procedures

SOLUTION (GOAL 11121212): DESIGN IMPACT OF SEMS EVALUATED BY BAES AS PART OF INITIAL REVIEW AND APPROVAL PROCESS UNDER IPT NATIONAL SUPPORT CONTRACT

Goal 1112122: IPT ensured that all design changes relating to SEMs STIs and STFs remained compatible with the evolving MRI

SOLUTION (GOAL 1112122): ESTABLISHED RAF MGT PROCEDURES PROVIDED FOR FORMAL SAFETY ASSESSMENT

SEMs were managed in accordance with AP 101B-4100-2(R)1 Leaflet 060 and AP 100B-04

STFs were managed in accordance with AP 100B-01 Order 1120

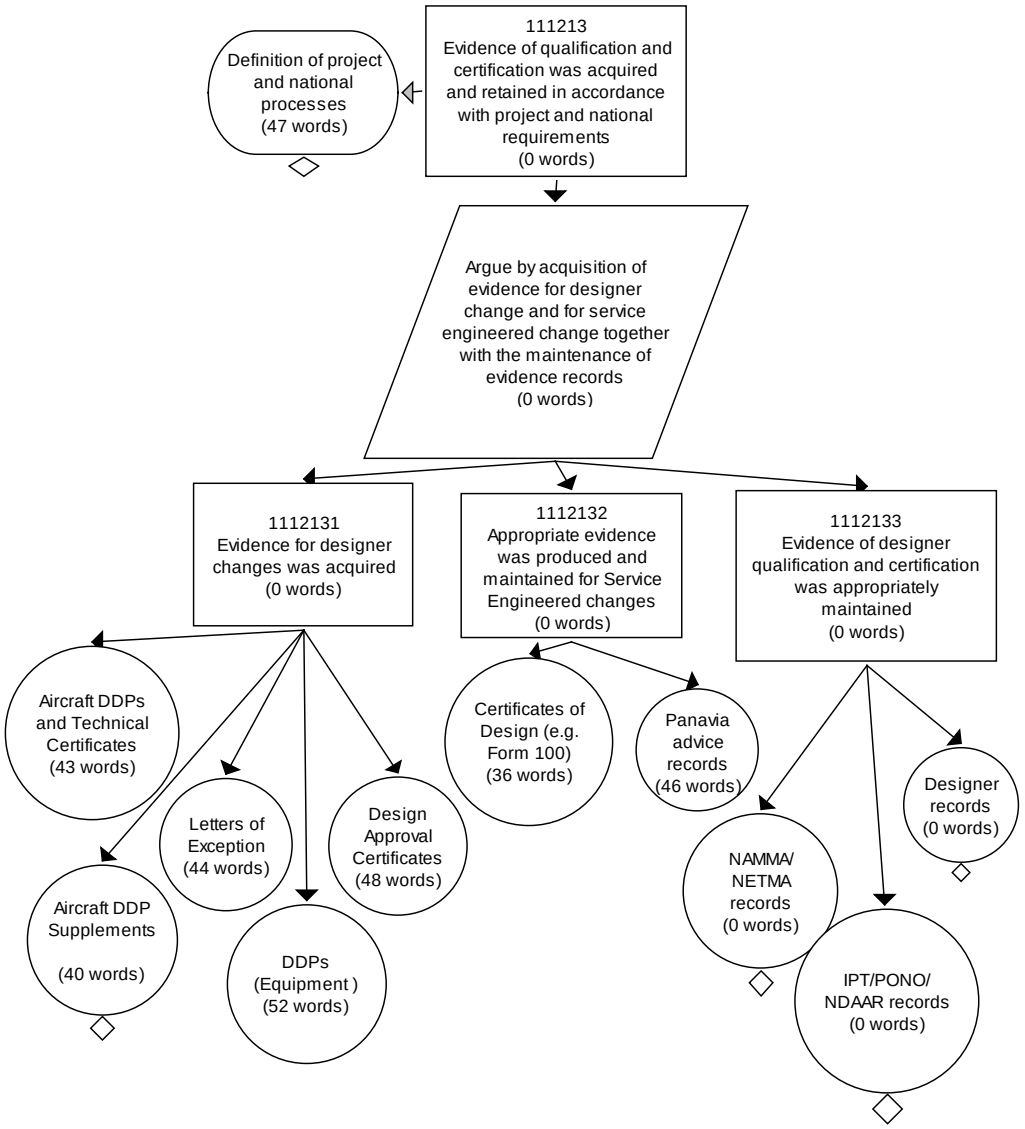
STIs were managed in accordance with AP 100A-01 (now superseded by JAP(D) 100A)

These APs all required an appropriate safety assessment.

SOLUTION (GOAL 1112122): DESIGNER COVER MODIFICATIONS

Designer cover modifications were commissioned and implemented as appropriate in accordance with Tornado Modifications Procedure

1.8 Evidence of qualification/certification (Goal 111213)



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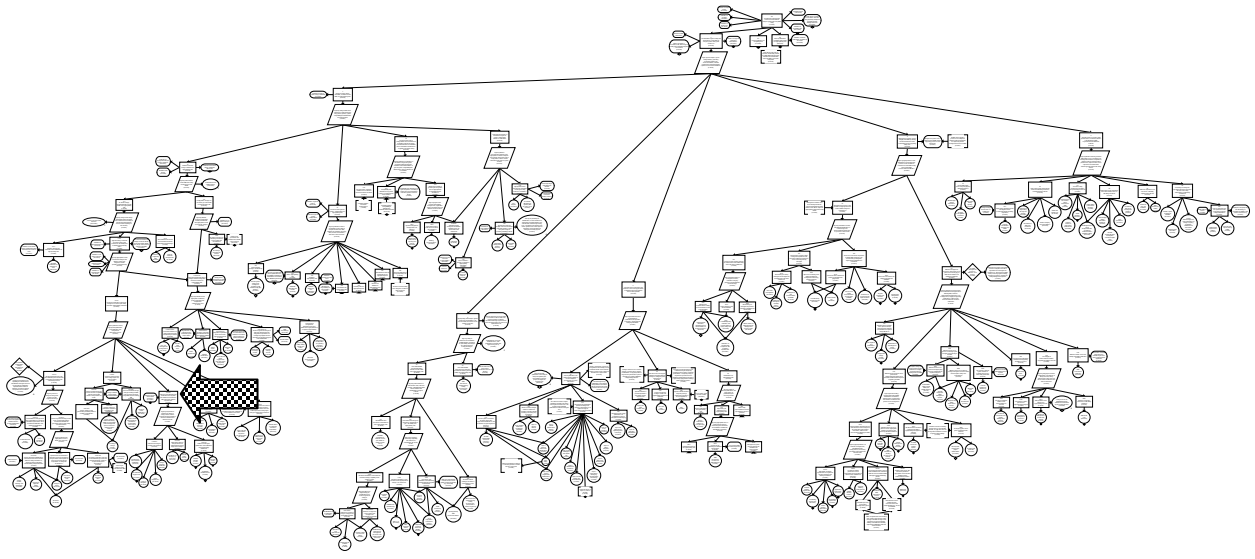


Goal 111213: Evidence of qualification and certification was acquired and retained in accordance with project and national requirements

Context (Goal 111213): *Definition of project and national processes*

The primary project and national processes are as defined in:

Panavia QFN 01

Panavia QFN 03

Turbo Union RB 199 Qualification Procedure ref [AX/695/021 dated 30 July 1976]

*NETMA/Nations procedures - [*TBD - primarily the QG and QSG(E) ToRs*]*

Def Stan 05-123 Technical Procedures for the Procurement of Aircraft, Weapon and Electronic Systems, Issue1 1, 1 August 1983 as amended.

Def Stan 00-970

Def Stan 00-971

Def Stan 05-124

Def Stan 05-122

Tornado Modification Procedure

Node Status: Development required to complete above references

Strategy (Goal 111213): *Argue by acquisition of evidence for designer change and for service engineered change together with the maintenance of evidence records*

Goal 1112131: Evidence for designer changes was acquired

SOLUTION (GOAL 1112131): AIRCRAFT DDPS AND TECHNICAL CERTIFICATES

IDS Series Aircraft DDP **-** M/CF/TOR/1423 Change 20 dated 20.9.95 (Dasa/LMQ13/PM304/CF/TOR/1423/0/20/20.9.95/P)

FMk2 & FMk3 Series Aircraft DDP - PN1285 Change 16 dated Aug 92 (P1261/01/0004/1-16/130792)

Technical Certificate RB 199 Mk101 Reference N/4302/1705/3771/NR

Technical Certificate RB 199 Mk 103 Reference N/4302/1705/0389/NR

Technical Certificate RB 199 Mk 104 Reference N/4302/1705/1291/NR

SOLUTION (GOAL 1112131): AIRCRAFT DDP SUPPLEMENTS

GR 4 (MLU) Supplement - ref P/1213/20M/121

Life Extension Programme (IDS/ECR - 8000 Flying Hour) - ref P/1100/DDP/1709/08.10.2002

Need to check if any supplements exist for F3 (e.g. CSP or Life Extension)

Node Status: Development required to clarify above open areas

SOLUTION (GOAL 1112131): LETTERS OF EXCEPTION

Letters or exception have been issued periodically by BAES, EADS and Alenia to reflect the evolving qualification status of the Design/Contractual Build standards.

At DPA/DLO handover the LoE status was:

- GR4 - Alenia (issue 9), BAES (issue 11), EADS (issue 25)
- F3 - Alenia (issue 9), BAES (issue 54), EADS (issue 25)

At the 4th TSMP the LoE status was:

- GR4 - Alenia (issue 9), BAES (issue 24), EADS (issue 30)
- F3 - Alenia (issue 9), BAES (issue 66), EADS (issue 30)

SOLUTION (GOAL 1112131): DDPS (EQUIPMENT)

These DDPs have been managed and approved in accordance with the procedures of QFN03. Comprehensive records are retained by NETMA, the RPOs at Warton and Bristol and the contractors. Where appropriate these records also include national equipment certifications such as Form 100s together with Ghost DDPs confirming Panavia acceptance of the integration.

SOLUTION (GOAL 1112131): DESIGN APPROVAL CERTIFICATES

DACs for GR 1 category T equipments were prepared and submitted as part of the initial certification and release to service of all major equipments requiring type records (See QFN 03 section D). Following initial acceptance of the equipment designs, no further updates of these certificates were required.

Goal 1112132: Appropriate evidence was produced and maintained for Service Engineered changes

SOLUTION (GOAL 1112132): CERTIFICATES OF DESIGN (E.G. FORM 100)

These have been generated as required in accordance with Def Stan 05-123.

NOTE: These relate only to items that are incorporated onto the aircraft via service engineered change and are thus very limited in number.

SOLUTION GOAL 1112132: PANAVIA ADVICE RECORDS

These are produced and maintained iaw the IPT contract on BAES for support in the issue and maintenance of SEMs and the advice provided under the NETMA PDS/ISS contracts. They form part of the ESM 3 files that are maintained in support of all SEMs.

Goal 1112133: Evidence of designer qualification and certification was appropriately maintained

SOLUTION (GOAL 1112133): NAMMA/ NETMA RECORDS

Node Status: Development required to establish and document the agency agreements, processes and practices for retention of documentation on behalf of the partner nations

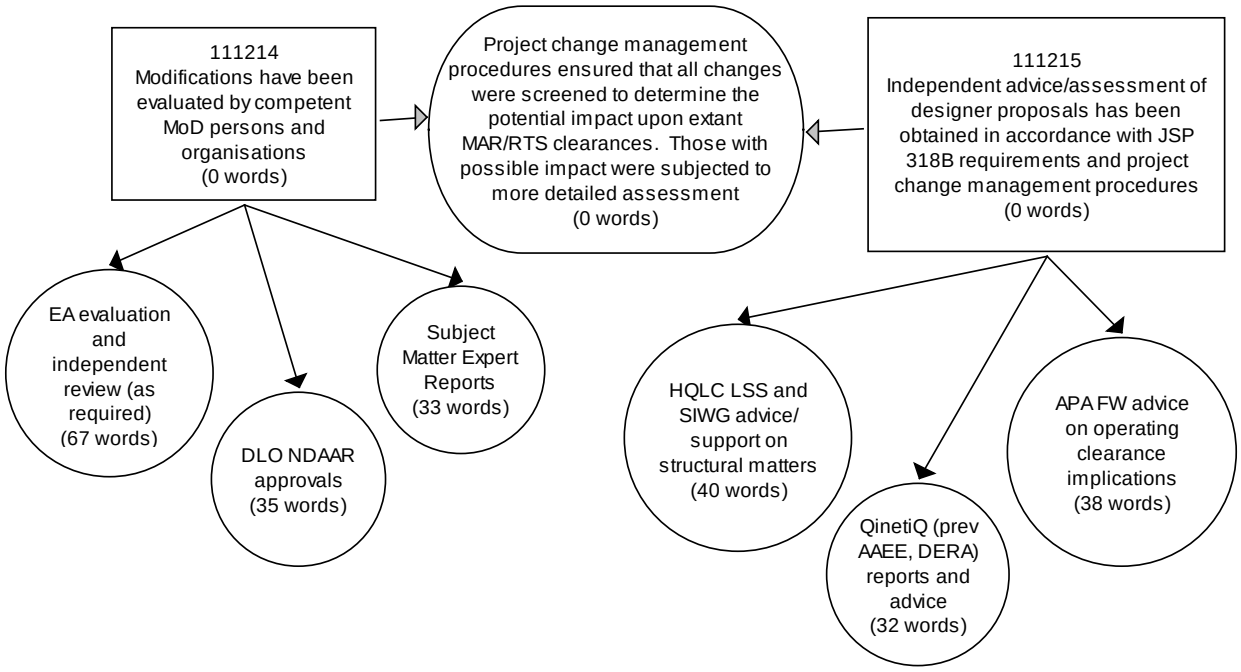
SOLUTION (GOAL 1112133): IPT/PONO/ NDAAR RECORDS

Node Status: Development required to establish and document the processes and practices for retention of documentation on behalf of the IPT and other partner nations

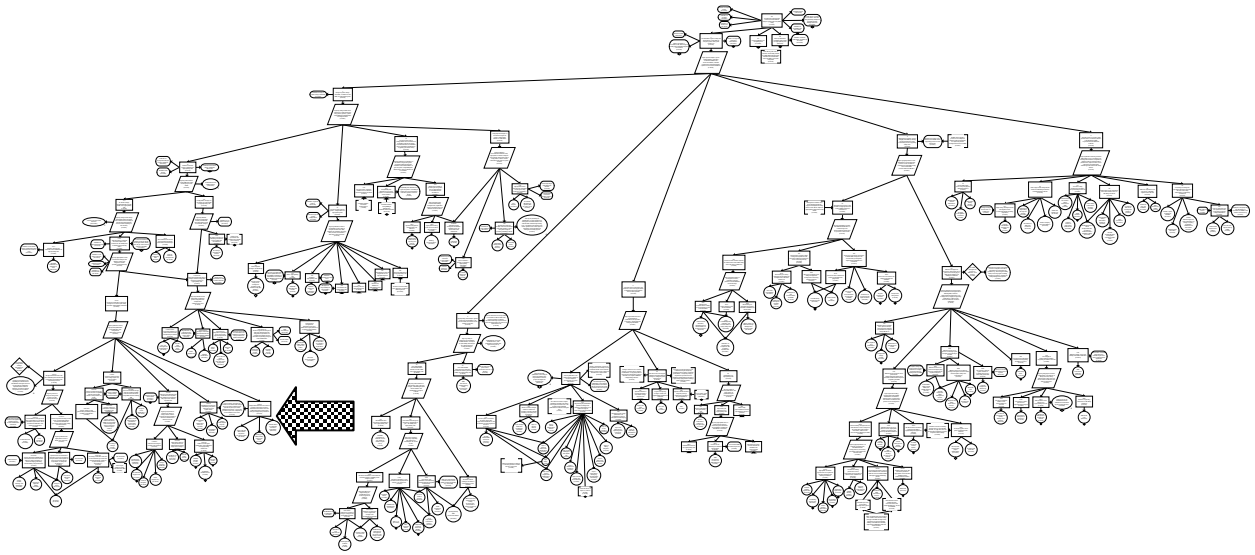
SOLUTION (GOAL 1112133): DESIGNER RECORDS

Node Status: Development required to establish and document the contractual provisions, processes and practices for retention of documentation on behalf of the customer

1.9 Evaluation by competent persons and independent assessment (Goals 111214 and 111215)



Location within Safety Case



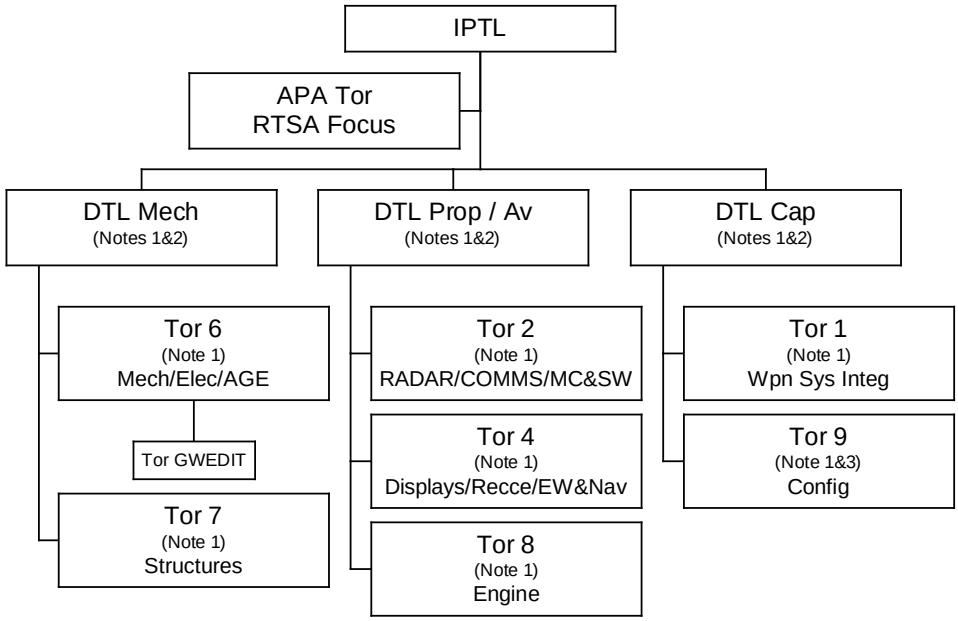
Goal 111214: Modifications have been evaluated by competent MoD persons and organisations

Context (Goal 111214): *Project change management procedures ensured that all changes were screened to determine the potential impact upon extant MAR/RTS clearances. Those with possible impact were subjected to more detailed assessment*

SOLUTION (GOAL 111214): EA EVALUATION AND INDEPENDENT REVIEW (AS REQUIRED)

Responsibilities for evaluation and control of modifications were assigned via letter of delegation (LoD) to nominated EA specialists within the IPT in accordance with the organisational responsibilities as shown in the following diagram. These arrangements were in place and maintained upto the date of the 4th TSMP.

Tornado IPT - Airworthiness and Safety Responsibilities up to Apr 03



Notes:

1. LoD Holder
2. Delegated Signatory for MAR
3. Co-ordination of qualification, certification and MAR matters

All airworthiness delegations were managed and maintained in accordance with the requirements of CE(RAF) Engineering Notice 8 (now BP 1206).

Records of the modification evaluations together with any recommendations from independent safety review of more complex modifications are maintained within the modifications folders held by Tor ESM (previously Tor 9)..

SOLUTION (GOAL 111214): DLO NDAAR APPROVALS

Nominated National Design Approving Authority Representatives assessed the impact of design changes and recorded their acceptance within formal design certifications that were prepared and maintained in accordance with approval procedures (primarily QFN03 and LI BS011).

SOLUTION GOAL 111214: SUBJECT MATTER EXPERT REPORTS

The safety impact of complex modifications were reviewed by relevant Subject Matter Experts and the resulting reports are kept in the modification files or MAR amendment files (held by Tor ESM) as appropriate.

Goal 111215: Independent advice/assessment of designer proposals has been obtained in accordance with JSP 318B requirements and project change management procedures

SOLUTION (GOAL 111215): HQLC LSS AND SIWG ADVICE/ SUPPORT ON STRUCTURAL MATTERS

The SIWG provides the primary UK forum for review and control of all matters relating to the structural safety and integrity of RAF service variants. The group meets twice yearly and works in accordance with AP 100A-01 Leaflet 315

SOLUTION (GOAL 111215): QINETIQ (PREV AAEE, DERA) REPORTS AND ADVICE

Wherever the change management reviews identified a possible impact on safety or in-service use, independent T&E or assessments have been commissioned using the appropriate national bodies such as QinetiQ.

SOLUTION (GOAL 111215): APA FW ADVICE ON OPERATING CLEARANCE IMPLICATIONS

In progressing and assessing design changes the IPT specialists have worked closely with the resident member of the RTSA to ensure that RTS and aircrew implications have been fully addressed wherever the change can affect the service user.

Goal 1113: The handover from DPA to DLO included all relevant information and knowledge

SOLUTION (GOAL 1113): TRANSFER OF SUPPORTING DATA

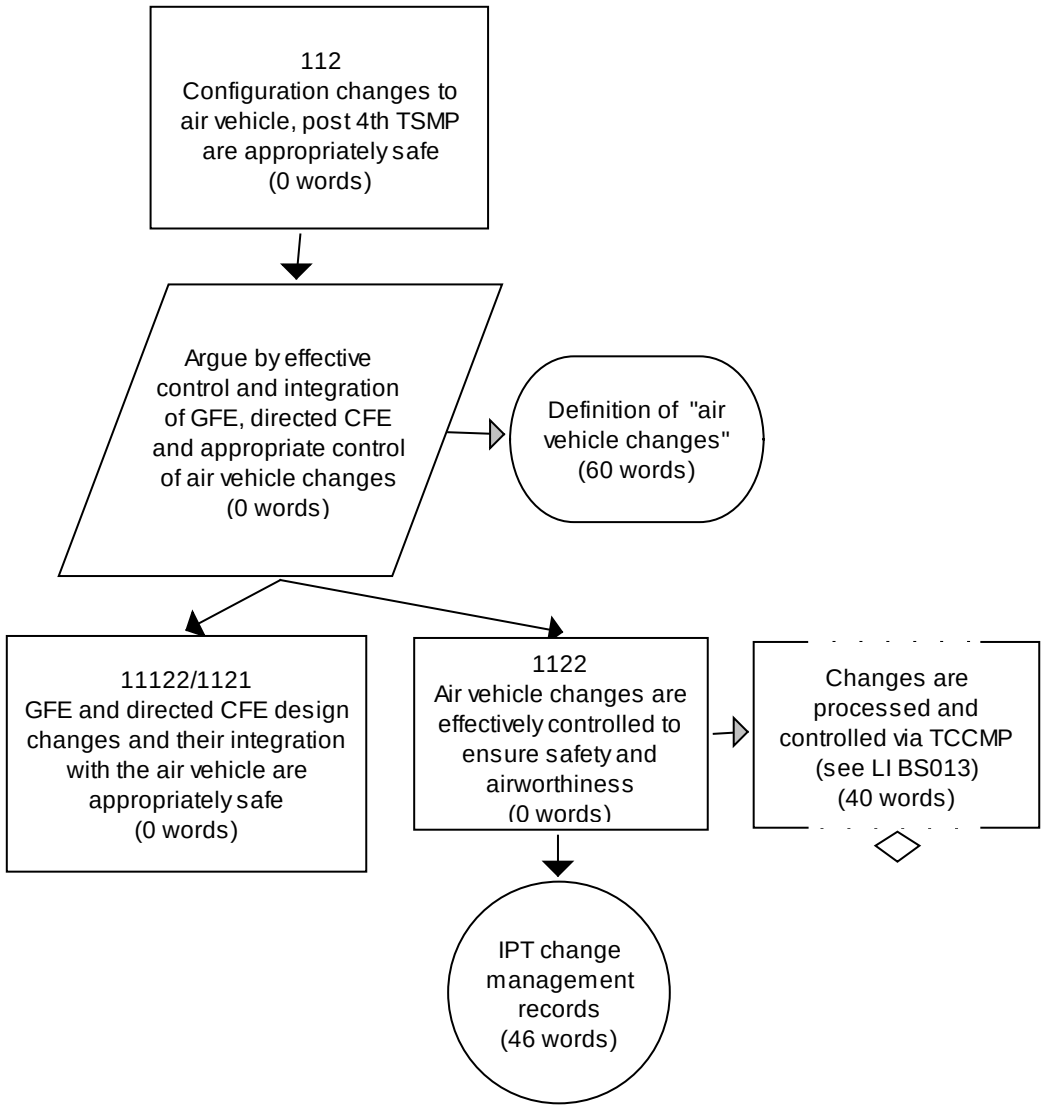
On transfer to DLO, the DPA provided a complete copy of the extant MARs together with archive copies on CD. The associated aircraft document set was also transferred at a defined status and issue level commensurate with the MARs. On receipt these were checked to ensure consistency and completeness. These records are now maintained by Tor ESM 1 as part of the MAR audit trail.

In support of the MARs, DPA also transferred all project files and supporting data records that comprised the airworthiness data record. At the same time, DLO assumed responsibility for maintaining the project support agreements with the centres of excellence and specialist technical advisers supporting MAR maintenance.

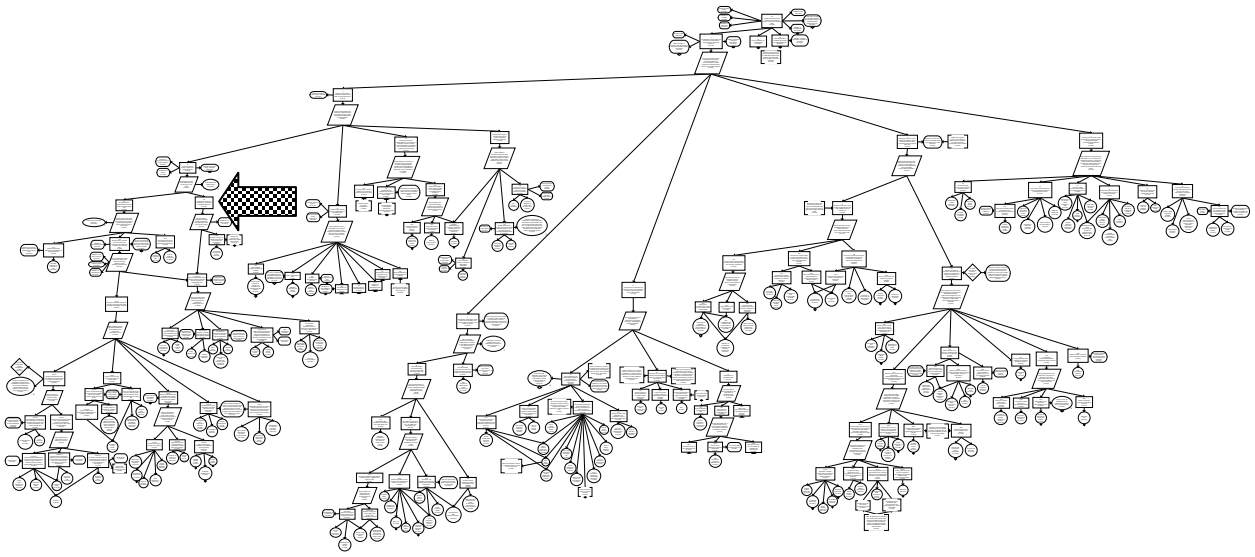
SOLUTION (GOAL 1113): PHASED HANDOVER ARRANGEMENTS

A staff handover period ensured that competent staff were transferred and that new competent staffs were fully briefed before taking up their duties. The FMk2/FMk3 MAR manager was transferred from DPA to DLO, and the nominated GR1/GR4 DLO MAR manager was detached to work with the DPA team, prior to transfer of responsibility to DLO.

1.10 Post 4th TSMP changes safe (Goal 112)



Location within Safety Case



Goal 112: Configuration changes to air vehicle, post 4th TSMP are appropriately safe

Strategy (Goal 112): *Argue by effective control and integration of GFE, directed CFE and appropriate control of air vehicle changes*

Context (Goal 112): *Definition of "air vehicle changes"*

These design changes comprise:

all designer modifications undertaken by Panavia, Turbo Union and Mauser under the tri-national PDS and PDT contracts managed via NETMA

all changes to Directed CFE

all changes to GFE (including NAMMA/NETMA furnished equipment)

all UK service engineered changes in the form of STFs, SEMs and SI(T)s which form part of the MAR

Goal 1122: Air vehicle changes are effectively controlled to ensure safety and airworthiness

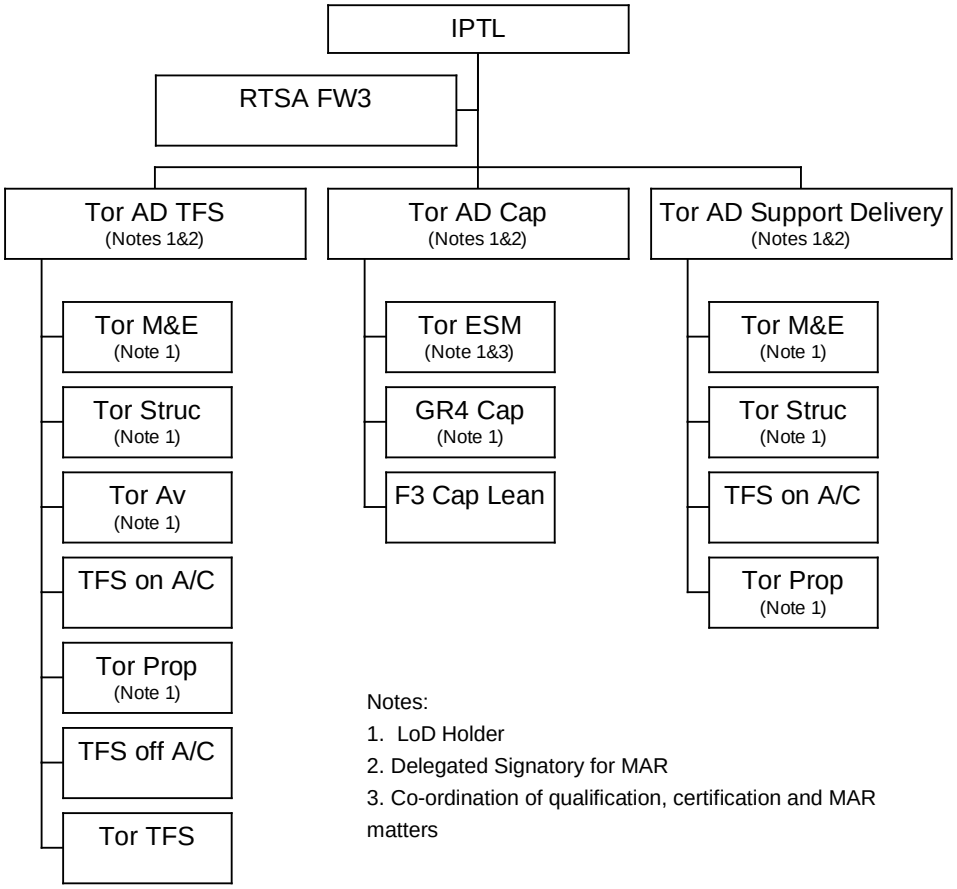
Notes (Goal 1122): *Changes are processed and controlled via TCCMP (see LI BS013)*

Decisions with airworthiness or safety implications are confined to those IPT members who hold specific delegations and competences iaw the requirements of ES(Air) BP 1206.

A management guide on MAR amendments is under consideration for those delegation holders with MAR responsibility.

The following diagram shows the current assignment of such responsibilities.

Tornado IPT - Airworthiness and Safety Responsibilities up to Apr 04



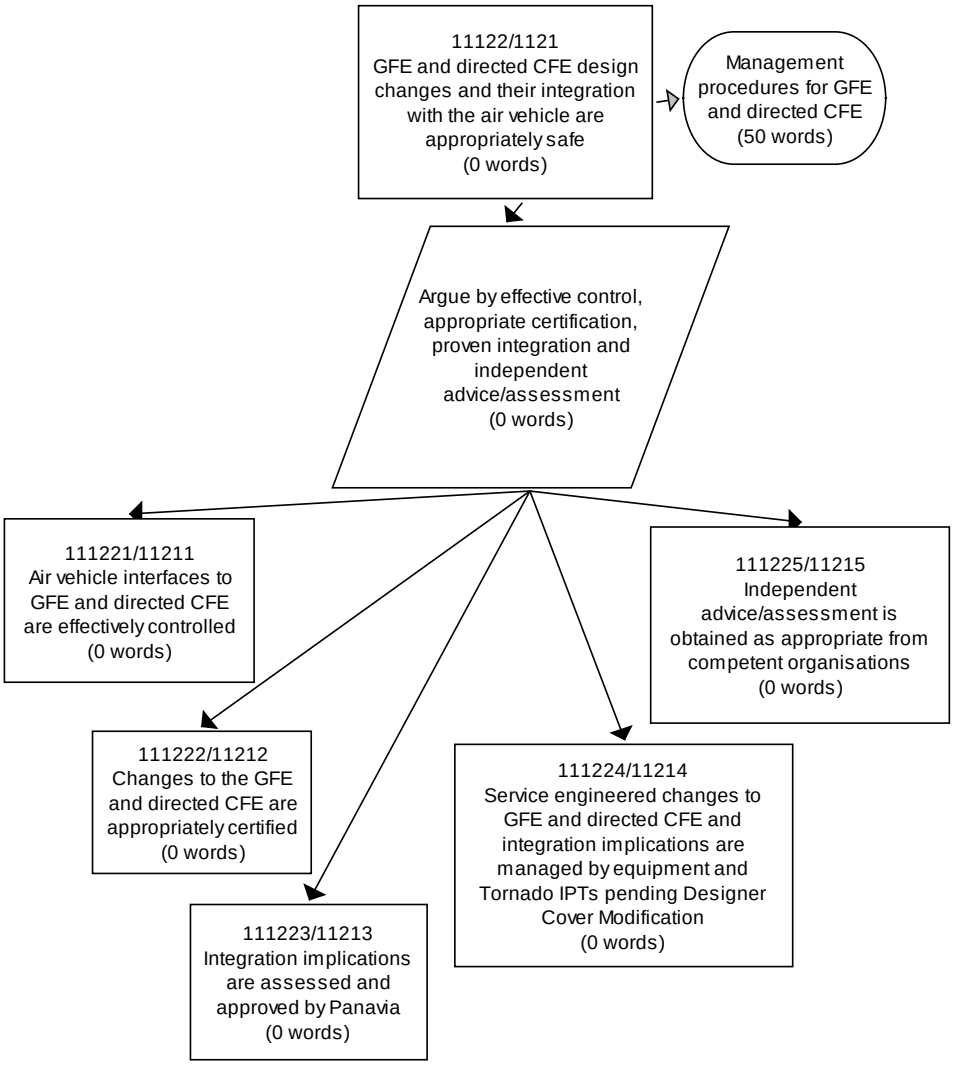
Node Status Development required to reference the above mentioned MAR amendment guide when it is completed and issued

SOLUTION (GOAL 1122): IPT CHANGE MANAGEMENT RECORDS

Comprehensive records of all intended and approved changes to UK aircraft standards are maintained by Tor ESM 3.

Additional records for all changes managed by the TMP are held by NETMA and the RPO at Warton maintains all change records relating to the UK PONO function.

1.11 GFE and directed CFE changes and integration safe (Goal 11122/1121)



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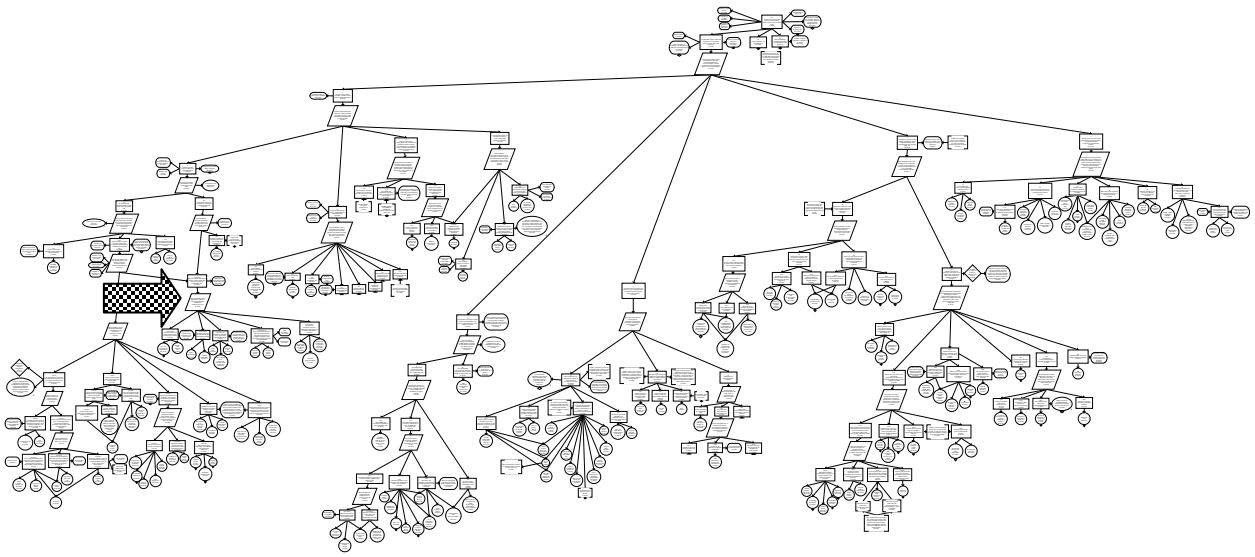


Goal 11122/1121: GFE and directed CFE design changes and their integration with the air vehicle are appropriately safe

Context (Goal 11122/1121): *Management procedures for GFE and directed CFE*

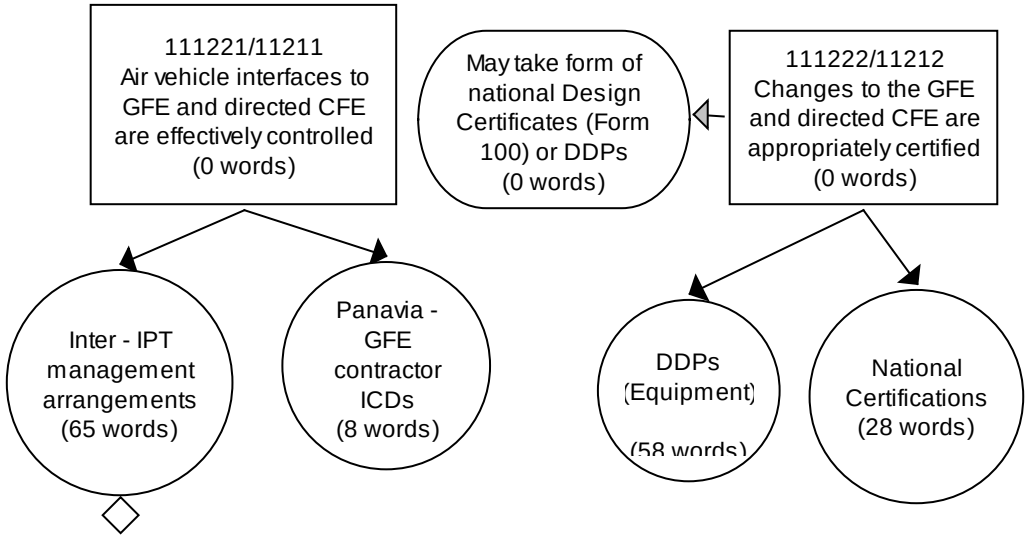
UK GFE is managed in accordance with Def Stan 05-123

NAMMA Furnished Equipment (NAMFE) (engines and gun) are managed in accordance with the Panavia (QFN01 and QFN 03) and TU procedures

Directed CFE - Combination of Def Stan 05-123 and Panavia procedures (QFN01/QFN03) as defined in procurement contracts

Strategy (Goal 11122/1121): *Argue by effective control, appropriate certification, proven integration and independent advice/assessment*

1.12 Air vehicle interfaces controlled and changes to GFE and directed CFE certified (Goals 111221/11211 and 111222/11212)



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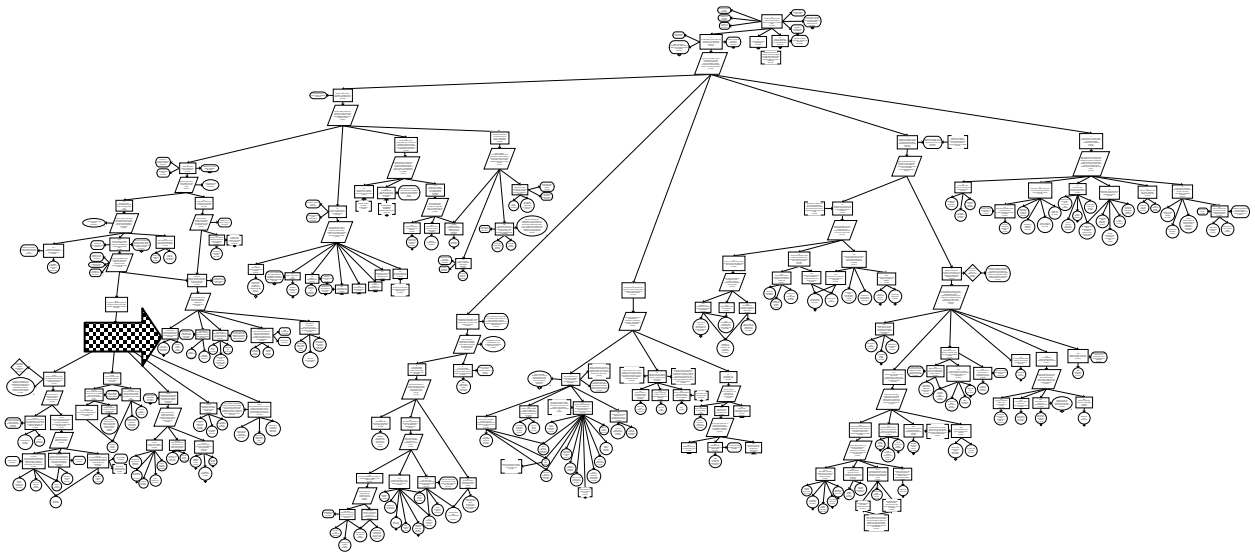


Goal 111221/11211: Air vehicle interfaces to GFE and directed CFE are effectively controlled

SOLUTION (GOAL 111221/11211): INTER - IPT MANAGEMENT ARRANGEMENTS

These have been primarily ad-hoc arrangements based upon legacy project arrangements initiated by the DPA and DLO inter-IPT working practices. Action is currently in hand to establish more formal arrangements and procedures via the establishment of inter-IPT Internal Business Agreements. Work on these arrangement is ongoing and full details will be provided in Annex D of the TESMP as they are completed.

Node Status: Development required to complete management arrangements

SOLUTION (GOAL 111221/11211): PANAVIA - GFE CONTRACTOR ICDS

These are as defined in the "Ghost" DDPs

Goal 111222/11212: Changes to the GFE and directed CFE are appropriately certified

Context Goal (111222/11212): *May take form of national Design Certificates (Form 100) or DDPs*

SOLUTION (GOAL 111222/11212): DDPS (EQUIPMENT)

For some GFE, Panavia or other forms of DDP may be used in place of Form 100 Design certificates.

Comprehensive records of all Panavia DDPs are held by NETMA. BAES retain records of all DDPs relevant to UK variants and further copies are held by the RPO at Warton in his role as NDAAR for the air vehicle.

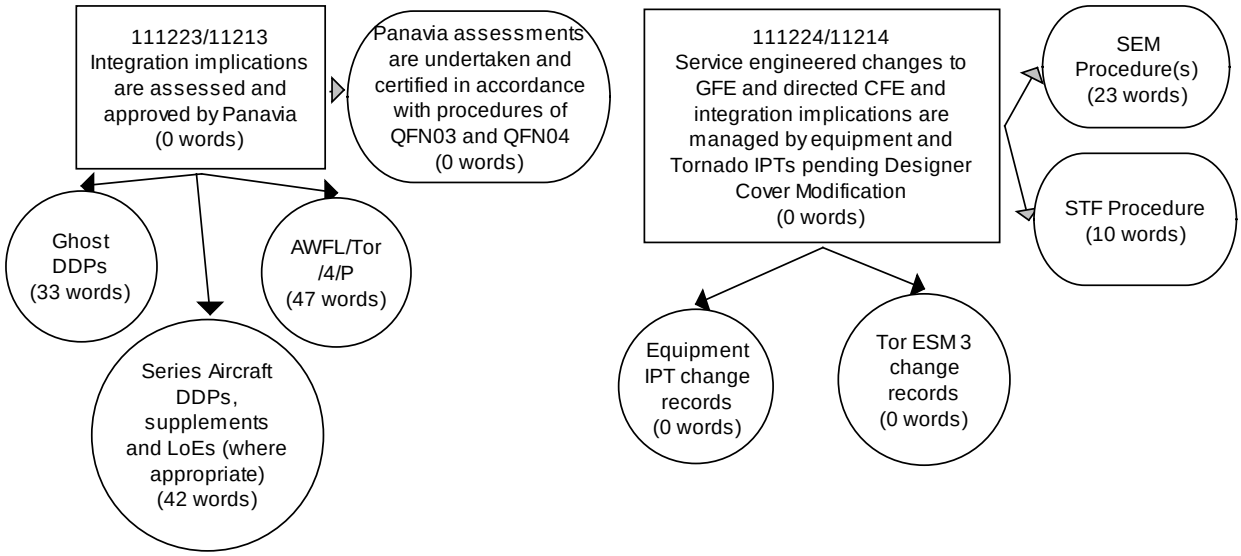
SOLUTION (GOAL 111222/11212): NATIONAL CERTIFICATIONS

These may take the form of:

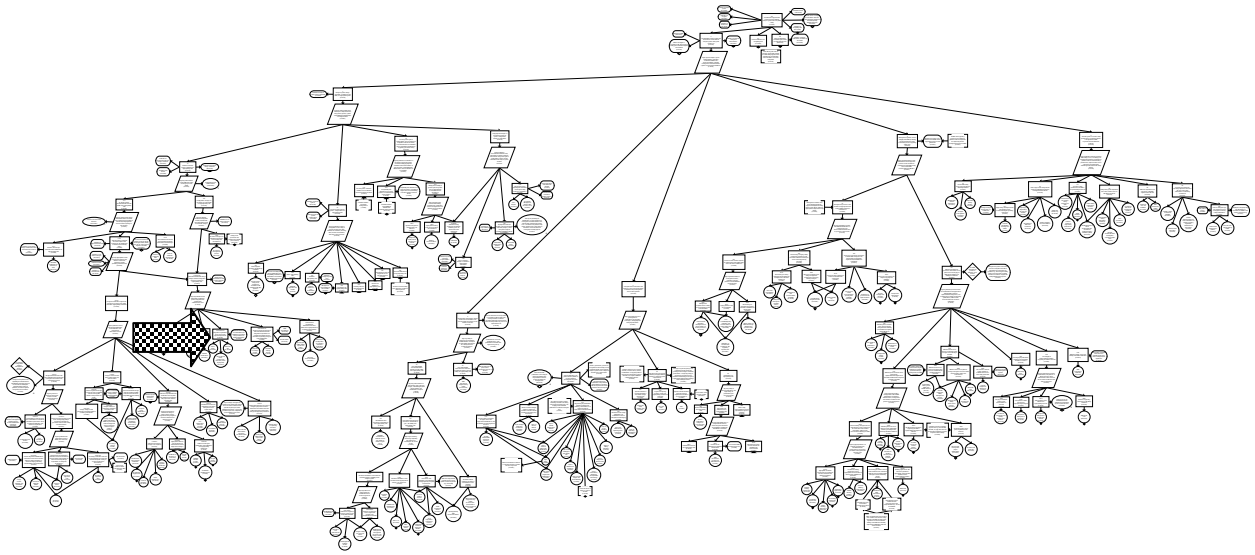
Software Release Statements - Managed and maintained by Tor Av

Form 100s & Guided Weapon Releases - Managed and retained by the responsible IPTs

1.13 Integration approved by Panavia and service engineered changes managed (Goals 111223/11213 and 111224/11214)



Location within Safety Case



Goal 111223/11213: Integration implications are assessed and approved by Panavia

Context (Goal 111223/11213): *Panavia assessments are undertaken and certified in accordance with procedures of QFN03 and QFN04*

SOLUTION (GOAL 111223/11213): GHOST DDPS

Prepared in accordance with the procedures of QFN03 and QFN04, these provide confirmation that Panavia has considered and is content with the integration of nationally certified equipments and systems with the air vehicle.

SOLUTION (GOAL 111223/11213): SERIES AIRCRAFT DDPS, SUPPLEMENTS AND LOES (WHERE APPROPRIATE)

These documents, prepared and maintained in accordance with the procedures of QFN03 and QFN 04, provide the basis for design acceptance and ongoing design change certification at the air vehicle level. Copies are maintained as part of the Tor ESM airworthiness database.

SOLUTION (GOAL 111223/11213): AWFL/TOR /4/P

This is prepared and maintained in accordance with the procedures as set out in Panavia QFN 01 and includes both the clean aircraft and all relevant store/weapon clearances. The document provides Panavia and QG confirmation of the safe integration and operating limitations for all cleared configurations.

Goal 111224/11214: Service engineered changes to GFE and directed CFE and integration implications are managed by equipment and Tornado IPTs pending Designer Cover Modification

Context (Goal 111224/11214): *SEM Procedure(s)*

SEMs were managed in accordance with AP 101B-4100-2(R)1 Leaflet 060, and are now managed in accordance with AP100B-04

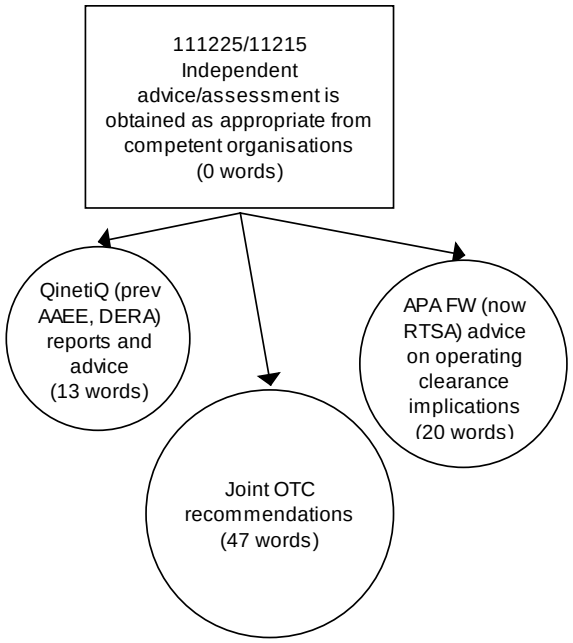
Context (Goal 111224/11214): *STF Procedure*

STFs are managed in accordance with AP100B-01 Order 1120

SOLUTION (GOAL 111224/11214): EQUIPMENT IPT CHANGE RECORDS

SOLUTION (GOAL 111224/11214): TOR ESM 3 CHANGE RECORDS

1.14 Independent assessments (Goal 111225/11215)



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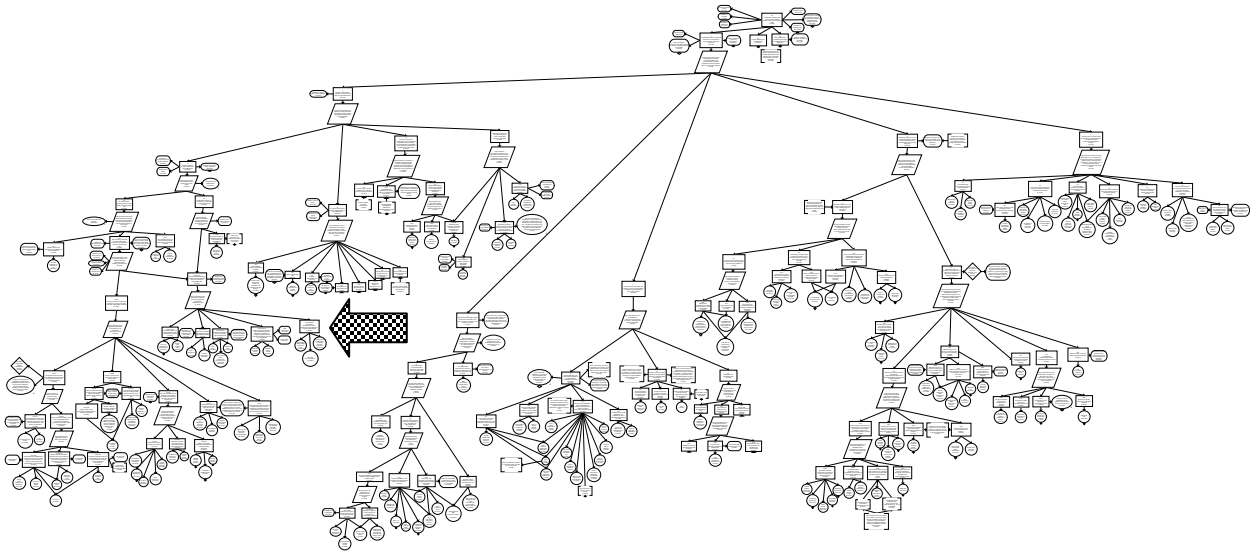


Goal 111225/11215: Independent advice/assessment is obtained as appropriate from competent organisations

SOLUTION (GOAL 111225/11215): QINETIQ (PREV AAEE, DERA) REPORTS AND ADVICE

Advice is provided in accordance with IPT tasks for support on MAR amendments

SOLUTION (GOAL 111225/11215): JOINT OTC RECOMMENDATIONS

Provided in accordance with:

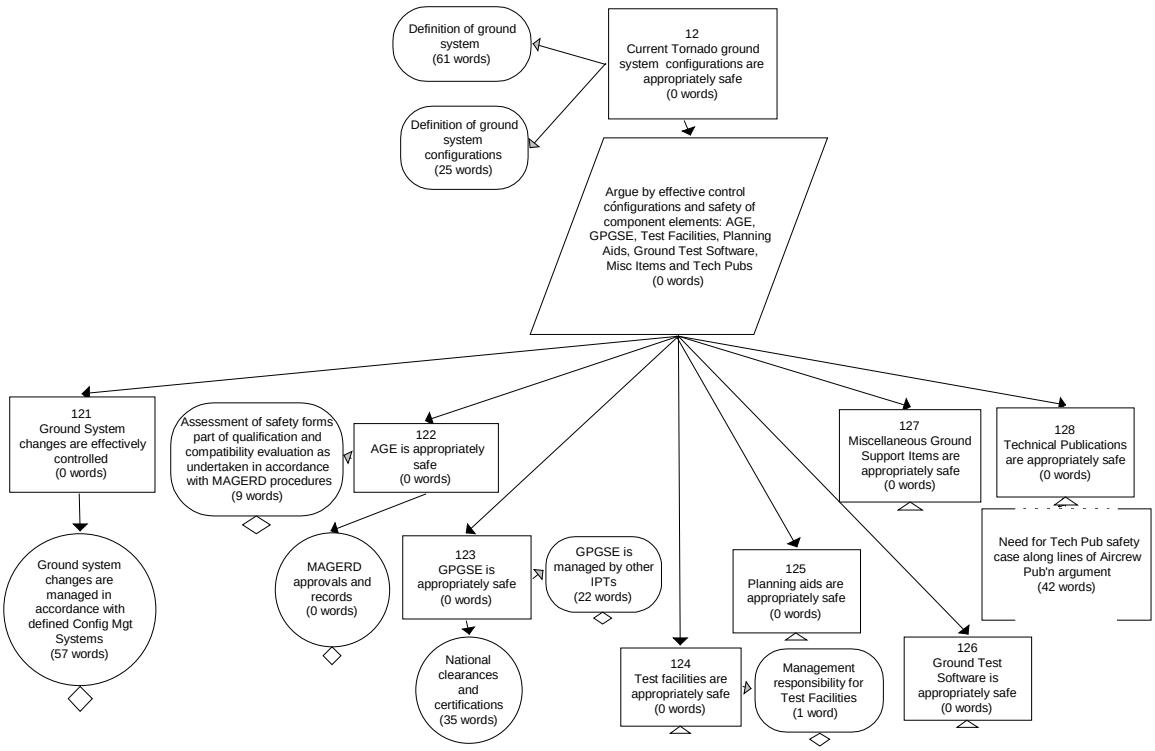
- "Co-ordination between the Official Test Centres on the Tornado Programme", reference OTC 2, dated February 1977.

- "The inclusion of clearances in the Nammo Release to Service and SRP/CWG revised ToR" reference T/33404/3656/13756/2000/NU, dated 8 May 2000

SOLUTION (GOAL 111225/11215): APA FW (NOW RTSA) ADVICE ON OPERATING CLEARANCE IMPLICATIONS

All changes to the MAR are reviewed with RTSA (prev APA FW) prior to submission for AD review and endorsement

1.15 Ground system configurations safe (Goal 12)



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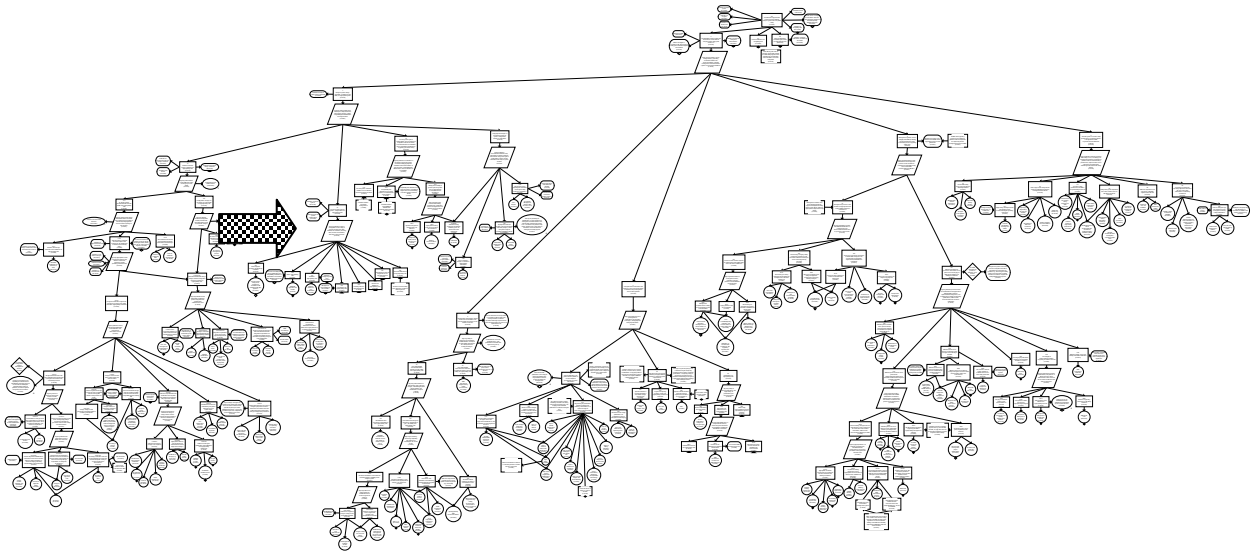


Goal 12: Current Tornado ground system configurations are appropriately safe

Context (Goal 12): *Definition of ground system*

The ground system embraces:

AGE (All project specific ground support equipment provided by Panavia, TU and Mauser and controlled via MAGERD procedure)

GPGSE (including GPTE, and all ground support equipment required to support GFE items such as weapons and stores)

Project specific test facilities e.g. MLU Enhanced Ground Test Facility

Ground Test Software (as resident in OFP or equipments)

Planning Aids (including TAMPA and Weapon Specific Planning Aids e.g. Storm Shadow, ALARM)

Miscellaneous support items e.g.Crypto Guns

Technical Publications (including Maintenance Procedures, Loading Procedures, General Equipment Descriptions as needed to ensure safe use of the system)

Context (Goal 12): *Definition of ground system configurations*

Special to type AGE, hand tools and test and measurement equipment (electrical) are defined in TOPIC 3C plus MAGERDS and LSS(AMDS) GSS drawing numbers.

Strategy (Goal 12): *Argue by effective control of configurations and safety of component elements: AGE, GPGSE, Test Facilities, Planning Aids, Ground Test Software, Misc Items and Tech Pubs*

Goal 121: Ground System changes are effectively controlled

SOLUTION (GOAL 121): GROUND SYSTEM CHANGES ARE MANAGED IN ACCORDANCE WITH DEFINED CONFIG MGT SYSTEMS

The relevant processes and procedures are as follows:

- AGE - UK TCCMP, TMP and MAGERD procedures
- GPGSE - *TBD*
- Test Facilities - *TBD*
- Ground Test Software - UK TCCMP and TMP
- Misc Items (e.g Crypto Gun) - *TBD*
- Tech Pubs - Air vehicle - UK TCCMP and TMP*
- Tech Pubs - GPGSE - *TBD* *
- TAMPA - *TBD*

* with periodic SME reviews of technical content iaw JAP(D) 100A-01, Chapter 8.1

Node Status Development required to identify and document the above configuration management arrangements

Goal 122: AGE is appropriately safe

Context (Goal 122): *Assessment of safety forms part of qualification and compatibility evaluation as undertaken in accordance with MAGERD procedures*

MAGERD - MRCA AGE Requirement Document

MAGERD Process Ref TBD

Node Status: Development required to identify and document the MAGERD management process

SOLUTION (GOAL 122): MAGERD APPROVALS AND RECORDS

Node Status: Development required to identify location or file references of MAGERD approvals and records

Goal 123: GPGSE is appropriately safe

Context (Goal 123): *GPGSE is managed by other IPTs*

Management arrangements with IPTs responsible for GPGSE are defined in Annex D of the TESMP (Note the IBAs are still under development)

Node Status: Development required to confirm that GPGSE management arrangements are adequately addressed within the IBAs and related arrangements

SOLUTION (GOAL 123): NATIONAL CLEARANCES AND CERTIFICATIONS

These will be maintained in accordance with Def Stan 05-123 or other relevant procedures as required by the responsible IPT.

The design and qualification standards will be documented in Form 100s or equivalent formats.

Goal 124: Test facilities are appropriately safe

Node Status: Instantiation required to show how this safety objective is achieved

Context (Goal 124): *Management responsibility for Test Facilities*

TBD

Node Status: Development required to identify and document the assignment of responsibility

Goal 125: Planning aids are appropriately safe

Node Status: Instantiation required to show how this objective is achieved

Goal 126: Ground Test Software is appropriately safe

Node Status: Instantiation required to show how this objective is achieved

Goal 127: Miscellaneous Ground Support Items are appropriately safe

Node Status: Instantiation required to show how this objective is achieved

Goal 128: Technical Publications are appropriately safe

Node Status: Instantiation required to show how this objective is achieved

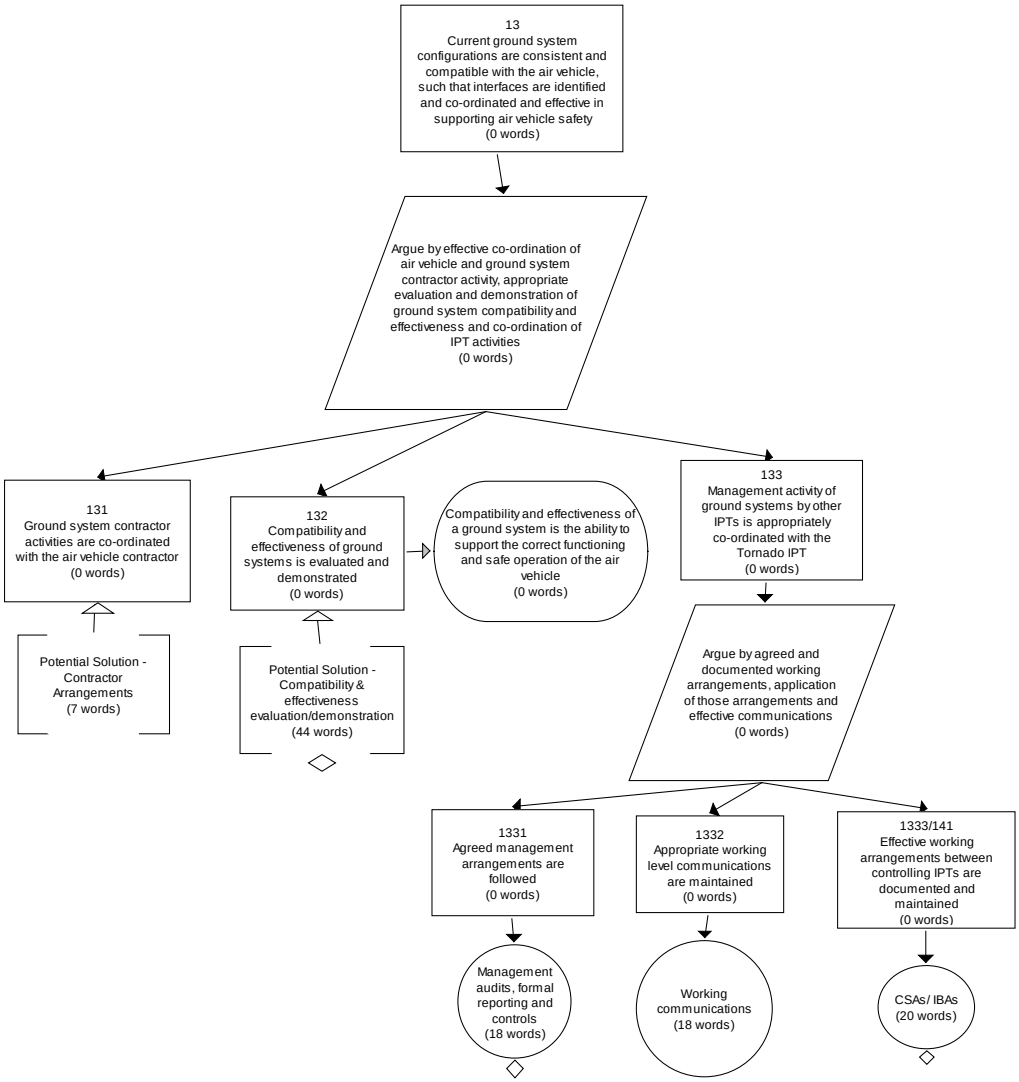
Notes (Goal 128): *Need for Tech Pub safety case along lines of Aircrew Pub'n argument*

This needs to cover:

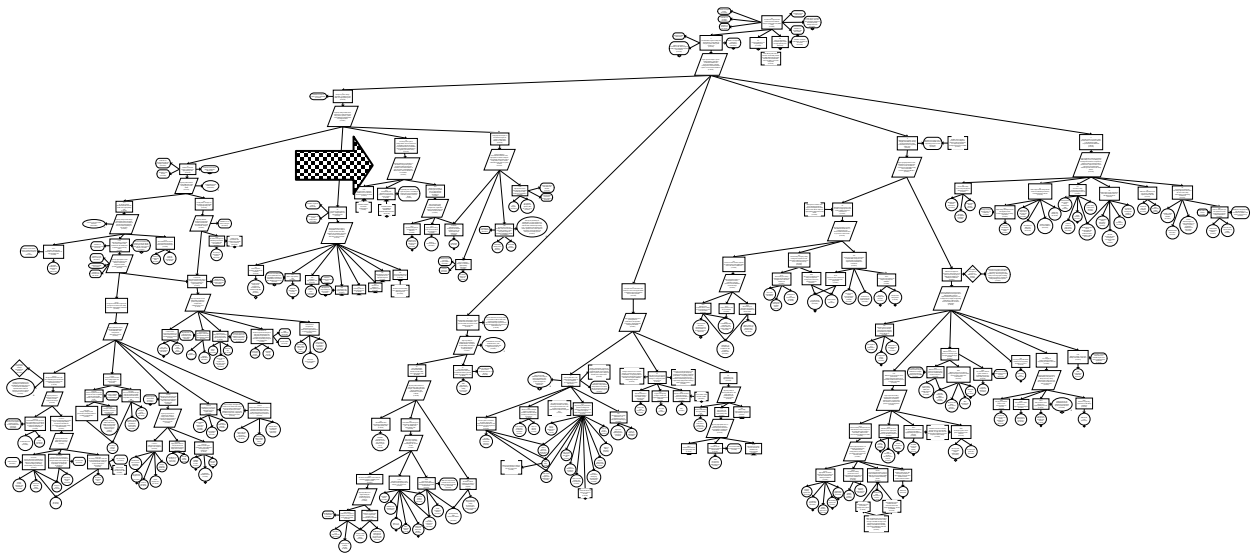
- *Competence of preparing organisation*
- *Independent validation*
- *Timely issue, co-ordinated with introduction of changes into service use*
- *Timely promulgation (via Llangennech) to be in hands of users when needed.*

Most challenging aspect may be management of TP changes related to S/W updates that can be progressed more rapidly than the publications. Move to CD TPs may help in this respect if overall process and controls are in place

1.16 Ground system and air vehicle configurations compatible (Goal 13)



Location within Safety Case



Goal 13: Current ground system configurations are consistent and compatible with the air vehicle, such that interfaces are identified and co-ordinated and effective in supporting air vehicle safety

Strategy (Goal 13): *Argue by effective co-ordination of air vehicle and ground system contractor activity, appropriate evaluation and demonstration of ground system compatibility and effectiveness and co-ordination of IPT activities*

Goal 131: Ground system contractor activities are co-ordinated with the air vehicle contractor

Node Status: Instantiation required to show how this safety objective is achieved

Notes (Goal 131): *Potential Solution - Contractor Arrangements*

This should embrace all Interface Control Documents.

Goal 132: Compatibility and effectiveness of ground systems is evaluated and demonstrated

Node Status: Instantiation required to show how this safety objective is achieved

Context (Goal 132): *Compatibility and effectiveness of a ground system is the ability to support the correct functioning and safe operation of the air vehicle*

Notes (Goal 132): *Potential Solution - Compatibility & effectiveness evaluation/demonstration*

For AGE this should be covered by MAGERD Part F

EA or AEDIT project teams may address other items

Areas that need to be investigated further include:

Co-ord of OFP changes (Panavia and TISMT) with Weapon Loading and Maintenance Procedure Tech Authors e.g for the Topic 5A6.

Need to establish effective management control of peculiar items such as TIALD Test Set (Originally DERA Dev't)

Need for independent assessment to complement contractor and IPT evaluations

Node Status: Development required to clarify above areas of uncertainty and to document final argument/evidence in support of safety case

Goal 133: Management activity of ground systems by other IPTs is appropriately co-ordinated with the Tornado IPT

Strategy (Goal 133): *Argue by agreed and documented working arrangements, application of those arrangements and effective communications*

Goal 1331: Agreed management arrangements are followed

SOLUTION (GOAL 1331): MANAGEMENT AUDITS, FORMAL REPORTING AND CONTROLS

These embrace:

- Internal and external audits of IPTs
- Reporting to FWAMG and other relevant bodies
- Line management oversight

Node Status: Development required to establish and document the processes/arrangements

Goal 1332: Appropriate working level communications are maintained

SOLUTION (GOAL 1332): WORKING COMMUNICATIONS

These include informal contacts, participation in reviews, safety panels and exchange of data via HIRF and other means

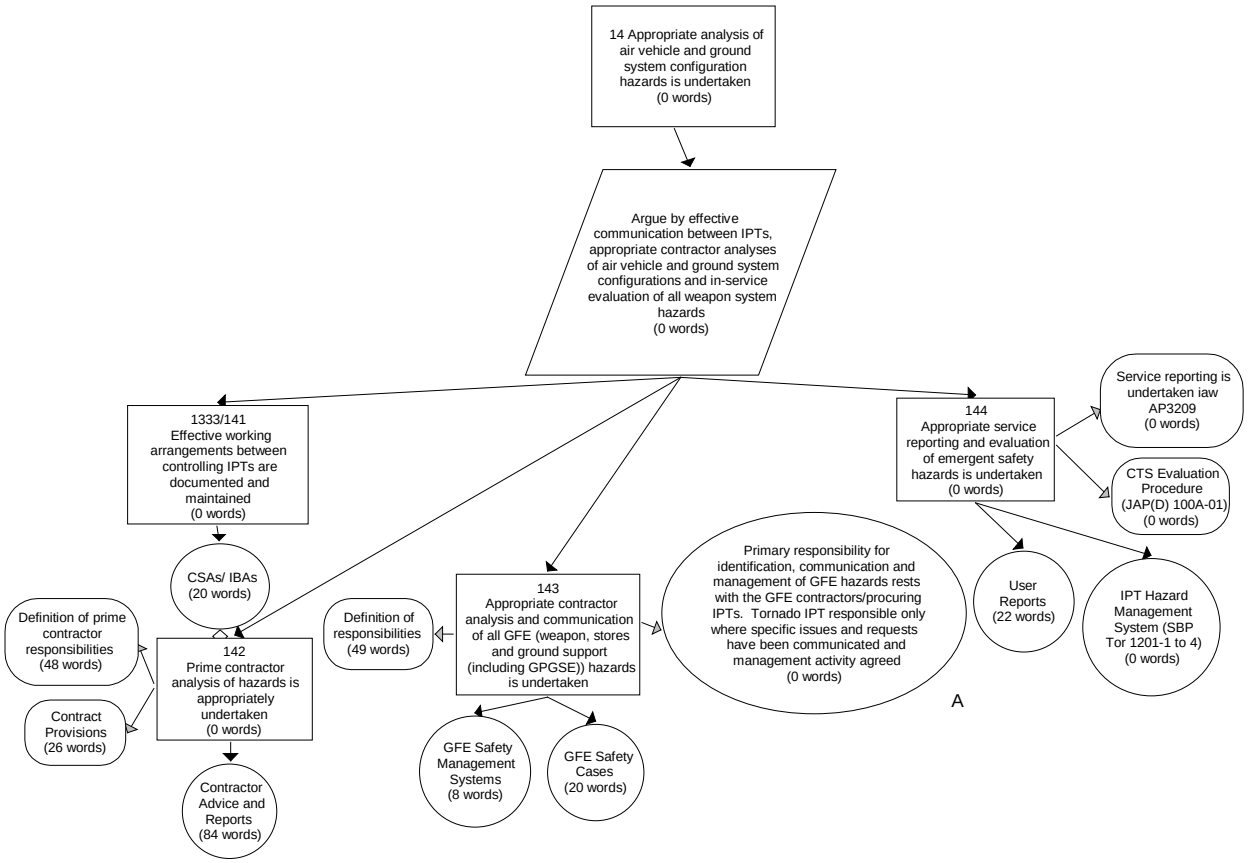
Goal 1333/141: Effective working arrangements between controlling IPTs are documented and maintained

SOLUTION (GOAL 1333/141): CSAS/ IBAS

For references see Annex D to TESMP. *Note these are still in preparation - Target date for completion - start of STP04*

Node Status: Development required to establish that these agreements provide the required solution

1.17 Analysis of air vehicle and ground system configuration hazards (Goal 14)



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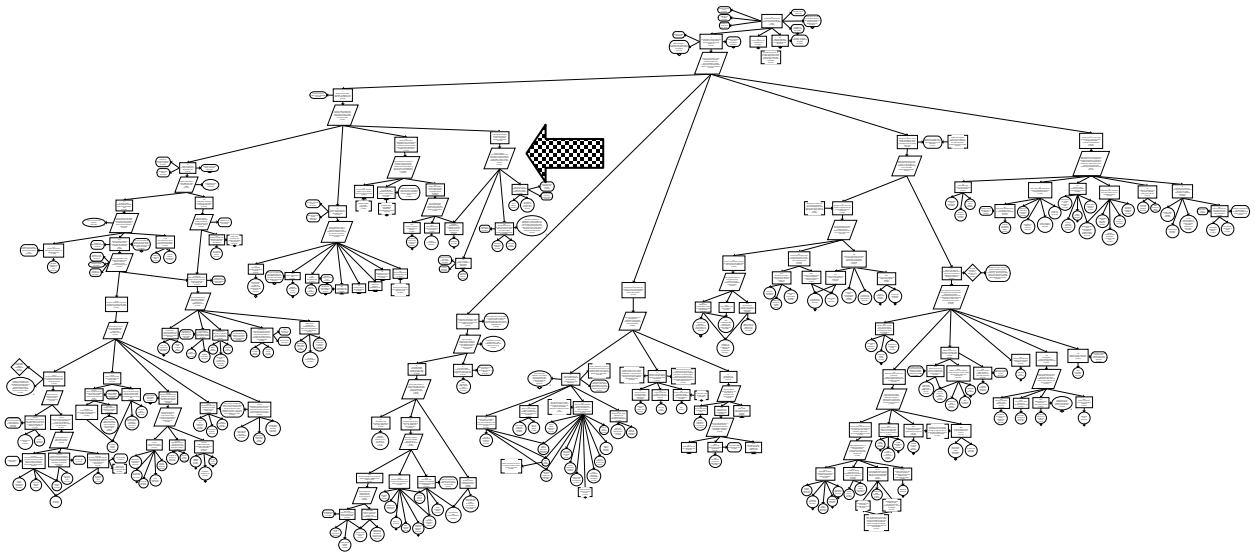


Goal 14 Appropriate analysis of air vehicle and ground system configuration hazards is undertaken

Strategy (Goal 14): *Argue by effective communication between IPTs, appropriate contractor analyses of air vehicle and ground system configurations and in-service evaluation of all weapon system hazards*

Goal 142: Prime contractor analysis of hazards is appropriately undertaken

Context (Goal 142): *Definition of prime contractor responsibilities*

Hazard analysis responsibilities embrace: all on-aircraft hazards stemming from design, manufacture, procurement, integration and support and in-Service use of the weapon system and any off-aircraft hazards associated with those elements of the ground support system furnished by the prime contractors (Panavia, Turbo Union and Mauser).

Context (Goal 142): *Contract Provisions*

Contract cover with Panavia, TU and Mauser is maintained via the NETMA In Service Support contracts.

Panavia activity is undertaken via PDT 1510 Sub Task 001

SOLUTION (GOAL 142): CONTRACTOR ADVICE AND REPORTS

Information is provided via a number of channels including:

- Panavia Service Release Recommendations
- Airworthiness Flight Limitations (AWFLs)
- Modification Screening Forms
- RR Red Tops and Green Tops
- System Safety Analyses and Reports

In addition the contractors provide periodic reports to NETMA/Nations and the IPT via inputs to the QG, RAM, QSG(Engine) and Structural Monitoring Group.

Contract cover for routine activity is maintained via TESP 9.

Occasional tasks have been placed with Panavia for structured analysis of emergent experience (e.g. PDT 1230-ST01 UK Airworthiness Requirements for Tornado). This provided a numerical analysis of the RAF fleet safety statistics over the period from 1980 to Sept 1996 together with a review of the subsequent recommendations and follow-up actions.

More recently. PDT 1510 Sub Task 001 has been placed on Panavia for the creation and maintenance of a comprehensive accident and incident database

Goal 143: Appropriate contractor analysis and communication of all GFE (weapon, stores and ground support (including GPGSE)) hazards is undertaken

Assumption (Goal 143): *Primary responsibility for identification, communication and management of GFE hazards rests with the GFE contractors/procuring IPTs. Tornado IPT responsible only where specific issues and requests have been communicated and management activity agreed*

Context (Goal 143): *Definition of responsibilities*

GFE contractors are responsible for the identification of all on and off-aircraft hazards.

On-aircraft hazards are to be communicated to the prime/integrating contractor. Off-aircraft hazards are to be communicated to and managed in conjunction with the procuring/in-Service support IPT for the GFE item.

SOLUTION (GOAL 143): GFE SAFETY MANAGEMENT SYSTEMS

For references of other IPT SMPs see TESMP

SOLUTION (GOAL 143): GFE SAFETY CASES

These safety cases are maintained by the IPTs responsible for procurement and in-Service support of the respective GFE items

Goal 144: Appropriate service reporting and evaluation of emergent safety hazards is undertaken

Context (Goal 144): *Service reporting is undertaken iaw AP3209*

Context (Goal 144): *CTS Evaluation Procedure (JAP(D) 100A-01)*

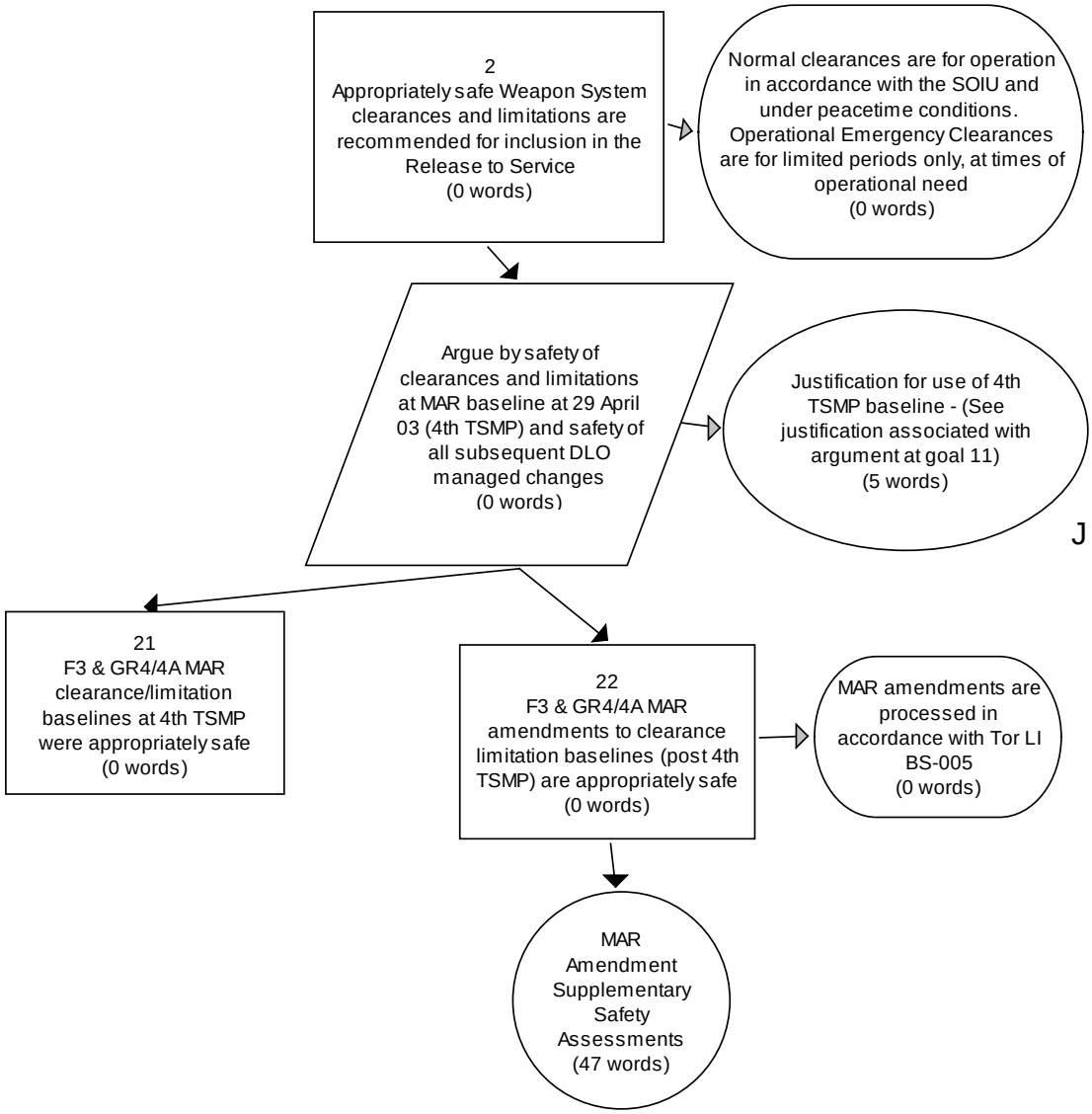
SOLUTION (GOAL 144): USER REPORTS

User feedback on hazardous occurrences are provided via various channels including:

- Incident/Accident reports
- Serious Fault Signals
- Defect Reports (MoD Form 760)

SOLUTION (GOAL 144): IPT HAZARD MANAGEMENT SYSTEM (SBP TOR 1201-1 TO 4)

2 Section 2: Safe clearances and limitations (Goal 2)



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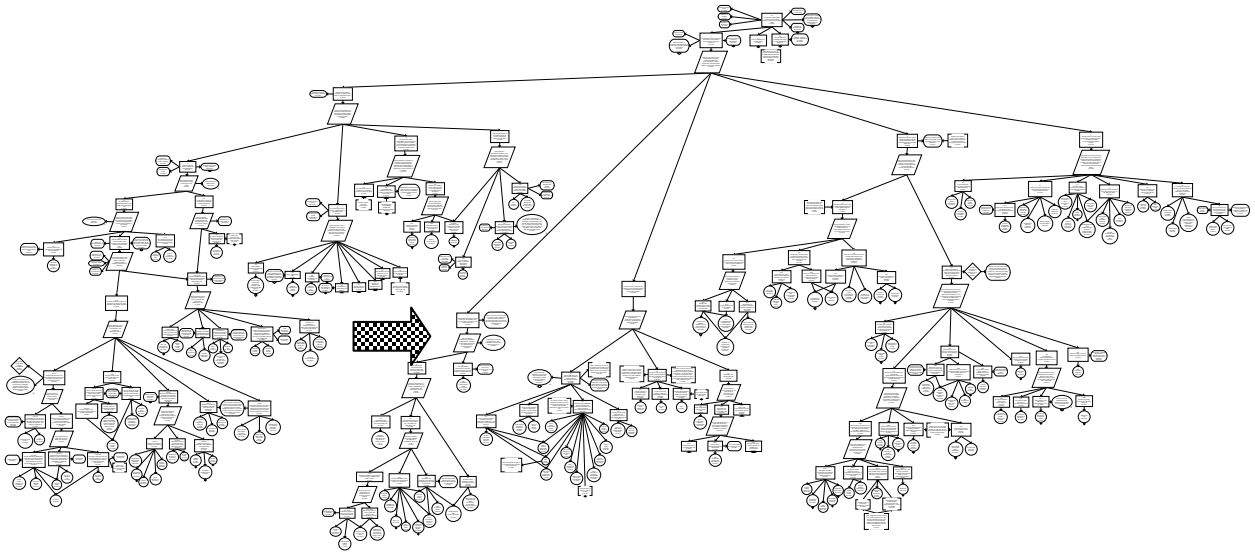


Goal 2: Appropriately safe Weapon System clearances and limitations are recommended for inclusion in the Release to Service

Context (Goal 2): *Normal clearances are for operation in accordance with the SOIU and under peacetime conditions. Operational Emergency Clearances are for limited periods only, at times of operational need*

Strategy (Goal 2): *Argue by safety of clearances and limitations at MAR baseline at 29 April 03 (4th TSMP) and safety of all subsequent DLO managed changes*

Justification (Goal 2): *Justification for use of 4th TSMP baseline - (See justification associated with argument at goal 11)*

Goal 22: F3 & GR4/4A MAR amendments to clearance limitation baselines (post 4th TSMP) are appropriately safe

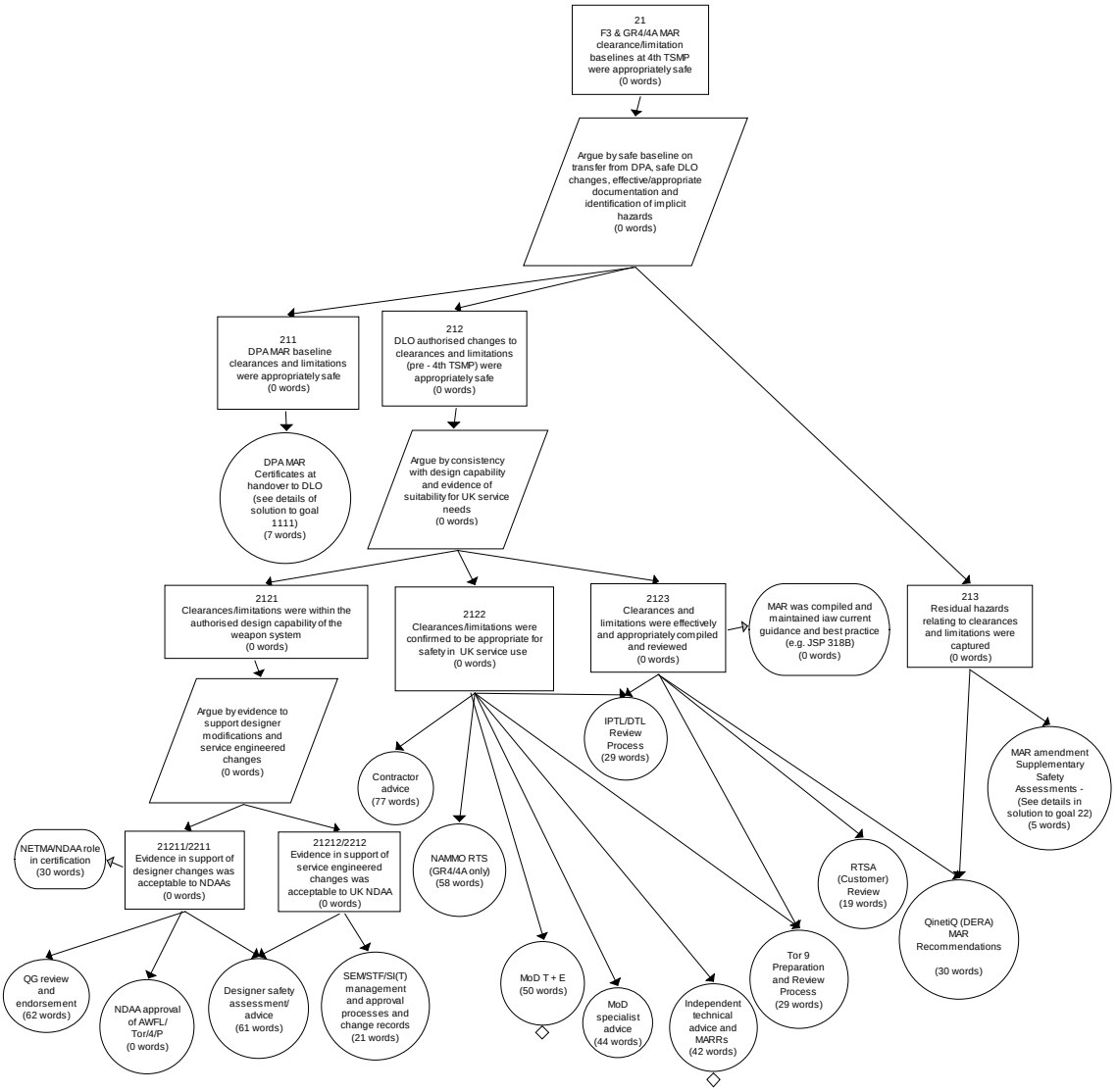
Context (Goal 22): *MAR amendments are processed in accordance with Tor LI BS-005*

SOLUTION (GOAL 22): MAR AMENDMENT SUPPLEMENTARY SAFETY ASSESSMENTS

These assessments constitute the documented safety case for the amendment and are maintained within the MAR amendment folder to provide part of the formal audit trail.

All information supporting each MAR amendment is maintained by Tor ESM 1 to form the airworthiness audit trail for the MAR.

2.1 4th TSMP clearance/limitation baselines safe (Goal 21)



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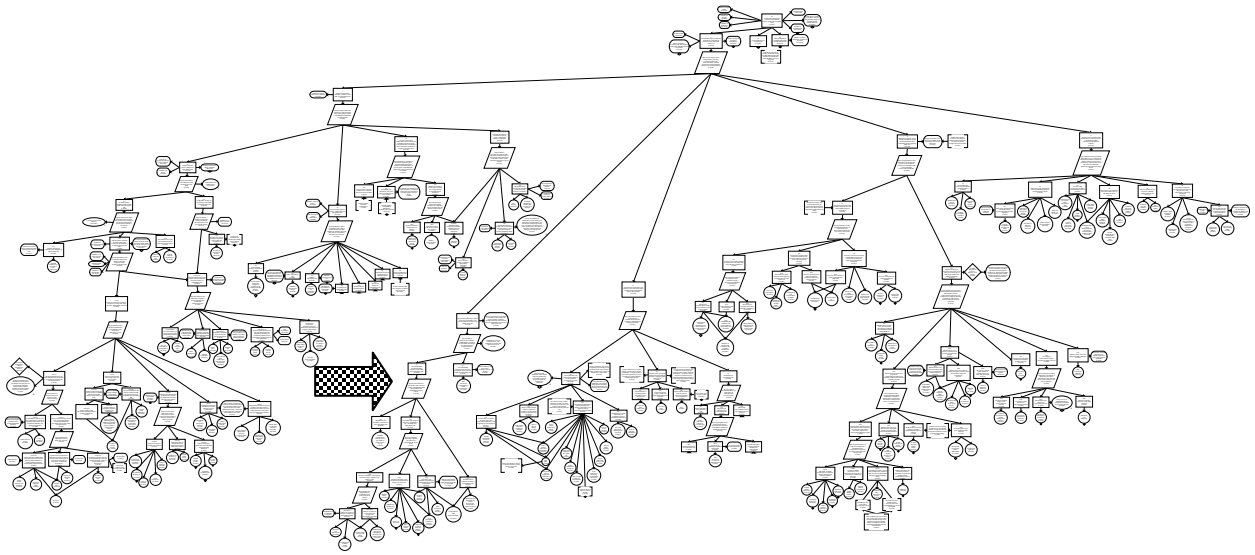


Goal 21: F3 & GR4/4A MAR clearance/limitation baselines at 4th TSMP were appropriately safe

Strategy (Goal 21): *Argue by safe baseline on transfer from DPA, safe DLO changes, effective/appropriate documentation and identification of implicit hazards*

Goal 211: DPA MAR baseline clearances and limitations were appropriately safe

SOLUTION (GOAL 211): DPA MAR CERTIFICATES AT HANDOVER TO DLO (SEE DETAILS OF SOLUTION TO GOAL 1111)

Goal 212: DLO authorised changes to clearances and limitations (pre - 4th TSMP) were appropriately safe

Strategy (Goal 212): *Argue by consistency with design capability and evidence of suitability for UK service needs*

Goal 2121: Clearances/limitations were within the authorised design capability of the weapon system

Strategy (Goal 2121): *Argue by evidence to support designer modifications and service engineered changes*

Goal 21211/2211: Evidence in support of designer changes was acceptable to NDAAs

Context (Goal 21211/2211): *NETMA/NDAA role in certification*

Official roles and responsibilities in design and flight certification are as defined in the Panavia QFN01, QFN03 and QFN04 documents and the NETMA ToRs for the QG and QSG(Engine)

SOLUTION (GOAL 21211/2211): QG REVIEW AND ENDORSEMENT

It is essential to note that QG approval requires only that an acceptable Panavia certification has been prepared, confirming that project design safety standards have been achieved and that the aircraft meet the minimum specification and national airworthiness criteria. Other factors essential to confirming safety and acceptability of use in RAF service are addressed before approval of MAR and Release to Service.

SOLUTION (GOAL 21211/2211): NDAA APPROVAL OF AWFL/TOR/4/P

SOLUTION GOAL (21211/2211): DESIGNER SAFETY ASSESSMENT/ ADVICE

For designer changes, the safety assessments are as documented in the IDS and ADV Series Aircraft DDPs and subsequent qualification/certification packs submitted in support of all post production modifications. In some cases this may be be sufficient to demonstrate that MAR safety standards can be achieved. For more substantive changes with implications for UK service use, additional evidence and independent assessment is required, to confirm fitness for use.

For service engineered changes the designer input is limited to advice on the potential compatibility with existing design baselines and ongoing designer change. This advice is obtained as part of the RAF management process for such service initiated changes.

Goal 21212/2212: Evidence in support of service engineered changes was acceptable to UK NDAA

SOLUTION (GOAL 21212/2212): SEM/STF/SI(T) MANAGEMENT AND APPROVAL PROCESSES AND CHANGE RECORDS

These comprise the extant RAF management processes as set out in APs and the change records held by Tor ESM 3

Goal 2122: Clearances/limitations were confirmed to be appropriate for safety in UK service use

SOLUTION (GOAL 2122): CONTRACTOR ADVICE

For some of the more significant design changes Panavia may have submitted proposals for appropriate conditions of in-service use that can be considered alongside advice from the official test centres and national specialists. These are generically regarded as Panavia Service Release Recommendations (Pan SRR).

There is no common definition, format or layout showing what constitutes Pan SRR, but Pan SRR are deemed to exist at a point in time where the company declares that it has undertaken all activities necessary in order to issue clearance recommendations for the product. Pan SRR is deemed to be supported by the collection of all reports/evidence necessary to support a company clearance. In simple cases this may be an AWFL amendment, Letter of Exception update or OEC advice. Where major system updates are being cleared, it is usual for the overarching company report to be entitled the Pan SRR.

SOLUTION (GOAL 2122): NAMMO RTS (GR4/4A ONLY)

For design changes that have been undertaken under the ongoing tri-national programme, advice may be provided by the joint OTCs and issued in the form of an amendment to the NAMMO RTS in accordance with the procedures set out in "The inclusion of clearances in the NAMMO Release to Service" reference: T/33404/3656/13756/2000/NU

SOLUTION (GOAL 2122): MOD T + E

Comprises all legacy work carried out by DERA and precursor organisations.

[All data records are now maintained via QinetiQ in accordance with the requirements defined in .....] - There is a need to check/confirm that explicit project taskings are in place for the through-life maintenance and retention of these records.

Node Status: Development required to confirm and document arrangements for retention of T&E records as part of airworthiness database.

SOLUTION (GOAL 2122): MOD SPECIALIST ADVICE

Specialist organisations and centres of excellence (See JSP 318B - now 553 Annex I) provided support as required to the project. For example:

- DOSG (advice usually accessed via the ALM IPT)
- DPA Armament Specialists (TEACASE, Weapon Ballistics, Self Damage)
- D Log Support - CTS System Support Group and Propulsion Support Group.

Advice or support was requested by change project managers as part of their change assessment and MAR amendment preparation activities.

SOLUTION (GOAL 2122): INDEPENDENT TECHNICAL ADVICE AND MARRS

The primary source of this advice was QinetiQ and its precursor organisations. MARRs were provided iaw specific tasking requests from the IPT in accordance with .....

NOTE: Ideally this should refer to a standard definition of criteria for assessment/recommendations - Does this exist?

Node Status: Development required to identify task definition and criteria

SOLUTION (GOAL 2122): TOR 9 PREPARATION AND REVIEW PROCESS

On initial assumption of MAR management responsibility from the DPA, Tor 9 practices were based upon legacy DPA processes. The practices are now documented and maintained via LI-BS005

SOLUTION (GOAL 2122): IPTL/DTL REVIEW PROCESS

On initial assumption of MAR management responsibility from the DPA, DLO review practice was based upon legacy DPA processes. The practices are now documented and maintained via LI-BS005

Goal 2123: Clearances and limitations were effectively and appropriately compiled and reviewed

Context (Goal 2123): *MAR was compiled and maintained iaw current guidance and best practice (e.g. JSP 318B)*

SOLUTION (GOAL 2123): RTSA (CUSTOMER) REVIEW

Working level reviews with the customer form part of all MAR amendment activities and are defined in LI-BS005

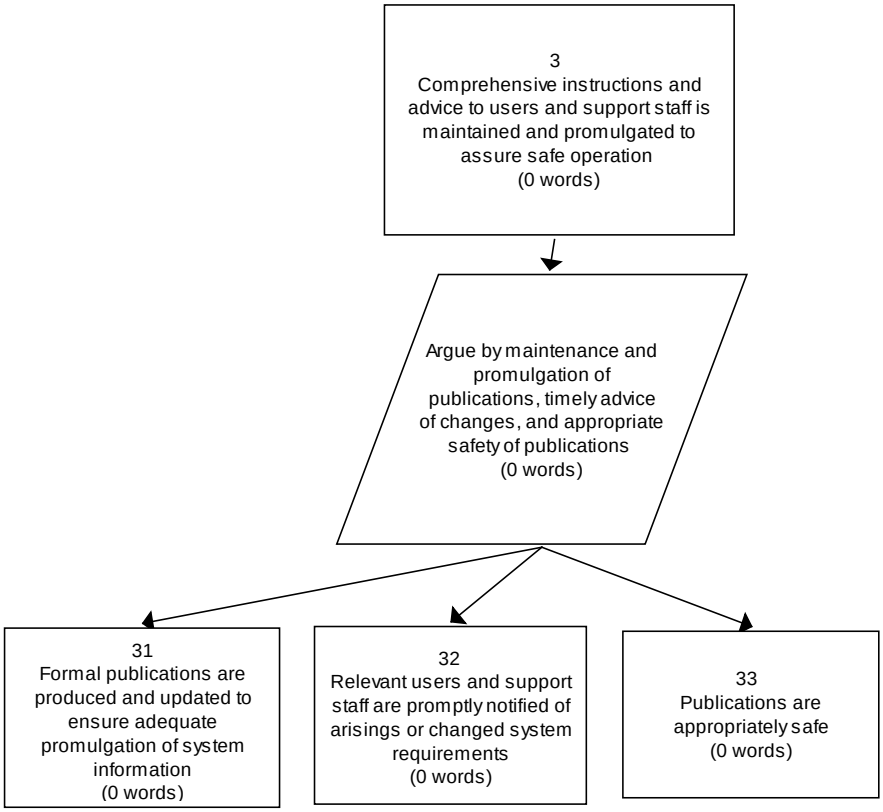
SOLUTION (GOAL 2123): QINETIQ (DERA) MAR RECOMMENDATIONS

MAR assessments and recommendations are produced by QinetiQ (prev DERA) under specific taskings from the IPT and form part of the evidence base for all substantive amendments to the MAR.

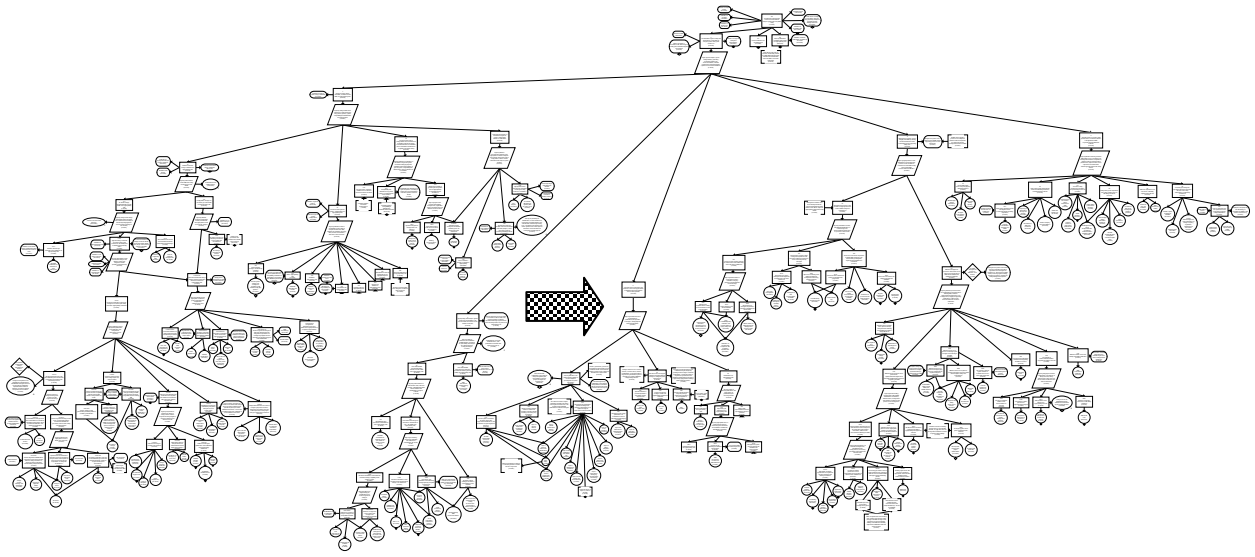
Goal 213: Residual hazards relating to clearances and limitations were captured

SOLUTION (GOAL 213): MAR AMENDMENT SUPPLEMENTARY SAFETY ASSESSMENTS - (SEE DETAILS IN SOLUTION TO GOAL 22)

3 Section 3: Instructions and advice to users (Goal 3)



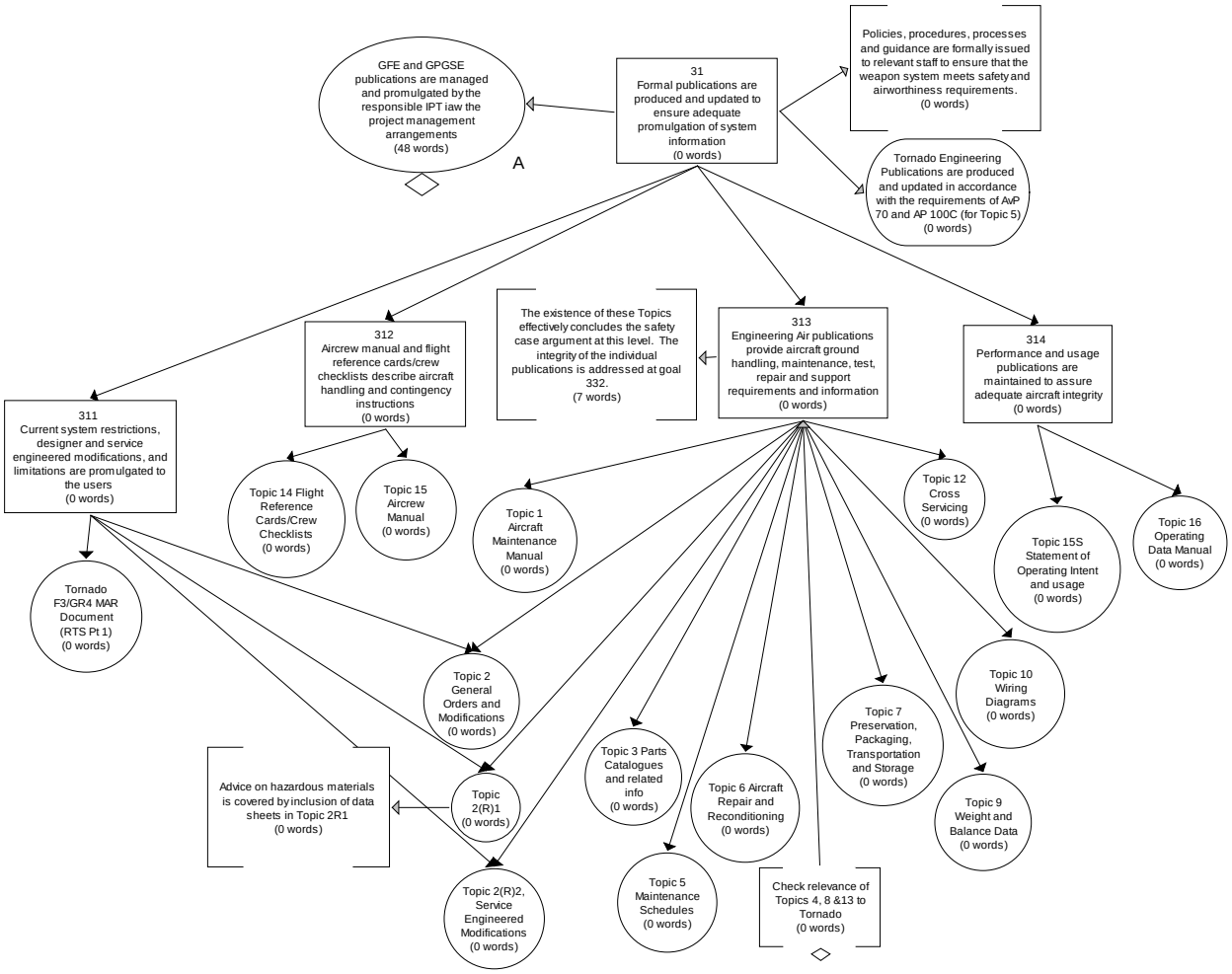
Location within Safety Case



Goal 3: Comprehensive instructions and advice to users and support staff is maintained and promulgated to assure safe operation

Strategy (Goal 3): *Argue by maintenance and promulgation of publications, timely advice of changes, and appropriate safety of publications*

3.1 Formal Publications (Goal 31)



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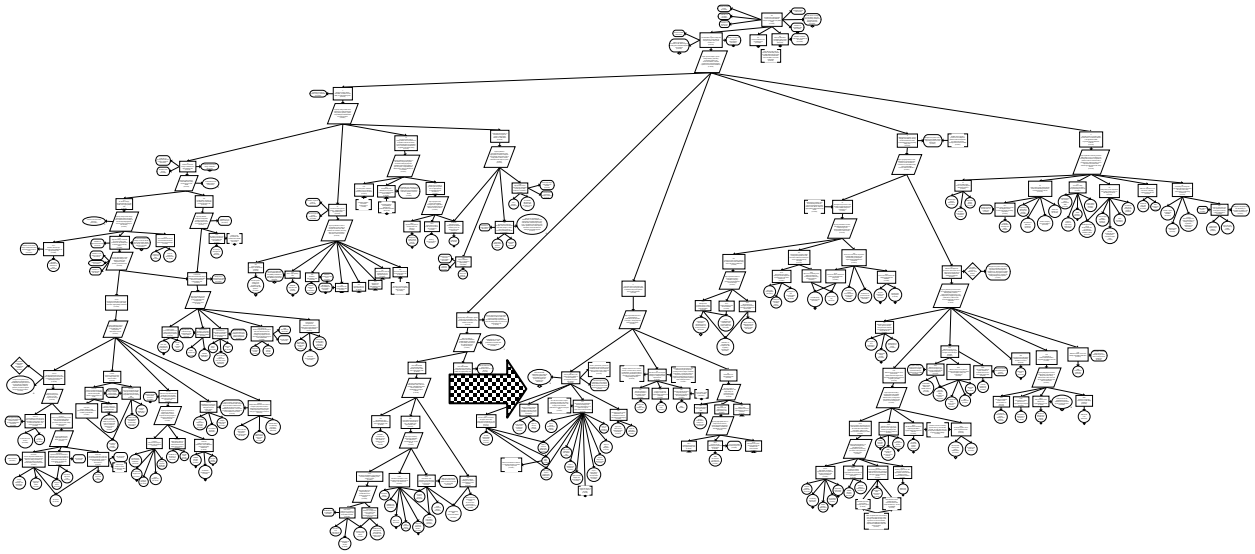


Goal 31: Formal publications are produced and updated to ensure adequate promulgation of system information

Assumption (Goal 31): *GFE and GPGSE publications are managed and promulgated by the responsible IPT iaw the project management arrangements*

Implicit to this assumption is that GFE and GPSE IPTs maintain the publications consistent with the needs and evolving standards and operating practices of the Tornado Weapon System

The requirements for this need to be clearly established via the intended CSAs/IBAs with other IPTs and safety contributors

Node Status: Development required to ensure that the above agreements fully cover this aspect

Notes (Goal 31): *Policies, procedures, processes and guidance are formally issued to relevant staff to ensure that the weapon system meets safety and airworthiness requirements.*

Context (Goal 31): *Tornado Engineering Publications are produced and updated in accordance with the requirements of AvP 70 and AP 100C (for Topic 5)*

Goal 311: Current system restrictions, designer and service engineered modifications, and limitations are promulgated to the users

SOLUTION (GOAL 311): TORNADO F3/GR4 MAR DOCUMENT (RTS PT 1)

SOLUTION (GOAL 311): TOPIC 2 GENERAL ORDERS AND MODIFICATIONS

SOLUTION (GOAL 311): TOPIC 2(R)1

Notes (Goal 311): *Advice on hazardous materials is covered by inclusion of data sheets in Topic 2R1*

SOLUTION (GOAL 311): TOPIC 2(R)2, SERVICE ENGINEERED MODIFICATIONS

Goal 312: Aircrew manual and flight reference cards/crew checklists describe aircraft handling and contingency instructions

SOLUTION (GOAL 312): TOPIC 14 FLIGHT REFERENCE CARDS/CREW CHECKLISTS

SOLUTION (GOAL 312): TOPIC 15 AIRCREW MANUAL

Goal 313: Engineering Air publications provide aircraft ground handling, maintenance, test, repair and support requirements and information

Notes (Goal 313): *The existence of these Topics effectively concludes the safety case argument at this level. The integrity of the individual publications is addressed at goal 332.*

SOLUTION (GOAL 313): TOPIC 1 AIRCRAFT MAINTENANCE MANUAL

SOLUTION (GOAL 313): TOPIC 3 PARTS CATALOGUES AND RELATED INFO

SOLUTION (GOAL 313): TOPIC 5 MAINTENANCE SCHEDULES

SOLUTION (GOAL 313): TOPIC 6 AIRCRAFT REPAIR AND RECONDITIONING

SOLUTION (GOAL 313): TOPIC 7 PRESERVATION, PACKAGING, TRANSPORTATION AND STORAGE

SOLUTION (GOAL 313): TOPIC 9 WEIGHT AND BALANCE DATA

SOLUTION (GOAL 313): TOPIC 10 WIRING DIAGRAMS

SOLUTION (GOAL 313): TOPIC 12 CROSS SERVICING

Notes (Goal 313): *Check relevance of Topics 4, 8 &13 to Tornado*

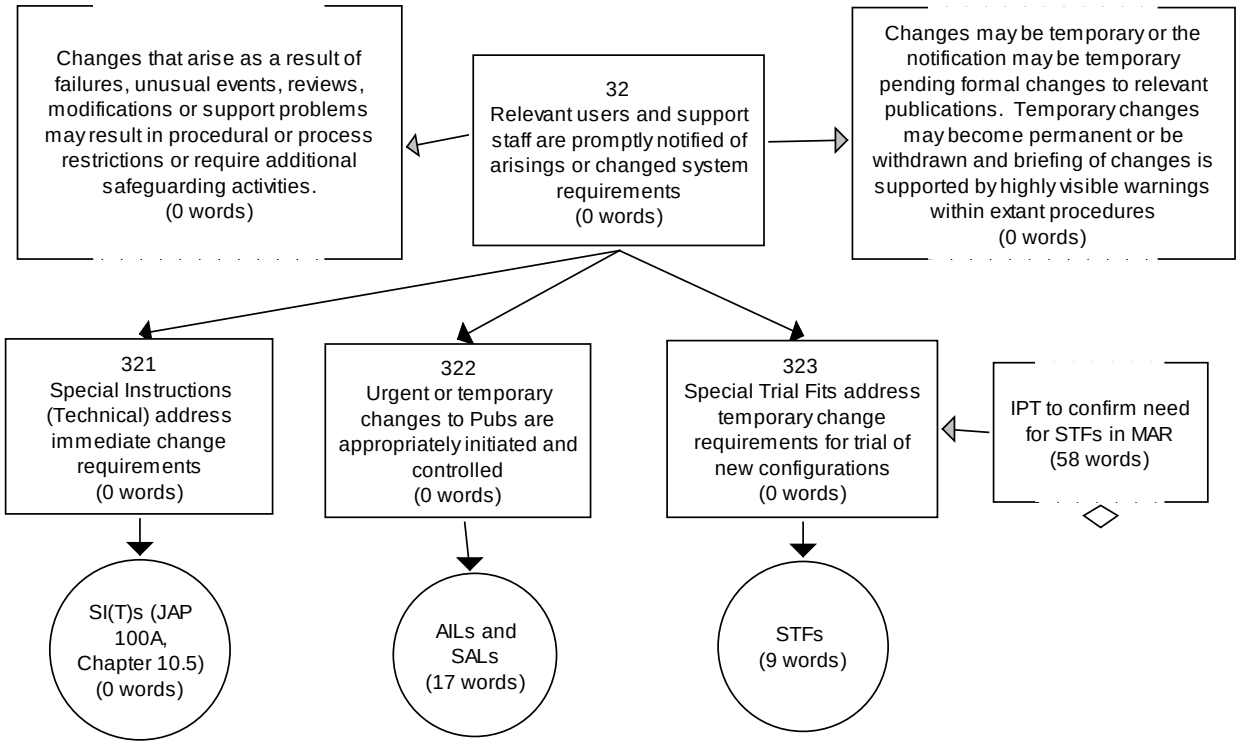
Node Status: Development required to establish the need for or existence of these topics

Goal 314: Performance and usage publications are maintained to assure adequate aircraft integrity

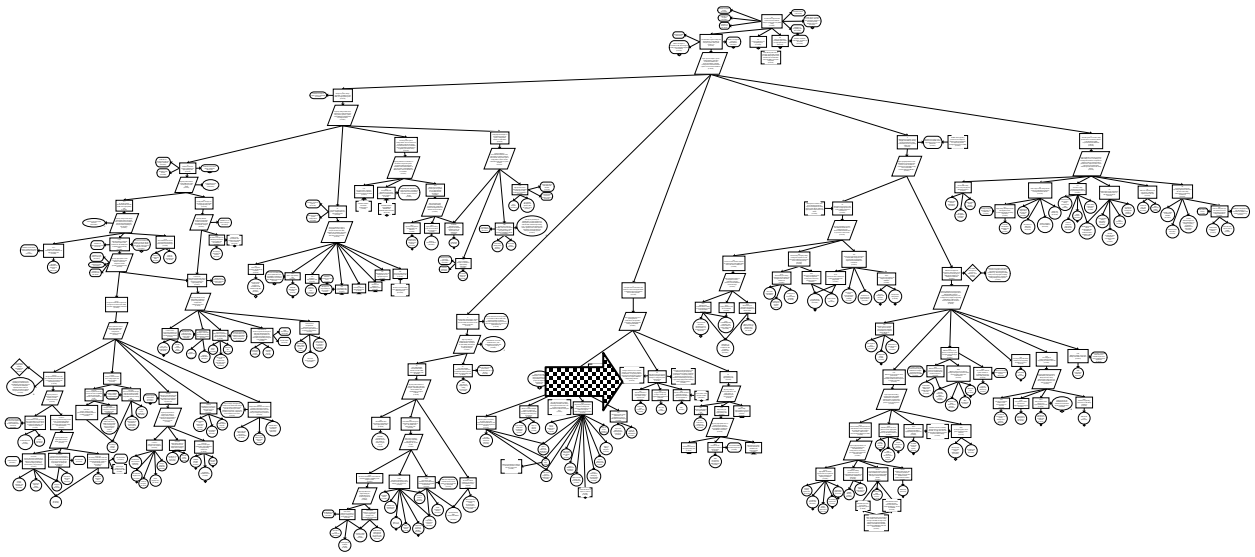
SOLUTION (GOAL 314): TOPIC 15S STATEMENT OF OPERATING INTENT AND USAGE

SOLUTION (GOAL 314): TOPIC 16 OPERATING DATA MANUAL

3.2 Prompt notification of arisings and changes (Goal 32)



Location within Safety Case



Goal 32: Relevant users and support staff are promptly notified of arisings or changed system requirements

Notes (Goal 32): *Changes that arise as a result of failures, unusual events, reviews, modifications or support problems may result in procedural or process restrictions or require additional safeguarding activities.*

Notes (Goal 32): *Changes may be temporary or the notification may be temporary pending formal changes to relevant publications. Temporary changes may become permanent or be withdrawn and briefing of changes is supported by highly visible warnings within extant procedures*

Goal 321: Special Instructions (Technical) address immediate change requirements

SOLUTION (GOAL 321): SI(T)S (JAP 100A, CHAPTER 10.5)

Goal 322: Urgent or temporary changes to Pubs are appropriately initiated and controlled

SOLUTION (GOAL 322): AILS AND SALS

Advance Information Leaflets and Service Amendment Leaflets are produced iaw Chapter 8 of JAP(D) 100A-01

Goal 323: Special Trial Fits address temporary change requirements for trial of new configurations

Notes (Goal 323): *IPT to confirm need for STFs in MAR*

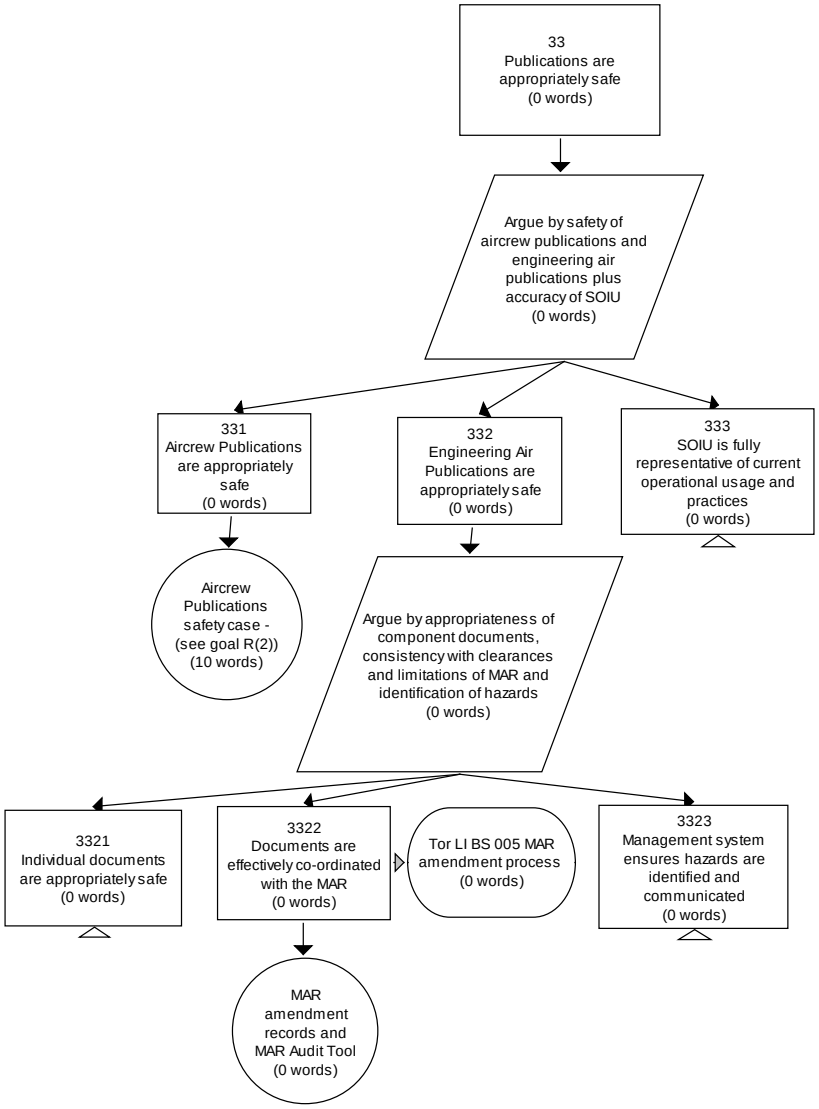
Work is currently in hand to convert the F3 STF (Towed Radar Decoy) to a SEM. Once this is completed, there will be no further STFs in the MAR and this goal can be deleted or perhaps better replaced by a comment or assumption at goal to indicate that STFs are not cleared for use via the MAR.

Node Status: Development required to review this area of safety case when STF superseded

SOLUTION (GOAL 323): STFS

Sole STF relates to use of TRD on F3

3.3 Publications are safe (Goal 33)



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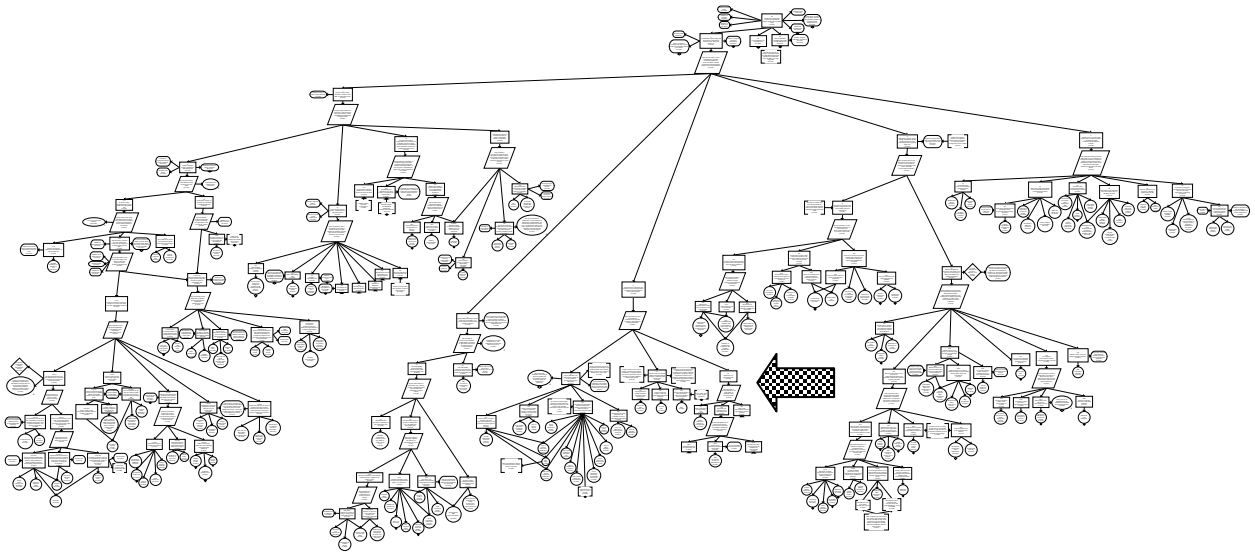


Goal 33: Publications are appropriately safe

Strategy (Goal 33): *Argue by safety of aircrew publications and engineering air publications plus accuracy of SOIU*

Goal 331: Aircrew Publications are appropriately safe

SOLUTION (GOAL 331): AIRCREW PUBLICATIONS SAFETY CASE - (SEE GOAL R(2))

Goal 332: Engineering Air Publications are appropriately safe

Strategy (Goal 332): *Argue by appropriateness of component documents, consistency with clearances and limitations of MAR and identification of hazards*

Goal 3321: Individual documents are appropriately safe

Node Status: Instantiation required to support this claim

Goal 3322: Documents are effectively co-ordinated with the MAR

Context (Goal 3322): *Tor LI BS 005 MAR amendment process*

SOLUTION (GOAL 3322): MAR AMENDMENT RECORDS AND MAR AUDIT TOOL

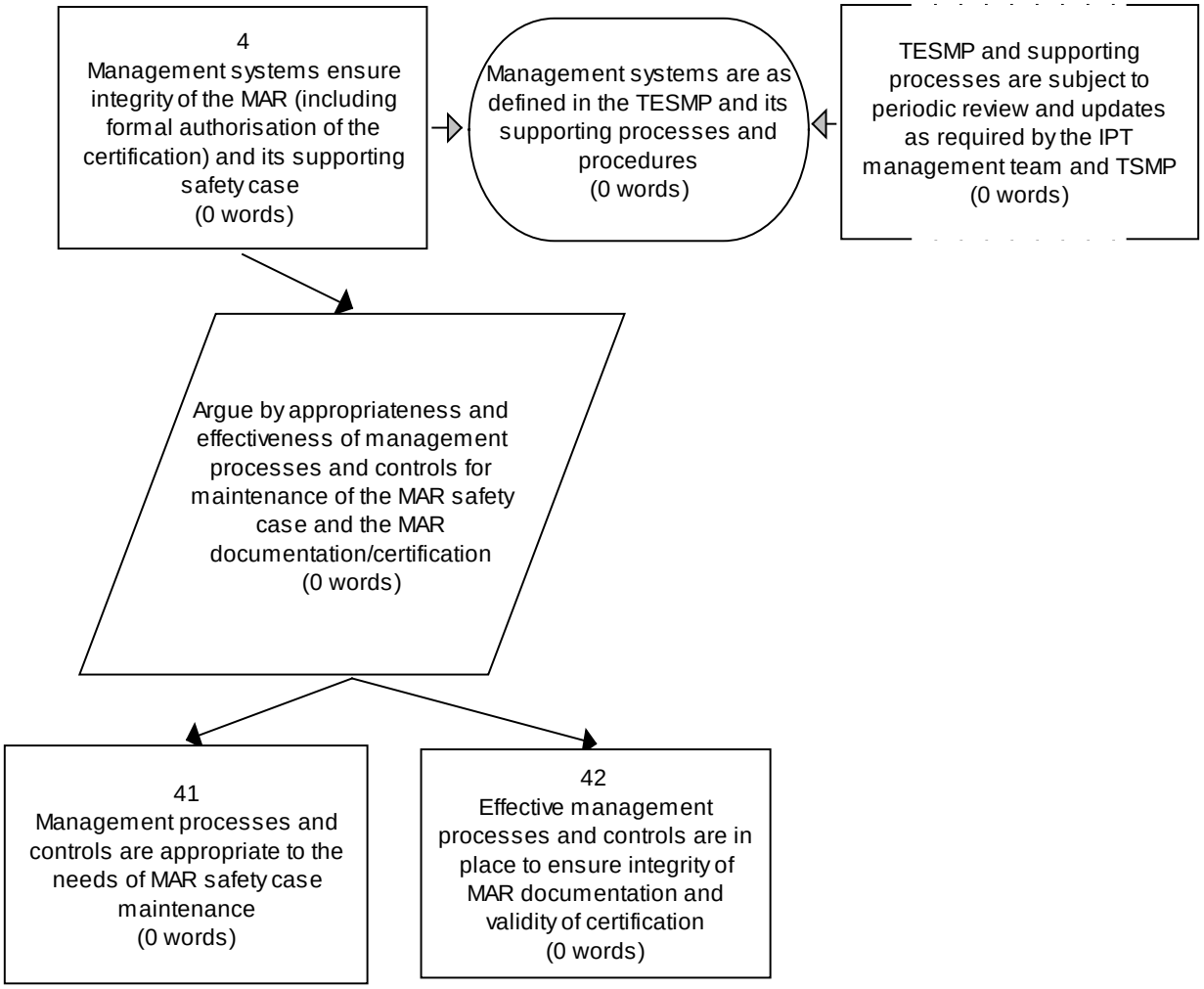
Goal 3323: Management system ensures hazards are identified and communicated

Node Status: Instantiation required to support this claim

Goal 333: SOIU is fully representative of current operational usage and practices

Node Status: Instantiation required to support this claim

4 Section 4: Management systems ensure integrity of MAR (Goal 4)



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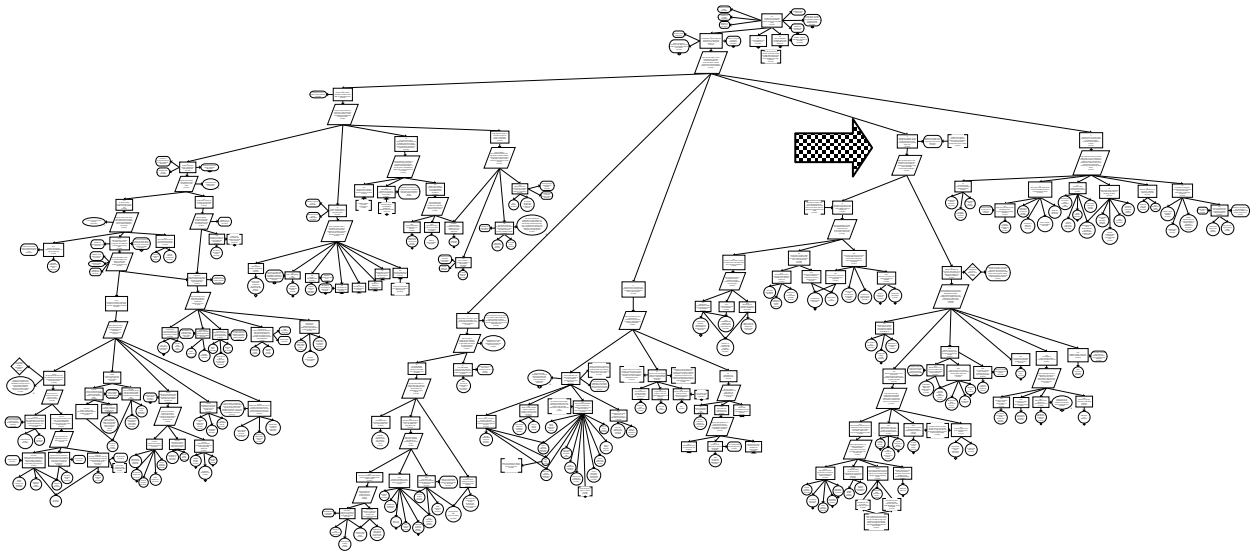


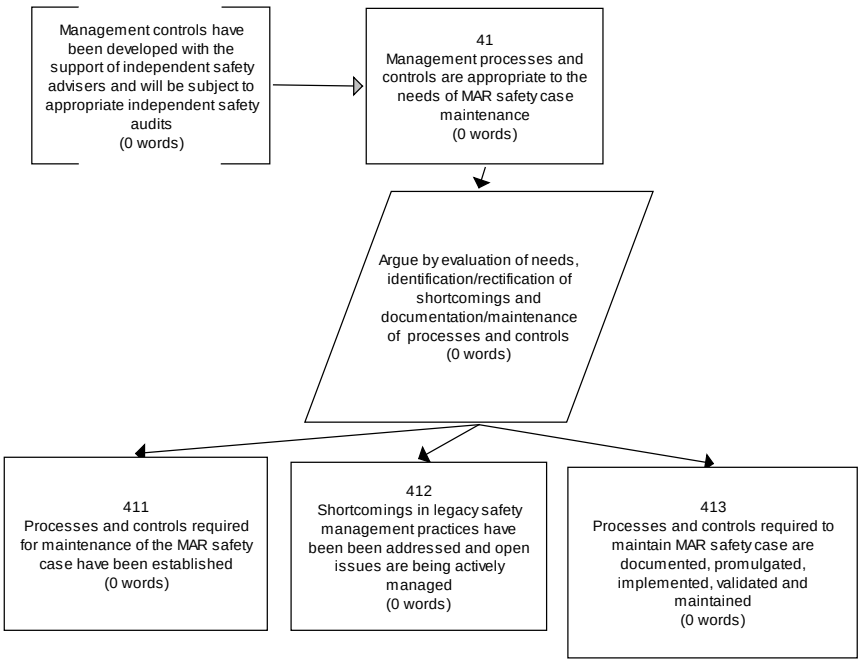
Goal 4: Management systems ensure integrity of the MAR (including formal authorisation of the certification) and its supporting safety case

Context (Goal 4): *Management systems are as defined in the TESMP and its supporting processes and procedures*

Notes (Goal 4): *TESMP and supporting processes are subject to periodic review and updates as required by the IPT management team and TSMP*

Strategy (Goal 4): *Argue by appropriateness and effectiveness of management processes and controls for maintenance of the MAR safety case and the MAR documentation/certification*

4.1 Management process and controls appropriate (Goal 41)



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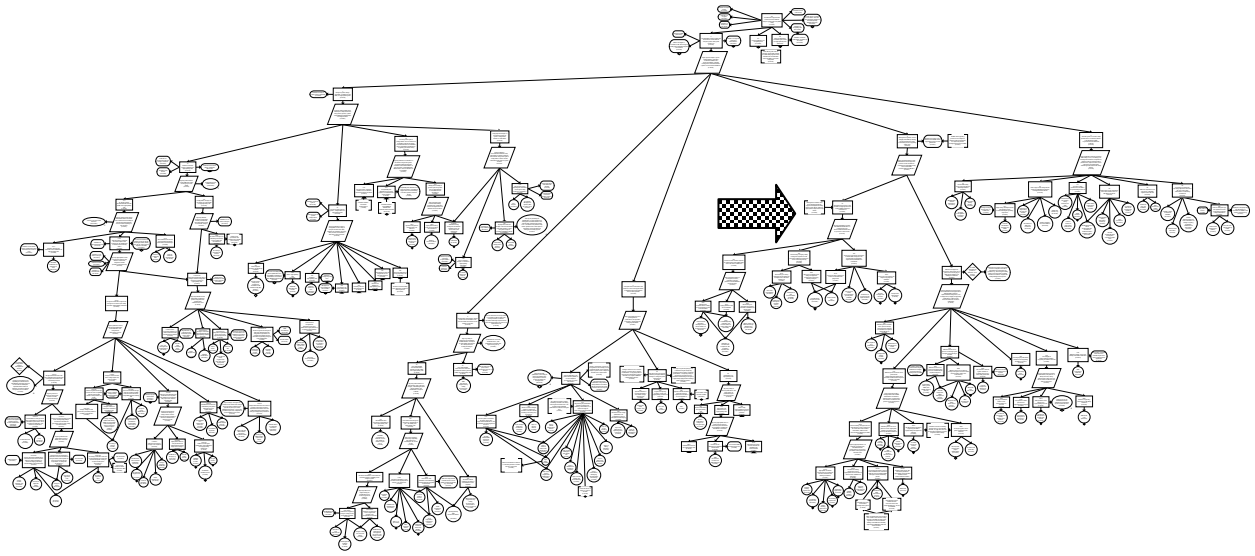
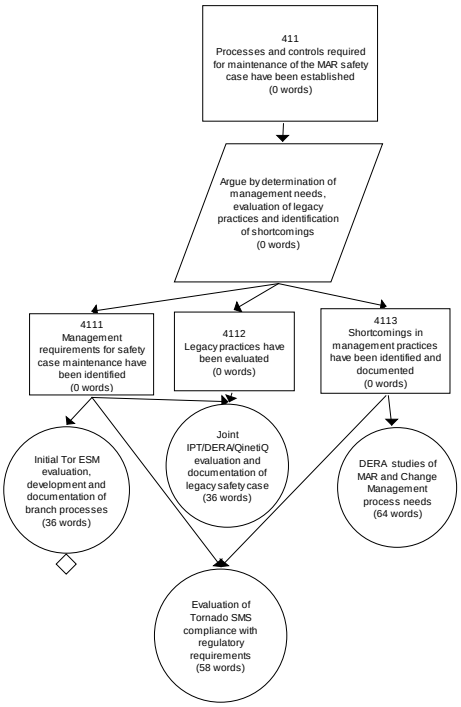


Goal 41: Management processes and controls are appropriate to the needs of MAR safety case maintenance

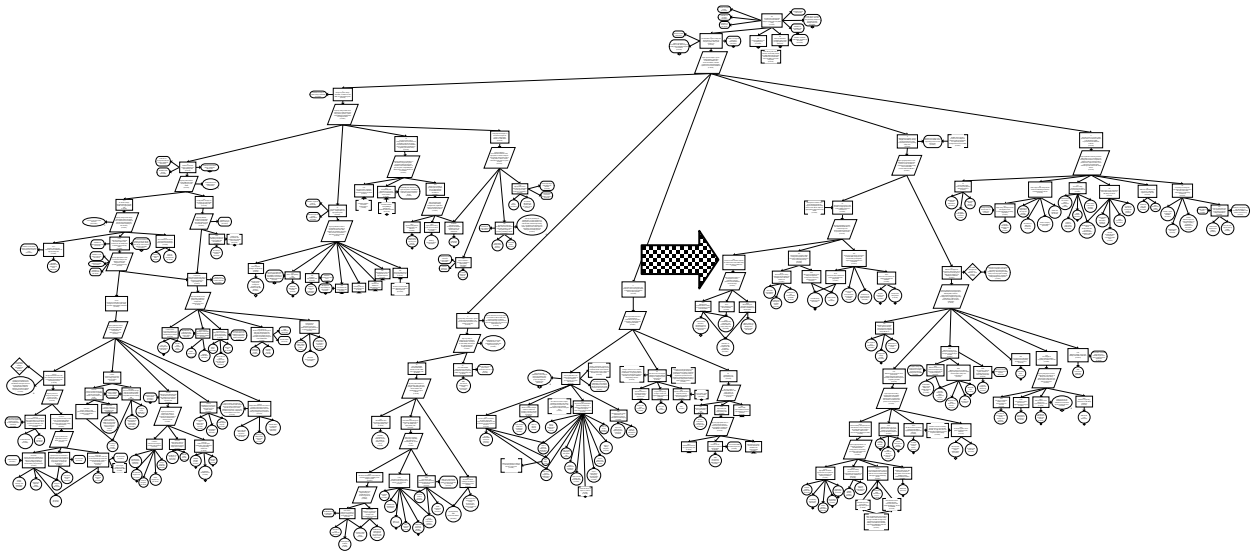
Notes (Goal 41): *Management controls have been developed with the support of independent safety advisers and will be subject to appropriate independent safety audits*

Strategy (Goal 41): *Argue by evaluation of needs, identification/rectification of shortcomings and documentation/maintenance of processes and controls*

4.2 Processes and controls established (Goal 411)



Location within Safety Case



Goal 411: Processes and controls required for maintenance of the MAR safety case have been established

Strategy (Goal 411): *Argue by determination of management needs, evaluation of legacy practices and identification of shortcomings*

Goal 4111: Management requirements for safety case maintenance have been identified

SOLUTION (GOAL 4111): INITIAL TOR ESM EVALUATION, DEVELOPMENT AND DOCUMENTATION OF BRANCH PROCESSES

Processes have been documented in Local Instructions and Supplemental Business Processes, primarily:

Tor LI BS005

Tor LI BS011

Tor LI BS013

Others TBD - These must include robust processes for management and review of the safety cases

Node Status: Development required to complete above references as appropriate

SOLUTION (GOAL 4111 & 4113): EVALUATION OF TORNADO SMS COMPLIANCE WITH REGULATORY REQUIREMENTS

The results of an initial evaluation were documented in QinetiQ/AT&E/CR01615 dated March 2003.

An updated evaluation has been undertaken and documented following the update of the TESMP from issue 1 to issue 2. (see TESMP Version 2 (v0.8) Compliance Assessment - submitted to IPT with QinetiQ e-mail of 08/10/03 15:49)

SOLUTION (GOAL 4111 & 4112): JOINT IPT/DERA/QINETIQ EVALUATION AND DOCUMENTATION OF LEGACY SAFETY CASE

The results of this work are presented in the Tornado MAR Safety Case
Reports: DERA/AT&E/CA/CR0854/1.0 dated March 2001 and QinetiQ/AT&E/CR00262/2.0 dated September 2001

Goal 4112: Legacy practices have been evaluated

Goal 4113: Shortcomings in management practices have been identified and documented

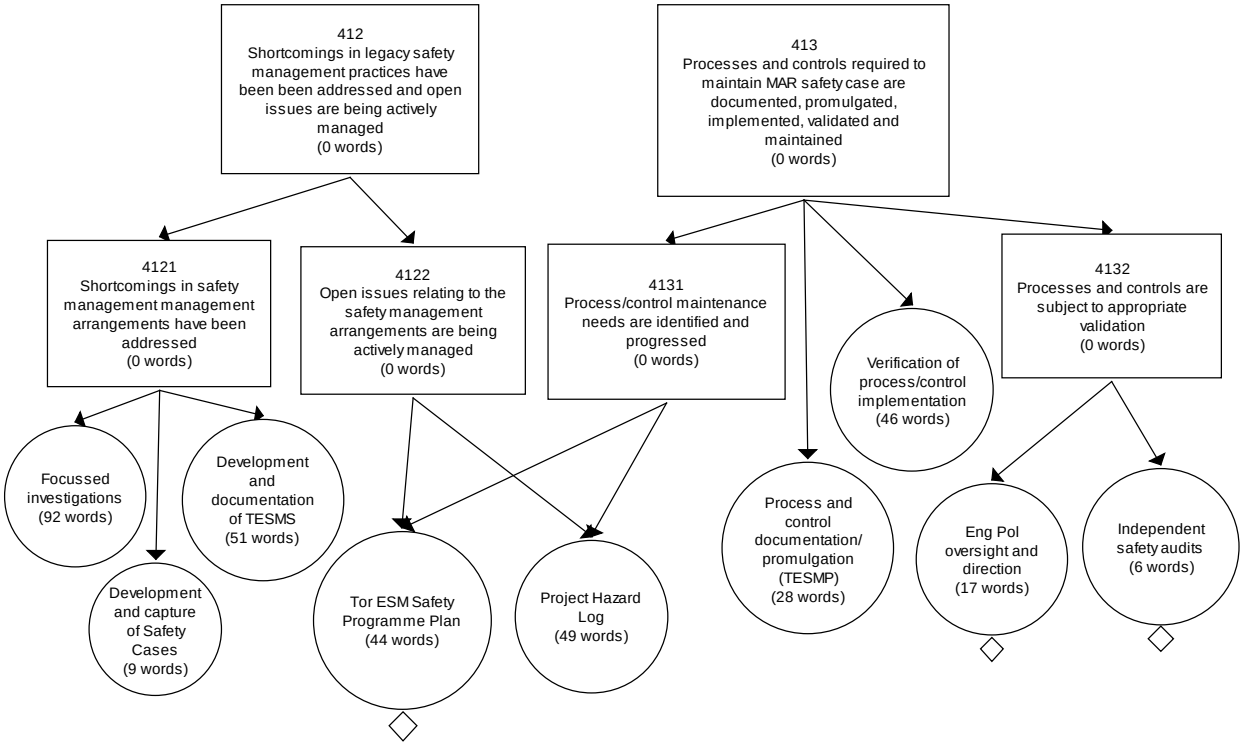
SOLUTION (GOAL 4113): DERA STUDIES OF MAR AND CHANGE MANAGEMENT PROCESS NEEDS

Tornado Configuration Control Process (DERA/AT&E/FFM/MAN/15/3 dated April 2001)

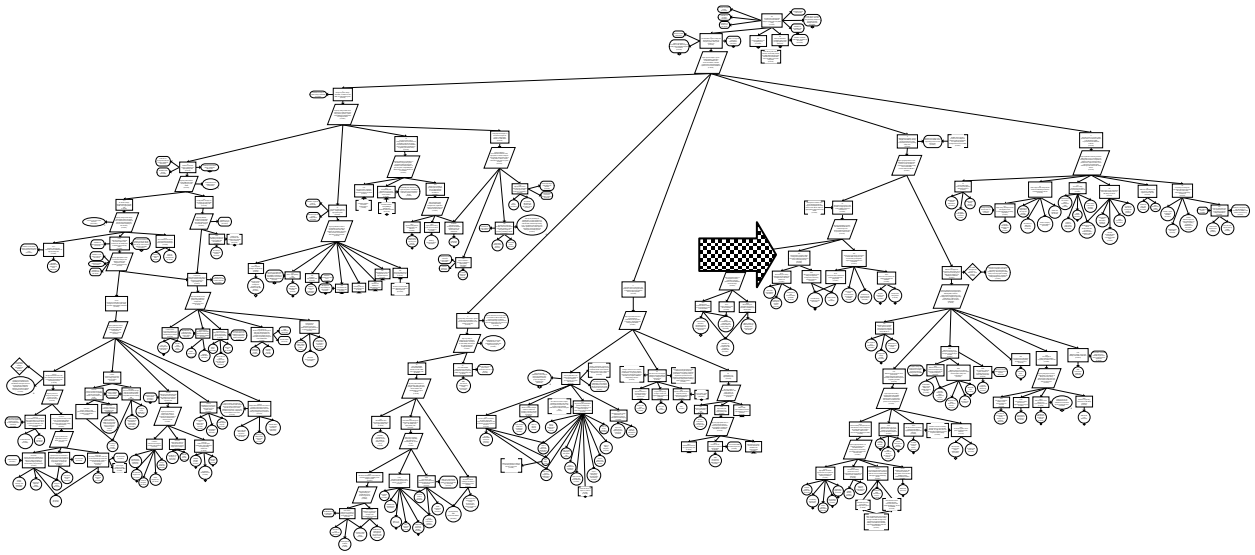
Tornado Clearance Process Study - Phase 1 Management Report (DERA/AT&E/CA/CR0756/1.0 dated Sept 2000)

Military Aircraft Release Safety Programme Plan (DERA/AT&E/CA/CR0853/1.0 dated March 2001 - subsequently updated to QinetiQ/AT&E/CR00263/2.0 dated Sept 2001)

4.3 Shortcomings and issues addressed and processesses promulgated and maintained (Goals 412 and 413)



Location within Safety Case



Goal 412: Shortcomings in legacy safety management practices have been been addressed and open issues are being actively managed

Goal 4121: Shortcomings in safety management management arrangements have been addressed

SOLUTION (GOAL 4121): FOCUSSED INVESTIGATIONS

This includes the ongoing IPT activities and the DERA/QinetiQ support activities documented in:

- MAR/RTS/ADS Update Management Process (QinetiQ/AT&E/CR00431 dated October 2001)
- Operational Change Capture Study (QinetiQ/AT&E/CR00453 dated November 2001)
- Proposed Hazard Management System Processes (QinetiQ/AT&E/CR00441 dated November 2001)
- Identification and control of the MAR/RTS configuration standards (DERA Ltr report RANGES/20/2/03 dated 19 July 2001*)
- Airworthiness Delegations (DERA Ltr report RANGES/20/2/03 dated 20 July 2001*)
- IPT working relationships with aircrew manual and ODM publication authorities (DERA Ltr report RANGES/20/2/03 dated 23 July 2001*)
- Airworthiness - Design Safety Criteria (DERA Ltr report RANGES/20/2/03 dated 31 July 2001*)
- Safety Argument for the Management of Aircrew Publications (QinetiQ/AT&E/CR01625/1.0 dated March 2003

* Note: These letter reports were subsequently reissued as "Compendium of Phase 2 letter reports" reference QinetiQ/AT&E/CR00591 dated March 2002

SOLUTION (GOAL 4121): DEVELOPMENT AND CAPTURE OF SAFETY CASES

This is evidenced by the MAR and Tornado GSNs

SOLUTION (GOAL 4121): DEVELOPMENT AND DOCUMENTATION OF TESMS

This embraces:

- Issue of TESMP
- Development and expansion of TESMP to include additional management responsibilities e.g Stakeholder identities, roles and management processes, COSHH, Human Factors, Software Mgt
- Investigation and improved documentation of NETMA/Panavia/TU management arrangements
- Development of Tor IPT business procedures e.g Tor LI BS 005 and 013 plus Tornado Supplemental Business Procedures
- Development of CSAs and IBAs

The above project arrangements are complemented by the appropriate provisions of JSPs, JAPs and ES(Air) BPs.

Goal 4122: Open issues relating to the safety management arrangements are being actively managed

SOLUTION (GOAL 4122): TOR ESM SAFETY PROGRAMME PLAN

The Tor ESM SPP is an EXCEL spreadsheet maintained by Tor ESM 2, in which the evolving status of activity on safety management actions is tracked. The initial content of the spreadsheet was derived from the QinetiQ report (QinetiQ/AT&E/CR00263/2.0 dated Sept 2001) it has subsequently been expanded and updated to include subsequent progress and emergent issues. The SPP provides the basis for ongoing management and improvement of the TESMS. It is maintained in accordance with the procedures as defined in [*TBD*]

Node Status: Development required to complete and reference the above maintenance procedure

Goal 4131: Process/control maintenance needs are identified and progressed

SOLUTION (GOAL 4131): PROJECT HAZARD LOG

The hazard log is being developed and populated to manage design and emergent hazards relating to the design, support, use and disposal of the Tornado weapon system.

The hazard log is managed and maintained in accordance with Tornado Supplementary Business Procedures (SBP) Tor 1201-1 to 1201-4 inclusive.

Goal 413: Processes and controls required to maintain MAR safety case are documented, promulgated, implemented, validated and maintained

SOLUTION (GOAL 413): PROCESS AND CONTROL DOCUMENTATION/ PROMULGATION (TESMP)

This comprises the Tornado Equipment Safety Management Plan together with all related Local Instructions and Supplemental Business Processes as maintained and promulgated via the ES(Air) web site.

SOLUTION (GOAL 413): VERIFICATION OF PROCESS/CONTROL IMPLEMENTATION

This comprises:

- TSMP oversight and reporting
- Line management oversight and direction
- Internal and external audits iaw Tornado QMS and ES(Air) QMS

NOTE: There is also a need for periodic reviews of the safety cases by appropriate bodies or persons. This should be covered within the process for managing the safety cases (See solution to goal 4111)

Goal 4132: Processes and controls are subject to appropriate validation

SOLUTION (GOAL 4132): ENG POL OVERSIGHT AND DIRECTION

This may be satisfied by the impending audit by Eng Pol appointed external safety advisers (TA Advantage)

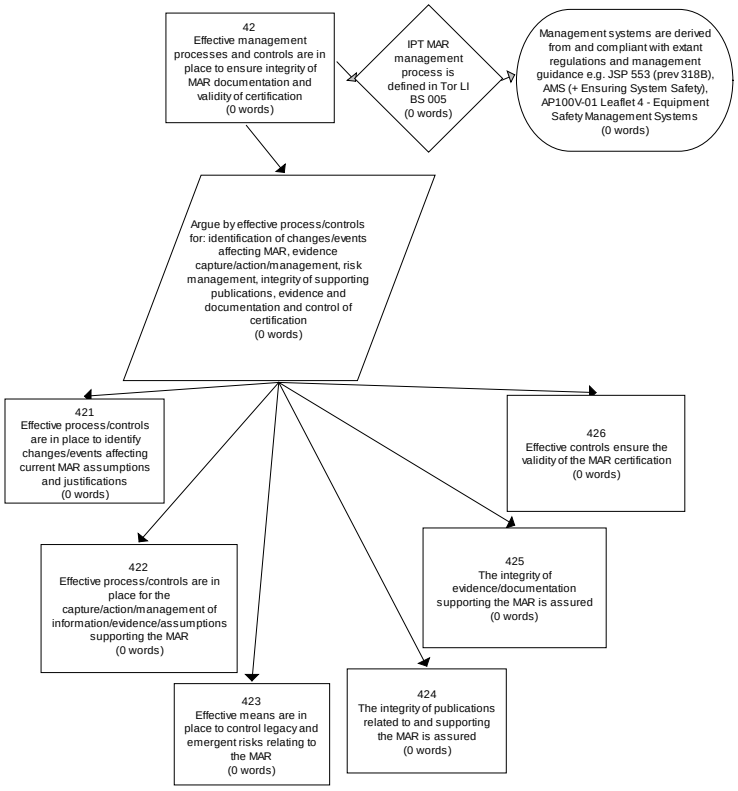
Node Status: Development required to finalise solution as appropriate following TA Advantage visit

SOLUTION (GOAL 4132): INDEPENDENT SAFETY AUDITS

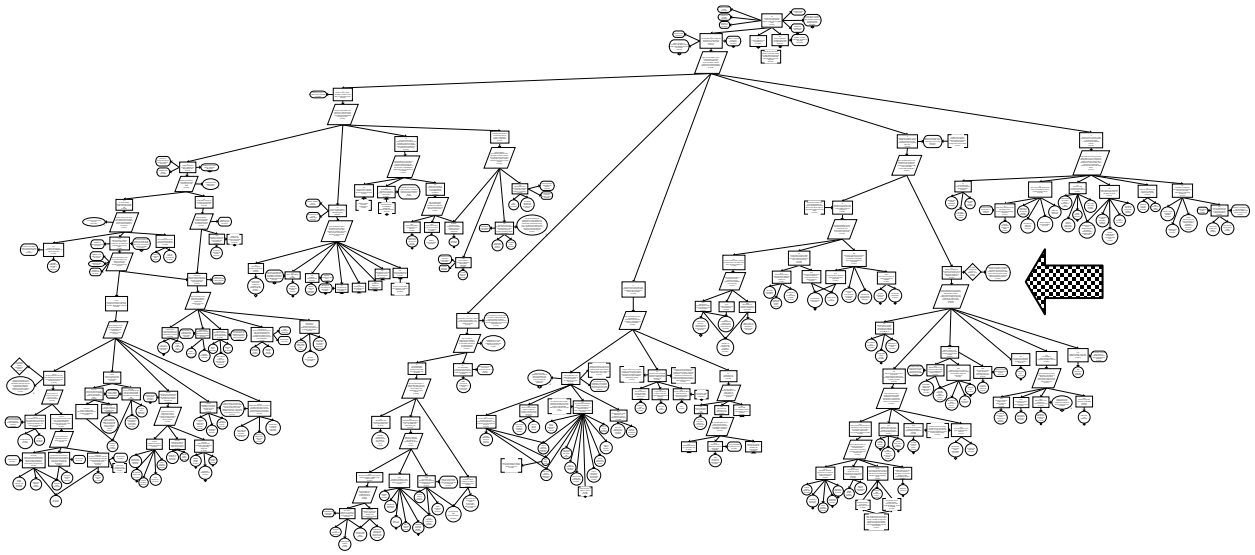
Arrangements to be documented when decided.

Node Status: Development required to document arrangements

4.4 Processes and controls in place to ensure integrity of MAR documentation and certification (Goal 42)



Location within Safety Case



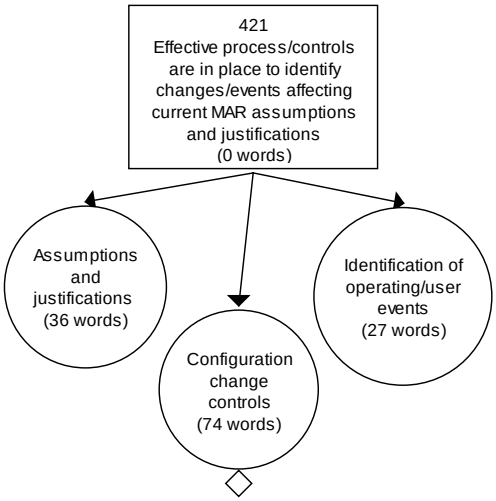
Goal 42: Effective management processes and controls are in place to ensure integrity of MAR documentation and validity of certification

Model (Goal 42): *IPT MAR management process is defined in Tor LI BS 005*

Context (Goal 42): *Management systems are derived from and compliant with extant regulations and management guidance e.g. JSP 553 (prev 318B), AMS (+ Ensuring System Safety), AP100V-01 Leaflet 4 - Equipment Safety Management Systems*

Strategy (Goal 42): *Argue by effective process/controls for: identification of changes/events affecting MAR, evidence capture/action/management, risk management, integrity of supporting publications, evidence and documentation and control of certification*

4.5 Process/controls to identify changes/events affecting MAR (Goal 421)



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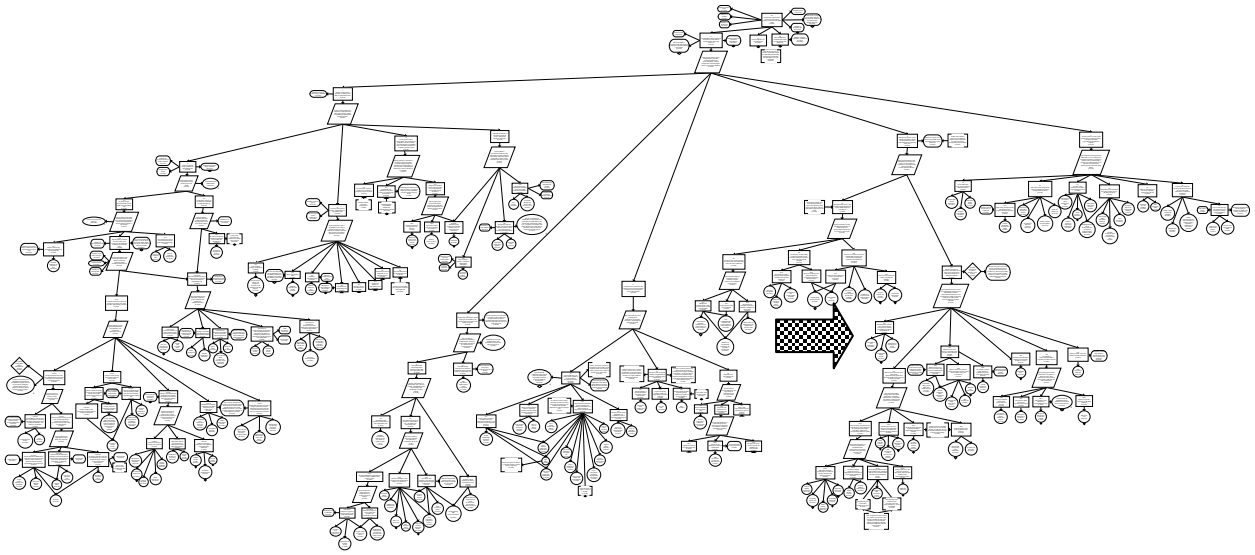


Goal 421: Effective process/controls are in place to identify changes/events affecting current MAR assumptions and justifications

SOLUTION (GOAL 421): ASSUMPTIONS AND JUSTIFICATIONS

These are documented in the AACE Document Audit Management System (ADAMS) and in the Supplemental Safety Assessments. These latter assessments are submitted to STANEVAL to ensure any information relevant to users is identified and promulgated appropriately.

SOLUTION (GOAL 421): CONFIGURATION CHANGE CONTROLS

All IPT managed changes are controlled iaw the Tornado Configuration Change Management Procedure (Tor LI BS013) requiring MAR impact and clearance to be considered as part of the change progression and approval cycle.

Changes managed by other IPTs are managed iaw the change control procedures of the respective project teams and communicated iaw the agreements as defined in IBAs. (Note some of these are still TBD - see Annex D of TESMP for current status)

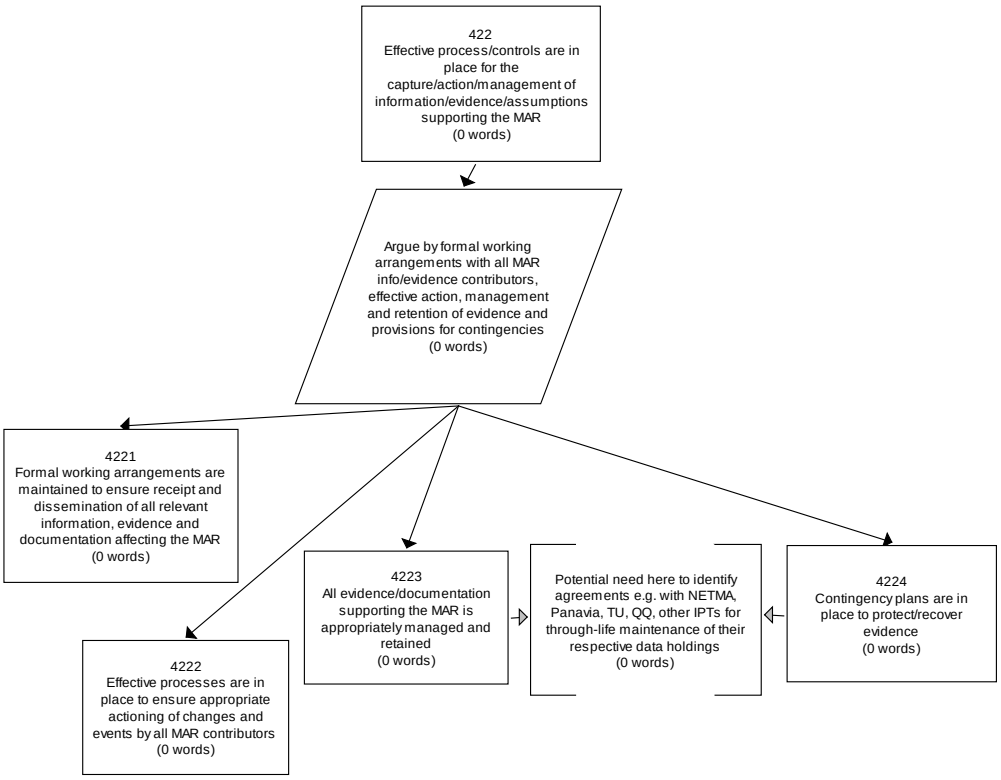
Node Status: Development required to check/ensure that all changes controls are effectively in place and identified via the inter-IPT arrangements

SOLUTION (GOAL 421): IDENTIFICATION OF OPERATING/USER EVENTS

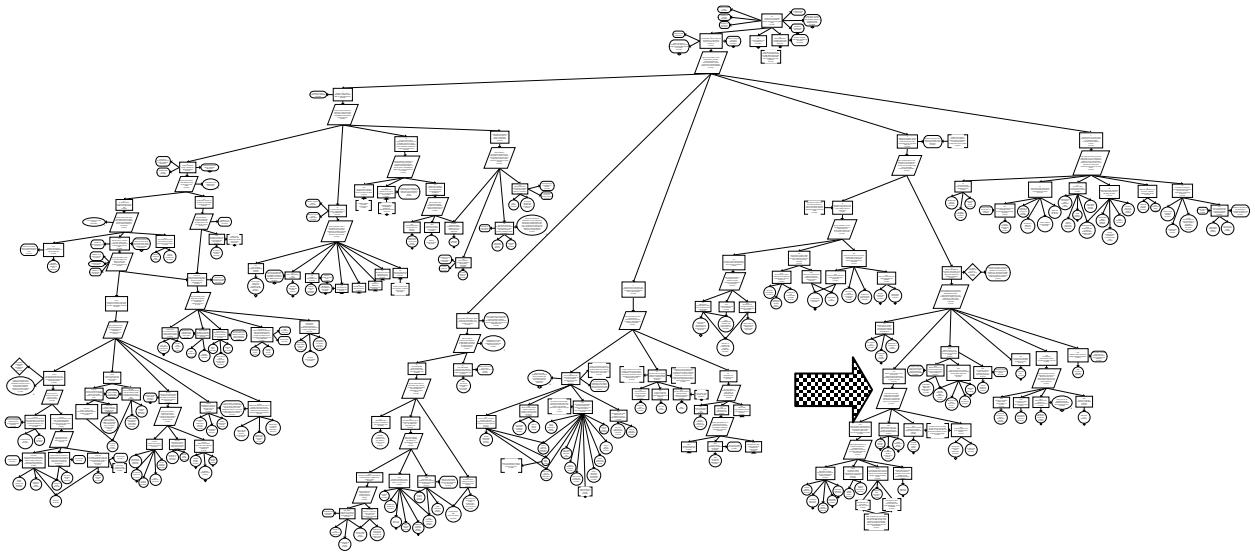
Aircrew use F765X for amendments to aircrew publications (Co-ordinated by IPT).

Amendments to RTS and MAR are co-ordinated by the RTSA and Tor ESM 1.

4.6 Process/controls to capture information/evidence/assumptions (Goal 422)



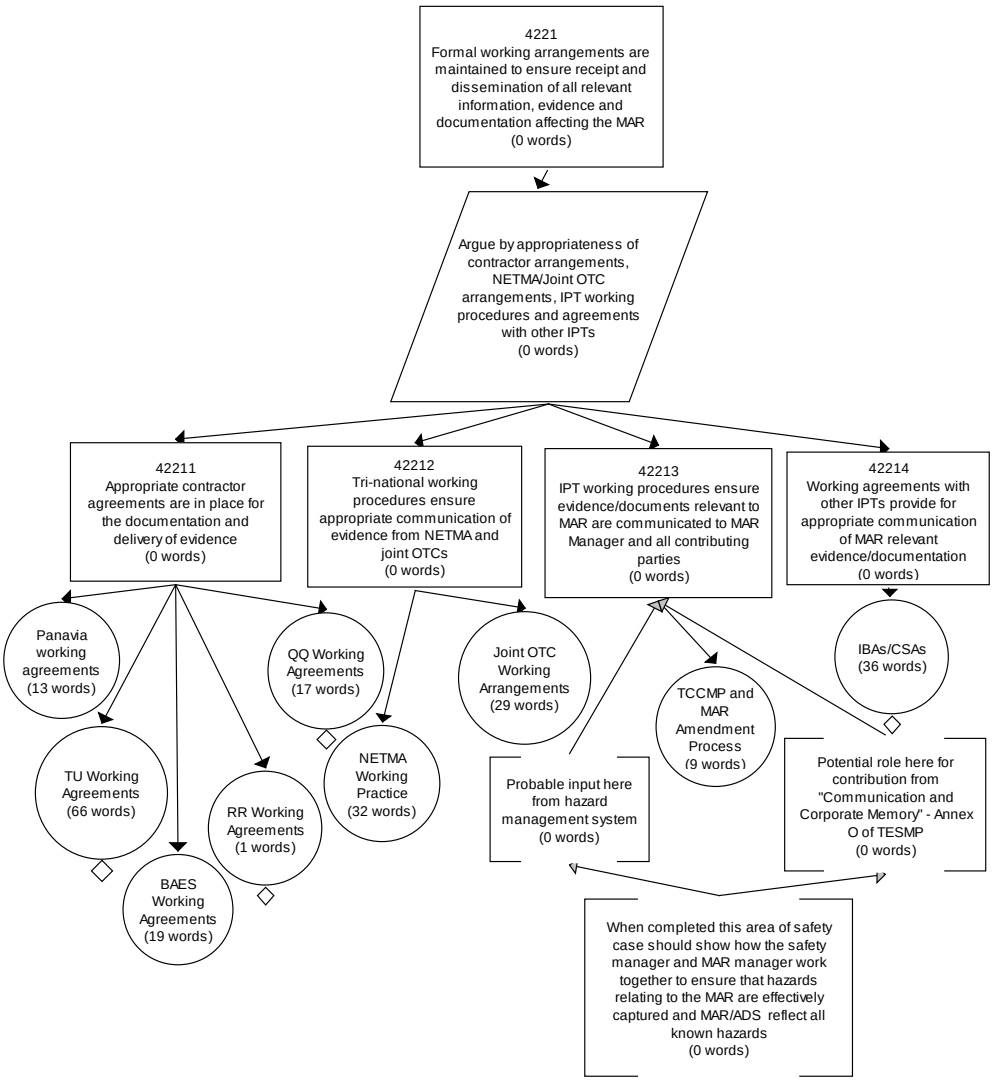
Location within Safety Case



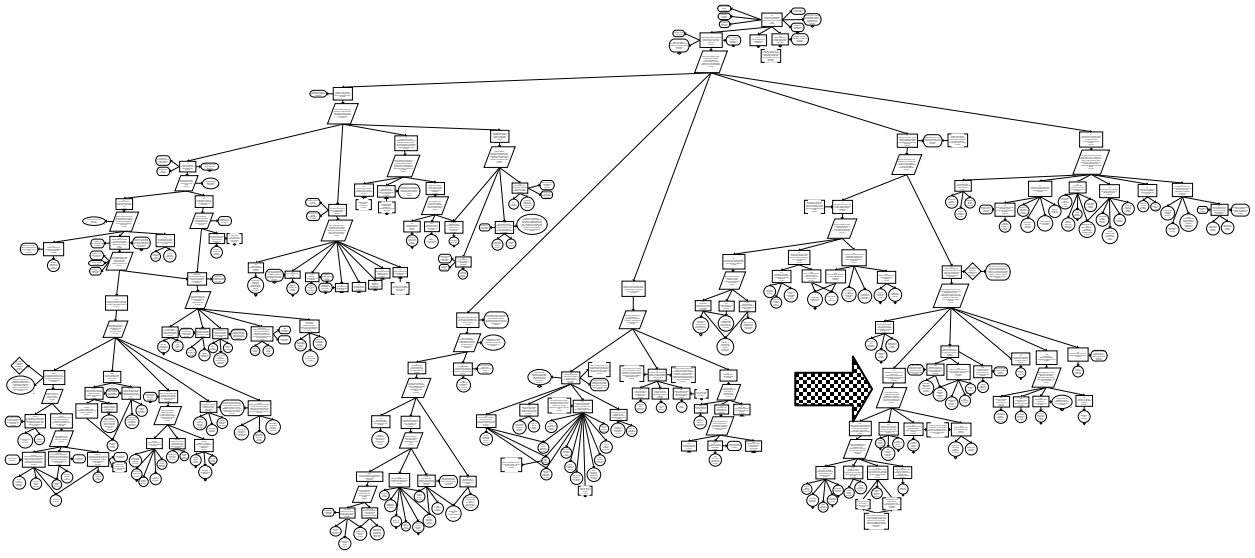
Goal 422: Effective process/controls are in place for the capture/action/management of information/evidence/assumptions supporting the MAR

Strategy (Goal 422): *Argue by formal working arrangements with all MAR info/evidence contributors, effective action, management and retention of evidence and provisions for contingencies*

4.7 Formal arrangements to endure receipt and disssemination of information (Goal 4221)



Location within Safety Case



Goal 4221: Formal working arrangements are maintained to ensure receipt and dissemination of all relevant information, evidence and documentation affecting the MAR

Strategy (Goal 4221): *Argue by appropriateness of contractor arrangements, NETMA/Joint OTC arrangements, IPT working procedures and agreements with other IPTs*

Goal 42211: Appropriate contractor agreements are in place for the documentation and delivery of evidence

SOLUTION (GOAL 42211): PANAVIA WORKING AGREEMENTS

Primary certification processes are defined in QFN 01, QFN 03 and QFN 04.

SOLUTION (GOAL 42211): TU WORKING AGREEMENTS

Working procedures are defined in [AX/695/021 dated 30 Jul 1976 - This might have been distributed to Nations with N/5404/7561/34706/NR dated 09 August 1976]. This is to be complemented by the NETMA document "Qualification and Certification Process for RB199 Engine Modification" - *still in draft, pending review by the Nations (NETMA letter T/33400/1705/25052/NU dated 10 Dec 2003 refers.*

Node Status: Development required to complete references as appropriate

SOLUTION (GOAL 42211): BAES WORKING AGREEMENTS

These are summarised in the BAES Safety Management System Overview for National Officials (BAE-WAW-RP-TOR-TGP-4675)

SOLUTION (GOAL 42211): RR WORKING AGREEMENTS

TBD

Node Status: Development required to complete references as appropriate

SOLUTION (GOAL 42211): QQ WORKING AGREEMENTS

TBD - appears to be no documented standard and that requirements are established on task by task basis

Node Status: Development required to complete references as appropriate

Goal 42212: Tri-national working procedures ensure appropriate communication of evidence from NETMA and joint OTCs

SOLUTION (GOAL 42212): NETMA WORKING PRACTICE

This is defined in the Service Release Panel ToRs and in "The inclusion of clearances in the NAMMO Release to Service" reference T/33404/3656/13756/2000/NU dated 8 May 2000

SOLUTION (GOAL 42212): JOINT OTC WORKING ARRANGEMENTS

These are defined in Co-ordination Working Group ToRs as initially derived from OTC 2 - "Co-ordination between the Official Test Centres on the Tornado Programme" dated February 1977.

Goal 42213: IPT working procedures ensure evidence/documents relevant to MAR are communicated to MAR Manager and all contributing parties

Notes (Goal 42213): *Probable input here from hazard management system*

Notes (Goal 42213): *Potential role here for contribution from "Communication and Corporate Memory" - Annex O of TESMP*

Notes (Goal 42213): *When completed this area of safety case should show how the safety manager and MAR manager work together to ensure that hazards relating to the MAR are effectively captured and MAR/ADS reflect all known hazards*

SOLUTION TCCMP AND MAR AMENDMENT PROCESS

Tor LI BS 013 and Tor LI BS 005

Goal 42214: Working agreements with other IPTs provide for appropriate communication of MAR relevant evidence/documentation

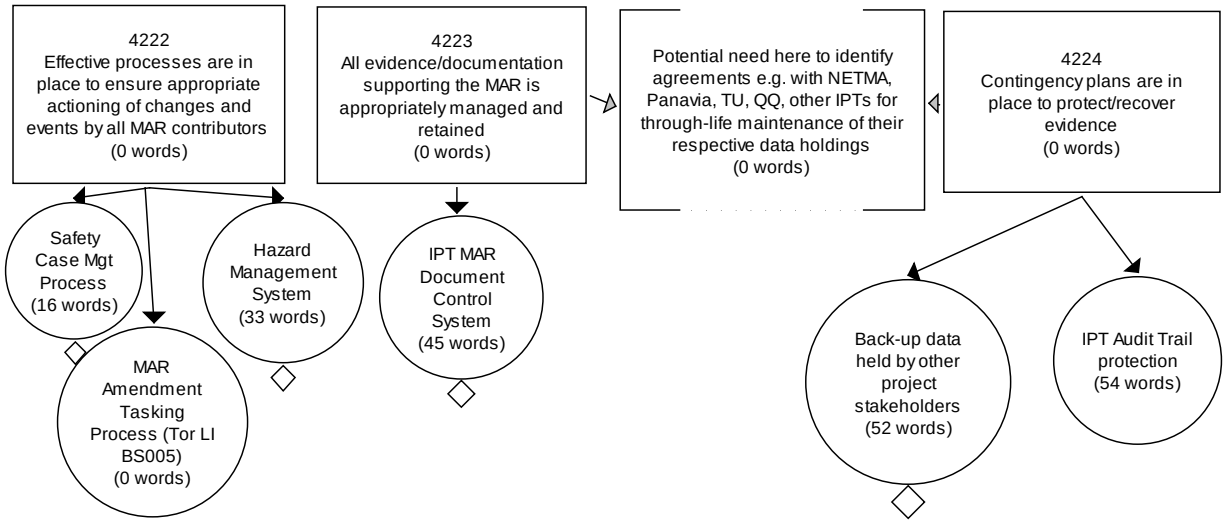
SOLUTION (GOAL 42214): IBAS/CSAS

See Annex D of TESMP

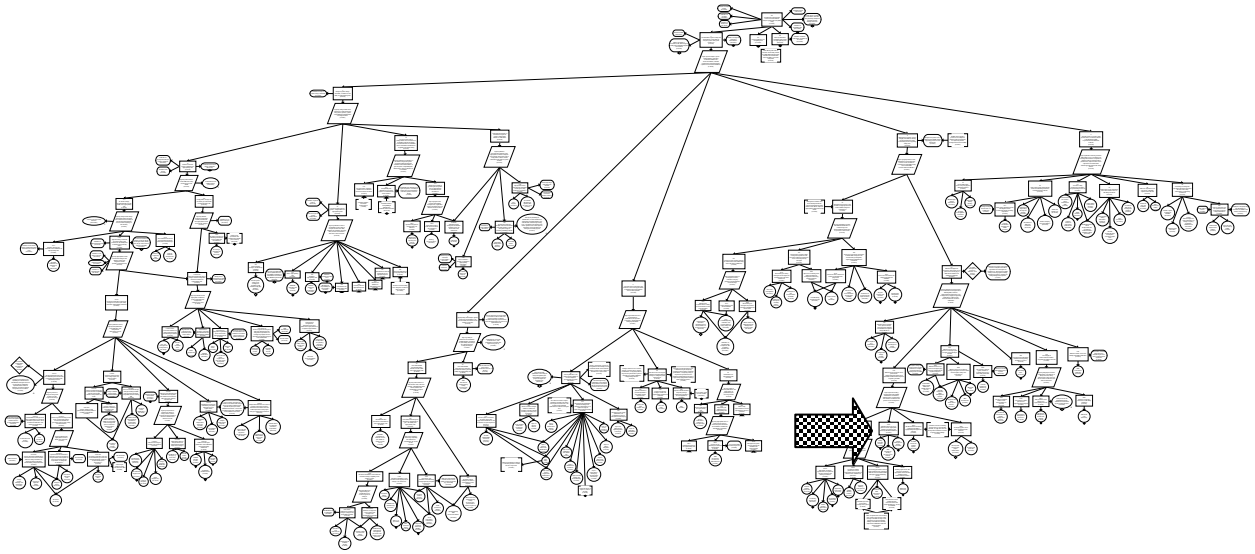
NOTE: Once completed these must provide for appropriate interchange of hazard information and the exchange of all information and evidence relating to the safety cases and certifications that support the MAR.

Node Status: Development required to confirm that the agreements, once established, satisfy this intended solution

4.8 Processes to action change/evidence managed and retained/contingency plans (Goals 4222, 4223 and 4224)



Location within Safety Case



Goal 4222: Effective processes are in place to ensure appropriate actioning of changes and events by all MAR contributors

SOLUTION (GOAL 4222): SAFETY CASE MGT PROCESS

TBD - See solution to Goal 4111

Node Status: Development required to implement and record process

SOLUTION (GOAL 4222): MAR AMENDMENT TASKING PROCESS (TOR LI BS005)

SOLUTION (GOAL 4222): HAZARD MANAGEMENT SYSTEM

Tor SBP 1201-1 to -4 inclusive.

As part of ongoing development of HMS management system, it is important to show that this system is available to and used by all MAR contributors.

Node Status: Development required to establish and document arrangements for dissemination of hazards to all interested parties and project stakeholders

Goal 4223: All evidence/documentation supporting the MAR is appropriately managed and retained

Notes (Goal 4223): *Potential need here to identify agreements e.g. with NETMA, Panavia, TU, QQ, other IPTs for through-life maintenance of their respective data holdings*

SOLUTION (GOAL 4223): IPT MAR DOCUMENT CONTROL SYSTEM

This comprises:

- IPT MAR files and amendment folders
- IPT Data Management System (covering Supplemental Safety Assessments (Safety case amdts)/briefing packs/change evidence)
- MAR action database
- MAR Audit Tool (ADAMS)

LI BS 005 is being developed to embrace these activities

Node Status: Development required to establish that intended update of LI fully covers all management arrangements

Goal 4224: Contingency plans are in place to protect/recover evidence

SOLUTION (GOAL 4224): BACK-UP DATA HELD BY OTHER PROJECT STAKEHOLDERS

This may be satisfied by establishing the formal arrangements for through-life data retention by NETMA/Pan/TU/QinetiQ, etc which replicate most, if not all of the information that might be needed in support of the MAR.

Also need to consider agreements with other IPTs supplying GFE or commodity equipments (IBAs)

Node Status: Development required when data management requirements have been identified and checked

SOLUTION (GOAL 4224): IPT AUDIT TRAIL PROTECTION

The LI provides for:

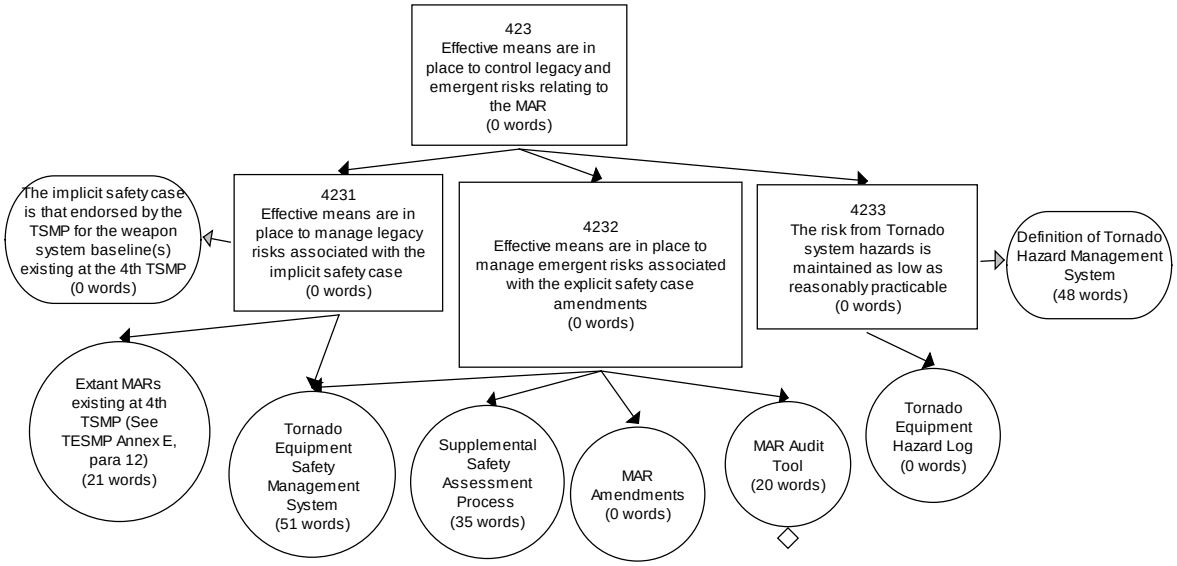
Skeleton paper files (including photocopies of unique references such as letters and e-mails and photocopies of front pages of QQ/BAES reports*) to be routinely produced and stored in Z Block at Wyton (local file storage area).

All CDs to be duplicated and maintained with the skeleton files.

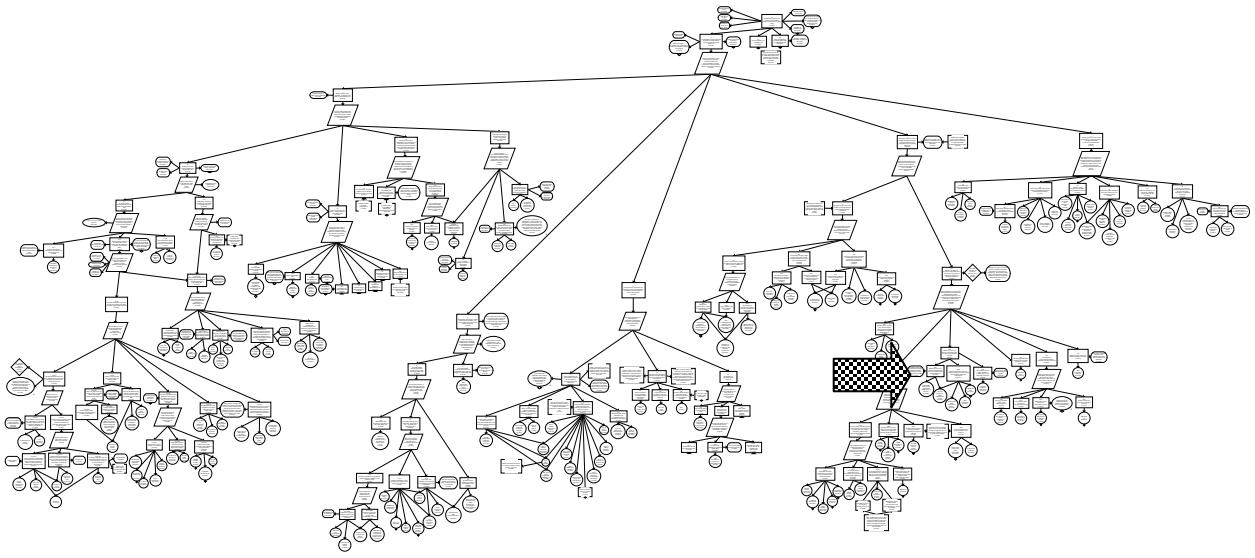
MARs to be copied and maintained with the skeleton files. Future amendments will also be maintained via the MAR Audit Tool (ADAMS).

* Through life retention of and ready access to the full reports is assumed to be provided by QQ and BAES under the extant project arrangements

4.9 Means to control risk (Goal 423)



Location within Safety Case



Goal 423: Effective means are in place to control legacy and emergent risks relating to the MAR

Goal 4231: Effective means are in place to manage legacy risks associated with the implicit safety case

Context (Goal 4231): *The implicit safety case is that endorsed by the TSMP for the weapon system baseline(s) existing at the 4th TSMP*

SOLUTION (GOAL 4231): EXTANT MARS EXISTING AT 4TH TSMP (SEE TESMP ANNEX E, PARA 12)

These MARs effectively define all user actions required to operate with and mitigate the identified risks inherent in the clearance standards

SOLUTION (GOAL 4231): TORNADO EQUIPMENT SAFETY MANAGEMENT SYSTEM

Compliance with the TESMS ensures that all risk within IPT control are effectively managed.

The TESMS protects the integrity of the MAR by establishing a comprehensive set of:

- Safety criteria
- Processes
- Controls

such that IPT safety management activities are undertaken in a systematic and rigorous manner. Integration of the TESMS with the safety management systems of other MAR stakeholders and contributors ensures that this same degree of discpline and control is maintained by all who have responsibilities for the safety and airworthiness of the weapon system.

Goal 4232: Effective means are in place to manage emergent risks associated with the explicit safety case amendments

SOLUTION (GOAL 4232): SUPPLEMENTAL SAFETY ASSESSMENT PROCESS

The process for undertaking supplemental safety assessments, which form part of the MAR amendment process, ensures that risks are appropriately exposed and addressed in the development and approval of MAR amendments (see Tor LI-BS005)

SOLUTION (GOAL 4232): MAR AMENDMENTS

SOLUTION (GOAL 4232): MAR AUDIT TOOL

AACE Document Audit Management System

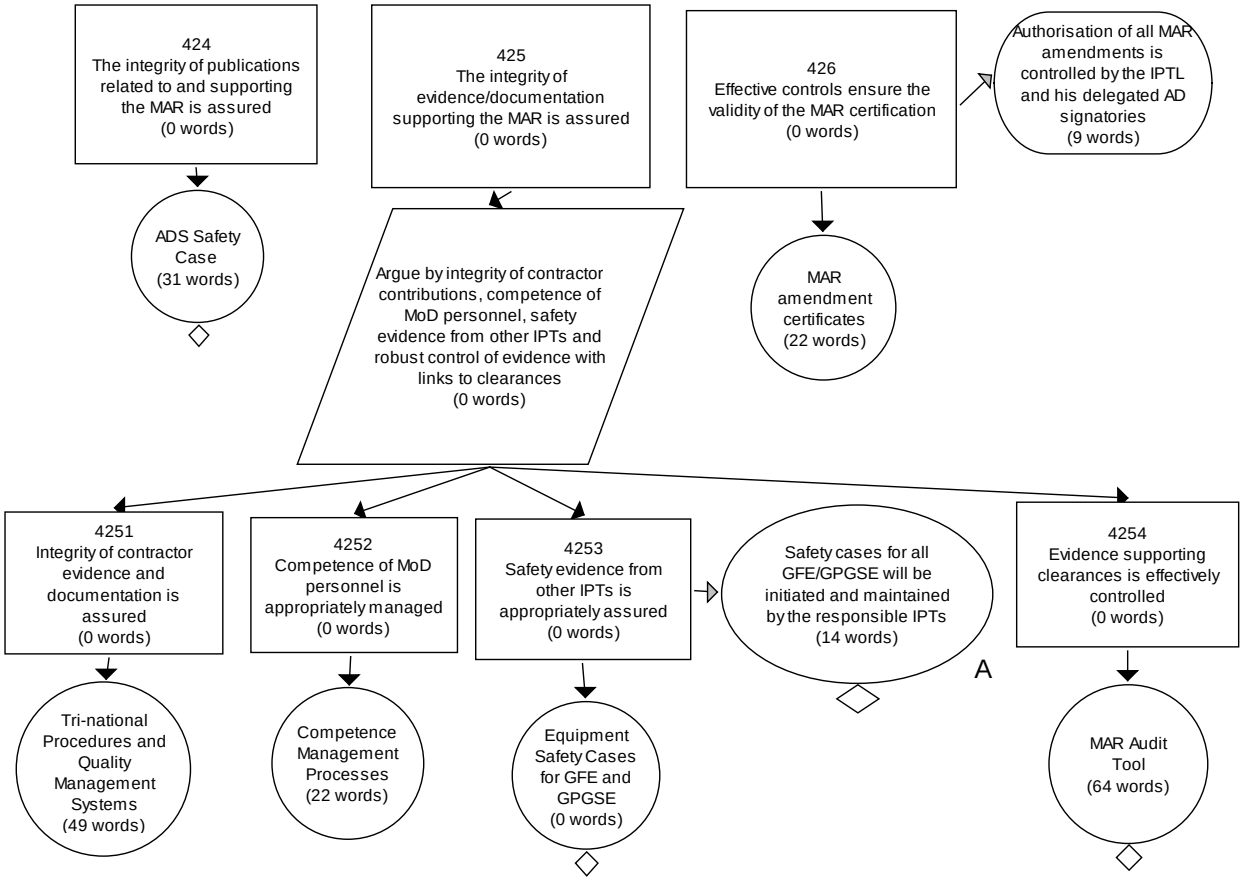
See AACE proposal (AACE/RH/56/4 dated 13 Sept 03) and USER Manual (*TBD*)

Goal 4233: The risk from Tornado system hazards is maintained as low as reasonably practicable

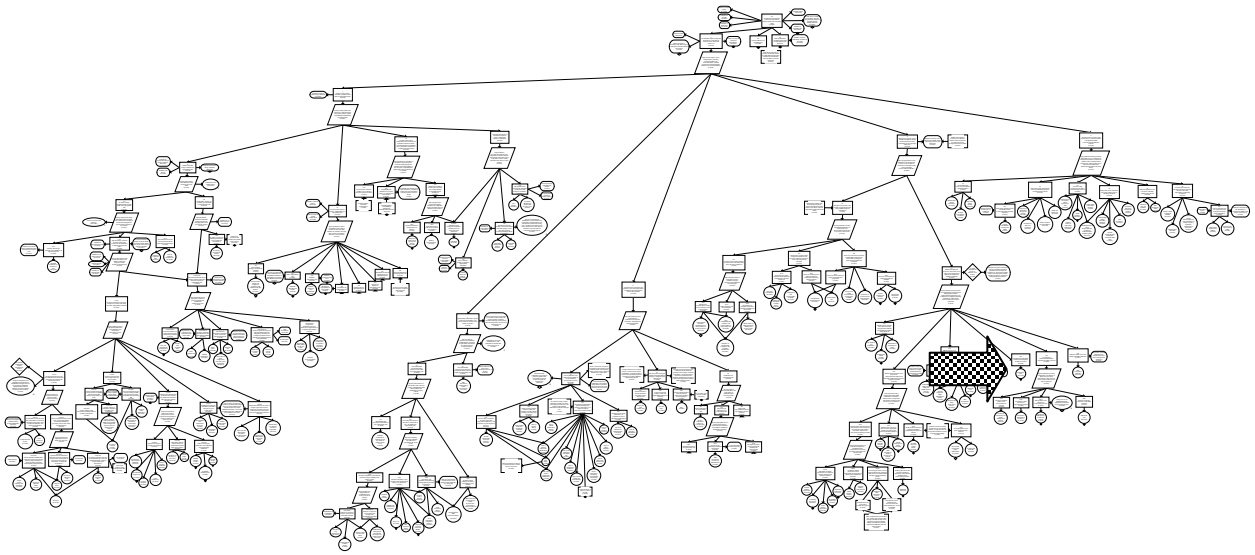
> ***Context (Goal 4233):*** *Definition of Tornado Hazard Management System*
>
> *The THMS is based upon the management requirements as set out in ES(Air) Handbook - BP 1201- Equipment Safety Management Issue 2, 2002.*
>
> *The ALARP (As Low As Reasonably Practicable) boundaries for system level hazards are defined in the Risk Classification table in Annex C of the TESMP*

SOLUTION (GOAL 4233): TORNADO EQUIPMENT HAZARD LOG

4.10 Integrity of publications/supporting evidence and effective control of certification (Goals 424, 425 and 426)



Location within Safety Case



Goal 424: The integrity of publications related to and supporting the MAR is assured

SOLUTION (GOAL 424): ADS SAFETY CASE

Aircraft Document Set safety case addresses the assurance argument for all aircrew, groundcrew and engineering documentation content. (note that this is not yet documented) - see goal 33

Node Status: Development required to establish ADS safety case

Goal 425: The integrity of evidence/documentation supporting the MAR is assured

Strategy (Goal 425): *Argue by integrity of contractor contributions, competence of MoD personnel, safety evidence from other IPTs and robust control of evidence with links to clearances*

Goal 4251: Integrity of contractor evidence and documentation is assured

SOLUTION (GOAL 4251): TRI-NATIONAL PROCEDURES AND QUALITY MANAGEMENT SYSTEMS

Tri-national Procedures

Panavia - QFN 01, QFN 03, QFN 04

Turbo Union - RB 199 Qualification/Certification Procedures

Quality Management Systems

Panavia - see TESMP Annex B

Turbo Union - see TESMP Annex B

Mauser - see TESMP Annex B

QinetiQ - Business Management System (certified to ISO9001:2000 by BSI under certificate FS73052)

Goal 4252: Competence of MoD personnel is appropriately managed

SOLUTION (GOAL 4252): COMPETENCE MANAGEMENT PROCESSES

DLO personnel are managed iaw BP 1206 (See TESMP Annex A)

Other MoD staff are managed iaw the practices of parent organisations

Goal 4253: Safety evidence from other IPTs is appropriately assured

Assumption (Goal 4253): *Safety cases for all GFE/GPGSE will be initiated and maintained by the responsible IPTs*

This requirement needs to be reflected in the IBAs/CSAs with the responsible parties

Node Status: Development required to ensure that this is appropriately covered in agreements

SOLUTION (GOAL 4253): EQUIPMENT SAFETY CASES FOR GFE AND GPGSE

Node Status: Development required to establish and document the existence of the safety cases

Goal 4254: Evidence supporting clearances is effectively controlled

SOLUTION (GOAL 4254): MAR AUDIT TOOL

ADAMS provides structured capture and maintenance of evidence supporting the current clearances and limitations.

Use of the tool will be subject to formal annual auditing by AACE to check appropriateness of evidence used in support of MAR amendments *(note that tool is still in process of introduction and population)*

Legacy DLO changes to MAR are documented via Supplemental Safety Cases and MAR amendment folders

Node Status: Development required to document status when tool is fully up and running

Goal 426: Effective controls ensure the validity of the MAR certification

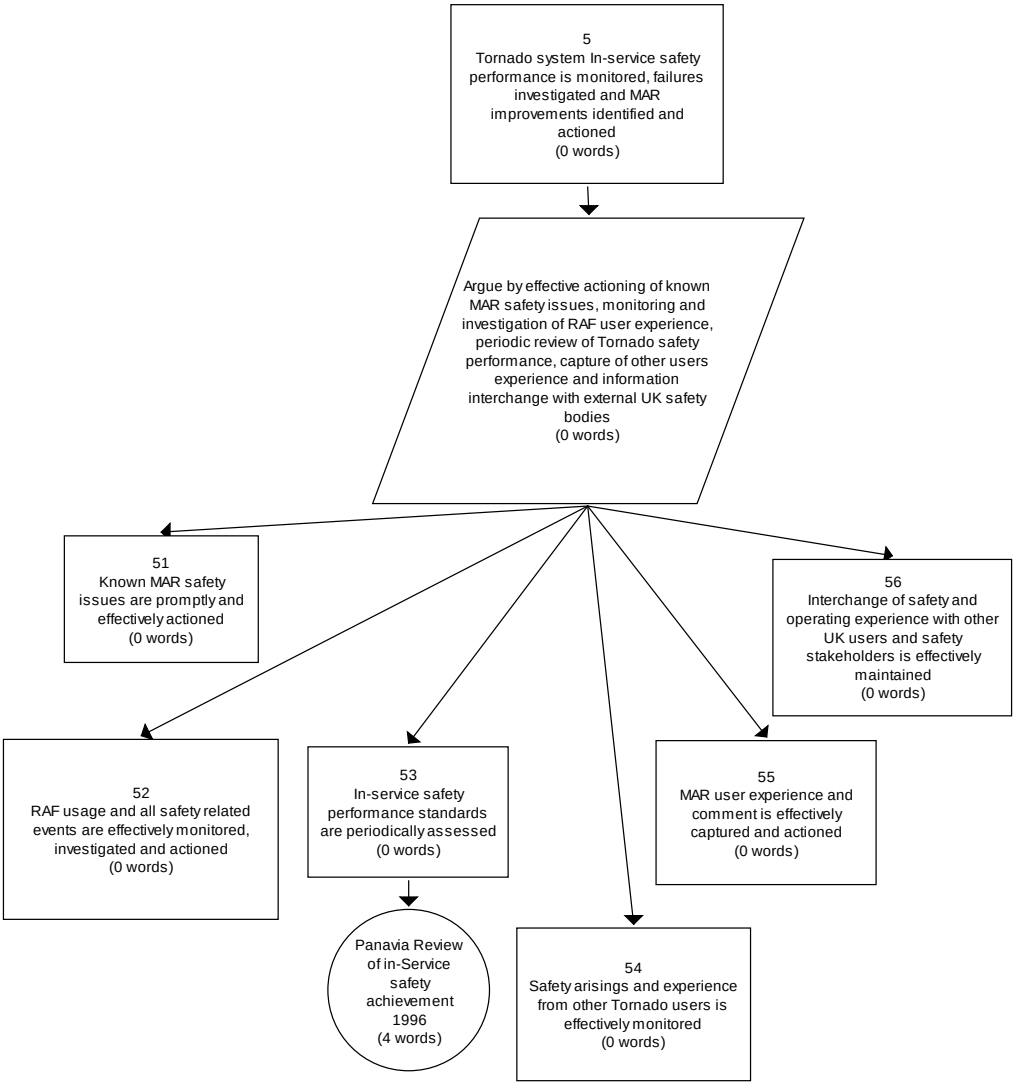
Context (Goal 426): *Authorisation of all MAR amendments is controlled by the IPTL and his delegated AD signatories*

Review/authorisation requirements set out in Tor LI-BS005

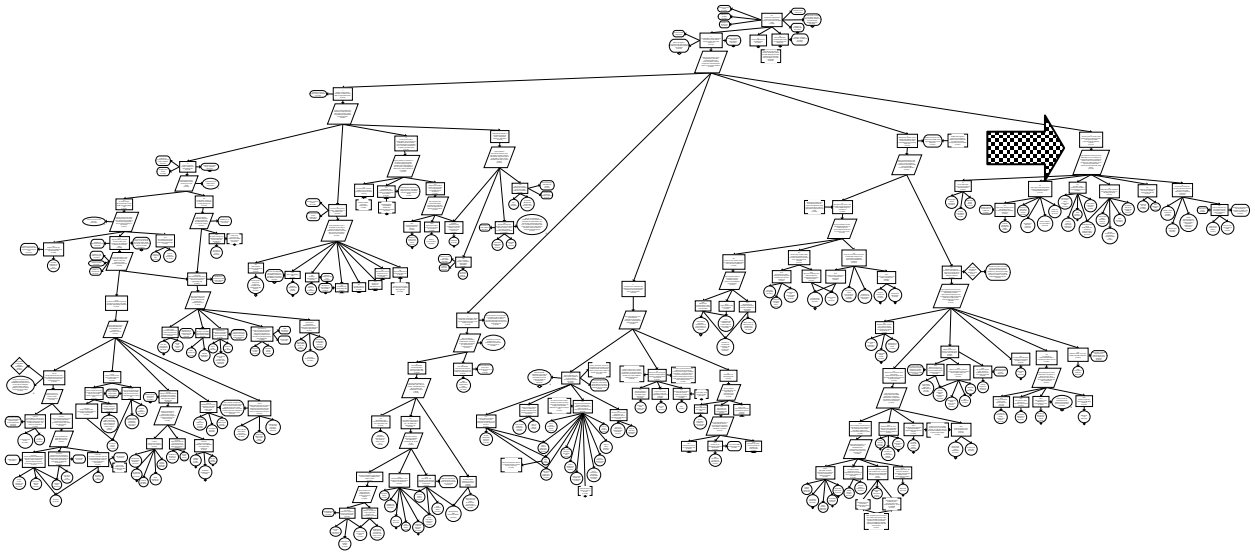
SOLUTION (GOAL 426): MAR AMENDMENT CERTIFICATES

These are provided to the RTSA with each MAR amendment and copies are retained within the Tor ESM 1 MAR amendment folders.

5 Section 5: Safety performance monitored and MAR improvements identified/actioned (Goal 5)



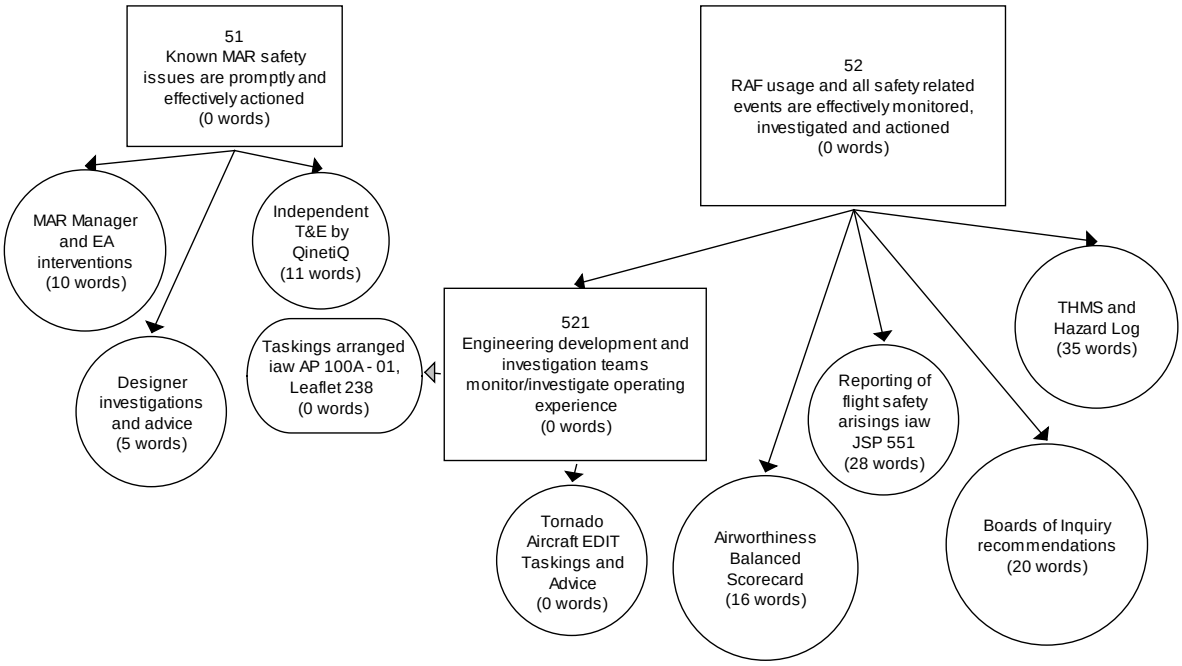
Location within Safety Case



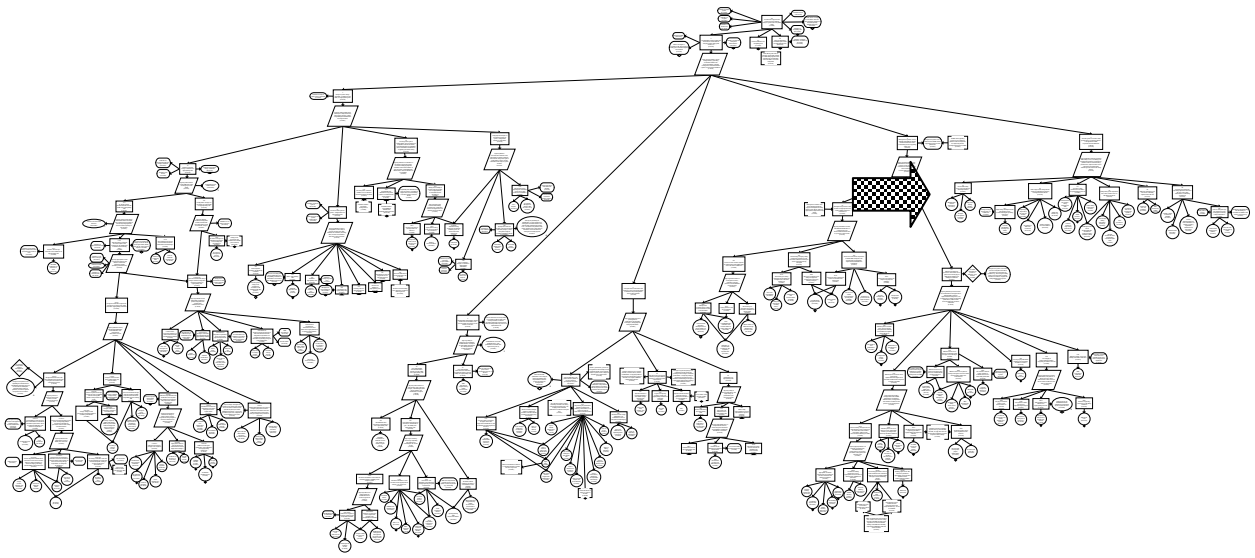
Goal 5: Tornado system In-service safety performance is monitored, failures investigated and MAR improvements identified and actioned

Strategy (Goal 5): *Argue by effective actioning of known MAR safety issues, monitoring and investigation of RAF user experience, periodic review of Tornado safety performance, capture of other users experience and information interchange with external UK safety bodies*

5.1 MAR Safety issues actioned/RAF use and safety events monitored and actioned (Goals 51 and 52)



Location within Safety Case



Goal 51: Known MAR safety issues are promptly and effectively actioned

SOLUTION (GOAL 51): MAR MANAGER AND EA INTERVENTIONS

Feedback channelled via RTSA and managed iaw Tor LI-BS005.

SOLUTION (GOAL 51): DESIGNER INVESTIGATIONS AND ADVICE

These are initiated via TESP

SOLUTION (GOAL 51): INDEPENDENT T&E BY QINETIQ

Initiated as required iaw Tor LI-BS002 and Tor LI-BS005.

Goal 52: RAF usage and all safety related events are effectively monitored, investigated and actioned

Goal 521: Engineering development and investigation teams monitor/investigate operating experience

Context (Goal 521): *Taskings arranged iaw AP 100A - 01, Leaflet 238*

SOLUTION (GOAL 521): TORNADO AIRCRAFT EDIT TASKINGS AND ADVICE

SOLUTION (GOAL 521): REPORTING OF FLIGHT SAFETY ARISINGS IAW JSP 551

All reports received by the IPT are copied to the Tor ESM 2 as Tornado Safety Manager, for entry in the Hazard Log and assignment to appropriate "owner"

SOLUTION (GOAL 521): AIRWORTHINESS BALANCED SCORECARD

Reviewed and revised on monthly basis with 6 monthly input to and review by the FWAMG.

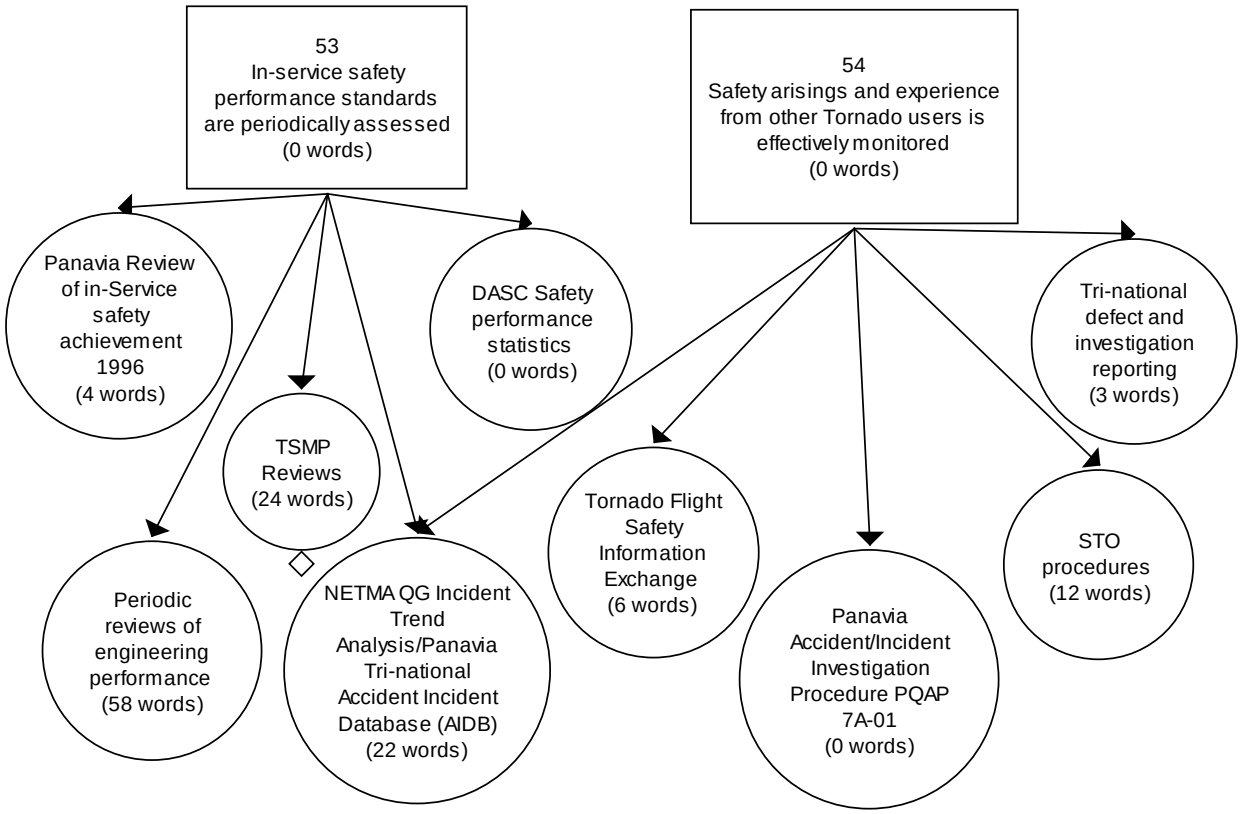
SOLUTION (GOAL 521): BOARDS OF INQUIRY RECOMMENDATIONS

All engineering and system related recommendations from BOIs are captured via the THMS and and managed via the Hazard Log

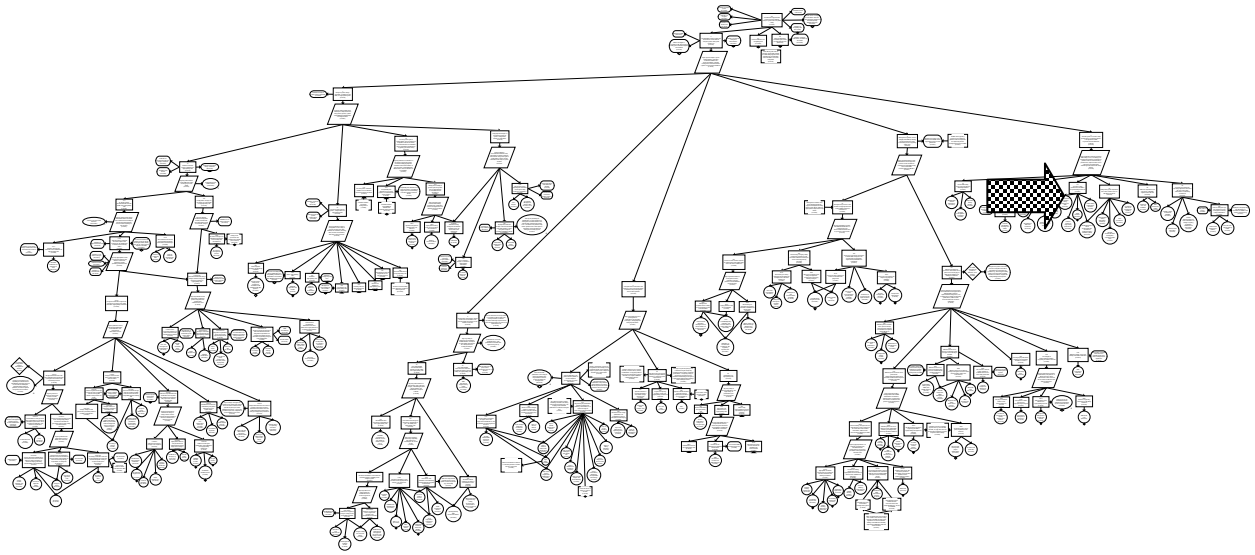
SOLUTION (GOAL 521): THMS AND HAZARD LOG

All events relating to accidents/incidents, Serious Fault Signals, safety related defects and other arisings relevant to the safety and airworthiness of the aircraft are captured by the THMS and managed via the Hazard Log.

5.2 Safety standards assessed/other user experience monitored (Goals 53 and 54)



Location within Safety Case



Goal 53: In-service safety performance standards are periodically assessed

SOLUTION (GOAL 53): PANAVIA REVIEW OF IN-SERVICE SAFETY ACHIEVEMENT 1996

PDT 1230 ST01, 1996

SOLUTION (GOAL 53): PERIODIC REVIEWS OF ENGINEERING PERFORMANCE

The Commanders Review of Engineering and Supply Trends (CREST) is undertaken iaw BP 1201. In future LITS may be used to support the ongoing review.

Annual statistical reviews of engineering performance of systems are currently undertaken by DLO Logistics Applications IPT using maintenance data system reports. The results are promulgated to all IPT members and other project stakeholders.

SOLUTION (GOAL 53): TSMP REVIEWS

NOTE: There is a need for the TSMP management procedures to ensure that available statistics form part of each TSMP briefing input from TSM.

Node Status: Development required to establish the TSMP process

SOLUTION (GOAL 53): NETMA QG INCIDENT TREND ANALYSIS/PANAVIA TRI-NATIONAL ACCIDENT INCIDENT DATABASE (AIDB)

The AIDB will provide user nations with quarterly reports on arisings and an annual analysis of trends, findings and actions completed/ongoing.

SOLUTION (GOAL 53): DASC SAFETY PERFORMANCE STATISTICS

Goal 54: Safety arisings and experience from other Tornado users is effectively monitored

SOLUTION (GOAL 54): TORNADO FLIGHT SAFETY INFORMATION EXCHANGE

Ref N/3105/5220 /01444/NR

SOLUTION (GOAL 54): PANAVIA ACCIDENT/INCIDENT INVESTIGATION PROCEDURE PQAP 7A-01

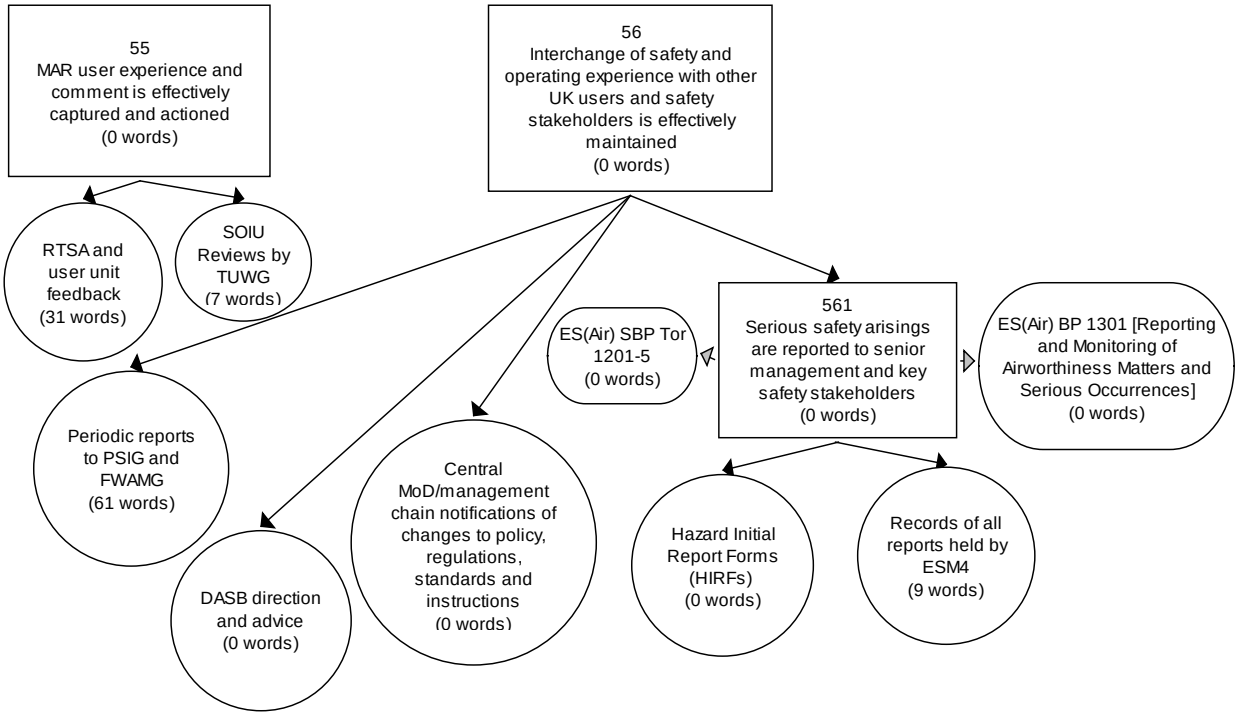
SOLUTION (GOAL 54): STO PROCEDURES

Ref TESP 1 and Panavia Serious Technical Order procedure P/1203/0008

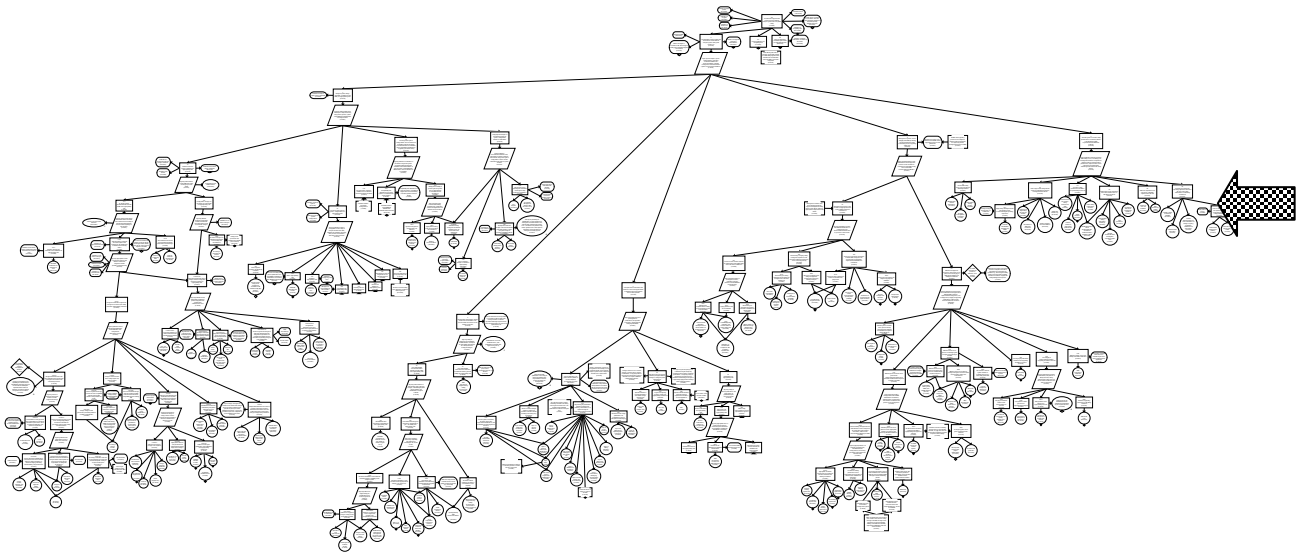
SOLUTION (GOAL 54): TRI-NATIONAL DEFECT AND INVESTIGATION REPORTING

Ref TESP 9

5.3 User experience captured and actioned/Interchange of experience (Goal 55 and 56)



Location within Safety Case



Goal 55: MAR user experience and comment is effectively captured and actioned

SOLUTION (GOAL 55): RTSA AND USER UNIT FEEDBACK

Feedback is provided by both RTSA and users on an ad-hoc basis and the IPT responses are co-ordinated and actioned by the MAR manager. Records kept in MAR database.

SOLUTION (GOAL 55): SOIU REVIEWS BY TUWG

Tornado User Working Group reviews SOIU accuracy

Goal 56: Interchange of safety and operating experience with other UK users and safety stakeholders is effectively maintained

SOLUTION (GOAL 56): PERIODIC REPORTS TO PSIG AND FWAMG

Fixed Wing Airworthiness Management Group

This group is responsible for reviewing the airworthiness of fixed wing aircraft and for advising the Defence Aviation Safety Board on airworthiness matters (JSP 553 para 7.12.2).

Propulsion Integrity Working Group ES(Air)

This group provides a specialist forum for aero-engine risk issues and reports to the FWAMG via AD Eng Pol (BP1202)

SOLUTION (GOAL 56): DASB DIRECTION AND ADVICE

SOLUTION (GOAL 56): CENTRAL MOD/MANAGEMENT CHAIN NOTIFICATIONS OF CHANGES TO POLICY, REGULATIONS, STANDARDS AND INSTRUCTIONS

Goal 561: Serious safety arisings are reported to senior management and key safety stakeholders

> ***Context (Goal 561):*** *ES(Air) SBP Tor 1201-5*
>
> ***Context (Goal 561):*** *ES(Air) BP 1301 [Reporting and Monitoring of Airworthiness Matters and Serious Occurrences]*

SOLUTION (GOAL 561): HAZARD INITIAL REPORT FORMS (HIRFS)

SOLUTION (GOAL 561): RECORDS OF ALL REPORTS HELD BY ESM4

Additional soft copy records are maintained within the AMDB