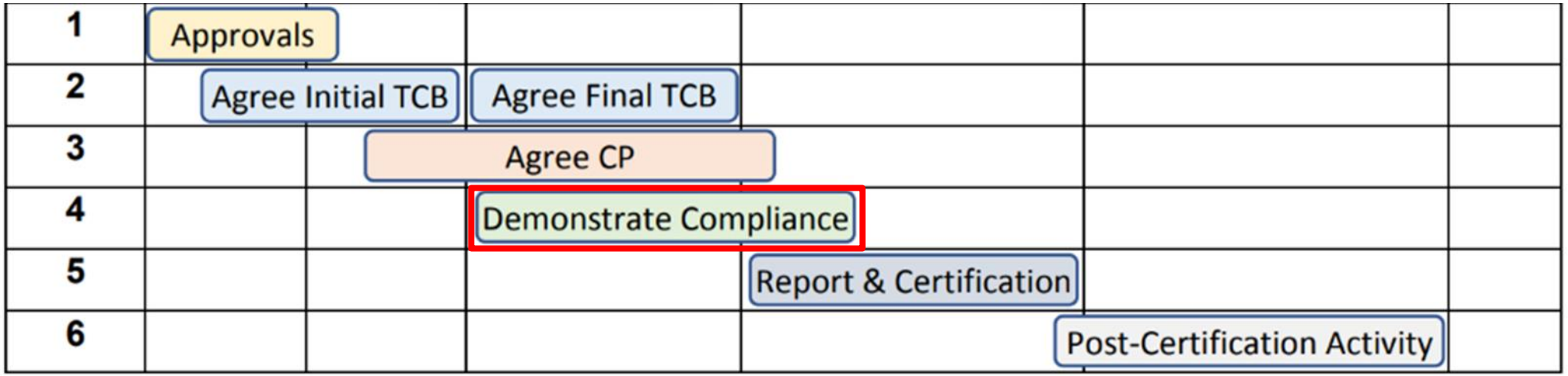
Military Air System Certification Process: Awareness Training Day 2 – Phase 4 Demonstrate Compliance

MACP Phase 4 – Demonstrate Compliance

The Military Air System Certification Process (MACP)



Purpose of Phase 4

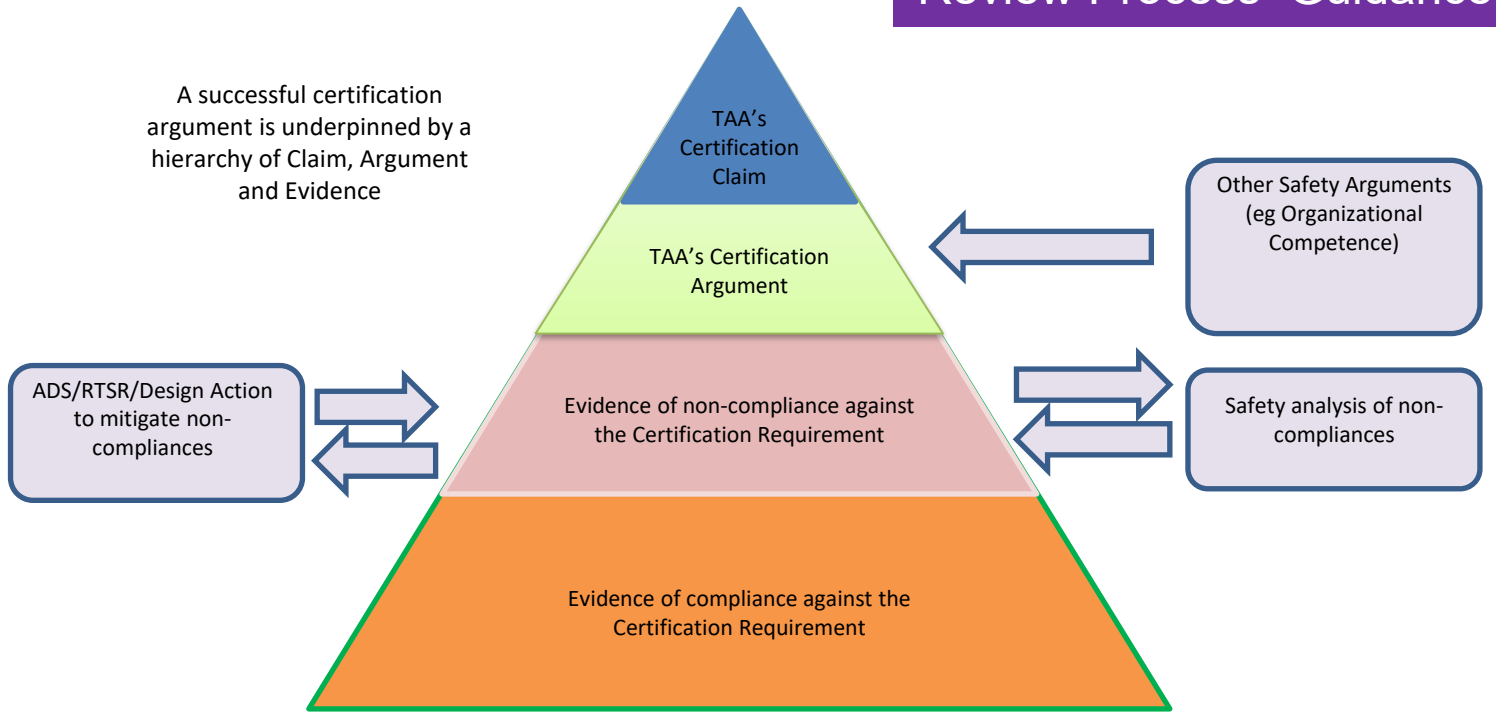
The purpose of Phase 4 of the MACP is to demonstrate compliance with the Type Certification Basis (TCB). This is achieved through the provision of compliance evidence, agreed during Phase 3, from the TAA to the MAA. This evidence is presented in a Type Certification Exposition, generated by the DT and approved by the TAA.

Compliance Demonstration

AET Tool 8AB: Certification Evidence Review Process Guidance

There are 3 elements to demonstrating compliance:

- Gathering the evidence as detailed within the CP;
- Review and acceptance of the evidence by the DT;
- Articulation of the evidence in a structured argument.

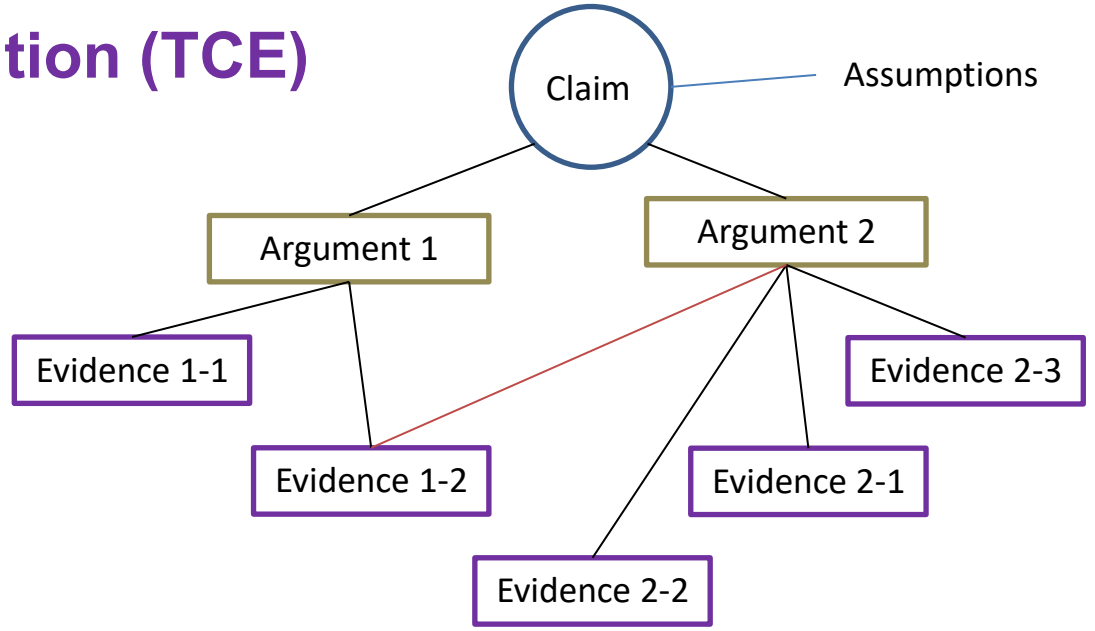


MACP Phase 4 – Type Certification Exposition (TCE)

Type Certification Exposition is the document that draws together all certification artefacts and evidence.

Claim, Argument, Evidence approach is recommended.

AET Tool 8O provides guidance and a top-level structure for providing a coherent case.



Simple CAE Structure Examples

Claim	Argument	Evidence
Claim 1	Argument 1	Evidence 1.1
		Evidence 1.2
	Argument 2	Evidence 2.1
		Evidence 2.2
		Evidence 2.3

AET Tool 8O:
Military TCE Guidance

Demonstrating Compliance with the TCB

The TCE must include:

- All compliance documents referenced in CP;
- Details of difficulties or events encountered that may affect safety or RtL;
- Identification of requirements not complied with but where an Equivalent Level of Safety (ELoS) is demonstrated or a Deviation has been agreed with the MAA;
- Where an ELOS cannot be shown and Residual Risk remains, and a Deviation cannot be agreed, transfer to and acceptance by the ADH chain must be demonstrated.
- Statement from TAA declaring:
  - Compliance with TCB via means approved in CP;
  - No features identified that may make the Air System unsafe.

Manual of Military Air System Certification (MMAC)
Chapter 2: Certification Of Air System Type Designs (MRP Part 21 Subpart B) And The Military Air System Certification Process (MACP)
Phase 4 – Demonstrating Compliance

AET Type Certification Tools

Air Engineer's Toolkit Tools 8N (Certification Log) and 8O Type Certification Exposition

Both provide guidance useful for constructing the TCE.

For a minor Type Design change, Tool 8E Minor Change Type Certification Exposition – Template should be used.

It is also important to engage with the Aviation Duty Holder (ADH) chain throughout the process.

AET Tool 8N:
Certification Log

AET Tool 8O:
Military TCE Guidance

AET Tool 8E:
Minor Change TCE - Template

TCE Evidence Sources

In Phase 4, TAA provides evidence agreed with MAA during Phase 3.

Evidence can include:

- Design Data;
- DO T&E qualification programmes;
- Performance Test Reports;
- Flight test data;
- Safety Assessments;
- In-service assessments.

Incorporating Independent Technical Evaluation

- The Type Airworthiness Safety Assessment (TASA) must be subjected to independent analysis and evaluation.
- Determine whether ITE is required based on level of competence within the DT and potential for airworthiness risk.
- The TAA should consider, sentence and decide whether to implement ITE recommendations.

Management of Non-Compliances

Five potential approaches to dealing with non-compliances:

Change the design to eliminate the non-compliance

Get more evidence in order to show compliance

Generate an Equivalent Level of Safety (ELOS) Argument at system level:

- TAA mitigates non-compliance via equipment DLOD.
- ADH mitigates non-compliance via operating DLOD.

Demonstrate that the Essential Requirements for Airworthiness have been met, and that a Deviation can be issued by the MAA.

Results in a compliant position

AET Tool 8P: Certification Non-Compliances

Transfer residual risk to the Aviation Duty Holder (ADH)

Remains a non-compliant position

Management of Non-Compliances

Retrofit of a old-fashioned analogue cockpit display to a modern digital display.
However, the underlying software for many of these new displays has not been developed to any recognised standard and therefore some primary flight data cannot be relied upon.

RE-DESIGN	GAIN FURTHER EVIDENCE	EQUIVALENT LEVEL OF SAFETY	DEVIATION	TRANSFER RESIDUAL RISK
The underlying software for the non-compliant displays is replaced with software developed to a recognised standard	Undertake further testing of the underlying software to demonstrate that the primary flight data display is compliant	Propose that the aircrew can cross-check the main display with the compliant Standby Instrument to achieve an equivalently safe outcome	Review and demonstrate that the software can meet the Essential Requirements for Airworthiness and propose that a Deviation can be issued by the MAA	Accept that the primary flight data may be inaccurate and that it could lead to an increased level of Risk to Life

Transfer of Residual Risk / ADH Acceptance of ECtRtL

Residual risk must be assessed and transferred to the Aviation Duty Holder, but they may decide that the risk is not acceptable.

To achieve military certification, the MAA requires evidence of risk transfer from the TAA and acceptance by the ADH that the RtL is ALARP and Tolerable.

AET Tool 8P:
Certification Non-Compliances

Transfer of Residual Risk / ADH Acceptance of ECtRtL

AET Process 17 provides processes and tools to enable articulation of the ECtRtL to the ADH chain and for their acceptance (or otherwise) of the risk.

Risks are transferred through the Equipment Contribution Evaluation Report (Summary) (ECER-S) for Certification Non-Compliances and the Equipment Contribution Interface Declaration (ECID) for enduring residual risks.

AET Tool 8P:
Certification Non-Compliances

AET Tool 17F:
Equipment Contribution Interface Declaration Template

Impact of Certification on the ADS

Air Systems can only be operated and maintained safely if there exists a set of instructions which describes:

- Operating procedures;
- Operating limitations;
- Maintenance procedures.

These publications are known collectively as the Air System Document Set (ADS).

Deficiencies within the ADS may mean the Air System is no longer Safe to Operate or being Operated Safely.

RA 1310 - Aircraft Document Set

AET Tool 11A:
ADS Definitions, Roles & Responsibilities

Impact of Certification on the ADS

The TAA, Commodity CE and ODH / AM(MF) shall ensure, through validation, that all the information contained within their contribution to the ADS is technically accurate and should ensure that quality assurance processes are in place to validate that all the information contained within the ADS is technically accurate before first use. [Source: RA1310(2)]

RA 1310 - Aircraft Document Set

Instructions for Sustaining Type Airworthiness (ISTA)

Instructions for Sustaining Type Airworthiness (ISTA) are a subset of the Air System Document Set (ADS).

ISTA includes the combined suite of methods, inspections, processes, and procedures necessary to support the Maintenance and operation of an Air System.

It also covers the associated Products, Part, Appliances, Airborne Equipment and Air Launched Weapons within its “**certified limits**”.

The 'Airworthiness Limitations Section' of the ISTA is deemed to be part of the Type Design.

RA 5815 - Instructions for Sustaining Type Airworthiness

Release to Service

The Release to Service (RTS) is the process that authorizes Service flying on behalf of the responsible Service Chief of Staff / Senior Duty Holder (SDH).

It defines the operating envelope, released configuration, and associated limitations.

It is the responsibility of the Release to Service Authority (RTSA) to issue the RTS.

RA 1300 - Release To Service

RA 1360 - Release To Service Recommendations Preparation and Authorization - – Withdrawn, incorporated within RA1300

Air System Limitations in ADS

Limitations in the Release to Service (RTS) are the definitive limits for the Air System. These will be established from a combination of the URD, Design Usage Assumptions, Flight Testing and limitations introduced as mitigations to certification non-compliances (risk transfer and ADH acceptance processes).

The RTS will allow for peacetime training, exercise, contingency, threat and war conditions.

RA 1300 - Release to Service

RA 1300(3): Limitations

AET Tool SP1:
RTS Recommendations

Phase 4 Major Inputs and Outputs

Inputs:

- Certification Programme (Phase 3)
- Type Certification Basis (Phase 2)
- The Type Design or change to the Type design (physical or change in usage), (Phase 2)
- Body of Evidence to demonstrate compliance
- Management of non-compliances.

Outputs:

- TCE (Type Certification Exposition): Submitted by TAA to MAA for review in Phase 5

Phase 4 TCE Awareness Refresher

The Awareness Course covered:

- MACP Phase 4 – Type Certification Exposition (TCE)
- Claims Argument Evidence (CAE)
- Demonstrating Compliance with the TCB
- Introduction to AET Tools 8N & 8O
- TCE Evidence Sources
- Incorporating Independent Technical Evaluation
- Management of Non-Compliances
- Transfer of Residual Risk / ADH Acceptance of ECtRtL
- Impact of Certification on the ADS
- Air System Limitations in ADS
- Instructions for Sustaining Type Airworthiness ISTA
- Release to Service

Break

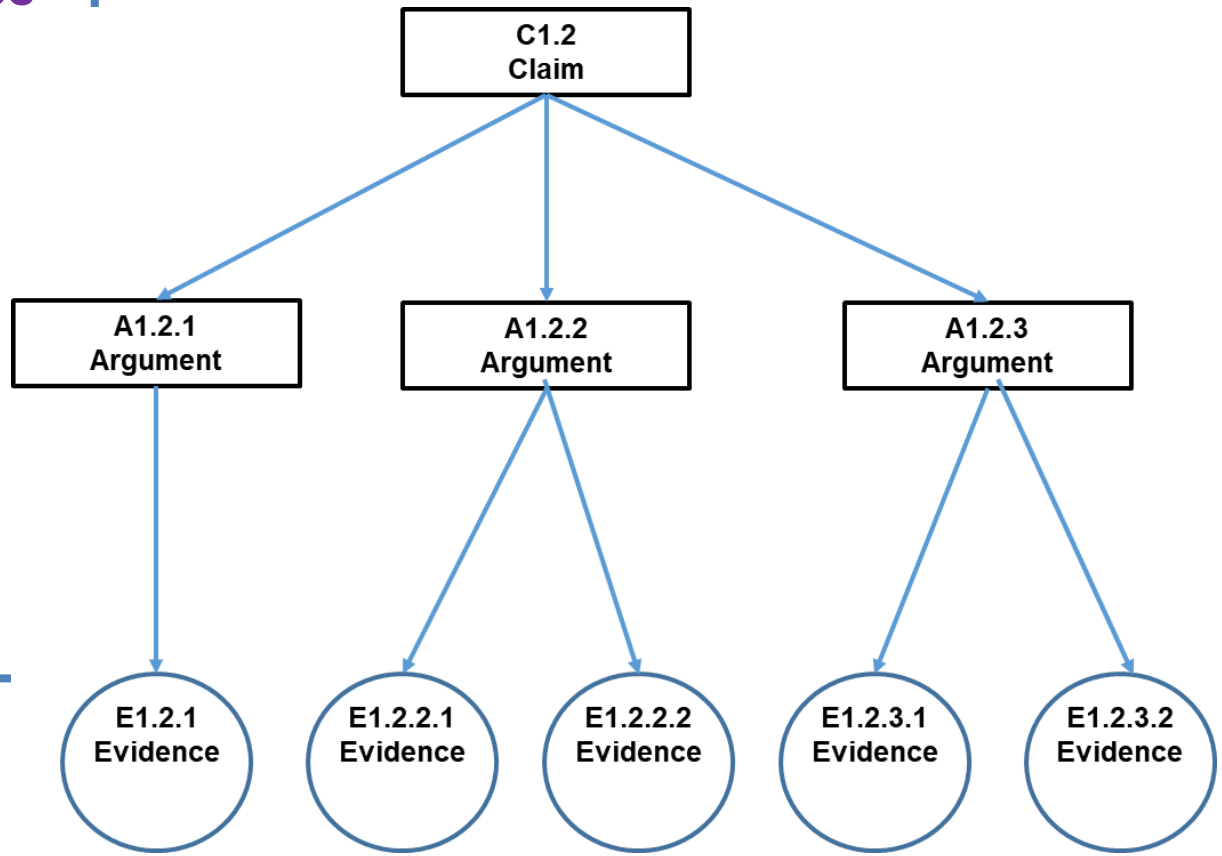
Activity:
Phase 4 – Syndicate Exercise

TCE Generation -
Claims, Arguments and Evidence

Phase 4 Exercise – TCE Generation

Phase 4 – Claims, Arguments and Evidence

- Decide whether each statement is a claim, argument or evidence.
- Build the pyramid using each of the statements listed on the webpage.
- Place each statement beneath the appropriate box or bubble.



End of Phase 4