



What price safety? The Realities of Qualifying & Certifying 'Simple' Survival and Safety Equipment

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Real Operations



Design Logic - Safety

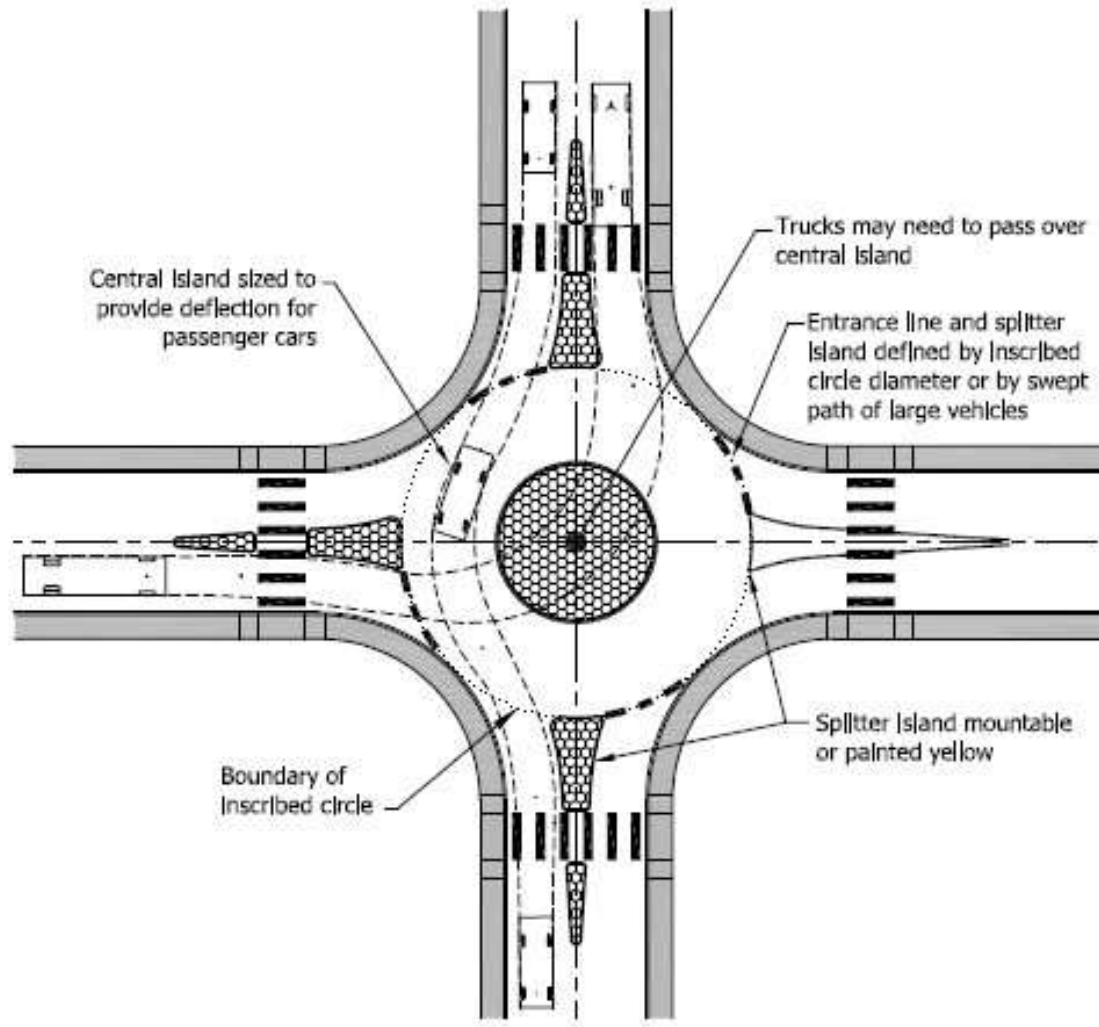
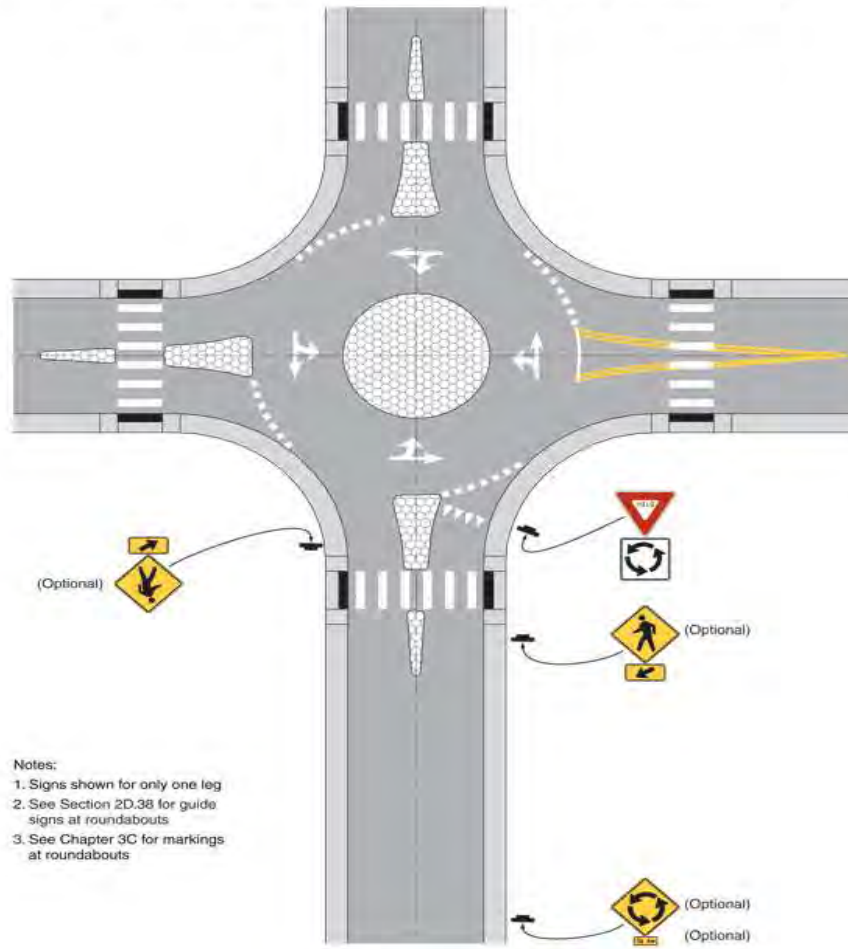


Figure 2B-21. Example of Regulatory and Warning Signs for a Mini-Roundabout



PROCESS: A foreigner's guide to navigating British roundabouts



Man - Machine Interface?



MAA: Ministry of Defence (MOD) Organisation

- Single regulatory authority
- independent and autonomous
- All aspects of Air Safety across Defence
- Provide the Secretary of State for Defence, through the Permanent Under Secretary of State for Defence, the necessary assurance that appropriate standards of Air Safety are maintained in delivering operational capability.
- Oversight Division:.....engineering and support activities, including airworthiness, maintenance and logistics, of Aviation Duty Holders and DH-facing organisations.

Design Approved Organisation Scheme (DAOS)



- MOD DAOS policy:
 - **Procure** only from contractors who have been assessed as competent.
 - The MOD **shall** only contract with competent organisations' and...
 - The MOD **should** only contract with Design Organisations approved under the Design Approved Organisation Scheme'.
- The DAOS is a mechanism:
 - by which **competence of design organisations** can be assessed.
- Organisations shall only be included and approved in the DAOS :
 - when it is in the interest of MOD and when the organisation has been accepted by the Military Aviation Authority (MAA).
 - for a **defined range of products**
- A fundamental precept of Airworthiness
 - is the use of **competent designers**. MOD Team Leaders must therefore assure themselves that they let contracts with competent design organisations

ASL Scope of approval

ALTG/07/03/11/291

- Parachute systems and associated equipment.
- Safety and survival products and associated equipment.
- Restraint harness systems and associated equipment.
- Airborne, air droppable and air transportable systems, including airframe components.

- Other organisations here at SAFE are similarly approved (or working towards approval) but in their own specialist areas...

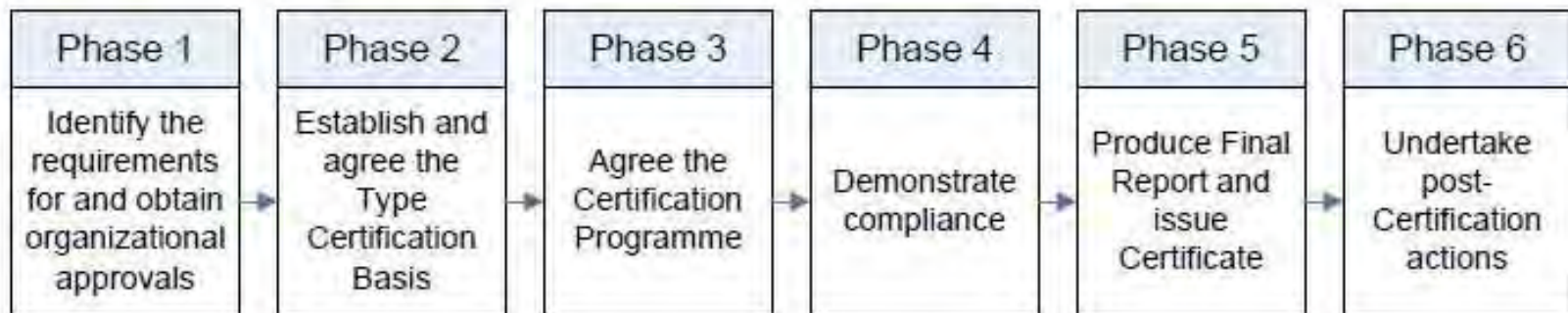
What affects my engineering team....Regulatory Articles (RA):

- 1000 Series: General Regulations
- 4000 Series: Continuing Airworthiness Engineering Regulations
- 5000 Series: Design and Modification Engineering Regulations
 - ...(these) apply to any personnel, be they civilian or military involved in continuing airworthiness engineering...
- Def Stans
 - 05-56, 05-57, 00-970... etc
- Def Cons
 - IPR, et al

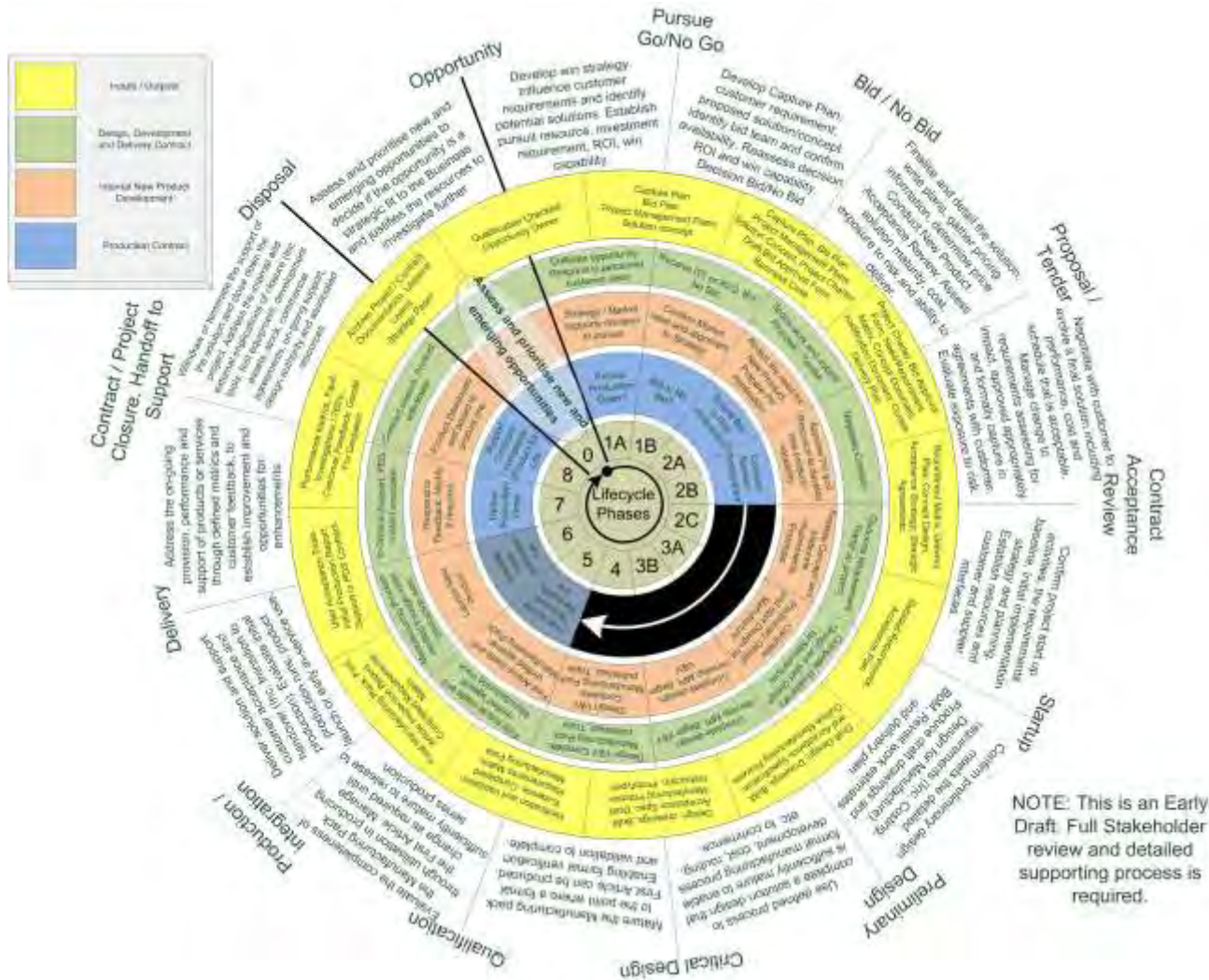
MAA Certification Rationale

- To ensure that an air system's design meets appropriate **safety requirements**, a systematic, independent certification process is required for both new types of military registered air systems and for major changes to existing designs.
- **6 Phase Approach:** The Military Air Systems Certification Process (MACP) certifies new UK military registered air systems and major changes to the type design of new and in-service air systems.

Military Air Systems Certification Process (MACP) 6 Phase Approach



ASL Engineering Project Life Cycle (Fits all!)



As DAOS DO, ASL is 'obliged' to consider and demonstrate to the MAA organisation that there is for each project:

- **ITT (Phase 1: Identify Requirements and Org'n approvals)**
 - User Requirement and Specifications
- **Proposal (Phase 2: Agree Type Certification Basis)**
 - Pursue' strategy: Risk, Cost and resource
 - Internal charter: Bid approval; design concept.
 - Safety, technical and contractual risk.
 - Company Strategy
- **Contract Acceptance (Phase 3: Agree Certification Programme)**
 - Baseline: Process!!!
 - Elaborate requirement (so that it is completely unambiguous)
 - Agree compliance reqt's... (incl contractual)
 - Ensure Def Stan requirements... design, safety, configuration mgt... et al.

DAOS Projects (Cont)



- Design Process and Configuration Management (New or Mods)
(Phase 4: Demonstrate Compliance)
 - Preliminary Design
 - Draft Data Pack: Type Records, preliminary safety considerations, Drawings, Bill of Materials, Acceptance Specification, Qualification req'ts.
 - Costings (design for manufacture)
 - Risks, Prod'n and QA involvement/commitment
 - Critical Design
 - Approved Data Pack: Type Record, Safety Assessment, Drawings, BoM , Acceptance Specification,
 - MPI, QA Plan, Certification req'ts (verification and validation), suppliers...
 - Qualification
 - Trials and Testing (Parachute include repetition test points for statistical analysis)
 - Materials compatibility/suitability/availability: strength, porosity temperatures, a/c, explosives, submarines etc
 - Bench: Configuration check and Slow speed deployment.
 - Verification: Low Speed dummy (balloon or light a/c), Opening 'g', RoD, Oscillation, twisted line, height loss, canopy behaviour.
 - Verification: High Speed dummy (B25 aircraft), Opening 'g',
 - Validation: Live (compliant self-loading dummies) ... Handling at various mass ranges
 - Repeat high altitude, (corners of envelope) etc.

Project Req'ts (continued)



■ Certification and configuration control

(Phase 5: Final Report and issue Design Certificate)

- Design Data Pack

- Compliance matrix report
- Type records
- Drawing pack
- Trials reports
- Safety Case (assessment)

- Check Point Review

- Final manufacturing Pack... Includes materials availability, obsolescence...
- MPI
- Quality Process (First Off approval etc)

■ Delivery and Disposal

(Phase 6: Post certification actions)

■ Post Design Services: Safety, Modifications, Obsolescence et al.

Materials Testing



Component Inspection



Testing: Dummies

Pipe Man Dummy



B25 bomb bay



Heavy Weight Dummy
(Self Loading)

Low speed Testing



High Speed Testing



Live Trials



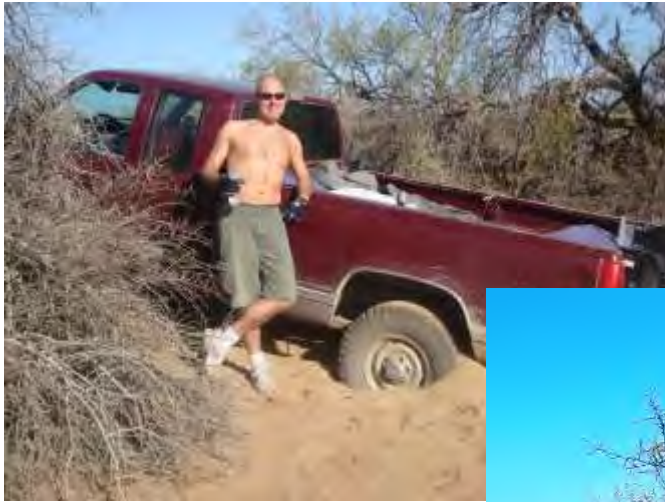
Customer Qualification Trials 'Zero-zero'



Customer Qualification Trials High Speed



Cost of mistakes?...



Configuration Management



- **Project Title / System Nomenclature : MRI / General Assembly Drawing Number :** Data / Documentation required
- **Contractual data:** Prime Customer Name / Reference; User Requirement Specification; Customer RFQ/ Proposal Request Reference; ASE Proposal Number : Project Cost Proposal Number : Main File Number / Location ; Customer Contract Number ; Customer Order Number / PV number ; IPR belongs to... ; Used on ... aircraft and/or system(s)?
- **System Definition:** Baseline Definition 2B ; Startup Checkpoint 2C; Top Drawing Number ; System Nomenclature ; Equipment Nomenclature ; Check Point ; Equipment Codification :
- **Design Development Documentation:** ASE Equipment Specification Safety Management Plan / Assessment 3A - Preliminary Design Review / Check Point Trials Spec / Plan Number(s) Trials Report Number(s) 3B - Interim Design Review Other Design reviews Reliability Ref ILS Ref Trials (Qualification) Report Number(s) Compliance Matrix FMECA ARMD Report Hazard Assessment Safety Case / Plan / Assessment 4B - Pre Qual Critical Design Review 5 - Final Critical Design Review
- **Design documentation:** Type Record / Structural Design Record Modification Number(s) Design Certification - Declaration of Design and Performance / F100A
- **Publications:** User Manual Packing Manual Repair / Maintenance Manual / AP Spare Provisioning List Technical Instructions Product Safety Sheet (if applicable) TP Amdt Number(s) Disposal Instruction
- **Manufacturing Documentation:** Manufacturing Process Instruction Production Aid Notes Construction Specification Production Readiness Review Meeting Minutes (ref) Introduction in to Service Meeting Minutes (Ref) (F555) Production / Concessions Production Qualification Test Specification Production Acceptance Test Specification Into Service Date
- **Quality Assurance:** Quality Management Plan Inspection plan FACI Report
- **Design Status:** (Dev/FACI/UMC) **Development/Qualified**
- **Design Life Data:** Finite Life - (Shelf) In-Use Life Number of uses - (descents / streams/ lifts) Repack Periodicity Maintenance Periodicity Other factors - remarks Max Life Extension and conditions Obsolescence Strategy Document
- **CE Marking:** Applicable European Directives Applicable Specifications
- **CAA/FAA/Other Certification Marketing and Sales** Product Data Sheet

Contractor Costs

Aircraft ball park costs US (UK can be double):

- Skyvan
 - \$1500 p.h
- Helicopter
 - \$2500 p.h
- B25
 - \$10,000 p.h (to include transit time etc.)
- C130
 - \$15,000 p.h
- C17 and Typhoon..... ?
- ASL Trials Crew (where is customer and user?)
 - T&S: (at States side test facility) Minimum 4 persons: DZ Safety Mgr; Photographer, despatchers/instrumentation x2

SUMMARY – Costs of MAA

- Test and approve equipment for MAA compliance:
 - Requirements: What is your real ‘need’ as a customer?
 - Following MAA Regulatory Publications, Aircraft Design Engineering and Safety Def Stans and Fed Cons is a contractual obligation as a DAOS Co.
 - Liaison and spec changes cost money. (aircrew ‘opinion’)
 - Qualification: Verification and Validation
 - Certification
- Employing a DAOS approved / ‘competent’ organisations is therefore relatively ‘expensive’ to commercial non-regulated industry... are the companies, DHs and their representatives overly risk adverse or simply hiding behind the guidance docs?
- Involve user community representatives at beginning of programme and keep on board, because as well as safety the equipment has to meet their requirement and needs.
- Does MAA allow free thinking by the company, the user/customer?

**Last thought: Statement from the QHI to
his Sqn during Ops in Afghanistan:
“I don’t want to see anything that is
Different, Daring or Dangerous!”**

Questions / Discussion