News story: QEC ship-air certification

It has been widely publicised that HMS Queen Elizabeth has recently completed her First of Class, Rotary Wing Flying Trials, the first major milestone in the integration of the Ship and the Aircraft that will operate from her. She is now in the process of preparing to embark the first Lightning II (F-35) for Fixed Wing Trials in the staged progression towards achieving her full operating capability. This article aims to explain the certification process of Ship-Air System Integration and how it has applied to the UK's newest Aircraft Carrier.

Allowing HMS Queen Elizabeth (and in due course, her sister ship, HMS Prince of Wales) to conduct embarked aviation operations, in either the Carrier Strike or Landing Platform Helicopter capacity, requires the integration of two complex and independent elements, the Ship and the Air-System, each of which operates through separate Duty Holders who need to ensure they are cognizant of and understand the implications of the others hazards and mitigations to their own areas of responsibility.

Conducting embarked aviation requires that the Risks to Life associated with operating Air Systems from any given Ship are understood and that the boundaries and scope of such operations are clearly defined. This process, defined in RA 1395, details the requirement for a Ship-Air Release; the document that authorizes a specific Class of MOD ship and Air System to conduct aviation activity. The Ship-Air Release, issued by the RN Release to Service Authority, is underpinned by safety evidence and documentation for the intended combinations of Ship and Aircraft, detailing specific safety information and operating limitations.

To facilitate the development of a Ship-Air Release, the input and engagement of numerous stakeholders from within the regulated community is required. RA 1029 details and clearly defines the roles and responsibilities of these stakeholders. The Ship-Air Release process requires reciprocal understanding between each of the stakeholders and the enduring engagements to ensure continuing safety of embarked aviation.

For an Air System, documented safety assessments and analysis are conducted by the relevant Air System Delivery Team, allowing the Type Airworthiness Authority to provide evidence of the aircrafts suitability for the intended embarked aviation operations in a given class of ship. On the ship side of the Ship-Air Release process this is reciprocated, with evidence assembled by the Platform's Strategic Class Authority and presented along with a written request for certification to the Naval Authority (Aviation), who sit within the Regulation & Certification Division of the MAA. The Platform's aviation facilities and associated safety assurance activities are then reviewed with the view to being able to certify as 'Safe to Operate'; the Ship itself being issued with a Certificate of Safety – Aviation (CS-A).

For a Ship, the process of obtaining a CS-A is detailed within JSP 430 Part 3 under Chapter 15 Aviation. This document sits under the broader DSA02 Defence

Maritime Regulator regulatory document set for MOD Shipping. The CS-A details those Mandatory Requirements and Conditions of Certification which should be addressed, adhered to, acknowledged and, where necessary, communicated to the appropriate Duty Holder; it supports the Ship-Air Release.

The process of issuing a CS-A should take less than 30 working days and is initiated by a request from the Platform Authority to certify a Ship for use with a specific Aircraft Type. This request is supported by a Ship Aviation Safety & Environmental Case Report (SASCR), generated by the Strategic Class Authority for the Ship. The Safety Case Report is intended to be a snapshot of the ship-air interface aspects of the ship's overall safety case, based on the 13 Risk Control Systems detailed within the DSA02 and the Defense Maritime Regulator Hazard matrix. It provides a clear and concise summary of the safety case and safety progress, assuring the Duty Holder that the safety hazards are being effectively managed and highlights any identified hazards and proposed mitigation to both operators and users. As such it is the primary document that pulls together the appropriate evidence that enables the award of aviation Certification. This document is reviewed by the Naval Authority (Aviation) alongside other evidence relevant to any specific ship/aircraft combination and its content used to generate the Mandatory Requirements and Conditions of Certification for a given CS-A.

For HMS Queen Elizabeth the process of achieving a CS-A and a Ship-Air Release has been a considered, incremental approach; ensuring that, at each stage of Ship-Air Integration, any associated hazards are identified and risks appropriately owned and controlled. To date HMS Queen Elizabeth, as the first in Class, has undergone certification for First of Class Flying Trials with Merlin HM Mk2 and Chinook HC Mk5. The incremental release of Conditions of Certifications and Mandatory Requirements has been achieved in tandem with Navy Command HQ assurance of aviation Harbor and Sea Acceptance Trials. At each stage of assurance, evidence to bolster the safety statements contained in the Safety Case Report has been generated, allowing a steady easing of limitations; either through amendment of the extant CS-A, or subsequent requests for certification. In this manner, the ship has been progressed from constrained aviation on a single spot and with limited Ships Helicopter Operating Limits (SHOLs), to multi-spot operations including use of the ships lifts and hangar facilities.

With the present CS-A limited to Rotary Wing Aircraft, HMS Queen Elizabeth is currently under-going its first Capability Insertion Package. This package sees the installation of those dedicated systems necessary to facilitate Fixed Wing Operations with the F-35. This includes additions to the Air Traffic Management and Landing Signal Officer equipment to include management and control the F-35 during Vertical or Ship-borne Rolling Vertical Landings. The newly developed rolling vertical landing procedure allows the recovery of an F-35 while still carrying a full payload. To date these landings have not been conducted on a maritime platform, making the Queen Elizabeth Class Carriers the first class of ship to recover an F-35 in this manner. There will also be alterations to the Thermal Metallic Spray which protects the deck from aircraft efflux during take-off and landing, as well as navigational interfaces for the ship and the aircraft.

Due to the nature of these ship systems, and how they interface with the aircraft, the Ship will require a further period of assurance activity, conducted by Navy Command HQ, prior to commencing Fixed Wing Flying Trials. This assurance will feed the next stage of certification, along with the release of the 2nd generation in-service Safety Case Report by the Queen Elizabeth Class – Strategic Class Authority. Combined with the results of Rotary Wing aircraft flying trials it is expected that subsequent certification will see a de-restriction of Rotary Wing operations and the inclusion of both Apache and Wildcat helicopters, whilst maintaining the staged and controlled incorporation of Fixed Wing capabilities, again feeding the Ship-Air Release for the Queen Elizabeth Class and F-35.

With the new dawn for UK Carrier Strike capability, decades of work combine to integrate new generations of combat aircraft with the largest, most advanced warships to serve in the Royal Navy. Committed to facilitating this, the MAA together with representatives from both the Naval Authority (Aviation) and Navy Command HQ are working together to deliver assurance and certification; working alongside stakeholders from the Strategic Class Authority and Lightning II Delivery Team to facilitate the return of British air-power projection from the sea.