

## **CARRIER ENABLED POWER PROJECTION**

### **INTRODUCTION**

When, on the 24th of June 2020, the National Audit Office (NAO) published their report "*Carrier Strike – Preparing for deployment*", the examination presented a mixed picture of the project. Although the report concluded that the ships themselves were broadly on track, many aspects of the essential and vital supporting requirements were struggling with funding issues that threatened to destroy the potential operational capability (OC) of the United Kingdom's (UK) Carrier Strike Group (CSG). CSG is, as the name implies, a System of Systems and its capability depends on all 'ingredients' being present and working in unison to be effective. CSG is like a hospital; all the ancillary resources, skilled staff, maintained equipments, logistics, replacement and regeneration capability are, in their most efficacious form, essential.

DefenceSynergia (DS) agrees, largely, with this report but believes that the NAO's reservations and criticisms of the project are limited to a current reading of the threats to the UK's security and defence and do not accord with the required long term analysis of the necessary OC this Carrier Enabled Power Projection (CEPP) demands. Additionally, there are very significant weaknesses that are not covered.

If we are to embrace the true concept of CEPP in the context of developing security and defence threats over the coming decades, it would be wise to be clear as to what OC the government believes it is getting for its "buck". In all the "hype" about this very expensive investment, great emphasis has been made on CSG being a most modern example of the genre. This invites comparison with the most obvious exemplar, that of the United States Navy (USN). In the following paragraphs, DS summarises, by implicit comparison, just how far short the UK's vital OC falls and how this not only makes the force extremely vulnerable but, in the extreme, ineffective.

On a very positive note, the massive technical and managerial challenge of constructing the aircraft carriers themselves is now almost complete. (The contract with the Aircraft Carrier Alliance (ACA) for final work on the carriers will end in March 2023). At a cost of £6.4Bn, two 65,000-tonne ships, designed to last 50 years will have been delivered. This is acknowledged and applauded.

These ships are almost ready to go, platforms with enormous potential to build on but, it is their future protection, the OC of the force that they are at the centre of, their running costs and the myriad supporting elements that

have not been fully invested in, costed and accounted for that give DS serious doubt that the aspirations for Carrier Strike (CS) and CEPP will be accomplished. More importantly, these omissions and failings will, almost certainly, result in such vulnerability that their effectiveness will be constrained to operations of very low risk.

In this paper, DS attempts to cover, in broad terms, the weaknesses in this impressive defence project and makes some effort to propose improvements. It is important, in this context, to emphasise that, even if all these elements are put right, the aircraft carriers' OC will not match those in the USN but, we must trust that they would then be able to operate against and match most likely threat levels. Any further reduction of vulnerability and an increase in OC would need some future refit to include the ability to operate aircraft and drones that require the fitting of catapults and arrestor gear.

## **CARRIER GROUP READINESS – COMBAT READY TRAINING AND JOINT SERVICE IMPLICATIONS**

Whilst a CSG can be a formidable deterrent and striking force in areas of high threat level, full attention must be given to making sure that all elements that constitute it are present and, equally importantly, to working those individual constituents up to a coherent and cohesive whole. Ideally, all units comprising the force will belong to a single nation so that its culture and operating procedures are "in the blood" and well practised together. Should this not be achievable, then greater time and emphasis must be placed on making units from all allied partners, with somewhat disparate cultures, fully cohesive. DS believes that this, latter, can only be achieved through a permanently constituted CSG.

In the case of the UK's CSG, it must be recognised that there is an added risk attached to the "jointness" inherent in the way this force is being developed. Each of our armed forces, quite naturally, have, over time, developed priorities and modes of operating of their own. In the case of the CSG any such differences must be made subservient to maximising its effectiveness. In other words, a very high priority must be given, by all services, to ensure that the necessary assets are made available to the CSG so that it is fully operational at all times.

DS is concerned that existing assets, particularly in the Royal Navy, will be insufficient for all the demands that are currently existing and likely to increase as a result of the developing and escalating threats. Any Integrated Review should make assessments to be sure that the UK's security and defence assets, in cohesion with dedicated allied forces, match the prevailing and developing threats.

## **AIR GROUP ISSUES - F35 B LIGHTNING II AIRCRAFT - AIRBORNE EARLY WARNING (AEW) CROWSNEST – JOINT HELICOPTER FORCES**

DS acknowledges that “we are where we are” with regard to the air assets available to the CSG so that few immediate improvements can be made to their OC. Nevertheless, their weaknesses should be pointed out with a view to giving high priority to reducing their vulnerability.

### **THE F35B LIGHTNING II**

In a sense, the issues which weaken this aircraft’s OC belong under other categories in this paper since they are not intrinsic to its design but are essential to its overall performance. This is because the aircraft’s unique feature is that of “stealth”. Other attributes are not over remarkable and, to a certain extent, downgrade its performance. Not overly fast or manoeuvrable, the Short Take Off and Vertical Landing (STOVL) capability detracts from the aircraft’s weapon payload, range and simplicity of maintenance. Whilst the F35B is an important advance in stealth technology, there are reasons to believe that this advantage is somewhat diminished by other inherent design features (of itself and of the CSG) and by advances in threat capabilities.

It would be useful to question the MoD about these aspects since the entire OC of the CSG is completely reliant on how these aircraft are able to perform.

### **AIRBORNE EARLY WARNING (AEW) - MERLIN AND CROWSNEST**

Ideally and in order to maximise detection ranges, the CSG should be equipped with fixed wing, long range early warning aircraft fitted with excellent AEW. Because the aircraft carriers are not fitted with catapults and arrestor gear, the AEW system has had to be deployed in MERLIN helicopters whose range is limited and its detection a greater risk.

The new airborne radar system (Crowsnest) – which is a key part of Carrier Strike’s protection – is 18 months late. This will affect the CSG’s capabilities for its first two years of operation. The delay has been caused by a subcontractor, Thales, failing to meet its contractual commitments for developing equipment and not providing sufficient information on the project’s progress. Neither MoD nor its prime contractor, Lockheed Martin, were aware of these problems until it was too late, reflecting MoD’s ineffective oversight of its contract with Lockheed Martin.

The Crowsnest kit transforms the Merlin HM.2 of the Royal Navy into an Advanced Early Warning (AEW) helicopter. Without this capability, the carrier strike group’s effectiveness will be severely downgraded if not nullified.

There is a contingency plan for deploying Crowsnest helicopters during the coming deployment in 2021, CSG21, without Initial Operating Capability, as an interim capability.

According to the NAO report issued June 26th , there is an "18 months expected delay to developing the Initial Operating Capability (IOC) for this new airborne radar system, critical to protecting the CSG. The IOC is the minimum level at which the capability or service is usefully deployable.

This IOC which was initially planned for March 2020 is now expected no sooner than September 2021. The Full Operational Capability (FOC) originally set for June 2022 has now been pushed back to May 2023. As a result, HMS Queen Elizabeth will be conducting her first operational deployment next year without a fully operational early warning system. The deployment will see the Carrier Strike Group sail to the Mediterranean Sea, the Persian Gulf and the Pacific.

## **NAO REPORT – CARRIER STRIKE – PREPARING FOR DEPLOYMENT**

The Ministry of Defence (MOD) was informed in early 2019 by industry that there were challenges associated with the development of the mission systems of the airborne radar capability. The programme was re-baselined in the first half of 2019, which included the adoption of an incremental approach to the delivery of the capability to the Royal Navy. The MOD has worked intensively with its contractors and sub-contractors to monitor the performance of the programme and manage the schedule of remaining activity. New management systems and control measures have been implemented by contractors and additional resources have been assigned. The MOD continues to engage with industry to ensure that all issues are raised and managed at the earliest opportunity to minimise impact to the schedule. The programme remains focused on fielding an initial capability in time to support Carrier Strike Group 21. DS does not know whether this is turning out to be successful or not so, it would be wise to ask if this is "on track" since DS believes this to be a potential serious vulnerability to a force sailing into far eastern disputed waters and would recommend further close questioning of the MOD on the risks involved and the proposed counters.

## **SUPPLY AND WEAPONS SUPPORT - CARRIER STORING AND ON-BOARD DELIVERY (COD) AND FLEET SUPPORT SHIPS**

**"Only a commander who understands logistics can push the military machine to the limits without risking total breakdown."**

The short quote above by Major General Julian Thompson is taken from page 18 of the UK's Joint Doctrine Publication 4, 4<sup>th</sup> edition dated July 2015 (JDP 4 4th Edition). However, some people say that the devil is in the detail so, in respect of the Supply of Spares and Weapons for operations the JDP 4-00 Logistics for Joint Operations<sup>1</sup>, promulgated as directed by the Chiefs of Staff, the problem is two fold:

1. The document is out of date because it does not cover fixed wing Carrier operations at all. Indeed, the Maritime Doctrine in Annex A of JDP 4 still speaks of HMS Ocean! And why not, at the time it was written QEC and POW were yet to enter operational service?
2. Despite JDP 4 being circa 260 pages long it is 'big hand, small map' in its delivery. We know from page iii (4) that it refreshes "...*the logistic planning process, aligning it with NATO operational-level planning by reflecting the changes flowing from JDP 01, UK Joint Operations Doctrine (Chapter 4)*". Good to know but what are the desired resource requirements for the actual business of deploying and operating Joint Forces in a CS or CEPP role? We are none the wiser.

## **SUPPLY SUPPORT TO CARRIER AIR OPERATIONS**

Whilst the casual reader can discern that a great deal of effort has gone into the Command and Control (C2) and theoretical higher level aspects of UK/NATO Logistic Support to Operations, very little has been published that helps quantify the requirements for calculating rates of operational effort leading to funding of a cohesive stock holding policy.

Where this conundrum is most evident is in the disparity that exists between the 3 single service supply doctrines (JDP 4 Annexes A, B and C) which have been written, it appears, without Carrier Support Operations in mind. So, for example, established RN doctrine calls for ships to sail with 28 days of stores before replenishment systems need to be activated, whilst the RAF doctrine is for between 5 and 10 days 'Priming Stocks' for fixed wing and 15 days for helicopter deployments. Army doctrine at Annex B of JDP 4 does not seem to cover 'Priming Stocks' but does explain part of the equipment support plan as follows:

*"Maintenance is organised into levels determined by the engineering content of the task...Level 1 is the least complex maintenance and is carried out by the equipment user. It is underpinned by equipment care which is a universal responsibility...Level 2 tasks require technical tradesmen and are more complicated or time consuming...Levels 3 and 4 involve complex equipment repair or overhaul by formation-level equipment support organisations or defence contractors."*

---

1

None of these single service doctrines seem to fit with CEPP which, invariably, will demand long periods (many months) of operations beyond resupply distance from a friendly coast or port.

The RN has a long tradition of extended operations away from main sustainment bases using RFA assets to replenish at sea (RAS) and onboard delivery systems (COD) to supplement the RFA. However, the RAF and Army have distinctive logistic doctrines and procedures that were never intended to meld with long duration RN operations. Without a Joint Carrier Concept of Logistic Operations to formulate, quantify, fund and agree doctrine ahead of the first major QEC deployment to the Far East in 2021 this mismatch in logistic doctrine will remain.

For example: The F35B fleet is under RAF command and based at RAF Marham until deployed aboard a RN aircraft carrier. Therefore, the bulk of air stores for the F35B will also be based at Marham using RAF and UK DES provisioning parameters until aircraft are deployed forward. Will this disposition allow for sufficient stores – engines, modules, avionics, weapons to support both the forward carrier deployment and the residue of aircraft remaining in UK? How is this figure being calculated and by which MOD organisation? Is it a single service, Strategic Command or DES function using what jointly agreed criteria?

RAF Marham is certainly tied into the established 'Just in Time' 'Coupling Bridge' with a supply chain 'Factory to Foxhole' (to use some of the management jargon employed in JDP 4). But, by definition, the CSG breaks this supply chain when it is stored and sails beyond UK based COD helicopter borne resupply – whether MOD or Contractor supported.

Does F35B spares and weapons funding and supply allow for two squadrons of up to 24 aircraft to operate afloat whilst at the same time supporting a similar number of land based fast jets remaining at RAF Marham? What will happen in the event of a major deployment of 36 of the planned 48 F35B on the Carrier(s)? Will current RAF logistic doctrine be modified and land based F35B resources and personnel allocated to support the major ongoing maritime operation even if this reduces UK units to a care and maintenance basis?

**DS maintains and proposes that it is time for a Joint Carrier Concept of Logistics in respect of Carrier Strike and CEPP operations and another Annex added to an updated JDP 4.**

## **SOLID STORES TRANSFER : RN HEAVY REPLENISHMENT AT SEA EQUIPMENT**

Solid replenishment at sea (RAS) is a critical operation in the success of a carrier group. RFA Fort Victoria is the sole vessel available to fulfil this role because HMG/MoD have procrastinated about the construction of new solid

support ships (FSS) for over a decade. The two earlier FSS ships date from 1978/79, and Fort Victoria from 1992. It is understood that in her recent refit, Fort Victoria's RAS tower can now transfer 2-5 tonnes as maximum lift. It should be noted that she will/may be unavailable in 2022 due to a planned refit.

The requirement for solid stores transfer using RN Heavy Replenishment at Sea Equipment (RAS(H)) was discussed by MOD in 2011, and the test rig and associated equipment to simulate conditions at sea in up to sea state 5<sup>2</sup> was commissioned at HMS Raleigh in mid-2013. The specification set out the need to transfer 25 five tonne loads every hour, over a five-hour period if necessary,,This equates, over the five-hour RAS, to 625 tonnes of solid stores. By comparison, the present equipment would enable at best, a transfer of circa 250 tonnes. MoD commissioned Rolls Royce who then developed new technology which permitted five tonne load transfers, even in relatively heavy weather. Once the concept, constructed ashore at HMS Raleigh, had been successfully demonstrated and accepted, the installation was converted to train both Royal Navy and NATO partners in the art of heavy jackstay replenishment at sea in mid-2013. Rolls Royce state *"...they are working on joint development of safe operating procedures for the equipment that will be fitted to the next generation of Royal Fleet Auxiliary supply ships...The HRAS system is designed primarily for the QE class carriers and is capable of transferring loads of up to five tonnes when transiting at 10-14 knots...25 loads per hour for up to five hours in sea state 5."* They go on to say *"...The weight requirement has been set around the engine module of the F-35 and the maximum weapons load."*

It is amazing to read that the deletion of this equipment is "because it [the heavy RAS gear] is a major cost driver" of the FSS contract. These are new 40,000 tonne ships, specifically designed to support the carriers. They should therefore be designed around the requirement, and not around some arbitrary cost figure. Are we now to accept that the research, the cost of constructing and the demonstration of the rig at HMS Raleigh is now to be wasted?

DS suspects that MOD believe that the Carrier will only routinely embark 12 British F35B and, therefore, that there is going to be sufficient space on board for spare engine modules. What then happens in a war fighting scenario, when up to 36 aircraft are embarked? The whole point of the 'fleet train' is to allow for flexibility, in storage and supply arrangements, to match such situations.

## **BANDWIDTH AND COOPERATIVE ENGAGEMENT CAPABILITY (CEC) - AUTONOMIC LOGISTICS INFORMATION SYSTEM (ALIS) AND ITS REPLACEMENT OPERATIONAL DATA INTEGRATED NETWORK (ODIN)**

---

2

Sea state 5: Waves 2.5 to 4m [8 feet 2 inches to 13 feet 1 inch] Description: Rough

## **BANDWIDTH**

Bandwidth is the maximum amount of data transmitted over an internet connection in a given amount of time. Bandwidth is often mistaken for network speed when it's actually the volume of information that can be sent over a connection in a measured amount of time – calculated in megabits per second (Mbps). Bandwidth determines how much information you receive every second, while speed is how fast that information is received or downloaded. Let's compare it to filling a bathtub. If the bathtub tap has a wide opening, more water can flow at a faster rate than if the pipe was narrower. Think of the volume of water as the bandwidth and the rate at which the water flows as the speed.

Maximising and optimising these features is crucial in an operational environment, where the threats and assets are many, since the command requires all elements of the scenario to be clear and as up to date as possible - low bandwidth will, by definition, make the operational picture out of date thus leading to the wrong decisions over the best warfare tactics to deploy.

## **COOPERATIVE ENGAGEMENT CAPABILITY (CEC)**

CEC is a relatively low priced means of sharing operational data across the whole range of platforms in an operational group and often leads people to overlook the revolutionary change it creates for wide-area fleet surface, air and underwater defence.

CEC is far more than a mere data-sharing program, or even a sensor fusion effort. The concept behind CEC is a sensor netting system that allows ships, aircraft, and even land radars to pool their radar and sensor information together, creating a very powerful and detailed picture that's much finer, more wide-ranging, and more consistent than any one of them could generate on its own. The data is then shared among all ships and participating systems, using secure frequencies. It's a simple premise, but a difficult technical feat. Deciding not to indulge in such a system weakens and slows the availability of threat information to individual units of the force.

## **ALIS / ODIN**

These systems are vital for the management, maintenance and operational capability of the CSG and, particularly, they are intrinsic to the full functioning of the F35Bs; without them, DS can say that the aircraft will not be operationally functional.

Due to long standing performance problems with ALIS and abysmal mission capable rates, its replacement is the Operational Data Integrated Network, or ODIN, which might be fielded by 2022 but still needs to solidify the acquisition strategy and its operational capability. However, in the US the U.S. Government Accountability Office (GAO) raised questions about the scope

of the ODIN program, most of which have not publicly been answered:

*"...The Department of Defence (DOD) lacks clarity about the goals of the re-design, such as the capabilities that will be included in the future system and the extent to which ALIS will be hosted in the cloud, in addition, DOD has not fully assessed key risks or uncertainties, including the extent to which DOD can adopt an Agile software development approach or manage the system itself. Finally, because it has not answered key questions about the future of the system, such as the extent to which the re-design will incorporate current ALIS software, DOD has not been able to develop accurate cost estimates for the ALIS re-design."*

The GAO noted that the Defense Department has often struggled to lay out exactly how much it has spent on ALIS over the program and that it has recently procured new hardware for ALIS despite being uncertain whether that hardware will be necessary once the transition to ODIN is complete.

*More recently: "...in a stormy two-hour hearing, members of the United States House Oversight Committee lambasted Lockheed Martin and Pentagon officials for putting pilots at risk of accidents by failing to fix the F-35's troubled maintenance system. "Fix this now, before you have blood on your hands," said Republican Rashida Talib."*<sup>3</sup>

With nearly 400 airframes already in service across the world the change to ODIN is likely to take some considerable time; the UK is hardly going to be at the front of the queue.

## **ACTION ON OPERATIONAL WEAKNESSES AND DEFICIENCIES**

DS believes that it would be wise for the MoD to be asked to acknowledge that the gaping holes in the CSG's assets exist, clarify the implications for OC and recommend that there be investment into their rectification in a timely fashion.

Whilst DS acknowledges that it is not practicable or cost effective, presently, to configure the ships as "ultimate" aircraft carriers fitted with catapults and arrestor gear, those elements that can be straightforwardly fitted in to the operational programme and magnify OC: Stores Fleet Train Support, CEC, Bandwidth, ALIS/ODIN etc., be fully and properly invested in.

It is high time for a Joint Carrier Concept of Logistics in respect of Carrier Strike and CEPP operations to be raised and another Annex added to an updated JDP 4.

It seems to be taken for granted that putting together a multi national group of ships, submarines and aircraft on an "ad hoc" constitutes a fully formed, worked up and operational CSG; DS does not believe this to be

---

3

[Lawmakers Blast Lockheed, DoD Over F-35 Parts Problems « Breaking Defense - Defense industry news, analysis and commentary](#)

realistic given the short periods currently being planned and given to integrating a number of culturally differing nations.

There has been a recent fitting (12/2020) of 4 x 30mm cannon mounts, which have very limited AAA capability, for protection from fast attack boats. This emphasises that the class has worrying self protection gaps, thus reducing its ability to engage leakers that penetrate the outer screen, in spite of the currently fitted 3x Phalanx mounts. Aircraft and Escorts provide limited effectiveness due to their low numbers. Against an opponent with its own carriers, the QEC could be at a major disadvantage. In the light of no CEC and limited escort numbers, DS recommends the fitting of at least a minimal outfit of the CAMM missile system at the earliest opportunity.

Whilst this paper focuses on the OC of the aircraft carrier in times of conflict, one might factor in the broader opportunities these ships offer as Maritime National Resource; some aspects of which are described at the annex to this paper.

## **Annex**

### **Aircraft Carriers – A Maritime National Resource**

In recent letters to the press the alleged vulnerability, in time of conflict, of the Aircraft Carrier platform, has been highlighted. This annex leaves this aside in the interest of highlighting the “low end” capabilities of these very capable assets. It is emphasised that these are “add ons” to the primary war fighting capability of these ships.

ALL Royal Navy warships are mobile platforms that represent British values and influence as they sail the seas that cover much of the globe. Through RN presence, the UK provides support to Allies; international trade; emergency relief, evacuation services, drugs seizures, port surveys and, through diplomatic port visits, opportunities to enter into the building of closer mutual cultural understanding with other countries. These services are present and available to the global community on a constant basis through forward deployment strategy currently being practised.

The largest of these platforms, the aircraft carrier/versatile mobile airfield, can supply emergency aid, often prepositioned, electric power for a town, disaster assistance at long range, evacuation capability, trade shop windows, secure meeting facilities for some thousands and all on UK sovereign territory. Her independent mobility enables faster delivery and the ability to be poised to act. This capability list is far from comprehensive because of the ingenuity and agility of the trained service people acting in circumstances that are unpredictable.

To complete the compendium of tasks above in other ways has often proved inefficient and expensive and rather more vulnerable in time of conflict! UK should continue to enable the Armed Services’ the rare opportunities to promote Global Britain.

These wide-ranging capabilities of the Armed Forces should be better known and understood by the Press and the public who pay for them.