

Exposing the incoherence and weakness in the United Kingdom's defence and strategic strategies.

June 2012

FOREWORD

Brief to MPs by DefenceSynergia for a Meeting in Westminster Hall at 17.15 18th June

We are representatives of DefenceSynergia (DS), a small group determined to try and identify the incumbent government's strategy and deduce from that national defence and security operational requirements. We emphasise that we do not limit these requirements to the armed forces.

Before Strategic Defence and Security Review 2010 (SDSR), we recognised that the Ministry of Defence was woefully underfunded for the programmes of all three services which were, in any case, operating in a strategic vacuum; Afghanistan was mesmerising everyone. With a fresh government, the establishment of the National Security Council (NSC), the generation of a National Security Strategy (NSS), the reports commissioned by Dr Fox to improve, radically, Ministry of Defence (MOD) procedures and the imminent SDSR promised much in spite of the severe economic situation. There was a chance that a clear set of intentions might emerge.

Admittedly, the timescale for SDSR production was extremely truncated but the inputs to it smacked of short term partisanship so, the review seemed to focus on immediate operations (things already well known that should have been planned for some years since) and, otherwise, took a panglossian view of the medium and short term. These errors became exposed very swiftly with our involvement in the Libyan conflict when the risks and rewards of providing the required air superiority, most cost effectively, were called into question. Since SDSR, DS has written to every Member of Parliament, developed a website, and written or sponsored a number of papers which either support particular aspects of the SDSR or highlight the incoherences in it. We agree, for example, that to go ahead with the Trident replacement system is a statement that we stand "inter pares" with western democracies prepared to deter rogue states. We decry the confused thinking that has led to an ill advised decision that means the Royal Navy and the Royal Air Force will not meet their proper operational requirements for "state of the art" fast jet fighters.

We believe that Defence is the action arm of Foreign Policy (FP). The government is doing FP on the hoof according to prevailing circumstances. That's a plan not a strategy. We need a strategy that allows all departments of State to discern, easily, their own plans. We call this a Grand Strategy (GS). Because there isn't a GS we don't have joined up and properly scoped FP, which in turn means we don't have a well thought out Defence Policy (DefPol).

Without a meaningful DefPol, MOD doesn't know what military power is required or how to equip for national risks. Hence, the Services guess the best they can with Defence Equipment & Support not knowing what to buy and industry not being told, accurately, what to deliver.

We deduce from all that has been written and said by the government that the emphasis has got to lie within a "Maritime Strategy" rather than a "Continental Strategy" which, incidentally, the United Kingdom has never been very good at nor truly aspired to and does not chime with present declared intentions for defending the nation. In military terms this means moving away from what might generally be called "standing armies" to flexible, rapidly deployable troops well able to operate autonomously in many and, quite often, distant parts of the world. For this, autonomous air cover and logistical support are vital. More generally, air defence of the UK, cyber warfare protection, policing and other emergency services need a strategy from which to derive their plans.

In a very real sense we have a metaphor for the incoherence that stems from a lack of Grand Strategy to steer almost all aspects of government policy and to establish clear directives for security and defence of the realm. This brings us on to the central feature of the meeting which is a lack of Grand Strategy that is demonstrated in the case of the RN and RAF by -"the reversal of the aircraft carrier fit from Catapults and Arrestor Gear to Short Take Off and Vertical Landing?" This one change, seeming so trivial yet applauded in cost saving terms by almost everyone, undermines FP, severely reduces our ability to operate effectively with allies at the strategic level and leaves the nation vulnerable because we will be very limited in acting alone whilst retaining little leverage when reliant on others – most importantly the United States of America and key allies in NATO and the European Union. The army too have been affected – note the current uncertainty over the future balance between the regulars, TA and combat support services (CSS).

You may have further questions for us arising from sight of this one page brief or may wish to ask us to explain our general position a little further or wish to discuss the issue of 'maritime strategy' in more detail. Please feel Free to contact DS at any time.

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DEFENCESYNERGIA MP BRIEF – MEETING 18TH JUNE 2012

DS ATTENDING:

CAPTAIN JOHN MARSHALL RN – NAVAL ENGINEER SPECIALISING IN NUCLEAR TECHNOLOGY – FORMER CO OF THE RN ENGINEERING COLLEGE MANADON & NAVAL ATTACHE IN MOSCOW.

MR CHRISTOPHER SAMUEL – FORMER NAVAL OFFICER AND EXECUTIVE IN DEFENCE INDUSTRY. NOW SPECIALISING IN UK STRATEGIC & RESILIENCE PLANNING – CONSULTANT & ASSOCIATE FELLOW AT RUSI.

MR TIM DANTON – CIVILIAN BACKGROUND -NAVAL RESEARCHER – MEMBER OF THE US NAVAL INSTITUTE AND RUSI SPECIALISING IN CARRIER OPERATIONS.

MR MARK BROUGHTON – FORMER ARMY OFFICER – CONSULTING SPECIALIST IN MOD PROCUREMENT. (May not attend due to short notice commitment).

MR MIKE PARNELL – FORMER RAF OFFICER (NAVIGATOR). EXTENSIVE AEW OPERATIONS, TESTING, PROCUREMENT EXPERIENCE. SCIENTIFIC RESEARCH & DEVELOPMENT, A&EE AND RSRE/DERA AT MALVERN. NOW PROFESSIONAL AEROSPACE ENGINEERING PROGRAMME MANAGER AND CONSULTANT.

SQUADRON LEADER DAVE TISDALE RAF – MOD PROCUREMENT & LOGISTICS (GROUND BRANCH) – SPECIALISING IN JOINT EXPEDITIONARY WARFARE – CONCEPTS OF OPERATIONS -FUELS & TACTICAL SUPPLY SPECIALIST.

Not all DefenceSynergia members publish their wide expertise and specific areas of knowledge on our website. However, for completeness please note that DS experience includes: Three former Air and Naval Attaches (Argentina and Russia), an Associate Fellow at RUSI, a Former head of Naval Medical Services and Maritime, Land and Aviation expertise covering: Government contracting in respect of procurement and leasing maritime and land assets; Major Project Management and operational experience in AEW, radar, navigation, avionics, communications, IT, Tactical Data Links, NEC, Programme Management; Risk Management, Home Land Security and Resilience Planning; MOD Procurement, Provisioning and Logistic Planning for Expeditionary Warfare; Nuclear Technology; Joint Operations Planning; Forces Clinical, Mental Health and Charity Sector et al.

MAIN INTERLINKING SUBJECTS FOR DISCUSSION

1. UK GRAND STRATEGY
2. AIRCRAFT CARRIER POLICY
3. UK AIR POWER DEVELOPMENTS

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APPLICATION OF MARITIME POWER – AIRCRAFT CARRIERS

Military: From the Sea: Power Projection -Strategic and Sub-Strategic Deterrence
-Coercion -Combat Operations Against the Land -Combat Operations in Defence of
Land Forces – Evacuation Operations -Conflict Prevention -Support to Peacemaking
and Enforcement -Poise or Presence in a troubled area offers diplomatic options .

At Sea: Operations against Enemy Forces -Protection of Maritime Trade.

Constabulary & Benign: Embargo, Sanctions & Quarantine Enforcement
Peacekeeping -Enforcement of Maritime Agreements -Disaster Relief -Assistance to
Refugees -Peace Building Operations -Search and Rescue -Military Assistance to For-
eign and Commonwealth Governments.

THE STRATEGIC CASE FOR CONVENTIONAL AIRCRAFT CARRIERS

Since the end of the cold war the Royal Navy (RN) has been unable to fully exercise its role as a strategic asset. However, the future Queen Elizabeth (QE) Class of aircraft carrier could complete all of the applications of maritime power identified above provided appropriate strategic capability -air-group, defensive screen and reconnaissance airborne early warning(AEW)capability – are made available.

The fact that successive governments have taken a risk by letting some roles slip due to budget pressure is not an argument for the status quo. Indeed, it is arguable that some contingencies -such as the Falklands and Libya -may only have succeeded through HM Forces professionalism -despite government policy. But it is a dangerous gamble to rely upon 'can do' to fill capability gaps, not least because of the draw-down in numbers of personnel and assets in recent years leading to lack of flexibility and robustness against losses. The current carrier air-power debate goes to the heart of this strategic capability gap dilemma.

This begs the question: Defence is said to be the first priority of government. Is it? Is there evidence to support the oft quoted phrase?

Further In this brief you will find a condensed appraisal of current and future aircraft types for performance data comparison. Having read the data you may agree with DS that they demonstrate that only one airframe in the F35 family fully meets both the RN and RAF Operational Requirement (OR) for carrier strike and Tornado replacement: F35C.'

[Albeit that leasing or buying the F18/f as an interim solution could provide MOD with a stop gap measure to afford entry of two carriers fitted with cat and traps until a more likely carrier variant and Tornado replacement -such as the F35C – has cleared development and entered service.]

However, the decision by HMG to revert to the Short Take-off Vertical Landing (STOVL) variant prevents the RAF from fully achieving its OR and severely restricts the development of the carriers to be 'future proofed' whilst undermining survivability by restricting RN Air Defence (AD), Airborne Early Warning (AEW) and Air to Air Refuelling (AAR) capability. The F35B and rotary wing being second best because they will offer far less endurance, range, ceiling height and coverage than other fixed wing types such as the Grumman E2-D Hawkeye and F35C/F18 whilst indigenous RN AAR or rapid air-freight resupply have not so far figured in any objective discussion.

When UK's defence focus was on the North Atlantic with NATO, the RAF was able to provide the RN with extensive air power support. However, this failed spectacularly during the Falkland's war, where there were no land bases available in-range or made available with the political support of nations adjacent to Argentina. The RAF could no longer deploy AEW or additional combat support, which left the RN exposed – losing 6 ships as a direct result.

Therefore, this STOVL decision has reintroduced an old air-power argument – that the RAF will be able to support maritime carrier operations with land-based aircraft from friendly bases along the Littoral. And this is where the 'systems' argument becomes strategically critical and the arguments in support of STOVL begin to unravel, not least because the difficulties associated with Access, Basing and Overflight (ABO) for land-based air-power have never been fully addressed. Even if the ABO difficulties are somehow overcome and overseas basing of RAF aircraft was not an issue their range and numbers certainly are.

You may wish to ask MOD UK (Air) how the RAF would provide Long Range Maritime Patrol (LRMPA) for the fleet without any LRMPA in the inventory; how they will provide fast jet Combat Air Patrol (CAP) and strategic AEW wide area surveillance over the fleet area, over 1000 miles from any shore base, when the total AAR fleet will be based around a maximum of 14 A330-200 tankers?

To complicate matters, the MOD's two fast jet fleet policy, coupled to the F35B decision affects the RAF, too. Few really believe that the original RAF operational requirement for a medium range 5th generation stealth fighter to replace the Tornado (750 nm combat range) is met by the F35B (470 nm combat range)? Even CDS and Lord Stirrup think that the F35C is the better aircraft - as do most impartial air-power analysts (note the recent report by the Defence Science and Technology Laboratory) - albeit that the former CDS hedged by suggesting that the F35B still largely meets the OR.

You might ask. Which OR – the RAF's, the RN's, both or neither?

The best that can be said for the decision to opt for STOVL is that it simplifies the MOD's procurement headache (line of least resistance) and may appear to save

money in the short term, it might even convince HMG to commission two carriers in SDSR 2015 (we must wait and see) and it may facilitate and simplify RAF operational cooperation with the FAA; but none of these alleged advantages change the fact that the decision to buy STOVL was not, is not, and never will be, the correct one for the long term strategic interests of UK or its armed forces. Indeed recent developments strongly suggest that the F-35B will mainly be limited to 'Rolling' landings, not 'Vertical', to reduce stress on its engine and airframe – that is, it will most likely be a STORL: Short Take Off and Rolling Landing.

So from a Strategic and operational point of view you may agree that the decision to buy F35B is flawed on these counts:

1. It fails to meet the UK National Security Strategy that calls for a Strike Carrier capability to enforce UK's worldwide role in air/sea battle terms (just the amphibious support role being practicable).
2. It fails to offer the carrier commander maximum survivability through effective long range Command and Control, Intelligence, Surveillance and Reconnaissance (C2ISR) and air defence cover.
3. It fails to fulfil the RAF's OR for a medium range 5th generation stealth fighter to replace the Tornado.
4. It fails to cater for future carrier developments such as unmanned air vehicles or the possibility that STOVL will not enter service or last the full 50 years that these carriers are designed for.

Have the British Armed Forces Met Their Waterloo?

[Julian Lindley-French](#) | June 08, 2012

Winston Churchill once lamented the "Want of foresight, unwillingness to act when action would be simple and effective, lack of clear thinking, confusion of counsel until the emergency comes, until selfpreservation strikes its jarring gong, these are the features which constitute the endless repetition of history." Reading the speech of British Defence Minister Philip Hammond yesterday to the RUSI Land Warfare Conference I was tempted to say here we go again.

These were the words of a minister given the almost impossible mission to cut the British armed forces irrespective of the changing world beyond Britain's shores. And yes, the very real danger exists that Britain will compound the profound loss of influence of late in Europe by in effect sacrificing the one tool that gives Britain real influence in the world – the British armed forces.

Now, it would be easy for me to jump on the bandwagon of criticism I can see rolling towards London. In fact Future Force 2020 and Army 2020 might just strike a

much-needed balance between strategy, capability and austerity; if that is the politicians hold their nerve and do not again raid the defence budget simply to satisfy the latest adverse press headlines.

Specifically, come the 2015 Strategic Defence and Security Review Britain must recommit to three simple defence strategic principles; sufficient military power to influence a changing US defence strategy, the absolute maintenance of Britain's position as Europe's leading military power and the use of military excellence to form strategic partnerships with key Commonwealth partners in and around Asia-Pacific.

Whilst the Hammond speech was couched in the 'we only recognise as much threat as we can afford' language so-beloved of this government there was much to commend it. The speech talked of facing the future with adaptable armed forces as part of a 'Whole Force Concept' that better integrates regular and reserve forces. This is common sense. However, what the speech lacked was a coherent statement of defence strategy that would provide context. Where is the vision, the level of ambition?

At the politico-military level such strategy would recognise that the shift in US strategy from a landcentric, regional focus to a maritime centric global remit has profound implications for Britain. The ability to work with European allies whilst important offers no alternative to a close defence relationship with the US. The imbalance of effort in Afghanistan demonstrates that under no circumstances should Britain allow itself to become reliant on European allies for effective operations simply to balance the books at home. That would render Britain utterly impotent both politically and militarily.

A Whole Force Concept is but at the military-strategic level what is needed is a Total Force Concept in which no single service owns land, sea or air. That in turn would require a new vision of military 'jointness' to re-establish Britain as a defence radical at the core of a hub of military excellence that preserves and enhances Britain's ability to lead what might best be termed 'junior coalitions', i.e. those that do not involve the Americans.

Here's the rub; the Royal Navy, Army and the Royal Air Force are developing all the components necessary for the strategic renovation of Britain's post-Afghanistan armed forces. The Royal Navy's two super-carriers will afford the British armed forces vital strategic projection for much of this century and help pre-cement critical strategic partnerships with the likes of Australia, India and South Africa with whom Britain shares a military heritage. The new Astute nuclear submarines and Type-45 destroyers will enable Britain either to support the US or act as the core of future task forces and battle groups. The RAF's emerging strategic lift capability will reinforce the strategic reach and resupply Britain and its allies will need, although important gaps will need to be plugged in command and control capabilities, air-to-ground surveillance and maritime protection. Even though the Army will be reduced from 104,000 to

82,000 by 2020 if the future force is comprised of cutting-edge regiments that can provide the core of a rapidly expandable force that employs properly trained reserves then Britain will be well-served by these reforms.

That is the good news. If, however, Hammond's speech was simply a return to the hollowed-out force that emerged from the Front-Line First reforms which and were found out by the 2003 Gulf War then Britain's ability to influence both allies and environments will be nil. Greater reliance on reserves and the private sector for support must mean just that, not the creation of mythical structures that again fails Britain's young people in uniform when the crunch comes, as it will.

My bet is that Future Force 2020 is too ambitious a target for this strategy-free government. In reality it will be 2025 or even 2030 before all the components are in place and Britain's armed forces can again play their full role in the defence of Britain's vital interests in the big twenty-first century. Moreover, there is a very real danger that the corporate memory of recent operations (a key British advantage) will be lost if a more systematic effort is not made to preserve them.

The British armed forces are a strategic brand and to destroy that brand in the name of the here and now would be a mistake that would set Churchill spinning in his grave.

Have the British Armed Forces met their Waterloo? No, not yet, but...

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'Cats and Traps' - Launching the Carrier Debate in the Right Direction?

By Dr Lee Willett, Senior Research Fellow, Maritime Studies, RUSI

Media debate on the UK's carrier programme is focusing on the jets, rather than the ships they land on. Central to this discussion is 'cats and traps', the launch and recovery system, which drives the choice of aircraft. Critics who say that this will cost too much overlook the long-term strategic value it will add.

Ahead of the 1998 Strategic Defence Review (SDR), *The Economist* argued that the United Kingdom (UK)'s on-going debate about aircraft carriers would provoke the 'biggest row of all' in the forthcoming defence review, simply because '[t]he possession, or not, of aircraft carriers -more than any other weapon -says a lot about a country's self-image.'^[1] Eighteen months on from the October 2010 Strategic Defence and Security Review (SDSR), and as serious debate develops about decisions to be made in the (expected) 2015 defence review, this argument still holds true.

Carriers and SDSR

The carrier question was pivotal both in the debates leading up to the SDSR and in the Review's conclusions and consequences. Intending to generate an adaptable capability based around two ships and balanced with the rest of the UK force structure, SDSR's principal points were:

Strategic Rationale

An aircraft carrier capability provides a range of political and military options, as a complement or alternative to ground engagements, to respond to state and non-state threats.

A carrier capability supports the strategic requirement to project air power where and when required in support of UK interests, without the need for reliance on land bases.

Although the UK envisaged few circumstances in the short-term where deploying sea-based air power would be essential, it acknowledged the need for the longer-term political flexibility provided by carriers to mitigate against dependency on permission of other states for access, basing and overflight (ABO) rights.

Programme Decisions

The construction of two carriers -HMSs *Queen Elizabeth* and *Prince of Wales* -with one to become operational and the other to be placed in extended readiness (able to return to service if required).

The in-service date of the operational carrier was revised to around 2020, from original dates for two ships (as announced in December 2008) of 2016 and 2018.

To fit catapults and arrestor gear ('cats and traps') to the *Prince of Wales* to enable interoperability with other navies, their aircraft and ships.

The purchase of the Carrier Variant (CV) of the F-35C Lightning II Joint Strike Fighter (JSF). CV, with longer range and the ability to carry internally a greater range of weapons to give greater power projection capability, also uses 'cats and traps' for launch and recovery. The decision comes after the UK considered both variants before the Short Take Off and Vertical Landing (STOVL), or F-35B, version was selected in September 2002 and approved in July 2006. Improved commonality across the fast jet fleet through operating one aircraft type at sea and ashore is estimated to reduce through-life costs by around 25 per cent.

Numbers of aircraft -both procured overall and embarked at sea -are to be reduced, as the UK no longer requires the scale of strike capability previously planned. The UK planned originally to buy 138 in total, but reports have suggested this number will be cut perhaps to just 50. The intention is to embark 12 fast jets routinely for operations on the single carrier, while retaining the capacity to deploy up to the 36 previously planned.

In recent weeks, reports have suggested the Government is considering a switch to STOVL or F-35 B because potential cost increases in 'cats and traps' are making the CV (F-35 C) option unaffordable in the short-term, especially given the on-going financial challenges. While the SDSR states the aim to seek 'in-built' flexibility to adapt the carriers' capabilities over their 50-year life, in the current debate some significant issues -particularly relating to this requirement for flexibility -are being overlooked.

Should the UK Bring Both Carriers into Service?

Possessing two operational carriers can offer strategic advantage. Minister for International Security Gerald Howarth MP, hinting that the Government hoped to 'look again' at and 'recover' in the 2015 defence review the decision to deploy only one operational carrier, stated that bringing both ships into service would provide 'continuous at-sea capability'. [2]

Recent operational history has highlighted the role of carrier strike operations in both Afghanistan and Libya. With only one operational carrier, the UK would have been unable to conduct concurrent operations in both theatres. One carrier also may not be sufficient to enable the UK to cover areas of interest which include the Indian Ocean, the Persian Gulf, the Mediterranean and the North and South Atlantic. With only one carrier, routine maintenance and refit may result in the UK having -at times no capability at all.

Should the UK Fit One -or Both -Carriers with 'Cats and Traps'?

Much of the current debate focuses on potential delays and cost increases in buying and installing 'cats and traps'. Recent press reports suggest that reverting to F-35 B, with the removal of the requirement for a 'cats and traps' fit, may result in savings which would enable the UK to bring both carriers into service.

At this stage, there is no evidence of any formal discussion of converting the second carrier to 'cats and traps', or of any potential costs. However, if the UK is able to consider bringing *both* ships into operational service at some point, should financial circumstances allow: having both fitted with 'cats and traps' would enable the capability to be available continuously.

'Cats and traps' also enable interoperability with the US Navy which is providing the launch and recovery system the UK will use. For its next generation carriers, the CVN-21 class, the US is developing a new 'cats and traps' system, comprising the Electro-Magnetic Aircraft Launch System (EMALS) and Advanced Arrestor Gear (AAG) technologies. The first-of-class, the USS *Gerald R. Ford* (CVN-78), is already in build, with the system being installed as the ship is constructed. According to Congressional testimony, the ship is on schedule to enter into service in 2015.[3] This is earlier than the planned in-service date for *Prince of Wales*. As the *Ford*-class carriers are expected to be in service for most of the rest of this century, installing 'cats and traps' would give the UK carriers interoperability with US Navy (USN) for as long as is required.[4]

Interoperability and Future-Proofing - Today and Tomorrow

Given SDR's stated intent to maximise the carriers' in-built flexibility, 'cats and traps' offer advantages for current and future capability, innovation and interoperability.

First, there has been regular discussion as to whether the UK has a 'Plan B' should JSF be delayed or even cancelled. 'Cats and traps' provides a 'Plan B' by enabling the UK to consider other aircraft options. If there is a gap between the ships entering service and the availability of an aircraft (should either STOVL or CV be delayed), installing 'cats and traps' would allow the UK to consider purchasing or leasing French Rafale aircraft or US F/A-18 Hornets to bridge the gap. These aircraft are both launched and recovered by 'cats and traps'. However, there is no other STOVL aircraft which could fill the F35B's place. The Hornet option is an interesting example. [A number of Royal Navy pilots already are flying Hornets in training and combat from US carriers. Moreover, Hornets are also already](#) interoperable with the French Navy's aircraft carrier *Charles de Gaulle*: C variants have flown from the French carrier on exercise in the Eastern Atlantic. The USN has already developed tanking and electronic warfare variants of the Hornet which the UK could use if required. An interim solution of either Hornets or Rafales would also enable the UK to embark aircraft on US and French carriers before its own ships arrive and to use these aircraft to help de-risk its 'cats and traps' fit. The Hornets are scheduled to be in service until 2036, so purchasing Hornets also gives the UK greater choice in *when* to start buying the Carrier Variant, as well as offering a longer-term option should JSF not work out. Moreover, an interim solution like Hornet would negate the political debate about 'ships with no planes'.

Secondly, 'cats and traps' will also pre-fit the carriers for future air capability developments beyond JSF. Much discussion of 'sixth generation' combat air vehicles focuses on the development of Unmanned Aerial Vehicles (UAVs). At present, some of the principal UAV programmes the US Navy is developing for carrier-based combat operations would be launched by 'cats and traps'. These include the X-47B Pegasus and the Sea Avenger.

A 'cats and traps' fit would also strategically appeal to the United States by providing an extra carrier deck to fly from. Richard Scott has argued that carrier interoperability is as strategically crucial to the [US-UK defence relationship as the existing relationships on nuclear weapons and submarines](#).^[5] With defence co-operation also a key factor in the UK Government's effort to improving strategic relations with France, so the ability to cross-deck with French aircraft and carriers would be an important contributor. Media reports suggest that the Carrier Variant is too heavy to land on the *Charles de Gaulle* and that the UK's own carriers will not be configured to carry French aircraft. However, as the aircraft and ship programmes are still being developed and as discussions between the navies are on-going, it seems unlikely that conclusive positions have been reached on these issues. At a time of enduring financial and strategic challenges, and with a wider government emphasis on strategic partnerships, the links between the three major navies would be strengthened considerably if all three possessed the same core carrier capability.

Which Carries Less Risk: CV or STOVL?

The F-35 B, or STOVL, remains potentially a very capable aircraft which meets UK requirements. The STOVL concept also continues to offer a unique benefit, with its vertical take-off and landing capability enabling aircraft to operate for example when available basing infrastructure may not support conventional take-off and landing.

However, the prominent press discussion surrounding a potential reversion to STOVL has not highlighted a number of development, production and operational risks and costs which remain, including: limits on aircraft's vertical landing weight, forcing the UK to develop a rolling landing concept for aircraft still carrying a certain weight of weapons and/or fuel; the less-capable STOVL will reduce the flexibility in the UK's carrier capability. Both aircraft may meet UK requirements, but the greater range and payload flexibility offered by the Carrier Variant improve the flexibility mandated by SDSR;

While likely final unit costs of both aircraft remain uncertain at this stage, [reports suggest](#) that buying the required number of additional STOVL aircraft to make up for the capability shortfall between the two variants would cost an extra £2.4 billion in total, with 136 STOVL required instead of 97 Carrier Variant. Moreover, the SDSR assessed through-life support costs for STOVL to be 25 per cent higher than for CV. Whether reverting back to STOVL will incur any additional costs, for example if the CV decision had precipitated ship design changes which would have removed the ability to operate STOVL

[The Daily Telegraph reported](#) that a leaked operational analysis paper produced by the MoD's Defence Science and Technology Laboratory (DSTL) demonstrated that the Carrier Variant is 'more effective ... [and] provides a more robust capability ... in almost all cases' when considering the respective contributions of both variants to the scenarios considered in the paper. As interoperability is an important factor in the carrier concept, it is worth noting that, although a STOVL aircraft can be flown off the deck of a carrier fitted with 'cats and traps', this is not something which the UK has done before with the US, and the way the US conducts carrier flight operations (using high-intensity sortie rates conducted over 12-hour period rotations) raises the question as to whether a STOVL aircraft could be operated from a US carrier deck without interrupting the flow of the ship's conventional strike operations.

Because JSF arguably is the only current 'fifth generation' aircraft, attempting such a conceptual leap forward in design, technology, build, testing, operation and support will inevitably be challenging. As a result, there remains risk of further problems, cost growth and time slip in all three variants (the third being the F35A Conventional Take-Off and Landing aircraft, scheduled to enter into service with the US Air Force). The US Government Accountability Office (GAO) has highlighted specifically the risk in conducting simultaneous development, testing and production.[6] For CV, one of the most prominent recent challenges has been the tailhook, which has been failing to catch the arrestor wire in certain tests. While a re-design and testing of the hook still needs to be completed, aircraft manufacturer Lockheed Martin stated in January that the issue is ['fairly straight forward and isolated to the hook itself ... It doesn't have secondary effects going into the rest of the airplane', and the testing of the new](#) hook is expected to begin in the second quarter of 2012.

Some of the current press debate seems to imply that the risks are greater in the Carrier Variant than in STOVL. The development challenges in both variants must not be understated, and there may of course be risks in both which are specific to UK programme requirements. However, it must be noted that --while a US Department of Defense-imposed two-year probation period on STOVL was lifted a year early in January 2012 --US Defense Secretary Leon Panetta acknowledged that STOVL had still only reached 'the kind of performance and maturity that is in line with the other two variants'.[7] In addition, the GAO reported that several of the fixes put in place are 'temporary and untested', adding that the effect of the fixes 'in some cases, will not be known for years'.[8] This view was supported by the findings of the DSTL paper [discussed in the Daily Telegraph, where it referred to 'considerable](#) technical risks' which still exist in the STOVL programme.

Cost and Strategic Risk

The carrier issue continues to generate heated debate. This has been evident in how the debate about the costs of the different variants as well as the installation of 'cats and traps' has been portrayed in the media. A number of articles claim that conversion costs of perhaps £2 billion are too expensive within the SDSR, with press sources quoting "Whitehall officials" as saying that there is 'every likelihood the costs will continue to rise'. Yet, according to statements from senior US officials,

such estimates are inaccurate. *The Daily Telegraph* reported that US Assistant Secretary of the Navy for Research, Development and Acquisition Sean J Stackley wrote to Peter Luff, UK Minister for Defence Equipment and Support, to inform the UK that 'cats and traps' equipment would cost £458 [million to procure and that the US would underwrite any equipment and cost risk \(with the *Telegraph* contending that defence experts estimate an additional £400 million to fit the equipment\)](#). While the US has its own budget constraints and while there may be some development costs which would be specific to the UK, this total of under £860 million nevertheless remains significantly smaller than figures mentioned in the press, where there has been no explanation of what the additional £1 billion might include. Also, fitting one or both ships with 'cats and traps' at this stage offers potentially more cost savings than deciding to do so later should this be required.

While Secretary Stackley's letter reaffirmed the US commitment to supporting the UK programme, [The Daily Telegraph quoted another](#) Whitehall source stating that the US '[wants] to ensure that the information the British Government is working from is accurate because currently that is quite clearly not the case'. The direct intervention of the US Government highlights the significance of the issue to the US, particularly in the context of the future of JSF and the question of interoperability. Given the impact any UK decisions may have on the US, this raises questions about whether the US is providing input into the UK decision-making process.

The Need to Opt for Long-Term Strategic Value, Not Short-Term Cost-Cutting

The UK carrier capability requirement is to deliver deployable aviation in support of government policy. This leaves policy-makers with a number of options: delivering two STOVL-capable carriers; bringing into service an aircraft type which can operate with one UK 'cats and traps' carrier and with any other compatible aircraft carrier; or bringing in two 'cats and traps' carriers, thereby maximising through-life operational flexibility.

The MoD has said little publicly, other than to state that no decisions on the variant have been made, and that it is continuing to assess a number of programme aspects. While generating a conventional carrier capability is acknowledged by some as 'a step change' to 'an altogether new carrier-borne capability' which brings significant short-term costs and risks, the whole point of the SDSR's original decision to switch variants was to deliver improved capability, flexibility and interoperability.[9] The Carrier Variant's improved capability -and, in particular, the interoperability enabled through the required 'cats and traps' fit -will generate greater long-term strategic utility, flexibility and value.

The choice facing the UK is not so much about jets as it is about whether the UK should opt for the longer-term strategic value provided by fitting 'cats and traps' to one or both carriers, or whether it should opt for possible short-term cost savings, which itself is subject to debate. Of course, any additional investment in new equipment for either carrier will have consequences for the balance of investment across the defence budget, but the question of through-life flexibility remains. 'Cats and traps' can both de-risk for today and future-proof for tomorrow. The F-35 B or STOVL will inhibit the very flexibility and political choice that is essential for the UK's carrier capability.

The views expressed here are the author's own and do not necessarily reflect those of RUSI.

Notes

[\(A fuller bibliography downloadable here\)](#)

[1] *The Economist*, 31 January 1998, p.32.

[2] Gerald Howarth (Minister for International Security Strategy), in 'Navy May Get Two Carriers After All', *The Daily Telegraph*, 23 August 2011, p.12.

[3] *Statement before the House Armed Services Committee Subcommittee on Seapower and Projection Forces on Navy Shipbuilding Acquisition Programs and Budget Requirements of the Navy's Shipbuilding and Construction Plan*, 29 March 2012. p.4.

[4] *Ibid.*, p.3.

[5] Richard Scott, 'Lining up the Approach: UK Eyes a New Special Relationship to Generate Future Carrier Capability', in *Jane's Navy International*, December 2011.

[6] United States Government Accountability Office (GAO). 'Joint Strike Fighter: Restructuring Added Resources and Reduced Risk, but Concurrency is Still a Major Concern'. *Testimony before the Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, House of Representatives*. GAO-12-525T. 20 March 2012. Executive Summary & pp.1, 7 & 17.

[7] Leon Panetta (Secretary for Defense). Cited in Amy Butler, 'Panetta Lifts F-35B Probation', *Aviation Week*, 23 January 2012.

[8] GAO. 'Joint Strike Fighter:', op. cit., p.10.

[9] Richard Scott, Op. Cit.

Impact of the F-35B Decision: Time Now to Have Two Ships, Not One
The UK Government's decision to opt for the F-35 B, vertical landing Joint Strike Fighter means that aircraft carriers will not be fitted with 'cats-and-traps' and will lose the strategic flexibility originally envisaged. To some degree, that loss can be offset by bringing two aircraft carriers into service.

[By Dr Lee Willett, Senior Research Fellow, Maritime Studies](#)

11.05.12: The UK Government's decision to revert to the F-35 B (or Short Take Off and Vertical Landing [STOVL] variant of the F35 Lightning II Joint Strike Fighter), raises as many questions as it answers. The UK policy on the aircraft choice can only be so firm, given persistent questions relating to the technological development of each of the JSF variants. A concern for the UK should be the loss of both the range and weapons-carrying capacity of the Carrier Variant (CV) aircraft and of the flexibility of the 'cats and traps' launch and arrestor gear -flexibility which would have enabled the UK to consider additional manned and unmanned aircraft options in due course. Yet this concern can be offset to a degree if the UK now considers other ways to maximise the flexibility of its carrier capability -such as bringing both ships into operational service.

While much of the debate has focused upon the aircraft choice, one consequence of the October 2010 Strategic Defence and Security Review (SDSR) decision to opt for 'cats and traps' was that -based on current budgets -the UK could only afford to bring one operational carrier into service. The second ship, not configured for 'cats and traps', would be mothballed. The Government has now stated that 'cats and traps' cost growth will add £1 billion to the cost of one ship. Thus, the decision to switch back to STOVL seems to be based mostly on cost growth in the platform, rather than in any potential cost growth in either of the aircraft variants. While the political future of the STOVL variant cannot yet be completely guaranteed as questions about the aircraft's development and cost remain, the UK's commitment to STOVL and the aircraft's importance to the future of the United States Marine Corps (USMC) has reinforced confidence in the Ministry of Defence (MoD) that significant effort will be made in the US in particular to ensure that the STOVL programme does not fail.

The Case for Two Carriers

Now that the UK's two carriers will be configured for the same method of aircraft operation, this offers the possibility to enhance operational flexibility by bringing both ships into service. At present, the Government's position remains unchanged: only one operational ship is planned. However, the two-ship option is something the Government has been considering

for a while. In August 2011, the Minister for International Security Strategy Gerald Howarth MP said that this question was one the UK hoped to 'look at' in the 2015 SDSR.[1] The latest announcement suggests that the option is back on the table. The Secretary of State for Defence Philip Hammond indicated that this is an issue which could be considered in 2015.[2]

Whatever the aircraft launch configuration, the two-ship option has always been fundamental to the flexibility of the carrier concept. Even if both carriers will now be configured to carry the same aircraft, having only one carrier in service will mean that due to planned and unplanned maintenance and repairs -there will be times when the UK will have no carrier capability available. Even with a purchase of a limited number of aircraft -enough for one ship only -having two ships available would allow those aircraft to be employed more of the time.

How Two Ships Enhance Flexibility

While losing 'cats and traps' may preclude interoperability with French and American strike carriers, options remain to cross-deck aircraft with the USMC and the Italian Navy, both of which operate STOVL aircraft. However, rather than through sharing ships and aircraft, interoperability is now being perceived by the MoD in terms of how to co-operate on maintenance and operational cycles to ensure that one of the major carrier nations always has a ship available to deliver deployed aviation in support of international requirements. However, the UK can only maximise the Royal Navy's contribution to support its own national strategic policy requirements for forward presence and crisis response by having two ships available to give 'continuous at-sea capability'. Because the UK could not afford to fit both carriers with 'cats and traps' at this time, continuing with CV would have precluded this option. One might argue too that the loss of flexibility provided by 'cats and traps' and of the greater capability provided by the CV aircraft can now be outweighed by bringing two carriers into service, thus maximising opportunities to deploy a highly agile aircraft like STOVL continuously.

According to the Defence Secretary, a reversion to STOVL means that the UK's plan to deliver a Carrier Strike Capability remains on schedule for around 2020, when the first of class HMS Queen Elizabeth enters into operational service. However, having two ships with the same fit means the UK also can now take a more considered decision as to whether and when to bring the second ship, HMS Prince of Wales, into service. While bringing two ships into service may increase cost and must be assessed in the context of the balance of investment across all elements of the planned Future Force 2020, this extra cost should be considered in terms of the strategic value generated by the availability of continuous at-sea carrier capability.

Back to the Drawing Board in the Future?

In the longer term, the loss of 'cats and traps' raises the question of what the principal capability for both ships will be once the Joint Strike Fighter comes out of service 30-35 years from now, when the carriers have perhaps 20 more years of service life. If the technology focus will have shifted more towards unmanned vehicles by that point, it should be noted that the existing carrier-based unmanned vehicles are all 'cats and traps' launched. While it is difficult to judge where ship and aircraft design technologies will be in 35 years,

the time taken to deliver complex defence programmes (as indeed demonstrated by the carrier story) suggests that the UK will need to be considering options well before this date. This also raises the question of whether major, costly reconfiguration of the ships will be required at some point in their service life. However, that decision -and its costs -will now be tackled in another chapter of this long and still-twisting story. If forward presence and flexibility in crisis response remain central to UK defence strategy, then the two-ship question is the next one to be answered in today's carrier chapter.

The views expressed here are the author's alone, and do not necessarily reflect those of RUSI.

NOTES

[1] Gerald Howarth (Minister for International Security Strategy), in 'Navy May Get Two Carriers After All', The Daily Telegraph, 23 August 2011, p.12.

[2] See Ministry of Defence (MoD). MoD Announces Change of Joint Strike Fighter Jet. www.mod.uk, 10 May 2012.

The Armed Forces: Our country needs them

Underlying the Defence Secretary's vision of a British Army of only 82,000 regulars are some dangerous assumptions that threaten national security.

By Gwythian Prins

Tony Blair casts a long shadow in British politics, and nowhere more directly than on the protracted and bruising campaigns in Iraq and Afghanistan to which he contentiously committed our Armed Forces. These were campaigns that morphed as they dragged on, radically so in Afghanistan; campaigns that puzzled, strained and poisoned public trust. Above all, they were campaigns where the lack of clear strategic aim and mismatch of scale to task placed our Armed Forces under extreme stress. Luck, superb generalship in crisis and powers of improvisation have got us – without disaster, but without clear success – to today's unhappy moment of transition. Finally closing that book was the main message of Philip Hammond's speech yesterday. In describing how the regular strength of the Army will be cut from 102,000 to 82,000, the Defence Secretary's intent was plain: to shift the focus from "campaigns to contingency".

Mr Blair's shadow was long across that speech, too. Mr Hammond did a workmanlike job of stating his case in his terms; but it is his terms that should worry us. Mr Hammond's terms – in effect, the prevalent culture in Whitehall and the Ministry of Defence – reveal no sense of what makes the defence of the realm an activity unlike any other that governments conduct with public money; nor any sense of the trumping priority that belongs to the "nightwatchman" functions of the state. Defence from the enemy without and the enemy within, by according the monopoly of violence to the state on our behalf, was what justified the introduction of income tax by Pitt the Younger. That had consequences then and now, yet they were

nowhere recognised in Mr Hammond's speech.

His first premise was the first premise of the Coalition agreement: that the economic situation is perilous and that reducing the bloated deficit inherited from the Blair/Brown years is the defining driver of his defence reforms. From that follows the whole shape of the exercise, to cut the suit to fit the cloth.

So there are proposals to outsource logistic and other so-called support functions. Does no one read military history? Martin van Creveld's famous study of logistics in warfare shows how very "front-line" and war-winning these "support" functions are. Ask General Patton whether the charge of his tanks to the Rhine after D-Day would have been possible without the "Red Ball Express" of his integrated, dedicated supply train of tankers and ammunition trucks.

Even more contentiously, there are suggestions to rely on "allies" (meaning Europeans) for essential functions. Lord Palmerston would have views on that. Rely on allies by all means, when their interests coincide with ours, but never put yourself in a position where without them you are unable to act alone. There are proposals to place reliance on reserve formations for essential functions that hitherto would have been integral to the regular force. Can the reserve forces really be asked to do this? Should they? Is that moral? Is that safe? Many worry not.

There are sensible ideas of "scaleability" built into the proposals of General Nick Carter, who leads the Army 2020 planning team, for an Army able to build up (or shrink further) in response to circumstance; and the general realignment of advanced Western militaries to give weight to electronic and information warfare is rightly recognised.

But military professionals worry about the loss of critical mass in key skill areas where the whole is always more than the sum of the parts; and while Mr Hammond had warm words for those who will be made redundant, arguing that it is more humane to tell them now so that they can "get on with their lives", there is and will be an undeniable impact on morale, especially if people don't really know why they are serving, and if the country at large doesn't understand what the point of armed forces is nowadays.

But maybe this doesn't matter? Well, it doesn't if you hold the three key submerged assumptions that, over the past 15 years especially, I have observed becoming widely absorbed into the unspoken consensus of Whitehall. They underpin the Coalition's infamous Strategic Defence and Security Review (SDSR), upon which current policy still stands, yet which two select committees of Parliament (Defence and Public Administration – twice) found to be so axiomatically flawed as to be unsafe. So let's haul them up and look at them.

The first assumption is that something wonderful has happened. For the first time, since the end of the long, intermittently Hot and Cold European civil war of 1914-91, peace has become the default condition of modernity. Yes, there are little wars here and there; but basically we have escaped into Immanuel Kant's realm of perpetual peace. The rule of international law and of its agents, the great supranational institutions (EU, UN, etc), by and large prevails.

A vital reason for this is the second assumption: that at last "soft" power has become more powerful than "hard" power. This means that it is more cost-effective to put defence money into the conflict prevention programmes of the Department for International Development than into regiments or frigates. It is a view I have heard privately in those terms from a serving minister (not Mr Hammond).

And the third assumption, which facilitates the other two, is that the purpose of strategy is principally one of management. Strategy for defence is no different from strategy for any large business, the thinking goes; it is about delivering the CEO's top-line objective. Which takes us back to Mr Hammond's top-line premises, because they are just of this type and executed in just that way.

The problem is that each of these three unspoken assumptions is dangerous and wrong. We have not escaped history. The role of all armed forces today remains to prevent bad things from happening; and they do this by projecting an aura of power that comes from a combination of capability (procured against the certainty of uncertainty) with perceived national will.

That was the enduring "Falklands effect" that helped keep us safe for a generation and that materially helped to persuade Gorbachev to end the Cold War. Paradoxically, it is usually cheaper to pay for this up front – because the logic of realpolitik is that those with the aura of power do not need to use it; while those who erode it, as we have, are more likely to have to do so.

The second fallacy is that "soft" power is autonomous. It isn't. Without hard power behind it, soft power is just limp. But central to the failure of the SDCR, and the National Security Strategy behind it, is the loss of understanding that operational strategy is different from and subordinate to national – or what we used to call "grand" – strategy.

Grand strategy understands all those geopolitical factors that affect our national security, both as risks and as threats, but which it is beyond the power of any government to control; and then it is about strategies to project our enduring national interests. Its relationship to operational strategy is to inform it of the range of capabilities that should be procured against uncertainty: the opposite of the elaborate scenario-based ways that the MoD defines force requirements nowadays.

Grand strategy's relationship to politicians is to inform their ignorance and to help them to choose actions wisely so that when they instruct the military to go to war,

we avoid the experiences of Blair's years.

Can we do this? We did once. This is exactly how the long forgotten Lord Chatfield caused the Defence Requirement subcommittee of the Committee of Imperial Defence in 1935-36 to initiate the construction of the aircraft that won the Battle of Britain, the ships that sank the Bismarck and gave Churchill the means of victory. "The vast sums required to make up for previous economies... horrified the financial minds," Chatfield wrote. He added: "Time after time the Services were told that the financial dangers to the country were greater than the military ones... the Government seemed unable to face the fact that every million spent now reduced the chance of war, and that if war came, it would not be spent in time, while the cost would be much greater."

Are we certain that our world is that much different from Chatfield's? I am not; and so I think that the defence cuts of the SDSR are an immense gamble with our future. Gwythian Prins is a research professor at the London School of Economics and a visiting professor in war studies at the Humanities Research Institute, University of Buckingham

UK Carrier Project A Strategic Asset. The Choice of Carrier or Amphibious Strike.

On the 19th April 2012, I personally wrote to David Cameron, offering my support at his choice of Conventional Aircraft Carriers and the F35C in the 2010 defence review. This was at a time when it became clear that wheels were in motion to revert back to the F35B and therefore a V/STOL (vertical and/or Short take Off and Landing) variant of the Queen Elizabeth class. I wrote to him again on the 2nd May 2012 upon discovery of an alternative launching system, the designer claiming the system to be both tried and tested by the US Navy, cheaper and easier to convert than the then proposed EMALS system. On the 26th April 2012 PUS Ursula Brennen told the HOC PAC that no decision on the carriers had been taken. On the 10th May The U turn was announced.

I received a reply from the Cabinet office stating that my concerns had been passed onto the MOD, to this date I have not received a reply. Along with this I sent separately a request under FOI rules to the MOD asking the following:

Dear Ministry of Defence,

Were other innovations and designs of catapult considered before EMALS was selected for use on the Queen Elizabeth class? If so, what were they and to what level were costing's completed? Again at the time of writing there has been no reply.

The Strategic Choice

There is no doubt from Analysts and commentators worldwide that only CATOBAR (Catapult Assisted Take Off Barrier Arrested Recovery) type carriers can supply true Carrier strike. V/STOL delivers a more restricted role, that of amphibious strike. That in turn restricts sea room and survivability as the carriers need to be closer to the action to affect events. Air to

air refuelling (AAR) is at present not possible for the F35B and therefore restricts operations to operate with land based or allied AAR assets. That may not be possible in missions east of Suez or the South Atlantic due to lack of both availability and politics of neighbouring states. There is also a restricted Airborne Early Warning (AEW) cover as rotary platforms lack the range and power of the fixed wing versions and again land based systems are affected in the same way as land based AAR assets.

Lockheed Martin vice president Steve O'Bryan has said that most F-35B landings will be purely conventional in order to reduce stress on the vertical lift components. Conventional operations also reduce the risk of self-induced foreign object damage. Is this a vote of confidence? If most of the landings are conventional, when will the F35B be doing vertical landings on the carrier? It is also a known fact that F35C is superior in every way to the F35B. Because of this the F35B will be forced to utilise a rolling landing, relying solely on its brakes to stop on a wet, slippery and pitching deck. The F35B also has issues with Weight, Altitude and Temperature (WAT) while operating in hot climates. Both these issues are discussed in greater detail in Nigel "Sharkey" Wards paper, included in this brief.

The problem is no one can guess where the next threat will come from and requires the most adaptable systems to cover all eventualities. Failure to do so I believe not only threatens security but our Maritime requirements for the supply of food and energy.

QE class Conversions.

The Idea of converting the wrong Labour Government choice of VSTOL carriers to CATOBAR in the 2010 review was without doubt the most forward thinking Strategic decision any HMG had taken since the introduction of Polaris. It was unfortunate that it happened at a time of fiscal tightening and that the fiscal situation caused the U turn.

The cost of the conversion and time delay seems to be the main reasons for the U turn. But that in itself poses several questions. Did the MOD look at all the alternatives? Did the MOD opt for the right system?

Internal Combustion Catapult Aircraft Launch System (ICCALs)

As I mentioned earlier, there has been an alternative launching system for conventional carriers since 1959, Its adoption in the US Navy was only dropped because of US navy politics and NASA being involved in a vertical launch system and EMALS (Electro Magnetic Launch System) was chosen because of NASA's involvement. NASA dropped out when it was realised that EMALS wasn't delivering as advertised and billions more needed to be spent to get it to work.

The ICCALS system has launched aircraft with greater efficiency, at less stress to the airframes and reducing maintenance costs for a long time before EMALS was off the drawing board. Dick Bushway, the Advanced Technology Catapult Procurement Officer for NAVAIR PMA 251, budgeted \$35 million in 1997 to build and test an early ICCALS as a competitor to the EMALS system. In 1998, NASA's Marshall Space Flight Center, proposed to co-fund and co-develop Electromagnetic Launch. NAVSEA decided that this was the way to proceed given the large increases in cash and personnel that this would provide. Also, Newport News Shipbuilding (NNS) found itself in the position of being a technology proposer and technology integrator at the same time. To avoid this conflict and in agreement with the Navy's decision for EMALS, pursuit of ICCALS technology was defunded and terminated to

avoid a conflict with EMALS although the ICCALS program was building and testing hardware.

An Advanced Technology Catapult concept for installation for backfit or new construction is available which provides greater performance than any current catapult including EMALS while significantly reducing weight, volume requirements and development time and cost, installation difficulty and costs and operating costs. The US Navy has indicated by the upgraded performance specifications for the EMALS electromagnetic catapult that the current C13 steam catapults are unable to perform the full range of tasks that will be asked of them in the future. The EMALS catapult technology was designed to fulfil a specific range of tasks for Ford Class aircraft carriers which have sufficient generating capacity to support EMALS which should be able to meet all of the future launch needs for those carriers, once properly sorted out.

However the EMALS launch system cannot be installed aboard the CVA Queen Elizabeth unless a substantial increase in generating capability is installed. This proposal, the Internal Combustion Catapult Aircraft Launch System (ICCALS), is designed to utilize the C13 steam catapults as the basis to exceed the performance specifications of the EMALS catapult – at a significantly lower hardware cost per catapult and greatly reduced cost for installation. The technology goal is to build, demonstrate and qualify the ICCALS technology to modify the current C13-2 steam catapults as currently used aboard the Nimitz Class carriers to use a combustion gas based energy source rather than steam to drive the current catapult launch engines. This allows the launch of a wider range of present and future vehicles, both manned and unmanned, under full closed loop control, and insures a more precise and controlled rate of acceleration over the entire launch event. The designer also proposes to further simplify the C13-2 launch system, increase the launch capacity, and provide closed loop control of acceleration and end speeds of the modified C132 catapult. Due to simplification, the MOD can reduce the level of manning currently required to maintain and operate the C13-2 steam catapults. This specifically allows installation of catapults aboard ships that cannot be easily fitted with the current steam or EMALS catapults such as the LHA class ship or converted CVEs.

The designer Mr Clint Stallard, had been in contact with the HMG before the U turn, as is still pursuing American orders for possible use of his catapult on LHA6 and as a backfit for the Nimitz class as it is not possible to use EMALS on these platforms due to the power requirements.

It is worth noting both classes will be in service for the next 20-30 years and that both the CVN77 and the earlier CVN Enterprise were designated to receive this catapult. In fact the USS Enterprise has had parts of the system installed for over 30 years. It has also been revealed by investigations from the catapult designer that the US Navy would be quite prepared to supply 4 catapults and one arrestor system for UK use when the USS Enterprise decommissions in 2013.

Because they are kept at A1 conditions at all times, they would in affect be as good as new systems but at less than half the cost. The designer, who was until recently the lead Engineer at Ingals Shipbuilding in the USA, has stated that the conversion would be possible within two years (2015) FOR BOTH CARRIERS at a cost of less than was quoted in the U turn for one. One has to ask a final question, HMG could have had the cake and cream, why haven't we now?

T A Dainton For DefenceSynergia.

RN-RAF STRIKE

GA =Ground Attack- Airdef= Air Defence- CAP= Combat Air Patrol

AEW Airframes

E2-C+

Radar AN-APY9 Max detection range 350nm

Significant Comms JTIDS/Link16 CEC

Max service Ceiling 37000' Normal Operating 20,000' Radar Horizon (geographic) 170nm

Power Plant 2 Allison T56-A-427 turboprop;

Max Speed at altitude 338kts

Edurance (Max) 6 • hrs On Station at 100nm 5 • hrs

Merlin

Searchwater 2000 150nm

JTIDS/Link16

11000' 10,000' 120nm

3 RR Turbomeca RTM322

166 knots

5 hrs 3 • hrs

It is important for the AEW platform to operate at distance from the carrier force so as not to declare carrier position. Platform speed, endurance, operating altitude and equipment must be looked at holistically. The ideal is fast dash speed to operating position, long endurance on station, high operating altitude (geographic horizon), and powerful long-range radar and communications. The E-2's pressurised cabin enables prolonged operations above 10,000ft without need for crew oxygen. Because of this and its better equipment, E-2 has at least 50nm detection range advantage over Merlin at normal operating height, and over 200nm on pure radar performance. This translates to between 5 and 20 mins warning of attack (mini-

mum). Even in the presence of a Type 45, AEW is essential -during the Falkland's war, surface ships had a maximum radar detection range of some 40 nm: about 4min warning of a threat closing at 600 knots at low level, less if a missile (2min or less). Lack of AEW was the most significant factor for losing so many ships. Cooperative Engagement Capability (CEC) is key to enabling maximum force integration and co-ordination of weapon systems and sensors to maximise force defensive capability and survivability by allowing the best placed platform to engage the threat.

Air-Sea Battle -Clearing the Fog

The goal is to ensure all forces can get to the fight

BY CAPT. PHILIP DUPREE, USN AND COL. JORDAN THOMAS, USAF

Recent articles about Air-Sea Battle reflect misperceptions about this new operational concept. These may have been fostered by the fact that portions of the concept document are classified. In any event, we — the service leads in the multiservice ASB office — would like to correct them.

Let us say at the outset what Air-Sea Battle is not. It is not a strategy, it is not designed to threaten other nations and it is not just the manifestation of traditional joint operations.

Perhaps the most troubling misperception is that ASB is only about air and naval forces, that it ignores the land component. To the contrary: It is an operating concept that seeks to assure, in the face of rising technological challenges, that all components of U.S. and allied forces can be brought to bear as deemed necessary. In 2009, then-Defense Secretary Robert Gates directed the departments of the Navy and the Air Force to develop a concept to counter emerging anti-access/area-denial challenges, known as A2/AD. Last year, the departments responded to Gates' directive with the Air-Sea Battle concept. In October, Gates' successor, Leon Panetta, formally endorsed the effort.

It should be noted that ASB is one of several supporting concepts nested under the Joint Operational Access Concept approved by the chairman of the Joint Chiefs of Staff. Both concepts will be complemented by the Joint Concept for Entry Operations, now in early development, which will be more primarily concerned with land forces.

THE A2/AD OUTLOOK

We can define anti-access capabilities as ones that slow deployment of friendly forces into a theater, prevent them from operating from certain locations within that theater or cause them to cooperate over longer distances than they would like. Area denial efforts are those that reduce friendly forces' freedom of action in the more narrow confines of the area under the enemy's direct control.

Such problems are not new. During World War II, for example, Imperial Japan possessed robust A2/AD capabilities in the form of air forces, surface fleets, submarine forces, naval minelayers and air defenses. All had to be overcome by U.S. and Allied air and naval forces to make effective power projection possible.

More recent adversaries have been largely unable to mount anti-access capabilities. During our operations over the last 20 years in the Middle East and Central Asia, our air superiority and sea control were not challenged in any meaningful way outside of adversaries' national airspace and littoral waters.

In the future, we are less likely to be so fortunate. Several decades of U.S. dominance have not blinded potential enemies to the value of A2/AD concepts. The ability to strike at incoming forces far beyond a nation's borders promises a powerful asymmetric challenge to the U.S. military, which since the Cold War has developed the means and the methods "to rapidly deliver combat power whenever and wherever U.S. strategy required," as Gen. Norton Schwartz and Adm. Jon Greenert wrote in a recent article. "Potential adversaries were clearly mindful of this transformation," the chief of staff of the Air Force and the chief of naval operations wrote in "Air-Sea Battle: Promoting Stability in an Era of Uncertainty" (The American Interest, Feb. 20). "They observed the inability of Soviet-era doctrine and weapons to blunt American power and reconsidered their approach to resisting U.S. military intervention. Competitors with the will and means gradually shifted from planning to fight American forces when they arrived and instead focused on denying U.S. access to the theater."

The emergence of A2/AD as a major concern is due to the proliferation of technology that places precise, long-range fires in the hands of potential foes. Such weapons include ballistic and cruise missiles, integrated air defense systems, anti-ship missiles, submarines, guided rockets, missiles and artillery, 4th- and 5th-generation combat aircraft — even space and cyberwarfare capabilities.

If left unchecked, these could allow adversaries to challenge joint and coalition forces in the global commons: those areas of air, sea, space and cyberspace shared by all nations and used for commerce, transportation, communication and trade. Since credible U.S. power projection is a fundamental pillar of regional stability, even the perception of a slipping ability to gain access to the global commons without resort-

ing to the threat of invasion or other escalation is a sign of strategic weakness that can lead to regional instability.

A 'PRE-INTEGRATED' JOINT FORCE

For decades, the primary asymmetrical advantage underwriting U.S. and allied power projection has been superior technology and the commensurate development of tactics, techniques and procedures, or TTPs. When adversaries can counter U.S. advantages with their own asymmetric capabilities, our best response lies in better integration and more flexible capabilities.

Accordingly, the central idea of ASB is an unprecedented level of joint integration leading to air and naval forces that can launch networked, integrated attacks in depth to disrupt, destroy and defeat an adversary's A2/AD capabilities.

At its core, ASB seeks a "pre-integrated" joint force that possesses habitual relationships, interoperable and complementary cross-domain capabilities, and realistic, shared training, while retaining the flexibility to develop new TTPs on the fly. Such forces will provide the strategic deterrence, assurance and stabilizing effects of a "force in being" and will also be operationally useful at the outset of hostilities, without delays for buildups and extensive mission rehearsal. Moreover, they will ensure that a joint force commander has a full range of options when facing an adversary with an A2/AD capability.

Another way to put this is that ASB seeks to preserve U.S. and allied air-sea-space superiority. It is this level of domain control that unlocks a land force's deterrent and war-fighting potential. If air and naval forces cannot establish control of the air, space, cyberspace and maritime environments, or if they cannot sustain deployed forces, no operational concept is tenable. If ground forces cannot get to the fight or be sustained in an advanced A2/AD environment, they will fail to serve the vital interests of America, our allies and the international system.

We may have developed a blind spot to this perennial truth, mainly because U.S. and allied forces have enjoyed uncontested freedom of action in the air, sea and space domains for more than a generation. Somehow write about conflict in contested areas seem to assume future adversaries will not effectively oppose deployment and sustainment of ground, air or naval forces. That has been largely true over the past two decades, but will not be guaranteed in the future. Against advanced adversaries, freedom of action cannot be taken for granted.

A FUTURE WITHOUT ASB?

Perhaps the best way to understand the value of the ASB concept is to imagine a future where its integrated air and naval capabilities and capacity do not exist.

In such a future, attempts to use the familiar expeditionary model of massing combat power — the so-called “iron mountain” — at a handful of main operating bases to conduct extensive mission rehearsals and subsequently seize the initiative at a time and place of the Joint Force commander’s choosing, may not be feasible.

Advanced adversaries could deny secure U.S. land basing at very long ranges, preventing air and naval forces from gaining local air superiority. Sea basing could also be challenged and attempts at ad hoc integration may be insufficient. Enemy capabilities could prevent surface action groups from operating at effective ranges and sea control may therefore be untenable. Space and cyberspace access would not be assured, and global communications and the exchange of information could be held hostage by any motivated aggressor.

Without freedom of action in the air, sea and space provided by integrated air and naval forces, aggressive nations with proliferated A2/AD capabilities could restrict or close off international airspace and vital sea lanes at will. Joint forces attempting to undo such aggression would face robust aerial threats and be required to operate in a heavily contested environment.

Lacking the networked, integrated force required to prevail in such conditions, U.S. and allied forces may not be able to prevent the undermining of the interconnected international systems of finance, trade, security and law enabled by access to the global commons. The loss of a secure global commons could weaken alliances, partnerships and the rule of law, and could force other nations to accommodate regional hegemony and make the world permanently less free. In this future, it would not matter how capable any ground assault forces are because, without freedom of action in the global commons, the joint force could not credibly deploy and sustain them.

A BETTER FUTURE

Air-Sea Battle seeks a better future — one that employs teamwork between air and naval forces to maintain U.S. superiority in the air, space and cyberspace, and at sea, at an acceptable cost, allowing the joint force to shape future A2/AD environments, deter other nations from threatening the global commons, and use all service and joint competencies to defeat a capable A2/AD adversary when necessary.

Though it is meant to facilitate all courses of action, the concept itself is not provocative. Instead, it is designed to produce forces that are more likely to have a stabilizing effect, making a major war less likely. ASB air and naval forces will allow the U.S. and its allies to avoid relying on more escalatory capabilities that existentially threaten another nation or its leadership (e.g., nuclear escalation or threat of invasion), or involve alternatives that are inherently defensive and less likely to deter adventurism and regional coercion (e.g., ceding the commons and relying on blockades and offensive mining).

In some cases, the commander might use such air and naval forces to deter potential adversaries; assure allies, friends and partners; and keep the global commons open and accessible to all. In other situations, he or she may need to use the freedom of action provided through ASB for strike operations, forcible entry or other methods of power projection.

Development of forces with this level of integration and capability will require years of effort and significant institutional change. This change has begun in the departments of the Navy and Air Force; the CNO and CSAF have written: "The Air-Sea Battle operational concept will guide our efforts to train and prepare air and naval forces for combat. We already train together and share joint doctrine. Under Air-Sea Battle, we will take 'jointness' to a new level, working together to establish more integrated exercises against more realistic threats."

In an ever-changing world that demands continued U.S. leadership, concepts like Air-Sea Battle are essential to sustaining America's military freedom of action and ability to project power. AFJ

THE NATIONAL SECURITY STRATEGY – FLAWS IN THE MACHINE

It is probably true to say that modern warfare doctrine is less concerned with traditional designations such as, Fleet, Corps, Division, Squadron – terms that may be misleading so much as with over-matching the enemy's professional and technical capability in any given strategic or tactical environment. This is not to say that superior numbers are now unnecessary – when facing a peer competitor a combination of superior numbers and capability can be crucial -only that in actual engagements against second tier opponents superior training, utility and capability have been shown to be war winning factors.

However, the National Security Strategy (NSS) has tended towards the view that reducing personnel numbers in HM Armed Forces is justified by 21st century circumstances and this is worrying, not least because, at the same time, platforms, capability and technological advantages are being relegated or lost. It is true that Global Strategic Trends (GST) analyses indicate that the danger of major state on state warfare is receding but it also postulates that threats to resources along the Littoral and sea lines of communication (SLOC) risk domestic security whilst counter insurgency (COIN) operations and asymmetric warfare leading to long term peace-keeping commitments overseas are more likely. Therefore, contrary to NSS plans for Future Force 2020 (FF20), the size and capabilities of some of HM Armed Forces may require rebalancing and even bolstering. For example, future combat operations for all 3 services will be heavily dependent upon tactical information systems and open systems architecture that is able to interlink with (and permit) data and control transfer between national and allied forces. **However, systems upgrades such as Cooperative Engagement Capability (CEC) that offer force multiplier effects as well as improved defence and survivability for the fleet and upgrades to RAF E3D communications suites for international interoperability are being cancelled or delayed by MOD.**

Where personnel numbers prove the greatest challenge is in COIN operations – most especially in the selection and use of special forces (SF). A belligerent local population inhabiting

urban sprawl over a geographically large area often proving to be a major hurdle unless **'boots on the ground'** are combined with technology. This larger army order of battle (ORBAT) providing the core around which to regenerate infantry, artillery and armoured forces -within reasonable warning time frames -to meet state on state general war conditions. However, this is not practicable for the RN/RAF that require years of warning time to procure platforms and train personnel to combat ready status.

FF20 AND THE NSS – A MARITIME CENTRIC STRATEGY IGNORED

The analysis by HM Government, as articulated in the NSS, points to an internationalised foreign policy that calls for a 'maritime centric' leaning defence strategy. To that end aircraft carriers, fixed-wing-air-power and highly capable surface and sub-surface vessels to support an indigenous amphibious capability are a central focus of the NSS. However, the NSS offers little by way of explanation as to what ground and air elements should be dedicated to this implied 'maritime centric' strategy. Indeed, counter intuitively, the Defence Planning Assumptions (DPA) appear to have been weighted towards scenarios for the use of land forces with the naval and air requirements being referred to in rather unquantifiable terms such as :“appropriate air and maritime support”. Nevertheless, the Strategic Defence and Security Review (SDSR) 2010 reduced the size of HM Forces – RN to 30,000 (including 7500 RM); RAF to 33,000; British Army to 82,000 (with 30,000 TA).

These NSS assumptions were broadly as follows:

1. The British Forces should be configured to conduct 2 concurrent battle group/ brigade size operations (the latter 6500 troops) - one of which would be long term with little or no war fighting but with increased exposure to humanitarian intervention and aid - with appropriate maritime and air support.

2. Or, HM Armed Forces to be capable of conducting a divisional size one-off operation of up to 30,000 personnel inclusive of 'supporting sea and air power' but limited to 6 months of active operations probably in concert with allies.

MARITIME CENTRIC STRATEGY AND CAPABILITY GAPS

Put simply a 'maritime centric' strategy requires integrated naval, air and ground forces capable of providing priority tasking in support of the nuclear deterrent; Littoral, SLOC and Blue Water amphibious operations; expeditionary defence of UK dependent territories and allied causes; defence of the UK homeland.

The nuclear deterrent task continues but is at risk because of the lack of LRMPA and the potential over-tasking of naval escort assets. Beyond the deterrent, other tasks are at risk where concurrency is required because one carrier, one landing platform, 7 submarines, 13 frigates, 6 destroyers and 15 MCMV cannot be in several places at one time (some will be laid-up for maintenance) and the RAF cannot make-up the shortfall because of the total lack of LRMPA and limited AWACS, air transport and air to air (AAR) refuelling capacity, range and Access, Basing and Overflight (ABO) uncertainties. All tasks are at risk if UK forces cannot operate in an Intelligence, Surveillance, Targeting and Reconnaissance (IS-TAR) environment enabled by integrated joint and multinational open system architecture with interoperable tactical information systems.

Although FF20 'Ground Forces' will operate with 40% fewer tanks (Challenger), 35% fewer long range guns (AS90) and reduced regular Combat Service Support (CSS) these can be supplemented through the use of reserve forces. Therefore, unlike the RN and RAF, the army, with a strength of 82,000 regulars, 30,000 reserves and revised equipment plan is able to meet its DPA obligations -with one major exception. **The Army's principal problem is not its own ORBAT but the FF20 ORBATs of the RN and RAF, who, as operation enablers, may not be able to guarantee safe delivery and combat support in accordance with established joint expeditionary warfare doctrine.**

As there are known capability gaps in current carrier, fixed-wing-carrier-air, LRMPA, air and sea transport, AAR and AWACS the expeditionary nature of the NSS assumptions are at major risk – in some circumstance, unworkable. Whilst some of these deficiencies are being addressed in the medium term through the new build QE Class carrier programme and procurement of the F35B Short Take-off and Vertical Landing (STOVL) aircraft there are no current plans to implement 'Project Eagle' to upgrade the RAF E3D to US/NATO standard open system architecture; no plans to replace LRMPA ; no plans beyond those already announced in the A330-200 PFI contract to provide more AAR capability; no plans to increase the number of RN frigates, destroyers or landing platforms. However, counter intuitively the MOD has cancelled CEC for the six RN Type 45 Destroyer fleet, is planning to retire Sentinel RI airborne stand-off radar (ASTOR) early and has not proceeded with the open system architecture upgrade (Project Eagle) for the RAF E3D AWACS fleet.

DefencSynergia freely acknowledges that it is largely unsighted as to the MOD rationale in respect of army FF20 establishment. So our concerns over the apparent disparity between the planned establishment of 112,000 (82,000 plus 30,000 reserves) and the NSS DPA requirement for 40,500 soldiers based on 5 x 6,500 MRB plus 8,000 16 AAB might well be unwarranted, if unexplained.

However, if it is even a possibility that the RN and RAF, within current limited capability, would be unable to guarantee protected transit for an expeditionary force, then parliament must surely ask why?

Indeed, parliament may wish to know from MOD the logic of having an implied 'maritime centric' expeditionary posture, if command of the global commons through effective air and sea combat support, transport and IT enabled force protection is being neglected?

In such circumstances is it not logical to ask HMG if the the overarching strategy, including the NSS assumptions, may be fatally flawed?

Sunday, May 20, 2012

[F-35B STOVL -The Mistake](#)

F-35B STOVL -Balancing the Books -or Haemorrhaging the Defence Budget.

Executive Summary.

i. This paper questions whether the Secretary of State based his recent decision on reversion to the F-35B STOVL aircraft on accurate and adequate advice from the MoD and other sources.

ii. It addresses the questionable timescales used by the Secretary of State to justify his decision and it discusses severe operational deficiencies/risks in the planned capability of the F-35B STOVL aircraft.

iii. The financial benefits (or otherwise) to be realised from the reversion to STOVL aircraft and ramp fitted decks is then questioned and the paper raises a major financial risk factor (through life cost) that does not appear to have been adequately addressed by advisers.

The paper then briefly argues that the poor decisions taken concerning the management and direction of the Carrier Strike are a direct result of the misleading advice provided by MoD over the past decade: not a result of Ministerial incompetence in either Government. However, it does conclude that a full investigation into the above issues and corrective action is necessary -without which Ministers could be held responsible and accountable for the inevitable emasculation of our future Carrier Strike capability and for the haemorrhaging of the defence budget which will take place as a result of their recent decision.

Introduction.

1. It was evident from the recent hearing of the Public Accounts Committee on Carrier Strike that the Ministry of Defence witness, the Permanent Undersecretary, was not quoting from the available up-to-date costs for the *Queen Elizabeth* Carrier Project. As a result the PUS did not furnish the Committee with any valid or accurate statement concerning the progress of this Project.

2. If the PUS was unable to demonstrate proper accountability and control of the Project to the Committee (of all MOD personnel, the PUS was best placed to have received a full briefing from her subordinates), this raises the serious question as to whether the Secretary of State himself was properly and fully briefed by MOD concerning the recent U-turn on the F-35 choice for our new carriers.

Was the Secretary of State Given Incorrect Advice?

3. From the content of his statement to the House of Commons concerning this matter, it would appear that the Right Honourable Philip Hammond MP had been misinformed by MOD on several issues (including timescales, costs, interoperability, global capability, to mention but a few).

4. Clearly, if our Ministers are not provided with accurate information by MoD concerning major procurement programs, they cannot make the right decisions concerning the future of our national defence capability. Further,

- a) If there is a gross imbalance between 'short term savings and long-term costs' and 'national strategic capability' and
 - b) If this is not clearly pointed out to Ministers, then it is likely that wrong decisions will be taken for the wrong reasons and great harm can be inflicted on the Nation's future strategic capability and MoD's economic credibility.
5. This would certainly appear to have been the case with the U-turn on the choice of F-35 aircraft for our new carriers.

Balanced Judgement requires a Level Playing Field.

6. The very relevant, recent focus upon the Voyager aircraft project and the latter's extraordinary costs raises important questions concerning the ability of MoD to compare properly the efficacy and worth of major projects when faced with the need to reduce defence expenditure. Had a better financial appreciation been made concerning the Voyager project, unit procurement costs for 14 aircraft would have totalled £700 million with an estimated through life cost of 1.5 x procurement cost resulting in a total bill of £1.75 billion -as opposed to the extraordinary figure of up to £12 billion (far more than the Carrier Project).

7. The Secretary of State has highlighted that the Carrier Project and its Air Group as at the very

heart of the UK's Strategic Defence Policy -as such taxpayers might reasonably consider that it should maintain pride of place in the priority list for defence expenditure. This view is, however, evidently not the case within MOD and this anomaly calls into question the strong possibility of vested interests and slack overall defence spending accountability.

8. Against this background, it would appear that under the present regime, the 'loudest voice' is heard irrespective of the operational strategic requirement and financial/operational common sense.

The Loudest Voice.

9. Is it not reasonable for the taxpayer to expect that the Secretary of State would seek and place considerable weight on the operational views of the military operator of the equipment to be procured? In the case of the Carrier Project, including its air group, the military operator is the Royal Navy, by definition.

10. At a time when:

a) The Government was clearly misled (SDSR 2010) over the wisdom of withdrawing the Harrier and HMS *Ark Royal* from naval service, thereby causing an unnecessary gap in Britain's already limited carrier strike capability and when

b) There is considerable disagreement between the Services concerning defence funding priority,

should not the Secretary of State have taken direct advice from the Naval Aviation branch of the Naval Staff about this important Project rather than listen to those who evidently have no experience or expertise concerning carrier operations?

11. It has been mooted that the Secretary of State was not personally briefed by the First Sea Lord and senior Naval Aviators during the F-35 STOVL decision-making process. If this is so, it casts doubt upon the efficacy and structure of the existing decision-making process. Perhaps this could have been addressed usefully by Lord Levene's Defence Reform Unit.

The Operational Strategic Requirement.

12. The reversion to the F-35 STOVL variant of the Joint Strike Fighter is likely to have serious negative implications for the future strategic capability of our new carriers. The "Carrier Strike" capability of these new capital warships is unlikely to be achievable: leaving Britain with just a littoral Amphibious Support Capability.

Timescales.

13. The Secretary of State's words:

'First, ... it has become clear that operational Carrier Strike capability, using the 'cats and traps' system, could not be delivered until late 2023 at the earliest, considerably later than the date envisaged at the time of the SDSR of "around 2020".'

14. Project officials have indicated that the *Prince of Wales* could be in service with an angled deck and the F-35C by early 2020; and the F-35C will have its weapons systems fully cleared for UK service when delivered. This is not the case with the F-35B which will require a prolonged and intensive weapons flight test program before it is cleared for UK operational use – thereby delaying its availability for front line service.

15. Further to paragraph 14, above, it is not understood how the advisers to the Secretary of State can predict a firm date for the operational availability of the F-35B when this cannot yet be established by the US Department of Defence (the recent GAO report is relevant).

16. The Secretary of State's words:

‘Because Britain’s carriers will have all electric propulsion, and therefore do not generate steam like nuclear powered vessels, the catapult system would need to be the innovative Electromagnetic version (EMALS), being developed for the US Navy. Fitting this new system to a UK carrier has presented greater design challenges than were anticipated.’

This statement is obfuscatory and misleading. The EMALS system has already been developed and will be fitted to the new US nuclear carrier *Gerald Ford*. It would appear that British Aerospace Systems has either neglected to cater for the possible fit of this system as required under contract or is exaggerating the design challenges. The fitting of EMALS should not in any way delay the planned timescale for the introduction of the carrier to service.

17. The Secretary of State's words:

‘But the facts have changed. I am not prepared to accept a delay in regenerating Britain’s carrier strike capability beyond the timetable set out in the SDSR.’

Had the Secretary of State been informed correctly by his advisers concerning the achievable in service date of the *Prince of Wales* and the weapons testing delays of any UK F-35B program, he would have realised that there was not going to be ‘a further delay’ in regenerating Britain's carrier strike capability. The F-35C option is on target for achieving SDSR timescales.

Carrier Strike.

18. Contrary to the advice given to the Secretary of State, reversion to the F-35B STOVL will not provide Britain with an effective ‘operational Carrier Strike capability’. The STOVL aircraft has a significantly lower radius of action and weapons payload than the F-35C and no ‘buddy-buddy’ air to air refuelling capability to extend its operational range. The perspective of the United States Navy and Marine Corps is that the STOVL aircraft is ‘an amphibious support weapons system’, no more and no less. Both of these American services are procuring the F-35C to satisfy their Carrier Strike requirement.

RISK FACTOR 1 – OPERATIONAL CAPABILITY.

19. It is considered highly probable that the Secretary of State was not fully informed of the major difficulties facing the STOVL aircraft for operations in high temperatures. These difficulties stem from the power/weight ratio of the aircraft and are so significant that they have dictated a

major change in the manner in which the aircraft is planned to recover to the deck. The F-35B will not have enough power to enable operational Vertical Landings on board in hot climates. A completely untested new standard recovery known as the Ship Rolling Vertical Landing (SRVL) is now being proposed to overcome this major "difficulty/loss in capability".

Ship Rolling Vertical Landing – F-35B ‘STOSRVL’.

20. It is proposed that the aircraft will approach the landing point with considerable forward speed relative to the deck (it will not come to a stationary hover over the deck) to enable extra lift to be provided by aerodynamic effect over the wings -to make up for insufficient engine power. It will therefore impact the deck with a forward speed of approximately 60 kn (70 mph) relative to the deck (and approximately 90 kn relative to the wind over the deck). The aircraft's computer-controlled wheel brakes will then be required to bring the 18 ton aircraft to rest before it disappears over the bow of the ship.

21. To the armchair observer making subjective judgement, this may be considered an effective

engineering solution to ensure the safe recovery of the aircraft. With a dry deck and no ship movement (pitch, roll, yaw and heave), such a mode of recovery may indeed be possible. However, flat calm conditions are extremely rare across the oceans of the world and, for a significant proportion of the time, warships are subject to wave and swell action that often generates severe ship motion in pitch, in roll, in yaw and with vertical heave. Further, the flight deck will often be wet from the effects of rain and sea spray. In a similar manner to main roads, deposits from tyres and grease can and do make the flight deck extremely slippery; especially in wet conditions.

SRVL – THE HAZARD.

22. Picture, if you will, an 18 ton petrol tanker/truck (the same inertial mass as the F-35B) with only three tyres in contact with a wet, slippery flight deck surface; travelling at 70 mph and attempting to come to a halt rapidly and in a safe and controlled fashion when the rolling/yawing action of the ship is applying immense side forces to the vehicle (physically moving it either towards the edge of the deck or towards other aircraft and the ship's superstructure). Add to this the downward pitch of the ship and downward heave which will markedly reduce the effect of any braking action being applied through the wheels. The result is an extreme flight safety hazard in which the driver (pilot) has no control over his truck (aircraft) and you have 18 tons of expensive, petrol-filled equipment skidding down the deck at high speed with a mind and a direction of its own.

23. Obviously, such a situation is completely unacceptable (catastrophic) and the end result is likely to be that the F-35 'STOSRVL' aircraft will be inoperable in all but benign sea states and weather conditions.

24. Is this an issue on which the Secretary of State was fully briefed? It appears not and removes all credibility from the Secretary of State's remark:

‘The balance of risk has changed and there is now judged to be no greater risk in STOVL than in other variants of JSF.’

RISK FACTOR 2, 3, 4, 5 – OPERATIONAL CAPABILITY.

25. There are several major technological risks associated with the continued development of the F-35 Joint Strike Fighter which will inevitably have an adverse effect upon Initial Operational Capability dates. From a UK point of view, delays associated with such risks will have the most

adverse effect on the supposedly earlier IOC of the F-35B STOVL. Some of these risks have been highlighted in Aviation Week (see Annex B), the most important of which would appear to be that affecting the aircraft's stealth qualities.

26. **Stealth.** It is reported that when a test version of the F-35 achieved the design speed of Mach

1.6 for the first time last December, the flight caused "peeling and bubbling" of the plane's stealth coating. The entire test fleet was subsequently limited to Mach 1.0. The ability to maintain the stealth quality of the aircraft in the maritime environment is also under question and is not yet assured.

27. Other serious problems exist with:

a) The Integrated Power Package (IPP). There is no defined way ahead and thus the IPP remains a major concurrency risk -a similar system is fitted to the F-22 Raptor and major problems with its IPP have recently grounded all aircraft.

b) The daunting issue of computer code -no end in sight to these problems.

c) Helmet mounted display -an alternative system may now be required.

28. Was the Secretary of State adequately briefed on all these problems and risks and how they might affect the F-35B STOVL availability?

Financial Truth and Common Sense.

29. The Secretary of State's words:

‘Secondly, and partly as a result of the delayed timetable, the estimated cost of fitting this equipment to the Prince of Wales has more than doubled in the last 17 months, rising from an estimated £950M to around £2Bn, with no guarantee that it will not rise further.’

30. Following the intervention of U.S. Navy carrier expertise and more detailed work by the Carrier Project Office, it is understood that the £2 billion cost given to the Secretary of State has now been refined down to approximately £1.5 billion. Against this figure one must balance the cost of reverting the design of the flight deck to ‘ramp-fitted’, which is understood to cost approximately £450 million (included estimated SRVL-associated aircraft guidance costs). The resultant saving that can be credited to a reversion to a ramp fitted deck is therefore likely to be of the order of £1 billion.

31. Although such a figure is not to be sneezed at (particularly in the light of the Secretary of State's desire to eradicate the 'black hole' in defence spending), it is of concern that the Secretary of State did not take into account the much larger through life savings that would be

realised through procurement of the F-35C rather than the F-35B. These amount to approximately £5 billion as referred to in Appendix 1 to Annex A to this paper.

32. The suggestion of a short term cost saving of £1 billion now at a price to the future defence budget of £5 billion would appear to lack responsibility and accountability and sets the stage for further haemorrhaging of that budget.

RISK FACTOR 6 -THE INCREASING COST OF THE F-35.

33. There have been many alarming statements from the United States Department of Defense concerning the spiralling costs of the F-35 program. These have not been lost on other prospective customers, including the Canadian government. The press release at Annex B discloses the concerns of the latter, highlighting some of the serious problems with the project (including major problems with 'stealth') and associated costs.

34. The price paid this year by the U.S. Air Force for 18 F-35A aircraft is given as US\$197 million per aircraft. This is a far cry from the figures being supplied to the Secretary of State concerning estimated unit costs (US\$111 million for the F-35B).

35. Concurrent development and production costs continue to rise and raise the questions:

a) Can Britain afford to procure this F-35 aircraft?

b) Can Britain afford the extra cost associated with the F-35B 'STOSRVL'?

36. Based on the figures given in the Canadian press release, the procurement and through life cost differential between the F-35B and the F-18 Super Hornet (for a fleet of 60 aircraft) is now approaching £17 billion and rising (Appendix 1 to Annex A to this paper). This places the £1 billion cost of reversion to an angled deck into full perspective.

Discussion.

37. In spite of the up-to-date facts provided above, the MoD continues to respond to letters to the public with the same spin that was fed to the Secretary of State. The letter at Annex C is an appropriate example of such spin.

Political Flip-Flopping?

38. The essence of this issue (the changes in course forced upon the Carrier Project and its associated air group) should not be the blaming of one political Party by the other in the

House of Commons. Rather, this issue should be investigated in full detail by the Public Accounts Committee, the National Audit Office and the House of Commons Defence Select Committee.

39. The Labour Party decision to opt for the F-35B in 2002 was taken on the direct advice of MoD and the associated Defence Committee. At that time, the decision was firmly opposed by the Naval Staff but they were overruled by a majority vote in the Defence Committee. This is not something that the Labour Party can be blamed for.

40. The SDSR 2010 decision to opt for the F-35C and the angled deck was 'the correct decision at the time' (as stated by our Secretary of State). It too was taken on the direct advice of MoD and is therefore a decision for which the Coalition Government should not be blamed. From all logical operational and fiscal points of view, this remains the correct decision.

41. If operational and financial logic are to have any weight, it must be accepted that the Defence Committee decision in 2002 was flawed and the SDSR 2010 decision corrected this. That the Secretary of State should now have been persuaded through:

- a) Misleading facts and
- b) A lack of proper briefing on the implications of reversing the SDSR 2010 decision, must be considered a serious indictment of the quality of advice that he has received from MoD and elsewhere.

42. In his statement to the Commons he remarked:

'The Chief of the Defence Staff and his fellow Chiefs of Staff – all of them – endorse this decision as the quickest and most assured way now to deliver carrier strike as part of an overall affordable equipment programme that will support Future Force 2020.'

43. It is extremely difficult to believe that the First Sea Lord would have changed position away from the firm views expressed by the Naval Staff in 2002 and 2010. It is understood that they, the Royal Navy, have been consistent in their preference for F-35C and angled flight decks because they have the expertise to understand the severe operational implications of reverting to the STOVL aircraft.

44. This issue is therefore not a result of Political Flip-Flopping but is clearly brought about by Ministerial Advisers (whether MoD or otherwise) who have not provided Ministers with up-to-date facts and implications concerning the decision taken.

Conclusions.

45. Fortunately, it is not too late for a further change in the way ahead and this must be addressed following a detailed investigation into:

- a) The financial and operational facts and figures that led to the F-35B STOVL reversion decision and
- b) The full implications of the same.

46. Should this investigation indicate that misleading advice was indeed presented to the Secretary of State, those responsible should be held accountable.

47. Should such a correction to the way ahead not be forthcoming, then indeed Ministers may be held responsible and accountable for:

- a) The inevitable emasculation of Britain's future Carrier Strike capability and for
- b) The haemorrhaging of the defence budget which will take place as a result of their recent decision.

Annex A. Carrier Costs: Reversion to STOVL Is Neither Simple nor Cheap.

Executive Summary.

- i. The short-term cost differential between remaining with the angled deck decision (SDSR 2010) and opting for ramp-fitted decks to support the STOVL variant of the aircraft is considerably less than originally anticipated (possibly less than £1.05 billion). This differential is likely to be eroded further when the true cost of ship-borne equipment and support for Ship Rolling Vertical Landings is established.
- ii. A reversion to STOVL will not result in a marked difference in the date at which an initial carrier operating capability is achieved.
- iii. The procurement and through life costs of the STOVL aircraft air group are significantly greater than those associated with the conventional CV variant (nearly £5 billion more). The operational capability of the STOVL ramp-fitted aircraft carrier is unlikely to be regarded as Carrier Strike and may equate to a zero capability in very high temperatures and/or bad weather East of Suez. The adoption of a ramp-fitted deck would remove the option for the future operation of other carrier borne conventional aircraft, whether manned or unmanned.
- vi. In warmer climes, the STOVL aircraft will not be able to land on smaller decks/platforms in emergency because of the constraints of its power/weight ratio and consequent planned Ship Rolling Vertical Landing (as opposed to Vertical Landing) characteristics. THIS ONE ITEM NEGATES THE ONLY ADVANTAGE THAT THE STOVL AIRCRAFT MIGHT HAVE HAD OVER THE CV VARIANT.

Introduction.

1. At this time of extreme financial constraint it is important that the Prime Minister and the Government should beware of 'stepping out of the frying pan into the fire' with regard to any decision on reversion to STOVL aircraft for our new carriers.

2. This is an extremely complex issue with far reaching implications if the wrong decision is taken.

Carrier Costs.

The Cost of Current Conversion to Angled Deck.

3. Declared costs of this conversion have been given at just under £2 billion. However, when this figure was first postulated, the United States equipment costs for EMALS and AAG were 'subjective/inflated UK estimates' and it is now understood that Britain has been given very firm and risk-free costs for this equipment that are far less than the early estimates. (The equipment would not now be fitted into the new US nuclear carrier *Gerald Ford* if they were not fully proven and risk-free.)

4. Just as the equipment cost estimates were somewhat inflated for contingency purposes, so were the integration costs that make up the balance of the £2 billion. It is understood that more realistic estimates of the overall costs of CV carrier conversion are probably in the region of £1.5 billion.

The Financial Cost of Reversion to Ramp-Fitted Decks (STOVL).

5. There is a tangible and not insignificant cost associated with reversion to ramp-fitted decks and if both ships are to be SRVL compatible the cost is likely to be of the order of £450 million for both ships and possibly more when the true cost of ship-borne equipment and support for Ship Rolling Vertical Landings is established.

Summary.

6. It is therefore logical to assume that a reversion now to STOVL and ramp-fitted decks would, in the short term, save the Treasury and the taxpayer something less than £1.05 billion for the ships alone. This figure does not include any development or fitting costs for the aircraft.

Timescales.

7. Current estimates for the in-service date of the *Prince of Wales* fitted with angled deck are towards the end of 2020. It is understood that this date could be brought forward to early 2020.

8. The *Queen Elizabeth* enjoys a much earlier in-service date at present but it is understood that reversion to a ramp-fitted deck would set this date back at least one year (and perhaps more if contingency work for STOVL/STOSRVL operability is taken into account).

9. Bearing in mind the two previous paragraphs, the initially declared capability for the carriers with their air groups could be no further apart than about one year -that is, with angled deck Carrier Strike option being just a little later than a STOVL ramp-fitted deck capability.

The Operational Cost of Reversion to Ramp-Fitted Decks (STOVL).

10. DSTL studies show that the STOVL variant of the F-35 will face severe engine performance-related operational limitations in the high temperatures to be expected East of Suez. Such limitations call into question the wisdom of opting for this way ahead.

11. Further, a ramp-fitted carrier with STOVL:

- a) Will have no deep strike capability -a comparatively limited aircraft radius of action (with no embarked air-to-air refuelling capability).
- b) Will only be able to launch aircraft with significantly lower payload in terms of weapons and fuel.
- c) Will have aircraft with much lower endurance on task -requiring the procurement of more aircraft (increased cost) to achieve the same level of capability.
- d) Is significantly more expensive in terms of air group procurement and maintenance costs/through life costs (approximately £5 billion more for a fleet of 60 aircraft).

12. One must add to these limitations two significant factors:

- a) The adoption of a ramp-fitted deck would remove the option for the operation of other carrier borne conventional aircraft, whether manned or unmanned.
- b) The requirement for the STOVL aircraft to carry out Ship Rolling Vertical Landings negates the flexibility associated with vertical landing on other smaller decks.

Summary.

13. The short-term cost differential between remaining with the angled deck decision (SDSR 2010) and opting for ramp-fitted decks to support the STOVL variant of the aircraft is considerably less than originally anticipated (possibly less than £1.05 billion). This differential is likely to be eroded further when the true cost of ship-borne equipment and support for Ship Rolling Vertical Landings is established.

14. A reversion to STOVL will not result in a marked difference in the date at which an initial carrier operating capability is achieved.

15. The through life costs of the STOVL aircraft are significantly greater than those associated with the conventional CV variant (approximately £5 billion more – see spread sheet at Appendix 1).

16. The operational capability of the STOVL ramp-fitted aircraft carrier is unlikely to be regarded as Carrier Strike and may equate to a zero capability in very high temperatures East of Suez.

17. The adoption of a ramp-fitted deck would remove the option for the future operation of other carrier borne conventional aircraft, whether manned or unmanned.

18. In warmer climes, the STOVL aircraft will not be able to land on smaller decks/platforms in emergency because of the constraints of its power/weight ratio and consequent planned Ship Rolling Vertical Landing (as opposed to Vertical Landing) characteristics. This one item negates the only advantage that the STOVL aircraft might have had over the CV variant.

Conclusion.

19. Reversion to a STOVL ramp-fitted carrier deck:

a) Would save the Exchequer less in the short term than originally anticipated.

b) Would cost the taxpayer far more in the longer term.

c) Would adversely affect the date at which the first carrier would be available for operations.

d) Would remove the option for the future operation of other carrier borne conventional aircraft, whether manned or unmanned.

e) Would markedly diminish the planned Carrier Strike capability and flexibility of the new carriers for the projection of British Foreign Policy.

Appendix 1. Air Group Costs (Costs in £ millions) .

The average UPC used for project costing (as agreed with CDM) is \$111M for CV and \$128M for STOVL. Cost of recent delivery of 18 F-35As to USAF is given as US\$197 million each. For demonstration purposes, this is the figure used below for the F-35C.

48 Super Hornets and 12
Mix of F-18 Super Hornet
£41
Super Growlers.

F35B STOVL
£350

F-35C
£280

Comment

Officially estimated to be 25% more than the F35C aircraft.

The current US appraisal for operations and support is \$1.1 trillion for 2457 aircraft.

This figure is expected to rise.

Total Cost differential between F35C and STOVL

F35B
F35C

Therefore F35C choice over STOVL saves Tax Payer

cost

£8,496

£7,388

Cost

£20,985.9 6

£16,788.7 7

£29,481.58

£24,176.27

£5,305.32

**Total Cost differential between F35C and F-18
Fleet of 60 Aircraft**

F35C
F-18

Therefore F-18 choice over F35C saves Tax Payer

Aircraft

Thru Life

cost

Cost

£16,788.7

£7,388

7 £10,073.2

£2,475

6

Total

£24,176.27

£12,548.26

£11,628.01

**Total Cost differential between F35B STOVL and F-18
Fleet of 60 Aircraft**

F35B
F-18

Therefore F-18 choice over F35B STOVL saves Tax Payer

Aircraft

**Thru Life
cost
Cost**

£8,495.6
£20,985.9
3
6
£10,073.2
£2,475
6

Total
£29,481.58
£12,548.26
£16,933.32

Annex B: A costly mistake — that keeps getting costlier [Canada].

“Even now, we have no real idea what the price of each F-35 will be”

Michael Byers and Stewart Webb

Debates about the costs of the F-35 stealth fighter overlook a crucial point: it is only a prototype that's still being tested and modified.

As the U.S. Government Accountability Office reported in March, the Pentagon is "incurring substantial additional costs to retrofit produced aircraft to correct deficiencies discovered in testing." Worse yet, "until manufacturing processes are in control and engineering design changes resulting from information gained during developmental testing are reduced, there is risk of more cost growth."

Design changes are needed with regard to the "fibre mat" that is cured into the composite surfaces of the aircraft, and which provides a large portion of its stealth.

According to *Aviation Week*, when a test version of the F-35 achieved the design speed of Mach 1.6 for the first time last December, the flight caused "peeling and bubbling" of the plane's stealth coating. The entire test fleet was subsequently limited to Mach 1.0.

Improvements also are required for the "helmet mounted display" that is supposed to give the pilot a 360-degree view, via cameras mounted on the plane. There are problems with the night-vision capability of the helmets, jittering in their displays, and potentially fatal delays in transmitting data to them.

According to the U.S. Government Accountability Office's report: "The selected helmet will not be integrated with the baseline aircraft until 2014 or later, increasing the risks of a major system redesign, retrofits of already built aircraft, or changes in concepts of operation."

A third area of concern is the "integrated power package" that is supposed to incorporate the engine starter, power generator and environmental control system into what the U.S. Department of Defense describes as a "high-reliability 2,200-flight-hour-subsystem." High-reliability is vital because breakdowns in the integrated power package can result in the loss of primary avionics, oxygen supply and cabin pressure. [A similar problem has recently grounded the entire

F-22 raptor fleet of 5th generation aircraft.]

A technological fix is desperately needed, but according to a Pentagon report issued in November 2011, "there is no defined way ahead and thus the IPP [integrated power package] remains a major concurrency risk."

Finally, there is the daunting issue of computer code. So far, the F-35 requires 24-million lines of code, 9.5-million of which are located in the aircraft. That's roughly three times more code than the F-35's sister aircraft, the F-22, and six times more than the F/A-18 Super Hornet (the latest version of the F-18s currently operated by Canada).

The process of writing and verifying all this code is far from complete. According to last November's Pentagon report, "while software growth appears to be moderating, contractor officials report that almost half of the on-board software

has yet to complete integration and test—typically the most challenging phase of software development." So while no longer a purely experimental "X-plane," the F-35 is far from fully operational and should never have been given the "F" designation of a completed fighter jet.

All these problems are rooted in a decision, taken more than a decade ago, to adopt a "test and repair" approach to

the development and production of the plane. This approach has resulted in **massive uncertainties**—including with respect to costs. And not surprisingly, as the uncertainties are resolved, the costs go up rather than down.

In 2001, the U.S. Government Accountability Office was estimating a per-plane cost of \$74.6million; by 2010, that had climbed to \$132.9million; by 2011, it was up to \$156million. This year, the U.S. Air Force paid \$197-million each for 18 planes that will undoubtedly have to undergo substantial modifications post-delivery.

How much will the final version of the F-35 actually cost?

How long is a piece of string?

National Post

Michael Byers holds the Canada Research Chair in Global Politics and International Law at the University of British Columbia. Stewart Webb is a Research Associate of the Salt Spring Forum. They are the authors of the article "Canada's F-35 Purchase is a Costly Mistake," published earlier this year in the peer-reviewed *Canadian Foreign Policy Journal*.

Annex C. Letter from Secretariat (Equipment Capability)

Maritime Level 2.K.11 dated 14 May 2012.

Lieutenant Commander M Barton Royal Navy Secretariat (Equipment Capability) Maritime Level 2.K.11 MINISTRY OF DEFENCE Main Building, Whitehall, London SW1A2HB

Our Ref: Sec(EC) 02-20 Mr R Shuttleworth 45 Warriner Gardens
London SW11 4EA

14 May 2012

Dear Mr Shuttleworth,

Thank you for your further email to the Secretary of State of 12 April regarding the choice of aircraft for the Queen Elizabeth Class aircraft carriers. I have been asked to respond.

As you will have seen, the Defence Secretary has now announced the Government's decision and I thought it would be helpful to outline the reasoning behind their decision. It is important to remember the financial context in which these decisions were taken and the hard choices the Government has had to make in order to focus resources where they are most needed. During the Strategic Defence and Security Review (SDSR), the Government committed to ensuring Britain's future Carrier Strike capability based around the new Queen Elizabeth Class Carriers and the new Joint Strike Fighter (JSF). As part of that decision the Government decided to purchase the Carrier Variant (CV) of JSF and to operate it from a ship fitted with catapults and arrestor gear ('cats and traps'), instead of the Short Takeoff Vertical Landing (STOVL) version. The introduction of the new aircraft carriers, carrying the new Joint Strike Fighter Aircraft, was planned to take place around 2020. It was a difficult and finely balanced decision, but, based on the information available at the time, it was the right one. It was also subject to an 18 month study looking at the costs and technical feasibility of such a new approach, in order to enable the Carrier Variant of the Joint Strike Fighter to become part of the capability. That has been subject to further detailed work assessing the technical and financial risks involved in the new approach, and in particular fitting cats and traps.

As a result of that work, it has become clear that the facts have changed. As the programme has matured, with more detailed analysis carried out by suppliers, **it has become apparent that an operational Carrier Strike capability using 'cats and traps' would not be delivered until 2023 at the earliest, and will cost twice as much as originally estimated. We do not believe that either the**

delay, or this increase in costs, is acceptable. The cost growth would distort the equipment budget, crowding out other important investment in our Armed Forces, and it extends the time period when our Armed Forces will be without a carrier strike capability.

Therefore, we will procure the STOVL variant to fly off the Queen Elizabeth class carriers. This means we can start flying jets off the Queen Elizabeth in 2018, years earlier than would otherwise have been possible, and at an affordable price.

The 'STOVL' variant is now a much less risky option than it was at the time of the SDSR. Although its range is lower than the Carrier Variant JSF, it is nonetheless a 5th generation stealth aircraft, with a range significantly greater than that of Harrier, and it represents a step change in Britain's combat air capability. Air to air refuelling will enable the range to be extended in most circumstances, while a STOVL carrier can more easily operate jets and helicopters simultaneously, increasing our amphibious capabilities.

This will also allow us the option at the next SDSR to have the choice of carrier capability available continuously, as we will be able to bring into service the second carrier, the Prince of Wales, as an active capability, covering any extended periods where the Queen Elizabeth is in maintenance. Although the final decision on that will be made in the 2015 SDSR.

The Government believe that getting Carrier Strike right is critical to securing our defences for the future and that this decision paves the way to us achieving a sustainable and balanced Budget. .

I trust this helps clarify the situation.

Yours sincerely

MA Barton Lt Cdr RN