

DefenceSynergia

A Defence & Strategy Research Group

Exposing the incoherence and weakness in the United Kingdom's Defence & Security Strategies

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RISK TO UK DEFENCE INHERENT IN THE F35B LIGHTNING II PROCUREMENT

In the summer of 2012 DefenceSynergia provided selected MPs with a full report on the government's decision to opt for the Lockheed Martin F35B Lightning II short take-off and vertical landing (STOVL) variant. In that report we expressed serious doubts about the F35B's capabilities and warned of the potential for the project to be cancelled if major technical and financial difficulties were not addressed. The difficulties persist.

You told us at the time that our report, although credible, was a tad too late to be useful in the House since the government's decision had already been taken. What MPs seemed to want was advanced warning of potential issues in order to allow time to investigate and, if appropriate, ask questions and to take action.

To that end we offer you the attached new briefing on the risk to UK defence posture from procurement of the F35B. All the evidence provided is readily available to you and your researchers coming as it does from the public domain – by definition it is also available and should be known to MoD.

We have taken the liberty of advising the National Audit Office (NAO) of these emerging risks.

Yours Sincerely,

Squadron Leader Dave Tisdale RAF (Retd)

for DefenceSynergia

DEFENCESYNERGIA BRIEFING PACKAGE

THE EMERGING AND ESTABLISHED FACTS REGARDING THE LOCKHEED MARTIN F35B LIGHTNING II PROJECT

The Financial Facts. Control over the cost of the development and pricing of the F35B Lightning II (indeed the whole Lockheed Martin F35 programme) is not in the gift of Her Majesty's Government (HMG), it is a matter entirely tied to Lockheed Martin's development and production methodology and the Federal budget of The United States of America. HMG's position, despite being a tier 1 partner with over £1bn invested, is that of a customer that must decide whether to buy, how many and of what type.

The final price per aircraft and associated support costs will be largely dependent upon the total number produced. The latter, originally in the region of 2500 airframes, is now falling as national customers, notably Canada and Australia, even the USA itself, reconsider their positions. Indeed, the UK buy has been reduced from circa 138 to 48, presumably because of rising cost and, given their perilous national financial position, Italy and the Netherlands must be a candidates for a buy reduction or outright cancellation. [See Compendium entitled F35 Partner Costs enclosed] As the numbers produced reduce so, inevitably, the cost per airframe will continue to rise and the fixed UK defence budget allocation will afford fewer and fewer fast jet aircraft.

On the matter of F35 costings the following table produced by Defence-Aerospace dated 19 Dec 2012 [full Defence-Aerospace article attached for reference] is offered for information. [We also enclose a very relevant Time Magazine (USA Edition) on the subject].

Variant	Defense-Aerospace.com estimate		Official F-35 Joint Program Office figures		
	LRIP5 no engine	LRIP5 + engine	LRIP5	Current URF	Average URF
	<i>inc all contracts</i>	<i>inc all contracts</i>	<i>w/o engine</i>	<i>With engine</i>	<i>with engine</i>
F-35A	n.a.	n.a.	\$105m	\$127m	\$78.7m
F-35B	n.a.	n.a.	\$125m	\$164m	106.4m
F-35C	n.a.	n.a.	\$113m	\$148m	\$87m
Average	\$183.6m	\$223.03m	\$114.3m	\$146.3 m	\$90.7m

Sources: DoD for data, defense-aerospace for presentation; F-35 JPO

Notes: URF = Unit Recurring Fly-away (includes engine); LRIP5 does not

(1) based only on original LRIP5 production contract awarded on 9/12/11

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The pertinent point to consider here is the difference in the F35 US Joint Programme Office (JPO) costings from those calculated by Defence-Aerospace who used the full Low Rate Initial Production (LRIP) figures for the batch 5 contract awarded in November 2011. This is the cost that US and UK tax payers actually pay when averaged across the 3 aircraft types - **\$183.6m without an engine and \$223.03m with an engine**. However, the F35B and C variants are acknowledged to be the most expensive – the USAF calculating that each F35A purchased thus far has cost nearer to \$100m than the **circa \$90.7m average Unit Recurring Fly-Away (URF) including engine** mentioned in bold in the table above.

The Financial Risk. These cost data are alarming, no doubt influencing MoD's decision to reduce their buy of F35B from 138 down to only 48. Although this figure is being touted by HMG as 'initial', the inference being that more F35B will follow, how realistic is this aspiration if the defence budget remains fixed at its current level and the cost of the aircraft continues to climb?

With the above in mind and taking into account that the combined carrier/F35B STOVL buy decision is absorbing such a large percentage of the defence procurement vote you might consider that this one procurement programme is putting the whole MoD budget at risk. In which case you may wish to ask MoD a few questions. For example:

1. **As HMG is determined that MoD should live within its current budget (possibly even want to reduce it) what effect is the F35B purchase having on overall UK defence posture?**
2. **Are MoD wedded to the F35B at any price, if so, what is the rationale?**
3. **What is the minimum number of F35B that MoD will accept before deciding that the force is not viable?**
4. **If the F35B programme is cancelled by the US what is MoD's fall back position?**
5. **What competitive tendering process did MoD undertake to arrive at their decision to buy F35B?**

In respect of the 'Plan B' question you might like to consult with Mr Tim Banfield of the NAO, who, in a 2006 RUSI paper on MoD acquisition 'A Conspiracy of Optimism' wrote this:

"...The aspiration, whether conscious or subconscious, to keep up with US standards of equipment needs to be tempered with reality. We cannot afford the most capable equipment in sufficient numbers across the board and, indeed, we have already abdicated from some capability areas where we now expect the US to supply. We need to identify and declare in DPAs those areas where: We do not need the most capable equipment and Greater numbers are essential.."

DefenceSynergia has consistently pressed the case that an F18/cat & trap based carrier system for the Royal Navy and F35A buy for the Royal Air Force would be cost neutral, far less risky, offer more potential capacity and meet DPA requirements in respect of UK air-power capability. It is, therefore, a mystery to us that the MoD seems unwilling to grasp this basic financial point: the F35B costs 3 times more than any comparable fast jet, thereby forcing MoD to reduce the buy from 138 to 48 notwithstanding a report from their own Defence Scientific and Technical Laboratory (DSTL) that concluded that more F35B than F35C would be required to meet the operational requirement, not less.

Is it not time for MoD to consider a formal tendering process in respect of the totality of the combined carrier/aircraft system procurement? Is it not time for MoD to re-evaluate?

Some final thoughts. DefenceSynergia has evidence, in addition to the financial risks discussed above, of worrying emerging technical risks to the F35 programme as a whole. The cost and availability of the essential Autonomic Logistic Information System (ALIS) is unclear. The sustained 'g' rating for the F35 has been downgraded from 5.5g to 4.5g for the F35B and without weight gain from certain fuel-draulic safety systems the F35 is 25% more vulnerable in combat. Flight International have said this:

Jan 13/13: Testing. The Pentagon's Department of Operational Test & Evaluation submits its 2012 report, which includes 18 pages covering the F-35. The fleet continues to work through significant technical challenges, which isn't unusual. What is unusual is the steady stream of deliveries that will have to be fixed later, in order to address mechanical and structural problems found during testing. From an air-to-air point of view, 2 issues deserve special mention.

One issue is weight. The F-35 was designed with little margin for weight growth, but new capabilities and fixes for testing issues often add weight. Weight growth above designated limits directly affects aerial performance, and at some point, weight dilemmas can become a lose/lose proposition. One frequent consequence is higher

costs, for example, as very expensive but lightweight materials are used to save an extra pound here and there. Another consequence is reduced performance, as seen in the F-35B's drop to 7.0 maximum Gs after its aggressive weight reduction effort. A third consequence involves ruggedness and survivability, as seen by the fleet-wide problem created by saving just 11 pounds in all variants. Without fuelstatic flow fuses and Polyalphaolefin (PAO) coolant shutoff valves, DOT&E estimates that these flammable substances make the F-35 25% less likely to survive enemy fire.

The second issue that deserves especial mention is that key aerial combat standards have been lowered, following initial tests. All F-35s will sit at 5.0g or less sustained turn performance – a figure that places them in a class with 1960s era planes like the F-5 or F-4 Phantom, instead of modern designs like the F-16. Acceleration is also poorer, compared to a reference F-16C Block 50 with AMRAAM missiles on its wing-tips zooming from Mach 0.8 to Mach 1.2.

The USAF's F-35A dropped the most, from an expected 5.3g – 4.6g in sustained turns. Acceleration will take 8 seconds longer than the F-16. **The STOVL F-35B** dropped from 5.0g to just 4.5g, and its engine is weaker in straight flight performance, in exchange for increased thrust during vertical landings. Its acceleration takes 16 seconds longer than the F-16. The Navy's large-winged F-35C did best in turning, with a slight drop from 5.1g – 5.0g, but transonic acceleration was abysmal at 43 seconds longer.

Some Further Issues. However, the risks do not end here. As currently envisaged the UK carrier system will consist of a STOVL configured QE Class carrier, between 8-12 routinely embarked F35B with a mixed complement of AEW, logistic and troop carrying helicopters escorted by RN FF/DD and RFA tankers and replenishment vessels.

To save money the QE Class carrier has no armour. Its only long range defence is vested in less than 12 embarked range, endurance and performance limited F35B and in height and range limited helicopter AEW cover. There is no carrier based force multiplying air to air refuelling capability: only RAF land based A330-200 Voyagers can reach the carrier from shore assuming Access, Basing and Overflight restrictions have been addressed. The shortage of FF/DD escorts, RFA support vessels, the lack of ASW units and a total dearth of LRMPA all affect operational performance and survivability. Therefore, the cancellation of Cooperative Engagement Capability (CEC) must be viewed as a major risk factor.

Finally, there are growing concerns over the Weight, Altitude and Temperature (WAT) and engine thrust limitations of the F35B which may further affect its performance East of Suez (hot and humid). As a consequence, Lockheed Martin have already announced that the F35B will normally be restricted to Short Take-off and **Rolling Landings** to avoid returning aircraft having to jettison fuel and/or stores (weapons) to remain within safe thrust to weight operating parameters.

NB. DefenceSynergia stands ready to provide more detailed data on technical risk if requested.