

Danny Nowlan

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BSc, BEng (Aero), MEng (Aero) (USyd)

Foreign Affairs, Defence and Trade Committee
Joint Strike Fighter Inquiry
Department of the Senate
PO Box 6100
Parliament House
Canberra ACT 2600

RE:THE PLANNED ACQUISITION OF THE F-35 JOINT STRIKE FIGHTER

Dear Chairman and Committee Members,

Allow me to introduce myself. My name is Danny Nowlan and I am an Aeronautical Engineer. I'm an honours and master's graduate in Aerospace Engineering from the University of Sydney. I have designed flight control systems for advanced fighter prototypes and my speciality is vehicle performance analysis. I have applied this knowledge in the motorsport industry but I still maintain close contact with friends and colleagues who are/where RAAF officers. My agenda is simple. To make sure we get an aircraft that can do the job.

The primary combat role of the RAAF is to maintain the air sea gap in our arc of interests and ensure we can project power if necessary. In order for this to be effective this needs to be done by establishing air dominance and eliminating ground and maritime threats. This need was identified clearly in the 2000 Defence white paper. The F-35 can not fulfil this requirement because it will not survive on the 21st century battlefield.

Yet the encouraging news is there are viable alternatives and Australian industry stands to benefit from them. Again we'll discuss this in detail shortly.

You will hear the reason we need the F-35 is because of it's stealth and data fusion. The advocates of the F-35 will repeat this like a mantra. The reality is somewhat different.

One of the worst kept secrets about the F-35 is that it can be seen by L-Band, VHF AESA and HF Skywave radar. This has been reported on sources such as the Air Power Australia website (which has been referenced in numerous US military dissertations) and was all but confirmed when Boeing released a briefing to the US Navy League in April of 2014. Also Boeing is not alone in identifying this. In an article for the Royal United Services Institute that was published on September 9 2014, [Dr Igor Sutyagin](#) who has a Masters in physics and was an officer in the PVO (Russian Air Defence Forces) stated how susceptible the F-35 is to L-Band radar detection.

What is even more critical is that the F-35 is not all aspect stealth. It is only optimised in the forward aspect in the X and Ku Bands. This is a critical oversight because you have no guarantees of where the radar will be in war time. In total contrast the F-22 and B2 were designed with all aspect stealth (the ability to be low observable regardless of the radar location) from the beginning which makes them much more effective because they are much harder to detect. Again this has been known in defence circles for years. Also this is something that can't be fixed. It is a consequence of the shaping of the F-35 and cannot be changed.

What all this means in plain English is that any stealth advantage the F-35 enjoys is temporary at best and is already compromised. A very stark example of this is that Russia has ordered 100 55Zh6ME Nebo M radars. This is a mobile radar that combines VHF, L-band and S-band components with data fusion for counter-stealth. It is also highly likely this radar system will be available for export.

The other mantra we hear from the RAAF and defence about what makes the F-35 special is data fusion. Data fusion is a term for incorporating all the sensors in an aircraft and assets such as satellites, AWACS and other fighter aircraft so the pilot has a clear and concise picture of the combat space. This is often termed as situational awareness. As the experience of the first gulf war showed it is an essential feature of modern fighter aircraft.

However in order to have an advantage you need to be unique and the F-35's contemporaries match and exceed this capability. The base software that will give the F-35 its data fusion is supposed to be ready by 2018. However these features are already available in aircraft such as the SAAB Gripen and the Dassault Rafale. Also Surface to Air Missile Systems (SAM) like the Russian S-400 and S-300VM/V4 can shoot down the big ISR platforms (such as AWACS aircraft) that are to supply the "situational awareness data" essential for the F-35's data fusion features to work. These SAMs can target aircraft from a range of 400km and the former has been deployed to Syria.

Also with regards to airborne early warning radars we no longer have exclusive dominance of the data fusion space. The forthcoming Russian A-100 AWACS radar will have the UHF band designed into it so it can detect aircraft like the F-35. It is also in testing right now mounted to the the Ilyushin / Beriev A-50 transport aircraft. It is also being tested in conjunction with aircraft such as the Sukhoi Su-35S and PAK-FA T-50. What this means in plain terms that any dominance the F-35 would supposedly enjoy in situational awareness and data fusion will be non existent by the time it enters service.

With these two supposed unique edges compromised the poor airframe performance of the F-35 can be readily exploited. This lack of performance was highlighted in a mock dogfight in January of 2015 when a twin seat F-16 mounted with external tanks easily defeated an F-35 in Basic fighter manoeuvres (dog fighting). The test pilot noted that the F-35 was at a distinct energy disadvantage. This is something that can not be fixed by software patches and is indicative of the sub standard aero propulsive performance of the F-35. The Sukhoi Su-35S Flanker will be equipped with L-Band radar and infra red detectors that can detect an F-35 at viable AMRAAM range. Also the Su-35S will have the ability to be data linked with ground and air based counter stealth radars that can detect an F-35. Given these factors a Su-35S could easily defeat an F-35 in air to air combat. What is also disturbing for Australia is the Su-35S is being acquired by both the Chinese and Indonesian air forces.

What makes this situation even worse is that modern 5th generation competitors to the F-35 will proliferate in the Pacific Rim. The Russian built Sukhoi T-50 PAK-FA is now in Initial Operation and Test Evaluation and the Chinese Chengdu J-20 will be coming on line in the latter years of this decade. They feature data fusion, stealth, they carry more weapons, and they can supercruise and are super manoeuvrable. An example in point is the Sukhoi Su-35S and the T-50 PAK-FA which will feature the TKS-2M Intra-Flight Data Link (IFDL) that has been used in Syria on the Su-30SM and Su-34. This data link feature is now no longer theory. This has been used in combat. The Sukhoi T-50 PAK-FA and Chengdu J-20 will also proliferate in greater numbers than the F-35 because they are more affordable. Little wonder the former head of US Air combat command, General Mike Hostage had this to say in an interview on Feb 3 2014,

"If I do not keep that F-22 fleet viable, the F-35 fleet frankly will be irrelevant. The F-35 is not built as an air superiority platform. It needs the F-22."

You will often hear defence and the RAAF counter this argument on the basis of the simulation work they have done. However this has been built on a foundation of quick sand. This program is referred to as the Verification Simulation (VSim) and to illustrate this point I have attached a power point slide from Lockheed Martin outlining the features of the VSim in Appendix A. This was published in February 2011. Yet the U.S Department of Defence DOT & E report of 2013 on the F-35 has found the VSim program used to validate the F-35 now has a significant chance of failing. To quote the report directly,

"The program (Verification Simulation) is now at significant risk of failing to mature the VSim and adequately verify and validate that it will faithfully represent the performance of the F-35 in the mission scenarios for which the simulation is to be used in operational testing"

This calls into direct question the testimony given by both senior Defence and RAAF officers over the years because the basis on which the F-35 has been selected is now no longer valid.

There is also a myth propagated by the F-35 advocates that the F-35 will be fine once it is fixed. The F-35 is a design that is fundamentally broken and cannot be fixed with software patches or hardware tweaks. We have discussed in detail the limitations of the stealth and the poor aero propulsive performance of the F-35. Another sign has been the Pentagon DOT & E reports into the progress of the F-35. These have identified a raft of problems with the program such as poor reliability, engine problems, structural and software deficiencies that have been ongoing for years. A good case in point is the buffet experienced in the F-35. This is critical for the F-35 given it's helmet mounted combat system. In the case of the F-18 this needed to be solved with wing fences and this is not an option for low observable aircraft.

The ultimate showcase of this was the United States Marine Corp (USMC) declaring initial operating capability for the F-35B. When you declare initial operating capability the aircraft should have the ability to do some form of combat. This is what the USMC got when it declared IOC for the F-35B

- It had no gun and it didn't have the ability to drop bombs.
- The aircraft where mission capable for 55% of the time.
- To keep the aircraft available required extensive contractor support.

This was highlighted in a report released by the Pentagon's weapon tester Dr Michael Gilmore in July of 2015. Bottom line despite the spin the F-35B was not ready for war. This raises significant questions about the standards being applied in this program.

Another significant point to consider is the actual aircraft unit price (AUP) for Australia's new air combat capability aircraft. The RAAF have slated the F-35A JSF to form the primary component of this. There are many costs that go into acquiring an air combat aircraft and to use only one of those subordinate costs to represent the total price is misleading to say the least. There is only one price and this is what must be budgeted then appropriated from Treasury at the time you buy for what you need. What Australia needs is an appropriate number of suitably capable, effective and survivable air combat aircraft fully operational on Australian flight lines.

The aircraft unit price (AUP) is the aggregate of those appropriations from Treasury divided by that appropriate number of aircraft. The AIR 6000 New Air Combat Capability Project established to replace the F/A-18s and F-111s determined 100 aircraft were required and the budget was set at \$14Bn. This has been quoted by senior defence officials since 2003. A case in point was the

testimony of then chief of the air force Air Marshall Geoff Brown on June 2 2014 at a Senate estimates hearing,

"One of the things that I would like to point out is that we put an amount of money aside in the budget in 2003. That was 11 years ago. We have managed to stay within those same confines for the budget right through to 2014 for the JSF."

If true, then the average aircraft unit price should be around \$140 Million per aircraft.

However adding up the costs so far appropriated to the requirement of AIR 6000, along with the funds we are told need to be committed through to 2024 a figure of over \$36Bn emerges. This is when the aircraft are supposed to be fully operational on Australian flight lines. That would equate to an average aircraft unit price of over \$360 Million. Yet there is no guarantee that's the final price since independent subject matter experts have been advising for years, "the F-35 JSF has a '*never ending price*' baked into its design". The same independent subject matter experts estimated, back in 2006/08, that Defence Plans for AIR 6000 would likely end up costing around \$36Bn and result in Australia losing regional air superiority. The link can be found here -

<http://www.ausairpower.net/jsf.html>

The alternative to the F-35 is to restart F-22 Raptor production and for the US Congress to release it for export. When it comes to modern fighters the F-22 Raptor is the platinum standard. It has performance that makes it 4th generation counterparts look pedestrian and it has all aspect stealth. Also the cost is not as outrageous as you would think. In 2006, Maj Gen Richard Lewis, the Air Force executive officer for the F-22 program stated, "If I am allowed to buy another 100 aircraft...the average fly-away cost would be \$116 million per airplane." To put this in perspective the RAAF will be paying an average of \$206 million just to acquire the F-35. As discussed previously this doesn't include the other costs to get it operational.

The reality is that if the western world wants to maintain air dominance the U.S and its allies have no choice but to re start production of the F-22. The Sukhoi T-50 PAK-FA and the Chinese Chengdu J-20 and surface to air missile systems such as SA-20 and above have been designed to engage the F-22 and B2 Spirit bomber. In this environment the F-35 has neither the performance nor the stealth to survive these threats. Also despite its technical failures there have been a lot of lessons learned on the F-35 program. These are lessons that could be readily incorporated into the F-22 and there is an international support program to sustain the F-22 courtesy of the F-35 program. This makes this not just necessary but it could be readily implemented with minimum political and economic cost.

Also if this option was to be taken there would be little to no effect on Australian partners involved in the F35 program. They are well setup to produce parts of the F-35 and all that would be involved is shifting focus to an airframe that is actually viable. Also the US Congress funded the preservation of the tooling used to produce the F-22 so there should be no excuse why this cannot be facilitated. Also it should be added that in 2002 Lockheed Martin claimed there would be \$10 billion dollars in industrial opportunities for Australian companies. Currently that has only translated into \$400 million and given the myriad of problems with the F-35 there is no guarantee that this will translate as advertised. In terms of the technical risk the F-22 is a much safer bet since it is in service.

Furthermore this is a solution that could be implemented quickly and redress the costly delays induced by the F-35 program. When Australia committed to the System Design and Development phase of the F-35 program in 2002 deliveries were claimed to start by 2010. We are now in 2015 and presuming things go to plan we will see the first F-35's in Williamstown by 2018 at the earliest. However the testing hasn't finished testing yet so we have no idea of the final costs or timeline. The

Pentagon's DOT&E reports of the F-35 do not bode well. In total contrast the F-22 is a proven platform that has been used in combat.

In conclusion now is the time to shift Australia's focus on the JSF program. The F-35 has neither the performance or stealth to survive on the 21st century battlefield and it cannot be fixed. Furthermore we have no clear indication of the final price to ensure the F-35 is operational. However despite the official protestations not only are there other options they are very viable. In particular shifting the focus of the JSF program to restarting production of the F-22 offers the best of both worlds. The F-22 will ensure the RAAF can maintain air superiority and it will keep the Australian aerospace industry involved in cutting edge aerospace technology. With the emerging 5th generation air to air and air to ground threats the bottom line is we don't have a choice. I commend this submission to the committee.

Yours sincerely

Danny Nowlan
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Appendix A: Lockheed Martin VSim brief February 2011



F-35 Program Information
Non Export Controlled Information – Releasable to Foreign Persons



VSIM F-35 Own-ship Simulation

All Models Verified and Validated

**Handling Qualities Level Models
For Airframe, Flight Control
Systems and Propulsion
System**

**Comm/Nav and
Datalink Models**

**Vendor-Supplied
High Fidelity
Sensor Models**

**High Fidelity
Weapons Models**

**Stores and
Expendable
Models**

**Mission Systems Integrated Core
Processor (ICP) Re-hosted OFPs**

**Simulator
HMDS**

**Simulated
Malfunctions**

**Realistic Signature Models
(All Three Variants)**

**Mission Systems Panoramic Cockpit
Display (PCD) and PVI via Computer
Re-hosted OFPs**



https://www.ndia.org/Divisions/Divisions/SystemsEngineering/Documents/Committees/M_S%20Committee/2011/February/NDIA-SE-MS_2011-02-15_Evans.pdf