

Inquiry into the planned acquisition of the F-35 Lightning II (Joint Strike Fighter)

Submission on

Terms of Reference (ToR) Item a.

“The future air defence needs that the F-35 aircraft is intended to fulfil”

Contemporary Air Defence Challenges Versus the F-35A JSF

"Air combat capability is the cornerstone of our national security and the cornerstone of our air defence capability. This aircraft is peerless; it has no identifiable rival in the air at the moment. We see it dominating the skies for the next at least 10-15 years; we will have this aircraft out to 2050."

"Air superiority is a fundamental pillar of air power, but more so it is an essential prerequisite for the Australian way of modern joint warfare. Without it, our nation's ground and naval forces would be required to fight in very radically different ways. But gaining and maintaining air superiority is not easy. It requires trained very proficient and ready air crew. It also requires large numbers of very capable and technically superior aircraft."

Highlighted Extracts from Joint Press Conference of former PM, MinDef, & CAF , 23 April 2014

Air Power Australia Submission to the Senate Standing Committees on Foreign Affairs Defence and Trade

Structure of Submission: 4 Pages (incl Title Page + Endnotes) plus 11 Pages of Annexes

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The 2013 Defence White Paper states in 8.79 “As a key part of Australia’s defence strategy, the Royal Australian Air Force must be able to control Australia’s air approaches and enable and support friendly operations in the land, sea and air environments.” This reflects the reality, true now for almost a century. Keeping hostile aircraft out of friendly airspace is the primary purpose of an air force in line with the primary mission of any Defence Force; namely, to maintain and sustain peace. Nations that fail to heed this critical idea will invariably suffer prohibitive losses across all arms in combat, will lose wars and lose their national sovereignty.

Control of the air, of which air defence capabilities are the most critical component, will remain the primary purpose of an air force. Whether the RAAF is tasked with operating over the Australian continental landmass, the air-sea-land gap and maritime approaches, a regional theatre of operations, or a distant theatre of operations, the ability to deter and, if necessary, defeat a hostile air force will remain the RAAF’s primary purpose. No amount of wishful thinking or ideological gymnastics by the Defence leadership can change this immutable reality¹.

For decades air defence capability has comprised three key components – combat capabilities encompassing fighter aircraft and surface based air defence weapons, primarily Surface to Air Missiles (SAM); supporting Intelligence Surveillance and Reconnaissance and Resourcing (ISR&R) capabilities, such as Airborne Early Warning and Control (AEW&C) and Aerial Refuelling; and, surface based sensors such as radars.

The RAAF has robust but limited air defence ISR capabilities in the E-7A Wedgetail AEW&C aircraft and the JORN (Jindalee) OTH-B radar capabilities².

The opposite is true of Australia’s combat capabilities for air defence, reflecting one and a half decades of wilful blindness on the part of senior defence officials, who have consistently placed other priorities ahead of what should be the RAAF’s primary capability. This inversion of priorities in Defence has happened despite a sustained post Cold War arms race in air power across Asia; despite immense technological and often numerical advances in the capabilities operated by neighbouring nations, and rogue states globally; and despite the proliferation across Asia of new capabilities such as high speed cruise missiles. This kind of aberrant planning was last seen during the late 1930s / early 1940s which resulted, *inter alia*, in Japanese bombers attacking Northern Australia, costing the lives of Australian civilians and military personnel³.

Central to this planning debacle has been the misguided insistence by senior officials that the F-35, a single seat bomber designed to hunt opposing battlefield ground forces, can compete against high performance air superiority aircraft specifically developed to kill other high performance air superiority aircraft. Despite an immense amount of publically available evidence, and despite a decade of expert collaborative contestability of this foolish idea, senior defence officials have continued to embrace this delusion. That the F-35 has also fallen short of its originally mediocre specifications, and has been a case study of “*acquisition malpractice*” as well as poor design and parlous program management practices has simply produced excuses and obfuscation from the senior defence officials.

At no time in history has a specialised bomber aircraft been able to defeat specialised fighter aircraft, and every known example of this delusion has resulted in heavy combat losses and often lost air battles⁴.

The reality for air defence capabilities now and in coming decades is sobering. Advances in both Russian and Chinese aircraft, air-air missiles, cruise missiles, and smart bombs now challenge the primacy of Western air power, believed unbeatable since the Cold War.

The Russians and Chinese have closed the gap with the West in most key areas of technology required to design/build modern equipment for air combat, and air defence⁵.

Asia is awash with variants of the highly capable Russian FLANKER series fighters, with more to come. Russia's Su-50 PAK-FA supercruising and extremely agile stealth fighter, developed to fight the most capable air superiority fighter in the West, the US F-22A Raptor, is entering production, will be exported to India, and most likely China. China is producing the J-20; like the Russian Su-50, a supercruising, extremely agile stealth fighter, and is developing the carrier suitable J-31 agile stealth fighter. Russia and China have developed a range of cruise missiles more expansive than US designs. Most advanced Russian weapons are now sold globally, and Russia's political break from the West will see anything exported to clients with the cash to pay for it. China is entering the global export market for such products, and is competing increasingly with Russian exports, while manufacturing evolved Russian designs such as the J-11B/J-15/J-16 FLANKER⁶.

The capabilities the RAAF will have to deter or defeat in the future, operating over the Australian continental landmass, the air-sea-land gap and maritime approaches, any regional theatre of operations, or a distant theatre of operations, will be "*peer competitor*" capabilities, developed and built by Russia or China or both, and exported globally.

The RAAF's future fighter aircraft will have to provide highly competitive capabilities to:

1. Defeat supercruising fighter aircraft in Beyond Visual Range (BVR) combat, which the F-35 cannot do as it lacks and never will have supersonic cruise capability;
2. Defeat stealthy fighter and bomber aircraft in BVR combat, which the F-35 cannot do as its sensor suite is inadequate, its radar too small, and it cannot carry a sufficient number of missiles internally;
3. Defeat extremely agile aircraft in BVR and Within Visual Range (WVR) combat, which F-35 cannot do as it lacks the performance and agility, due to poor design;
4. Defeat fast and high flying bombers in Beyond Visual Range combat, which the F-35 cannot do as it lacks the required performance and combat persistence, due to its basic design;
5. Defeat low flying subsonic and supersonic cruise missiles, which the F-35 cannot do as it lacks the required performance and persistence, due to its basic design, and cannot carry a large number of missiles;

Hundreds of pages could be filled with a detailed technical forensic analysis of exactly why the F-35 fails in these five critical aspects of air defence capability – the totality of submissions by APA to parliamentary committees since 2004 did exactly that⁷. No upgrades or fixes or modifications to the F-35 can morph it into what it was not designed to be – an agile, supercruising air superiority and air defence fighter. Believing otherwise is to ignore physics, mathematics, and over a century of combat aircraft design experience.

That senior defence officials have chosen to do so, and chosen to wilfully ignore the immense advances in competing Russian and Chinese built capabilities, proliferating globally, must rank as the single biggest Defence planning failure in Australian history.

APA has provided independent, collaborative and competitively based contestability in keeping with the **One Australia Defence** ethos of its principals. The oversight level of governance function of the Australian Parliament is key to fixing what ails and is broken in Defence, today. Thus, we stand ready to bear witness to this and all testimony of APA.

Endnotes

¹ Refer Kopp C. et al, National Military Strategy and the Defence 2008 White Paper, *Air Power Australia Analyses*, vol V, issue 7, Air Power Australia, Australia, pp. 1-30, URI: <http://www.ousairpower.net/APA-2008-07.html> and

Kopp C., Basing Infrastructure Considerations in the Defence of Australia's Indian Ocean Approaches, *Air Power Australia Analyses*, vol IX, issue 1, Air Power Australia, Australia, pp. 1-60, URI: <http://www.ousairpower.net/APA-2012-01.html>

² Refer Kopp C., Wedgetail: Australia's eagle-eyed sentinel, *Strategic Insights* 29, Australian Strategic Policy Institute, 26 September 2006.

³ The best illustration of this mindset is the famous quote by Air Chief Marshal Robert Brooke-Popham: "Let England have the super-Spitfires and the hyper-Hurricanes. Buffaloes are quite good enough for Malaya". The underperforming Buffaloes flown by 453 SQN RAAF, 488 and 243 SQNs RAF later suffered prohibitive combat losses against the superior Japanese A6M2 Zero fighters. Refer Smith C., *Singapore Burning: Heroism and Surrender in World War II*, Viking, 2005.

⁴ Possibly the best and most recent example was the Republic F-105 Thunderchief, used heavily during the Vietnam war. Of particular interest is that in many ways, the F-35 appears to have been modeled on the F-105, and shares most of its vices, with none of its virtues. Refer: Kopp C., Joint Strike Fighter = Thunderchief II? Back to the Future in Battlefield Interdiction, *Australian Aviation*, November 2004,

URI: <http://www.ousairpower.net/Analysis-JSF-Thud-2004.html>; also

Heffron, Jr, C.H., *Air-to-Air Encounters Over North Vietnam, 1 January - 30 June 1967*, Project CHECO Southeast Asia Report, PACIFIC AIR FORCES HICKAM AFB, 30 NOV 1967 and

Weaver, R.B., *Air-to-Air Encounters over North Vietnam, 1 July 1967-31 December 1968*, Project CHECO Southeast Asia Report, PACIFIC AIR FORCES HICKAM AFB, 30 AUG 1969 and

RAND Corp MR719, *The Next-Generation Attack Fighter – Affordability and Mission Needs*, 1997 - http://www.rand.org/pubs/monograph_reports/MR719.html

⁵ Refer Kopp C., Evolving technological strategy in advanced air defense systems, *Joint Force Quarterly*, vol 57, National Defense University Press, Washington DC USA, pp. 86-93; and Kopp C., East versus West: Divergent paths in air power, *Defence Today*, Vol.8.No.6, 2011.

⁶ Refer Pelosi M.J. and Kopp C., A Preliminary Assessment of Specular Radar Cross Section Performance in the Sukhoi T-50 Prototype, *Air Power Australia Analyses*, vol IX, issue 3, Air Power Australia, Australia, pp. 1-37;

Kopp C. and Goon, P. A., Assessing the Sukhoi PAK-FA, *Air Power Australia Analyses*, vol VII, issue 1, Air Power Australia, Australia, pp. 1-27;

Pelosi M.J. and Kopp C., A Preliminary Assessment of Specular Radar Cross Section Performance in the Chengdu J-20 Prototype, *Air Power Australia Analyses*, vol VIII, issue 3, Air Power Australia, Australia, pp. 1-35;

Kopp C., An Initial Assessment of China's J-20 Stealth Fighter, *China Brief*, Volume: 11 Issue: 8, The Jamestown Foundation, Washington, DC 20036, USA, 6th May, 2011;

Kopp C., *Advances in Russian and Chinese active electronically steered arrays (AESAs), Phased Array Systems & Technology*, 2013 IEEE International Symposium on (ARRAY-2013), 15-18 Oct. 2013, Waltham, MA, USA, doi: 10.1109/ARRAY.2013.6731796, pp. 29 - 42. [Invited, Plenary Paper]

⁷ See Annex B for details and links to previous related Submissions and works of APA.

Annex A to APA Submission to SFADT Inquiry
Contemporary Air Defence Challenges vs the F-35 JSF
Terms of Reference (ToR) Item a.
Dated 18 January 2016

ANNEX A

REPRESENTATIVE CONTEMPORARY THREAT CAPABILITIES

Annex A: Representative Contemporary Threat Capabilities

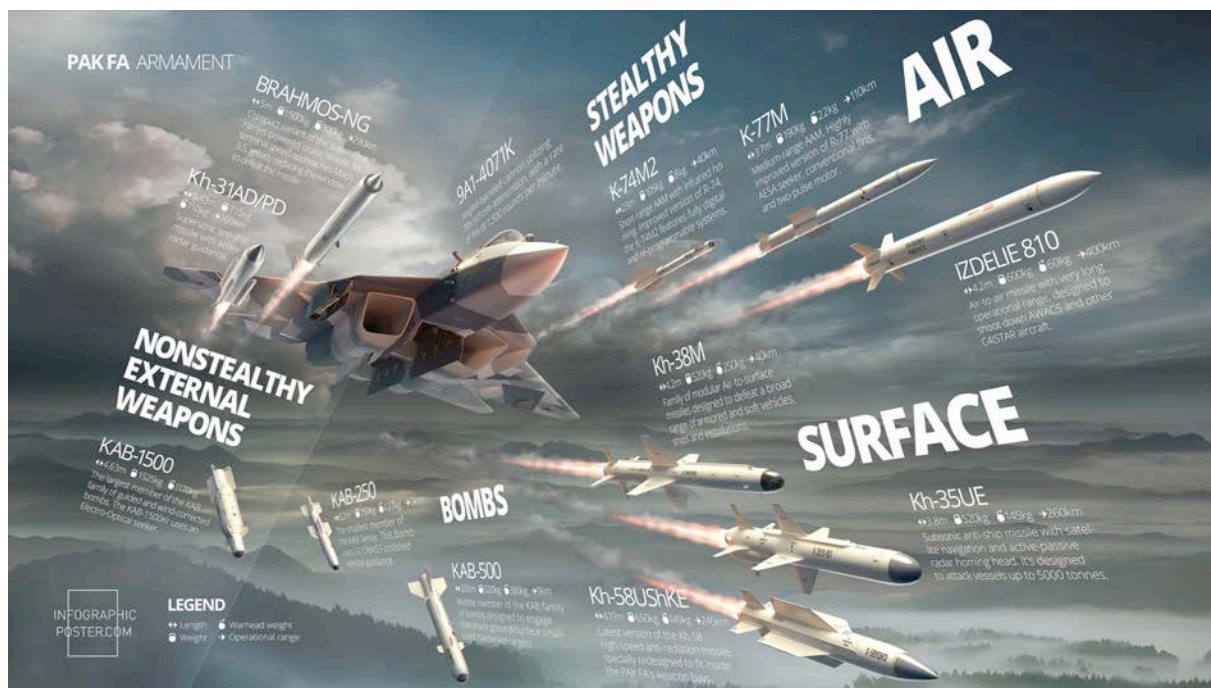


The Sukhoi/KnAAPO Su-35S FLANKER is the most recent variant of this family of agile, high performance air superiority fighters. It is equipped with supersonic cruise engines, and one of the most powerful radars carried by a fighter. The Su-35S is flown by Russia, and being exported to China, while other clientele is sought. The Su-35S outperforms the F-35 in all aspects of aeropropulsive performance (Max Bryansky).



The Sukhoi/KnAAPO Su-57 / T-50 PAK-FA is a supercruising stealth fighter, equipped with a dual band AESA radar system, InfraRed Search and Track, advanced digital avionics and modern datalinks. It was developed to compete with the F-22A Raptor, and is sufficiently stealthy in its front quarter to be difficult for an F-35 to detect at useful combat ranges (Artyon Anikeyev).

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Manufacturer's graphic of Sukhoi/KnAAPO Su-50 / T-50 PAK-FA weapons capabilities. Not depicted are the Grom E1/E2 Small Diameter Bombs, and the low observable Kh-59Mk2 stand-off missile (UAC Russia).



Russian Kh-59MK2 low observable stand-off missile, intended for internal carriage (TMC Russia).

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The Russian KTRV Grom E1/E2 glide-bombs are modelled on the US Small Diameter Bomb, but one variant has a motor to increase stand-off range (IHS Janes).



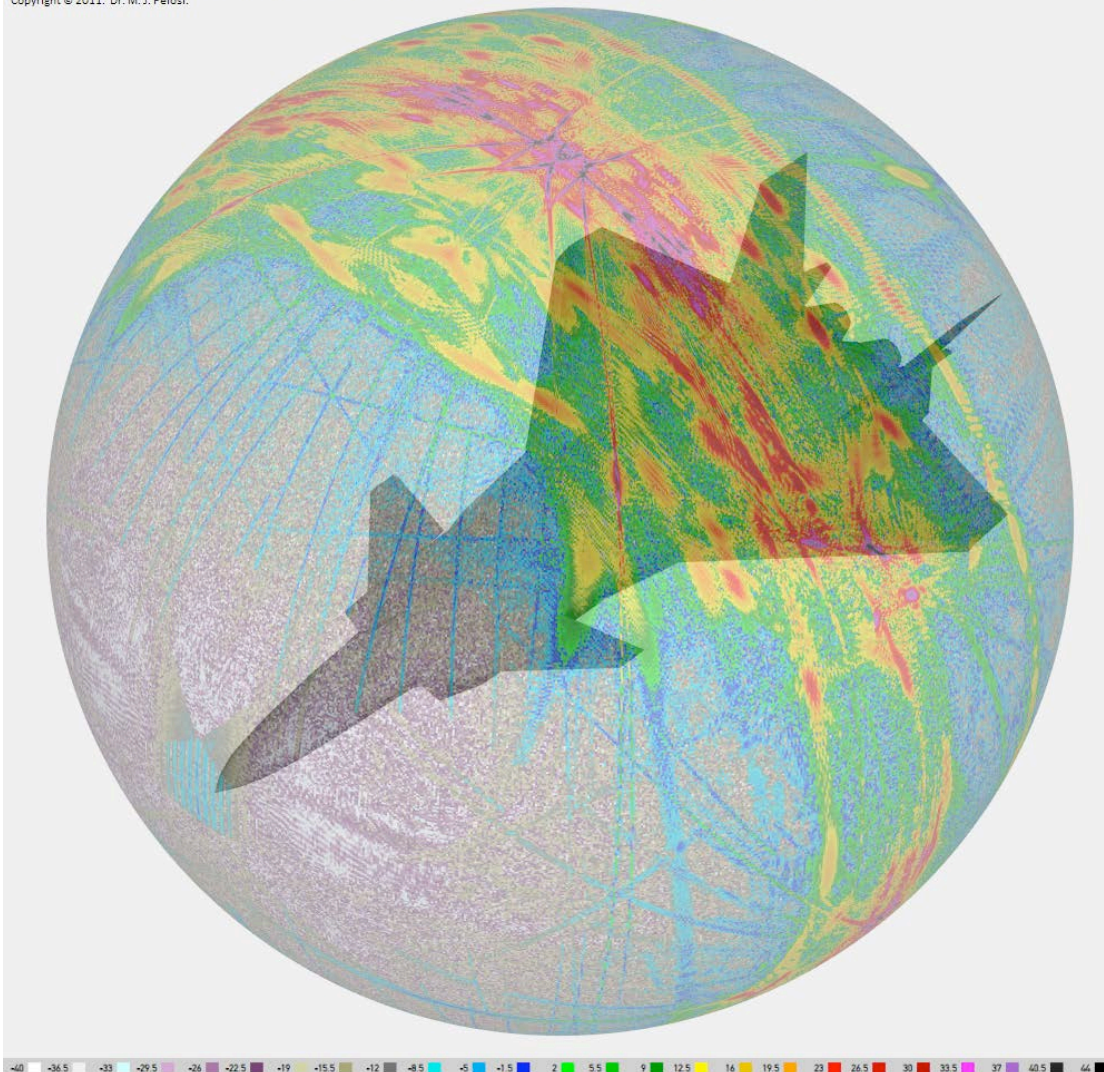
Russian Raduga Kh-101 low observable long range cruise missile during trials, carried by a Tu-95MS BEAR H. This stealthy cruise missile has been used repeatedly to attack targets in Syria (Anatoliy Burtsev).

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Prototype of the Chinese Chengdu J-20 supercruising high agility stealth fighter. The aircraft is now entering production, and was developed to compete with the US F-22A Raptor (PLA).

Chengdu J-20 0000 Ohms/sq. @ 08.00GHz IncPol:TM Pol:Theta Elev=045.0 Azm=225.0
Copyright © 2011. Dr. M. J. Pelosi.



Forensic modelling of specular Radar Cross Section of the J-20 in the X-Band, used by Western fighter radars. Key shaping features were “borrowed” from the F-22A Raptor (M.J. Pelosi and C. Kopp, 2011).

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Above, below: Shenyang J-31 prototype at the 2014 Zhuhai air show. This Chinese stealth fighter is commonly described by Western media as a copy of the F-35, but key stealth and aerodynamic features appear to be borrowed from the F-22A Raptor (David Bignell via APA).



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The Chinese LETRI SD-10/PL-12 "Sino-AMRAAM" is modelled on the US AIM-120 AMRAAM. Variants employ Russian Agat 9B-1348E active radar seekers, and a newer Agat dual mode seeker, providing also passive anti-radiation homing capabilities (Zhenguan Studio via APA).



Chinese Luoyang PL-10 close combat missile, observed on the J-20. This is missile is reported to be a derivative of the Ukrainian Luch Gran, itself modelled on the MBDA Iris T missile (Chinese Military Review).



Chinese Luoyang/CASC LS-6 Small Diameter Bomb. This weapon is similar in configuration to the US MMTD demonstrators for the GBU-39/B Small Diameter Bomb.

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Annex B to APA Submission to SFADT Inquiry
Contemporary Air Defence Challenges vs the F-35 JSF
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ANNEX B

APA PARLIAMENTARY SUBMISSIONS

Inquiry into the planned acquisition of the F-35 Lightning II

<i>Author/s</i>	<i>Document Category</i>	<i>Date</i>	<i><u>Hyperlink</u></i>
P A Goon and C Kopp	Submissions to JSCFADT	Feb 2012	<u>Review of Defence Annual Report 2010-11</u>
AIRCDRE (Retd) E J Bushell	Submission to SFADT	Oct 2011	<u>Submission #3: Procurement procedures for Defence capital projects / Supplementary 3B</u>
AIRCDRE (Retd) E J Bushell	Submission to SFADT	Oct 2011	<u>Submission #3: Procurement procedures for Defence capital projects / Supplementary 3A</u>
AIRCDRE (Retd) E J Bushell	Submission to SFADT	Mar 2011	<u>Submission #3: Procurement procedures for Defence capital projects / Annex 3</u>
AIRCDRE (Retd) E J Bushell	Submission to SFADT	Mar 2011	<u>Submission #3: Procurement procedures for Defence capital projects / Annex 2</u>
AIRCDRE (Retd) E J Bushell	Submission to SFADT	Mar 2011	<u>Submission #3: Procurement procedures for Defence capital projects / Annex 1</u>
AIRCDRE (Retd) E J Bushell	Submission to SFADT	Mar 2011	<u>Submission #3: Procurement procedures for Defence capital projects</u>
AIRCDRE (Retd) E J Bushell	Submission to JCPAA	Mar 2010	<u>Review of 2008-09 DMO Major Projects Report (MPR)</u>
AIRCDRE (Retd) E J Bushell	Submission to JSCFADT	Sep 2008	<u>A Measure of Professional Language in Defence</u>
AIRCDRE (Retd) E J Bushell	Submission to JSCFADT	Jul 2008	<u>Review of Defence Annual Report 2006-07</u>
C Kopp and P A Goon	Submission to JSCFADT	Jun 2008	<u>Review of Defence Annual Report 2006-07</u>
AVM (Retd) P J Criss, AVM (Retd) B J Graf, Dr C Kopp, AIRCDRE (Retd) G F Bates, WGCDR C L Mills, SQNLDR (Retd) P Goon, WGCDR (Retd) B Dirou, GPCAPT R G Green	Submission to JSCFADT	Jun 2008	<u>Review of Defence Annual Report 2006-07</u>
AIRCDRE (Retd) Bushell, Edward and Kopp, Carlo	Submission to JSCFADT	Jun 2008	<u>Review of Defence Annual Report 2006-07</u>

<i>Author/s</i>	<i>Document Category</i>	<i>Date</i>	<i><u>Hyperlink</u></i>
C Kopp and P A Goon	Submission to JSCFADT	Feb 2006	<u>Inquiry into Australian Defence Force Regional Air Superiority: Attaining Air Superiority in the Region: Testing the Evidence</u>
P A Goon	Submission to JSCFADT	Jun 2006	<u>Inquiry into Australian Defence Force Regional Air Superiority: Joint Strike Fighter Program Costing Data</u>
C Kopp and P A Goon	Submission to JSCFADT	Apr 2006	<u>Inquiry into Australia's Regional Strategic Defence Requirements: Meeting the Regional Challenge</u>
P A Goon	Submission to JSCFADT	Jan 2006	<u>Inquiry into Australian Defence Force Regional Air Superiority: The Absence of Integrity and Common Sense</u>
C Kopp and P A Goon	Submission to JSCFADT	Apr 2005	<u>Inquiry into Australia's Defence Relations with the United States: The Cruise Missile Defence Problem</u>
P A Goon	Submission to JSCFADT	Apr 2005	<u>Inquiry into Australia's Defence Relations with the United States: SBR Opportunities</u>
C Kopp and P A Goon	Submission to SFADT	Apr 2005	<u>Inquiry into Australia's Relationship with China: China's Rise as a Regional Superpower</u>
C Kopp and P A Goon	Submission to JSCFADT	Jan 2004	<u>Review of Defence Annual Report 2002-03: Analysis of Department of Defence Responses</u>
C Kopp and P A Goon	Submission to JSCFADT	Jun 2004	<u>Review of Defence Annual Report 2002-03: Analysis of Department of Defence Responses</u>
C Kopp and P A Goon	Submission to JSCFADT	Jun 2004	<u>Review of Defence Annual Report 2002-03: Analysis of Department of Defence Responses</u>
C Kopp and P A Goon	Submission to JSCFADT	Jul 2004	<u>Review of Defence Annual Report 2002-03: Analysis of Department of Defence Responses: Proof of Prior Knowledge: Regional Capability Growth and Joint Strike Fighter Limitations vs The 1998 F/A-18 Replacement Study</u>

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<i>Author/s</i>	<i>Document Category</i>	<i>Date</i>	<i><u>Hyperlink</u></i>
C Kopp	Submission to JSCFADT	Mar 2004	<u>Inquiry into Australia's Defence Relations with the United States: Interoperability, Force Structure and Missile Defence Issues</u>
C Kopp	Submission to JSCFADT	Mar 2004	<u>Inquiry into Australia's Defence Relations with the United States: Interoperability, Force Structure and Missile Defence Issues</u>
C Kopp	Submission to JSCFADT	Mar 2004	<u>Inquiry into Australia's Defence Relations with the United States: Interoperability, Force Structure and Missile Defence Issues</u>