

THE SIR RICHARD WILLIAMS FOUNDATION INC

www.williamsfoundation.org.au

Chairman:

Air Marshal E.J. McCormack AO (Retd)

Executive Officer

Wing Commander L.J. Halvorson MBE (Retd)



PO Box 5266
KINGSTON ACT 2604

chairman@williamsfoundation.org.au
ABN 25 204 613 891

Future Air Combat and 5th Generation Fighters

Errol McCormack

Since the Korean War when significant numbers of jet powered fighters engaged in combat, the United States Air Force has used a “generation” classification to describe in broad terms the capabilities of groups of fighters. While increases in capabilities to date have been largely linear there is a growing belief that the latest generation has resulted in a step-change. This is based on the fact that “5th Generation” fighters incorporate far-reaching technological advances over their 4th Generation predecessors.

These include all-aspect stealth (while retaining 4th Generation performance), Low Probability of Intercept Radios and Radars (LPIR), and integrated avionic systems that provide an unprecedented level of situational awareness and support to decision-making by the pilot. Overall, the avionics systems in the 5th Generation F-22 and F-35 are nothing less than revolutionary.

1st Generation fighters were typified by the F-86 and MiG-15 day fighters of the Korean War which relied on the Mk 1 eyeball and possibly a ranging radar for guns. 2nd Generation fighters included the Century series (F-101, F-102, F-106, etc) which emphasised speed at the expense of manoeuvrability and relied on air intercept radars and (relatively) long-range air-to-air missiles. The war in Vietnam demonstrated the fallacy of this approach, so 3rd Generation designs (F-4, Harrier) reintroduced manoeuvrability and guns.

4th Generation aircraft like the F-15, F-16 and F-18 provided great advances in manoeuvrability, but continued the traditional approach of using on-board systems that were under the individual control of the pilot.

A fundamental break with that approach is one of the revolutionary features of the 5th Generation F-35, on which the five major combat systems automatically interact to present the pilot with an optimum solution. In other words, the pilot does not have to determine which system is the best in any particular set of circumstances.

Consequently, one of the issues the RAAF will face with the F-35 will be cultural. There will need to be a change of mind-set towards tactics and tasking. Military organisations are by nature conservative and resistant to change. History contains many examples: the British in WWI failing to learn the lessons of the American Civil War; the British and French at the beginning of WWII, even though superior in numbers and equipment, being defeated by superior German command and control and tactics; and so on.

Closer to home, when RAAF ex-Mirage pilots planned their first Hornet deployment to Malaysia, cultural conditioning saw them ask for communications and navigation/SAR support. It was pointed out that the Hornet had two engines, HF radio, and an inertial navigation system, and perhaps they should just get on with it!

Integration of the RAAF’s Wedgetail AEW&C systems into tactical scenarios will also challenge cultural norms. As the “eyes” of a 4th Generation force, AEW&C aircraft are a high value asset and could

be subjected to enemy one-way operations to take them out. 5th Generation fighters, however, need not necessarily rely on data derived from AEW&C. Used in a honeycomb formation, each fighter becomes a command node and each pilot a potential battle commander. The loss of individual aircraft would not significantly degrade the enhanced situational awareness of the whole.

Some critics of 5th Generation fighters have asserted that the RAAF would be better off with a 4th generation aircraft fitted with various levels of 5th Generation avionics, leading to the term “4.5 Generation”. But this reveals an ignorance of contemporary air combat. As one qualified military pilot has wryly observed, the pilot of a 4.5 Generation opposed to a genuine 5th Generation would simply know who’d shot him down!

It is the nature of warfare that there is no such thing as a “silver bullet”, and any system will require development over its lifetime. Thus, F-22s and F-35s delivered in 2030 will have superior systems to those delivered in 2020.

Russia and China have recently fielded prototypes of fighters with external stealth characteristics. While it is relatively easy to assess those characteristics through observation, it is much more difficult to assess the synchronisation of all systems to generate integrated situational awareness within a stealth airframe. The level of technological advances in all-aspect stealth, LPIR, and fusion of on- and off-board systems in those aircraft is unknown. Nevertheless, we must assume that over the next decade Russia and China will make advances with such systems.

Recent open-source material has raised the possibility of the development of 6th Generation fighters, for fielding around 2035. Characteristics include speeds above Mach 3, multi-spectral stealth, ubiquitous situational awareness, advanced target recognition, long-range, and persistence. The question arises: Is technology driving development; or is our imagination driving technology? The fact that 6th Generation fighters are under consideration could indicate that the 5th Generation will not be the last manner fighter. If so, development of the necessary balance between manned and unmanned systems will be an important discussion with significant implications for future air combat.