Te Matataua

The Scouting Party of Air Power

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FIFTH-GENERATION AIR WARFARE

What it is and why it is 'fifth-generation', even though there has not really been a first, second, third or fourth

One of the more recent terms to be added to the ever-changing lexicon of air power is "fifth-generation air warfare"; a term used to describe a concept of operations which is effectively the next evolutionary step in how air warfare is conducted. The Royal Australian Air Force (RAAF), our closest military ally, has embraced the term to such an extent that their future strategy is centred on the concept and their major strategic aim is to become a 'fifth-generation air force' by 2027. But the term can be a confusing one as 'fifth-generation air warfare' implies that there has been at least four previous, clearly identifiable, evolutionary steps in air warfare, which is not the case.

Fifth-generation fighter: F-35 JSF

'Fifth-generation' actually stems from the world of aerospace marketing and, until very recently, was only used with reference to jet-powered fighter aircraft. In order to differentiate between 'old' and 'new', aerospace companies referred to generational change in capability and through the power of marketing the description eventually worked its way into military-speak. The various generations of jet-powered fighter aircraft (as explained by the RAAF) are:

First-Generation

First-generation generally refers to the introduction of sub-sonic fighter jets, first introduced in late World War Two. The de-Havilland Vampire, operated by the RNZAF from 1951 – 1972 is an example of a first-generation fighter aircraft.

Second-Generation

This generation is generally considered the mid 1950's to early 1960's, when afterburning turbojet engines entered production. The A-4K Skyhawk operated by the RNZAF from 1970 – 2001 is an example of a second-generation fighter aircraft, though it did not have afterburning capability. By the time it entered RNZAF service, the Skyhawk had evolved to include some third-generation abilities and the subsequent Kahu upgrade in the late 1980's introduced limited fourth-generation capabilities to the aircraft.

Third-Generation

The 1960s to approximately 1970 produced aircraft with increased manoeuvrability and ground attack capabilities, combined with the introduction of guided missiles. The F-4 Phantom is an example of a third-generation aircraft.

Fourth-Generation

Between approximately 1970 and the mid-1990s, aircraft were characterised by their multi-role configurations and equipped with sophisticated avionics and weapons systems. The F/A-18A/B Hornet in current RAAF service is an example of a fourth-generation fighter aircraft.

Four-and-a-half Generation

This generation of aircraft from the 1990's until 2005 are often modified fourth-generation aircraft with significantly enhanced capabilities. They are commonly identified by signature reduction, helmet-mounted sights, GPS-guided weapons and highly

integrated systems. The F/A-18F Super Hornet, recently purchased by the RAAF, is an example of this fighter generation.

Fifth-Generation

Fifth-generation fighter aircraft are characterised by low-observability (including the use of internal weapons bays), vastly improved situational awareness through a network-centric combat environment and the design ability to act as an integrated data node. The F-35A Joint Strike Fighter is an example of a fifth-generation fighter aircraft.

It is the introduction of this last generation of fighter, or more specifically the environment in which this type of fighter is optimised to operate within, that has given rise for the term 'fifth-generation' to be applied more widely, even though none of the previous generations of fighters produced similar cross-overs. 'Fifth-generation' is now used to describe an air warfare concept that encompasses and combines aspects such as network-centric thinking, the combat cloud operational construct, multi-domain battle and fusion warfare; space only permits a brief overview of the first two aspects.

The fifth-generation air warfare concept is based around interconnectivity and instantaneous sharing of information. It is reliant on an effective *sensing grid* that can detect, track, and identify targets and an *information grid* that can receive, process, store, protect and communicate information quickly and securely. The sensing grid comprises anything ranging from dedicated sensing systems, such as surveillance satellites, to the single soldier on the battlefield. Each sensor becomes an individual node within the grid and a vital requirement is having the ability to upload information.

Each node must have data-link connectivity that enables real-time interaction as well as contribution to what has been termed the 'combat cloud'. A derivation of commercial 'cloud' computing, the 'combat cloud' is the central repository into which all nodes feed sensed information and from which they can extract the combined 'big picture'. Instead of a crew or individual only being aware of what is happening based solely on their own sensors, the 'combat cloud' provides a wide-area, integrated surface and air picture to all, extending for hundreds of kilometres, vastly improving situational awareness.

The 'combat cloud' also enables targeting information and designation to be pushed into it from one node and then extracted by another without the need for each platform to be able to communicate directly with each other. This has tactical advantages in that the receiving aircraft can then engage the target without having to use their own on-board sensors; sensors that could be tracked by enemy defence systems. Less stealthy aircraft can use targeting information, gleaned through the 'combat cloud', from stealthy aircraft operating further forward in hostile territory in order to release weapons from safer stand-off distances.

Fifth-generation air warfare is therefore reliant on data and connectivity for success. These are also the concepts biggest weaknesses. Poor or corrupted data will lead to either an incomplete or inaccurate 'big picture'. Targets that need to be immediately engaged may not be due to uncertainty while misleading data could lead to the engagement of friendly or neutral elements. A complete lack of data will make some systems, particularly fifth-generation fighters that have a complete reliance on electronic data to operate effectively, practically useless. Connectivity is not always guaranteed and different nations have different levels of connectivity protection. Connectivity also allows potential gateways into other, potentially highly-sensitive, systems hence interoperability amongst nations is of necessity limited and variable. Both the data and the information paths are vulnerable to physical attack, electronic jamming and cyber-attacks. A virus introduced into, say, a single F-35 could potentially spread through the entire network almost immediately.

Fifth-generation air warfare is expensive, very expensive, and is not a concept that most nations can afford. Developed to provide a winning edge during major-power peer vs peer conflict by forces that operate fifth-generation fighters, it is also not a concept that all nations need to afford.

Key Points

- 'Fifth-Generation' refers to a specific generation of jet-powered fighter aircraft.
- Fifth-Generation Air Warfare is network-centric and uses a 'combat cloud' operational construct.
- Fifth-Generation Air Warfare is expensive and vulnerable to physical and cyber attacks.

References

If you would like to know more about fifth-generation air warfare then RAAF APDC Paper No 43 'Fifth-Generation Air Warfare' by Dr Peter Layton is highly recommended. This paper can be accessed at: **http://airpower.airforce.gov.au/Publications/Working-Paper-43-Fifth-Generation-Air-Warfare**

Te Matataua wishes all its readers a Merry Christmas and a Happy New Year

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