5TH-GENERATION AIR FORCE

The F-35 replaces nothing. It changes everything.

Air Marshal Leo Davies, AO, CSC

Until recently, Air Force has not spoken of itself in generational terms. However, with the imminent introduction to service of the 5th-generation combat aircraft, the F-35A Lighting II, the terms ‘5th generation—enabled’ and more generic ‘5th-generation’ Air Force have begun to appear in common use. What is meant by these terms?

The development of combat aircraft is well documented and is currently described as five generations of capability evolution since the advent of the jet fighter towards the end of World War II (see Pathfinder No 170 for a full explanation of generations of combat aircraft). As an example of a 5th-generation asset, the F-35’s immediately recognisable ‘5th-gen’ feature is its physical design for radar signature management, or ‘stealth’. It is readily apparent by simply looking at the latest combat aircraft that their shapes are part of their ability to avoid detection, to permit them to penetrate and operate in hostile environments. However, just as important is what lies under the skin.

Fifth-generation aircraft, certainly the Western examples, feature a degree of on- and off-board data, sensor, weapon and communication fusion not possible in earlier combat aircraft. This inherent capability provides the crew with synthesised and coherent awareness of the combat environment. In contrast, earlier generations featured multiple displays and information inputs which the crew had to fuse in their head, called ‘building situational awareness’. It is fair to say that in 3rd- and 4th-generation aircraft, the volume of data to be fused by the crew presented a major challenge, particularly in single-seat aircraft. It made the aircraft difficult and demanding to operate, pushed the limits of human cognition, and in demanding environments, increased mission risk. To help alleviate the problem, some aircraft were multi-crewed to provide the capacity to interpret, fuse and exploit the information presented to them. Otherwise, the problem was addressed by selecting and training truly superior aircrew, but people with the right combination of skill and temperament are quite rare.

Until the arrival of 5th-generation aircraft, military response options were based on a combination of discrete role-specific systems (e.g. specialist platforms, skilled people, semi-autonomous data processing and information exchange systems), with their separate outputs combined to support the achievement of a common task. As a result, the battlespace was occupied by a variety of platforms, each with its own unique, often self-contained, interpretation of that battlespace.

Advances in networking the battlespace through the ongoing development and deployment of datalinks means information synthesised in one platform can be shared between systems to increase the awareness of those other systems operating in the battlespace: other fighters, aircraft conducting other missions, command and control agencies, and land and naval assets. Similarly, several platforms may contribute information via datalink to build the synthesised view.

These two attributes—a readily available, synthesised appreciation of the battlespace and the ability to share or build it with others—are the key characteristics of the 5th generation. Taken to the force level, one can begin to see a 5th generation—Air Force emerge, one where these attributes permeate the battlespace.

With the F-35 as a trigger, Air Force is on the verge of becoming a 5th-generation, or in other words, a comprehensively networked force—a force with the advantages embodied in its 5th-generation combat aircraft being shared across the battlespace. Other systems may not themselves embody all the 5th-generation attributes,
however, their ability to contribute to and share a common view of the battlespace, and pass it to others, make them worthy of inclusion in a 5th-generation force. So, while a KC-30 aerial refueller may not be stealthy, its ability to know how far it can safely move forward in support of combat aircraft, informed by its access to a common and accurate picture of the battlespace, makes it an enhanced element of the force. Similarly, it can relay the picture it accesses for other assets to make their own decisions concerning their contribution to the fight. Those other platforms need not be air assets. Land and naval forces, suitably equipped, will also be recipients of and share in a common appreciation of the battlespace. Air Force is actively preparing for this imminent future.

Through its program of experiments and demonstrations, Plan JERICHO is already beginning to show what might be possible. Sensor video of an area of interest has been streamed live from a UAV into the cargo compartment of a C-17, enabling commanders en route to a situation, be it a combat or humanitarian assistance/disaster relief scenario, to develop an operational plan—before arriving at the scene. The current problem of incompatibility between legacydatalinks, which have often evolved to solve a particular mission set in the battlespace, has been shown to be solvable. An airborne gateway has demonstrated the ability for the incompatible protocols of datalinks used by Super Hornets, ARH Tigers and ground forces to be overcome by providing an ‘airborne translator’.

The capabilities Air Force has deployed on Operation OKRA—Hornets, Wedgetail and KC-30—are evolving and implementing innovative new methods of operation while undertaking combat and combat support tasking. While technically not 5th-generation platforms individually, their evolving modes of operation exhibit the characteristics of a 5th-generation force. Their operationally derived lessons learned will prepare Air Force for the transformation that the arrival of the F-35A will enable.

The 5th-generation Air Force is being designed to better connect, among its own systems and with the rest of Defence, to assure military advantages to the joint force over potential adversaries. The introduction and integration of the F-35A will mark the arrival of a 5th-generation Air Force—one that will provide new levels of potency, agility, and capability advantage. It will ensure Air Force collects the right information for timely use by the right people. It will contribute to ensuring Air Force maintains decision superiority into the future.

**Key Points**

- Air Force has evolved through a series of technology-driven step changes in capability.
- The 5th-generation Air Force will deliver a new level of capability through the ability to produce a synthesised appreciation of the battlespace, networked among more capable sensors and platforms.
- With its 5th-generation capabilities, Air Force will be a critical contributor to, and enabler of, the joint force.