"If we can offer a team of people dispersed among multiple locations [the opportunity] to work together, what's the reason to come to an instructor?" – Keith Cooper, Vice President, Training and Professional Services, Boeing, December 2017

The air forces of the world have always been on the lookout for ways to improve their training to create the next generation of aviators. This has always been the underlying basis for attempts to expand the cognitive learning envelope through the innovative use of technology. The skill sets necessary to operate an advanced high-performance fighter aircraft efficiently are difficult to bring to the necessary levels wherein mission accomplishment and safety are not jeopardised. Over the years, training processes have been developed and fine-tuned to bring the trainee to an acceptable minimum standard. Technological advances in simulation capabilities could now revolutionise the training process being followed in most air forces.

Contemporary training is not only required to be realistic but must also encompass the potential to increase the speed, efficiency and knowledge retention of the trainee. In this arena, simulation capabilities promise to improve traditional training processes and systems. Individual air forces have their own visions of future simulation and training methodology. The ultimate aim of simulation would be to create a combined live, synthetic and blended training environment, in which the operators would be able to interact with weapon systems in highly dynamic and realistic scenarios. The simulation would depend on the individual air force's concept of the threat scenario that it is likely to face.

The more advanced air forces across the world are pursuing a trajectory of greater interoperability between live and synthetic training, while at the same time attempting to maintain an optimum balance between the two. The RAAF’s Exercise Black Skies is a step forward in this direction. The balance between the two will determine whether or not a particular ‘improved’ training process will improve the existing proficiency-base being achieved by the current process.

Irrespective of the ability of an air force to resource the development of simulation capabilities in training, the role of simulation in realistic training is being enhanced at a rapid rate. One of the main factors that is pushing simulation forward is the cost factor. A standing air force is always in the process of training new aircrew in order to sustain the generation of air power at the required rate. While the more sophisticated and tailor-made simulation systems are costly, in the long-term requirement of continuous training to maintain the level of air power needed to sustain national security imperatives, they vastly reduce the cost of training compared to using expensive real-time flying for training. Available statistics indicates that a simulator hour costs about 15 per cent of actual flying hours in a training aircraft. Obviously this ratio will vary significantly from platform to platform and is also dependent on the technological sophistication of the simulator.

Other than cost-savings there are some other obvious advantages that come with simulation. The latest simulators have the ability to evaluate student performance as well as provide mission performance statistics. By monitoring the progress of a student it is possible to move a student through the program at a pace that is individually suited, unlike in live
training where it is normal to follow a set pattern. Adapting to new ways in which different people learn and bringing in mobile technology, such as tablet computers, into the learning cycle is becoming increasingly important in training. These provide more efficient ways to train future aviators.

Simulation training uses big data and highly evolved analytic techniques to evaluate the progress of trainees and then use that information to improve the efficiency of the next training mission. However, the collection and analysis of big data has its own difficulties that must be overcome before it can be used optimally. Most defence companies associated with flight simulation have clearly stated that using learning science is the best way forward to improving the training process of students. In this context, adaptive learning with the aid of computers is being used to tailor individual student’s learning needs within the future simulation systems.

Simulation is being improved by military forces, the civil aviation sector and the defence industry in a collaborative manner. Research is being undertaken to improve the fidelity of the simulation and training products. There is also a move within the industry to streamline the training sector so that more options could be provided to the primary customer, which is the military aviation group. The military forces focus on combat effectiveness in a live environment and are honed on fourth to fifth generation air combat scenarios. Therefore, industry groups are currently focusing on this need through airborne instrumentation systems. While air combat manoeuvring instrumentation has been used for more than three decades, the technological improvements that are being introduced have made the systems into an entirely new training capability. With the introduction of datalink, the system is now capable of interoperability with a number of training systems and enables secure, relevant and realistic training.

Better performance at an affordable price in simulation has become the watchword for developments in flight simulation training. In order to achieve a reduction in price, a common, open-system architecture for air force simulators, which will function in a secure training environment and is being considered by the more advanced air forces. The necessity to interact between simulators of different generation aircraft and between allies, so that information sharing is possible emphasises the need for security. This common approach is also likely to minimise life cycle costs.

There are a number of technological hurdles to be overcome to achieve the vision for future simulation and training. The hurdles have been identified by the manufacturers and the users as persistent and secure networking, interoperation of live and synthetic systems, leveraging open-system architecture for integrating reality and virtual reality and security and data aggregation.

The legacy simulators are designed for stand-alone training, which is not compatible with the current training needs. Geographic spread and security concerns have become the driving factors in the development of training simulators that are becoming extremely complex, both technologically and in their usage. Connecting simulators to each other to derive maximum benefit have so far yielded only peripheral success. The delivery of high-end training in air combat and development of tactics still remain constrained to the beginning of their spectrum. However, as per hour flying cost of modern aircraft increase exponentially, the future of training will be tilted more towards simulation than live training.

Key Points

- Contemporary training is not only required to be realistic but must also encompass the potential to increase the speed, efficiency and knowledge retention of the trainee.
- The latest simulators have the ability to evaluate student performance as well as provide mission performance statistics.
- Adapting to the different ways in which different people learn and bringing in mobile technology, such as tablet computers, into the learning cycle is becoming increasingly important in training.