

Report of May 16 Meeting 2013
Royal Society
Southern Highlands Branch

Speaker: Dr Rik Heslehurst, School of Engineering and Information Technology, University College, UNSW, Australian Defence Force Academy

Topic: Advances in Aviation

Since the dawn of powered flight, aviation has been at the forefront of scientific and technological development. Dr Heslehurst introduced his lecture with a brief overview of the decades of flight from 1900 to 2020.

The Wright Flyer in the first decade was followed by the advance of more power with the use of multi-engines. Improved structural materials and design followed, then in the 1930s came significant improvements in design, aerodynamics, powerplants and structures. The jet engine appeared in the 1940s followed by the advancement to Mach 1 and the development of helicopters in the fifties. The next decade brought the Apollo missions and the race for space, with the seventies introducing advanced structures such as composite wings. Over the next 20 years, reusable launch vehicles appeared, as did low-observable vehicles. The turn of the century saw the Space Station, and now research is concentrating on multi-role affordable high performance aircraft.

Dr Heslehurst then presented a detailed technical analysis of the areas of advancement and development that had made possible the extraordinary features of our modern aircraft. The advances in aerodynamics have seen the introduction of the mission adaptive wing stemming from research into wing aerofoil sections, winglets, the morphing wing and sophisticated boundary layer control. The winglets allowed diminished resistance, cutting drag and boosting fuel efficiency, by shrinking the vortex of air at the edges of the wings. Advances in aerodynamics also allowed the feature of the quiet sonic boom.

In the field of avionics too, there have been marked developments in recent years. Helmet mounted displays are now common place, and their development has been accompanied by advances in optical sensors and artificial intelligence. Improvements in flight simulation techniques and voice and thought command are currently exciting areas of development in the avionics sphere.

As regards the ongoing studies into material science, metals, composites and nano-materials are all being researched, developed and refined. Dr Heslehurst presented fascinating data on a sophisticated area of materials science, Self Healing, where cracks may be able to heal themselves using a polymerized healing agent in the material itself.

This fifty minute presentation covered so many aspects of aviation that it could only be described as a short trip down the lane of technical development in aviation through the eyes of an aerospace engineer with an obvious passion for his subject. Despite the time restraints, the 35 person audience declared the evening a great success. They had been taken on a journey from the technical genius of the Wright Brothers through to the elegance of long range flight and the mystique of space travel. They had been challenged to consider designs and advances which right now must remain in the imagination, but which clearly have huge potential for realization – thanks to our sophisticated ongoing research in aviation.

Anne Wood