*The Aeronautical Journal* (2024), 1–3
doi:10.1017/aer.2024.116

FOREWORD

# A brief history of aerospace engineering at the University of Glasgow

The University of Glasgow's connection with engineering can be traced back to the 18th century. Perhaps the most notable event was the appointment of James Watt as mathematical-instrument maker in 1757. In collaboration with John Robison, a chemistry lecturer, he performed early experiments in steam power. It was in Glasgow that he devised the idea of introducing a separate steam condenser, and it was this innovation that led to the development of much more efficient steam engines which then powered the industrial revolution. Much of the activity in engineering at the University through the 19th century was influenced by the city's emergence as the global centre for heavy engineering with the growth of ship building and manufacture of steam locomotives and of course all of the supporting industries.

There were important achievements in aeronautical engineering also in these early years. In 1870 Prof. W.J.M. Rankine, holder of the Regius Chair of Engineering made a significant breakthrough in identifying that shock waves existed and developing shock-wave theory by presenting the proper normal shock wave equations for continuity, momentum and energy. Percy Pilcher, a lecturer in Naval Architecture built and flew gliders (or 'soaring machines' as he called them) in the 1890s. In fact, he achieved the first manned heavier-than-air flight in the U.K. at Cardross, (on the Clyde just west of Glasgow) in July 1895. He began the development of a powered glider but unfortunately was killed in a gliding accident in 1899. Many have speculated that had this accident not occurred, he may well have achieved powered flight before the Wright Brothers did in 1903.

Aeronautics was first taught as a specialisation of mechanical engineering in the 1920s by Dr Alexander Thom. Thom obtained his Ph.D. by designing and building a wind tunnel and carrying out some experiments in fundamental aerodynamics in the facility. During World War 2 he was to join the Royal Aircraft Establishment before becoming chair of Engineering Sciences at Oxford University. It was not until 1947 when Sir Henry Mechan, a Glasgow industrialist, provided an endowment to the Faculty of Engineering that the possibility of expanding the Faculty's interest in aeronautical engineering was considered. The decision was made to create a new chair (the Mechan chair of Engineering) and a new department was founded in 1950: the Department of Aeronautics and Fluid Mechanics (part of the faculty of Engineering). The first holder of the Mechan chair was professor William Duncan.

Duncan graduated in Engineering at University College London in 1913 before joining the family firm, Ross & Duncan, marine engineers based in Govan, Glasgow. During the first World War he was with the Aeronautical Inspection Department before re-joining the family business. His main interest had become aeronautics, and in the mid-1920s he joined the Aerodynamics Department of the National Physics Laboratory. During World War 2 he was head of the Research Department at the Royal Aircraft Establishment at Exeter, and later of the Flight Section. In 1945 he was sent to Germany to take part in the collection of aeronautical information. Later in 1945 he became professor of Aeronautics at Cranfield, and in 1947 he was elected as a fellow of the Royal Society for his contributions to the understanding of the phenomena of flutter, and also his much-respected work on the use of matrices in applied mathematics. He was also chair of the Aeronautical Research Committee.

This is the introduction to the online collection celebrating the 75th anniversary of aerospace engineering at the University of Glasgow.

Duncan's importance in establishing aeronautics at Glasgow cannot be over-emphasised. He was able to attract support for the new department both externally and internally. He established the degree of B.Sc. in Aeronautical Engineering in 1951 and was instrumental in attracting new academic staff to the department. By all accounts he was very supportive of those he recruited to the department and was often able to help them establish their research using the many links he had through the aircraft industry and research establishments. In those early days the department was based in the James Watt Laboratories overlooking Kelvingrove Park. This building was designed by John Oldrid Scott (son of Sir Gilbert Scott) and opened by Lord Kelvin in 1901. Duncan was also successful in obtaining significant funding to establish aeronautical laboratories in the University, and in updating the existing hydraulics labs. This included a wind tunnel laboratory in the basement of the adjacent Anatomy Building. The main wind tunnel in this lab (a 3' x 3' low speed tunnel) was used for student classes and projects until very recently. Generations of aeronautics students referred to this facility as the 'anatomy tunnel'. The laboratory in the basement of the Anatomy Building housing the wind tunnel (and other fluids rigs) had previously been used by Joseph Lister, the pioneer of antiseptic surgery.

As engineering grew both in terms of student numbers and research activity an extension to the James Watt Laboratories was built. The James Watt Laboratories were renamed James Watt North and the new extension, James Watt South. This building was opened by Field-Marshal Viscount Montgomery in November 1959. The Aeronautics and Fluid Mechanics department was based on the top floor of the building and was equipped with a large structures laboratory and further wind tunnels (including a supersonic blow-down tunnel).

After Duncan's death in 1961 professor Terrance Nonweiler was appointed to the Mechan chair. Prior to coming to Glasgow Nonweiler had worked for the RAE (primarily on high speed aircraft), and lectured at Cranfield and Queens University in Belfast. During his time in Glasgow he developed a series of low Reynolds number aerofoils (the GU series), which are used on many microlight aircraft. During this period, as the U.K. aircraft industry went through a very painful restructuring, the department was able to secure a large (7' $\times$ 5') low-speed wind tunnel from the Handley-Page Company as it went into receivership. The tunnel was brought to Glasgow in 1970 where it was rebuilt and is still in use today.

The appointment of professor Bryan Richards to the Mechan chair in 1980 initiated a period of growth for aeronautics in Glasgow. Bryan joined the department from the von Karmen Institute where he had been head of the high-speed laboratory. Under his leadership the department adopted more modern approaches to research in particular. There were many appointments of new staff and in 1989 professor Rodderick Galbraith took over as head of the department. The same year (and possibly also as part of the modernisation) there was a change of name to the department of Aerospace Engineering. The department continued to grow and flourish with rapid increases in staff and student numbers and the introduction of an Avionics degree programme (this would later be modified and renamed as Aerospace Systems). In 1997 the Shoda Chair of Aerospace Systems was established in the department. This chair was named after Paul Tiaso Shoda who graduated with a B.Sc. in Shipbuilding Engineering in 1916. He later returned to Japan to work for Mitsibushi, rising to the position of vice-president of Mitsibushi Industries. Prof. Galbraith was appointed the first holder of this chair, and it was under his leadership that the department was able to secure funding to transfer the (9' $\times$ 7') wind tunnel from British Aerospace Hatfield to a new site a few miles from the main Glasgow Campus. This tunnel was originally built by the de Havilland company in the 1950s and now forms part of the U.K. National Wind Tunnel Facility. The de Havilland and the Handley-Page tunnels are both located at this facility (along with a number of transonic and supersonic tunnels). This range of aerodynamic testing facilities is used for research and for commercial testing and gives the University of Glasgow a set of unique

During the early part of the 21st century there was diversification of research interests with significant success in new areas including space systems, autogyro airworthiness, air traffic management and CFD analysis. The department was led by Dr Douglas Thomson until 2007 when Dr Marco Vezza took over. In 2006, after the retirement of Bryan Richards, professor Richard Brown was appointed to the Mechan chair. This strengthened one of the main themes of the department's research activity – rotorcraft. The development of research in the area of rotorcraft began in the early 1980s through links with Westland

https://doi.org/10.1017/aer.2024.116 Published online by Cambridge University Press

Helicopters and the Royal Aircraft Establishment. Initially the focus was on flight dynamics, and wind tunnel testing of blade sections. The latter activity involved the design, manufacture and installation of a dynamic stall test rig in the Handley Page tunnel by Gordon Leishman and Roddy Galbraith. This led to the collection of a large volume of data which was used in support of the development of predictive codes by Westland Helicopters. This experimental capability has been enhanced in recent years with the acquisition of a scale rotor rig for the de Havilland tunnel. Close links with RAE led to a range of projects in modelling, simulation, control and system identification methods, all supported by having access to flight test data from RAE aircraft. Rotorcraft research remains a mainstay of the aerospace research in Glasgow.

In 2010 the University embarked on major restructuring and the existing 9 faculties, and 50 departments were replaced by 4 colleges and 26 schools. The faculty of Engineering was disbanded, and the four existing departments (Aerospace, Mechanical, Civil, and Electronics & Electrical Engineering) were merged into a single school of Engineering (as part of a College of Science & Engineering). Within the new school research was managed under the banner of the Aerospace Sciences Research Division, led by Dr Douglas Thomson, and teaching activities organised through the Aerospace Teaching Discipline, led by Dr Richard Green. These two groupings were made up of the staff from the old department. Prof. Kostas Kontis joined the division from the University of Manchester in 2013 when he was appointed to the Mechan chair, and subsequently took over leadership of the division the following year. In the early 2020s there was further restructuring and aerospace research is now part of a multidisciplinary division called Autonomous Systems and Connectivity.

In the early days of the department of Aeronautics & Fluid Mechanics Prof. Duncan had a staff complement of two colleagues, and the B.Sc. programme attracted a single figure number of students (it reached the heady figure of 11 entrants in 1959). Today there are around 20 academic staff supporting two undergraduate programmes which attract around 150 entrants each year, and two taught postgraduate programmes with around 20-30 entrants. The study of aerospace engineering has never been more popular, and graduates find that they have developed skills which put them in an advantageous position when entering a fiercely competitive graduate jobs market. Although the demise of a single aerospace unit within the University may be mourned by some, this is really just a reflection of the multidisciplinary nature of the engineering profession. It is very difficult for an aerospace-only unit to thrive particularly when, as is the case with Glasgow, it is located so far from the major national industries and research establishments. The restructuring of aerospace research within the (recently renamed) James Watt School of Engineering and the popularity of the aerospace degrees offered ensures there will be a continuing flow of graduate aeronautical engineers, and high impact research from Glasgow well beyond its 75th anniversary.

**Douglas G. Thomson**
James Watt School of Engineering, University of Glasgow, Glasgow, UK
douglas.thomson@glasgow.ac.uk

https://doi.org/10.1017/aer.2024.116 Published online by Cambridge University Press