The Melbourne Branch of the

Royal Aeronautical Society, Australian division

May 2009

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From the Editor

Hello All,

The Melbourne Branch would like to sincerely thank Peter Lewis for his many years of voluntary service on the committee as Events Manager. Peter put in an amazing effort to always bring us an exciting and varied program!

Karen Trezise,

Newsletter Editor

May Event

Boeing brings corporate research to Australia

Presenter: Al Bryant,
General Manager, Boeing Research and Technology Australia, The Boeing Company

Date: 11th May 2009

Time: 6pm for a 6.30pm start

Cost/Registration: Free – Everyone welcome! No registration req'd.

Venue: Rooms A & B,
Engineering House,
21 Bedford St, North Melbourne

The Boeing Company has established a component of its Corporate Research and Technology organisation in Australia to focus on providing in-country capability supporting its strong businesses in Australia. Mr. Bryant will focus his talk on key areas of research being performed in Australia, how Boeing Research & Technology (BR&T) Australia aligns with Boeing's Global Research and Development (R&D) Strategy and will discuss the role of industry in the New National Innovation System in Australia.

Al Bryant leads the Boeing R&D effort in Australia as General Manager, Boeing Research & Technology Australia He is responsible for the research direction, strategic interfaces with internal Boeing organisations and external R&D collaborations with Industry and Government in Australia. In this assignment, he is focused on establishing a fully operational R&D presence of The Boeing Company in Australia.

Boeing last year established BR&T Australia, only its second R&D centre outside the US, to synchronise its substantial resources with long-standing Australian high-technology projects, including collaboration with the CSIRO for 20 years. The initial BRT&T objectives include minimising risk on defence projects, enhancing ageing aircraft maintenance capability, exploring next generation composite structure and leveraging local expertise in aviation biofuels.

Previously, Mr. Bryant was Director, Distributed R&D and Customer Partnerships within a department of Boeing Research & Technology. In that assignment, Mr. Bryant was responsible for all non-Seattle USA-based R&D sites, all strategic interfaces with internal Boeing Customers, external R&D alliances and led the marketing and communications function.

He has worked for The Boeing Company for 31 years holding various positions and has a Bachelor of Science in Architectural Engineering from Virginia Tech, USA.

May 14th 1939

The prototype Short Stirling four-engined heavy bomber first flew at Short's Rochester factory. The Stirling was the result of Air Ministry specification B12/36, which called for a "heavy bomber, capable of being launched via a catapult system, able to maintain height with one of its four engines shut down and carry a heavy bomb load, and have a wing span of no more than 100 feet." It was to be this last point of the specification which was to prove the Achilles heel of the Stirling in later years. At 22 feet and 9 inches from the ground at her highest point and with a wingspan just over 87 feet, the Stirling was the largest of any aircraft to serve with the RAF in the War.

Aircraft tyres

For a short period during take-off, jet-engined transport aircraft tyres have to resist a speed of around 360 km/hr while carrying a weight that sometimes exceeds 30 tonnes per tyre. The temperature variations are just as extreme. At the end of a landing, tyre temperature may exceed 100°C whereas, shortly before, in the undercarriage well, the temperature was –45°C.

Airfield rubber removal, also known as runway rubber removal, uses high pressure water, abrasives, chemicals and/or other mechanical means to remove the rubber that builds up on airport runways. The Aviation Authority specifies friction levels for safe operation of aeroplanes and measures friction coefficients for the evaluation of appropriate friction levels. Individual airports incorporate rubber removal into their maintenance schedules based on the number of take-offs and landings at each airport.

The time it takes for the tyres to get up to speed is referred to as "spin up time". During this time the tyres are effectively dragging on the runway as well as being put under pressure by the weight of the aeroplane. The friction built up causes the rubber to polymerize and harden to the runway surface.

The build up of rubber affects the level of friction of the runway; this is most noticeable as a reduction in braking and ground handling performance. This can lead to incidents such as runway overruns or a lateral slide off the runway.

September 2008 Aerospace Professional and Aerospace International

We have received from London a small number of copies of the September 2008 issue of Aerospace Professional and Aerospace International. Members may recall that the majority of Division members did not receive this particular issue. If you would like to receive a copy, on a first-come, first-served basis, email Peter Brooks at www.petercbr@bigpond.net.au or phone at (02) 9523 4332.

747-8 Freighter

The Boeing Company has completed major assembly of the first set of wings for the 747-8 Freighter. The new 135-foot 3-inch (41.2 m) wings incorporate the latest aerodynamic technologies to fly farther and more efficiently. The advanced aerofoil provides improved overall performance and greater fuel capacity and efficiency. The Boeing 747-8 Freighter and Intercontinental are the new high-capacity 747s that offer airlines the lowest operating costs and best economics of any large passenger or freighter airplane, while providing enhanced environmental performance.

June Event

AIAA National Lecture

From Earth to Mars: Steps towards the first human mission to the red planet

Presenter:	Dr Pascal Lee
Date:	Monday 1st June 2009
Time:	6pm for a 6.30pm start
Cost/Registration:	Free – Everyone welcome! No registration req'd.
Venue:	Casey Plaza Lecture Theatre, Level 4, Building #10, Bowen Street RMIT University, Melbourne

Join Dr Pascal Lee for a fascinating insight into the cuttingedge technologies and exploration strategies being developed in preparation for the first human mission to the Red Planet. Find out about the what, why, when and how of exploring Mars.

Dr Pascal Lee is Chairman of the Mars Institute, a planetary scientist with the SETI Institute, and the Director of the Haughton-Mars Project at NASA Ames Research Center. He has worked extensively in the Arctic and Antarctica, viewed as “analogs” for the Moon and Mars. He first proposed the Cold Early Mars Model based on his geological field work in Earth’s polar regions. Dr Lee was recently scientist/pilot in the first field test of NASA’s new Lunar Electric Rover, a small pressurised rover concept currently under development for the return of humans to the Moon.

De Havilland

Geoffrey de Havilland, born in 1882, had a strong and enthusiastic interest in flying machines, but originally worked in London as a draftsman, a job that did not allow him to express his enthusiasm for airplanes. Fortunately, he had a wealthy grandfather, and he invested £1000 with young de Havilland for the design and construction of his first aeroplane.

De Havilland proceeded to build an engine, while Frank Hearle, the brother of his fiancée, helped to construct the aircraft. While its wing broke on take-off, a second aeroplane in 1910 was far more successful. It passed acceptance tests and became the first such aeroplane to be purchased by the British government.

De Havilland joined His Majesty's Balloon Factory in Farnborough in 1910 and set to work designing new aeroplanes. In 1914, only a month before the outbreak of World War I, he transferred to private industry and became chief designer at the Aircraft Manufacturing Company (Airco). There he achieved his first major success: the DH-4, a two-seat bomber that first flew in August 1916. Highly manoeuvrable and with a top speed of 230 km/hr, it could outfly most fighters. DH-4s carried the early U.S. airmail; some also carried passengers.

After 1918, the end of the war brought a sharp fall-off in demand for new aircraft. The assets of Airco plunged in value, and de Havilland bought the company. With Airco now in his hands, he renamed it the De Havilland Aircraft Company. Incorporated in September 1920, it overhauled existing aircraft while constructing a small number of new designs.

Good aircraft need good engines, and De Havilland was dissatisfied with those that were available. His longtime friend, the engine designer Frank Halford, modified a French motor and came up with one that was lighter in weight and simpler in design. The company then set up a strong in-house engine division. Its motors powered De Havilland's highly successful Moth family of aircraft. The first such aeroplane flew in 1925, ushering in a line that stayed in production through World War II. These included the Gipsy Moth that used Halford's Gipsy engine, the Giant Moth, Hawk Moth, Puss Moth, Swallow Moth, Tiger Moth, Fox Moth, Leopard Moth, and Hornet Moth. They served as private planes, trainers, and light airliners.

In 1934, De Havilland's Comet Racer won an air race that ran halfway around the world, from London to Melbourne, Australia. In an era when boxy biplanes still were common, the Comet showed a highly streamlined form that foreshadowed the speedy fighter aircraft of a decade later. All-aluminum designs had not yet become standard, and the Comet was built with plywood. De Havilland used the same construction in an early four-engine airliner, the Albatross. Drawing on this experience, the company proceeded to use plywood in crafting one of the outstanding aircraft of World War II: the Mosquito.

De Havilland also took the lead in building jets. The inventor Frank Whittle constructed an early jet engine prior to the war. In January 1941, the senior British aviation official Sir Henry Tizard asked Halford and De Havilland to design a new jet interceptor and a new engine. Halford simplified Whittle's design, crafting a successful engine called the Goblin. It powered the Vampire fighter, which first flew in September 1943. This led the company to build postwar jet fighters: the Venom and the Sea Vixen. In 1944, he built the DH-108, an experimental jet powered by a Goblin that was to break the sound barrier. One of them broke up in flight, killing the pilot — his son, Geoffrey, Jr. A DH-108 flew supersonically in September 1948. But by then America's Chuck Yeager had already done this in the rocket-powered X-1.

De Havilland built the world's first jet airliner: the Comet, named after the 1934 racing aeroplane. Orders poured in. But during 1954, two Comets broke up in midair. Investigation showed that this airliner was subject to a new and unanticipated type of structural weakness. All remaining Comets were withdrawn from service, with De Havilland launching a major effort to build a new version that would be both larger and stronger. This one, the Comet 4, enabled De Havilland to return to the skies in 1958. By then, though, it was too late. The United States had its Boeing 707 jetliner along with the Douglas DC-8, both of which were faster and less costly to operate. The Comet soon faded, as orders dried up. De Havilland returned to the airline world in 1962 with a three-engine jetliner, the Trident. Other airlines found it unattractive and turned to a rival tri-jet: the Boeing 727. De Havilland built only 117 Tridents, while Boeing went on to sell over 1,800 727s.

In 1959, De Havilland Aircraft merged with the firm of Hawker Siddeley Aviation, while the engine division became part of Bristol Siddeley. Sir Geoffrey died in 1965. He had pioneered from aviation's earliest days until well into the 1950s. But after the war, competing with the United States, he repeatedly fell short.

Comet

When boarding a commercial aircraft today, we are used to the speed and comfort standards. Only forty years back such standards were not at all common, commercial transport was performed with aircraft powered by piston engines and most aeroplanes were direct or indirect descendants from WW2 aircraft. Flying was made difficult by the bad weather at low cruising levels, the cruising speed was reduced making long trips a tough and exhausting business.

The development of jet-engines in WW2 allowed important milestones to be achieved in commercial air transport. One of them was the De Havilland DH 106 Comet.

De Havilland had the innovative spirit to build the first commercial jet aircraft. The DH Comet was a huge step into previously unknown territory. Never before had a commercial aircraft been designed for such a high cruise speed at such high altitudes. The engineers and designers who, at the time, had no computers and calculators, were facing totally new problems in relation to concepts, materials and production methods. Nearly all components of the new aircraft were designed in the De Havilland offices. Those were the engines, the landing gear, the seats and many other smaller components.

The DH Comet included many innovative techniques, it speeded up the development of new radars and modern radio technology, which became necessary to guarantee safe flight on board the Comet.

The fantastic initial success of the Comet was interrupted following two crashes that were caused by layout-faults. The reason for these problems was not a lack of qualification of the engineers who designed the Comet, it was the price which had to be paid for entering areas of the aviation which had not been realised before. These mainly involved long distance flights, a challenge when we remember that computers, calculators and other items that are commonplace nowadays did not exist at the time the Comet was designed.

The price De Havilland had to pay for its innovating spirit was high, but the positive and negative experiences of the introduction into service of the Comet helped to design the next generation of commercial airliners. Even today the Comet remains the origin of commercial airliners.

From a commercial point of view the Comet was a disaster for De Havilland. It lasted three years until a jet aircraft from another company overtook it. Sadly for De Havilland, the confidence of the airlines and passengers in the Comet had gone.

After having finished the investigations into the two major Comet crashes, the detailed design of the Comet 4 could be started. But the two year long investigation had allowed to the two US giants Douglas and Boeing to design respectively the DC-8 and B707, which had a significant technological lead. That is why the fate of the Comet is so similar to most other innovative developments; even if technically the Comet was a success it was a total financial disaster.

More than forty years ago the Comet impressed with its clean and elegant design, making it even nowadays a nice plane to observe. A military derivative of the Comet, the Nimrod, entered service in the RAF in 1973 and is still flying today.

Vortex Generators

If you look closely at the top of a jet airliners wings, you will probably find a row of small metal tabs standing about one inch tall, especially in front of the ailerons. These are vortex generators, which actually help the air follow the shape of the wing during flight by creating tiny whirlwinds over the wing.

When an aircraft flies at high angles of attack, the airflow over the wing can become detached, or it stops following the shape of the wing. When this happens, the lift produced by the wing will suddenly and rapidly decrease, and the wing is said to be stalled. When the flow separates from the wing, it usually means the air is moving too slowly, or there isn't enough energy in the flow to keep it moving. Since vortices are energetic, they can be used to put energy back into the flow to keep it moving in the desired direction. This is what vortex generators are designed to do. Vortex generators are simply small rectangular plates that jut above the wing surface. They look like tiny little wings jutting up perpendicular to the wing itself. As air moves past them, vortices are created off the tips of the generators. These vortices interact with the rest of the air moving over the wing to speed it up and help reduce the possibility of separation.

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PO Box 6229,
St Kilda Road Central,
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melbournebranch@raes.org.au
(Aust. Division)
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Retirement of the DHC-4 Caribou

The Minister for Defence, the Hon. Joel Fitzgibbon MP, announced the Government has accepted the reality that it will be necessary to bring forward the retirement of Australia's remaining thirteen DHC-4 Caribou aircraft to December 2009.

After 45 years of tireless and distinguished service with the Royal Australian Air Force, the Caribou fleet is suffering badly from a range of ageing aircraft issues. The RAAF took delivery of its first Caribou in April 1964. The Caribou has a proud 45-year history of supporting Australian Defence Force operations, throughout the South West Pacific and in South East Asia, including active service in Vietnam, humanitarian relief in Kashmir, Cambodia and Papua New Guinea and also in support of peacekeeping operations in the Solomon Islands and East Timor.

Despite its outstanding track record, the Caribou is now well beyond its sustainable life of type. The Caribou fleet suffers from corrosion, fatigue and issues that make them increasingly difficult and costly to maintain. The Air Force is struggling to achieve four to five serviceable aircraft at any one time.

Project Air 8000 Phase 2 plans to deliver a Tactical Battlefield Airlift capability for the RAAF to replace the Caribou in 2013. As an interim measure, a leased fleet of five additional Hawker Pacific B300 King Air aircraft will undertake light air transport tasks. These aircraft will be phased into the Townsville-based 38 Squadron as the Caribou is progressively retired towards the end of 2009. The King Air is a modern aircraft with digital avionics, advanced displays and navigation systems and turbine engines, that will assist in transitioning 38 Squadron aircrew and technicians to the more modern aircraft types being considered under Project Air 8000 Phase 2.

Upcoming Events

Planned future events include:

- 13 July - ATSB
- Gippsland Aeronautics
- Careers Expo
- First flights in Australia

Details of the program for 2009 will be provided once events become finalised. Visit our website for up to the minute details at http://www.raes.org.au/~raesorga/melbourne-branch/

The branch welcomes any suggestions or ideas for future events/lectures.

Super speed travelling

The US space agency, NASA, has successfully tested an 8,000 kph jet, the x-43A, which would allow you to fly from the UK to Australia in two hours.

Plans for a Cosmoplane, the successor to the Concorde, are underway with a projected launch date of 2024. The craft, which is being developed in Russia, is intended to take off and land like a normal aeroplane but act like a spacecraft while in the air, reaching an altitude of 200 kilometers.

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