

From the editor

Hello All,

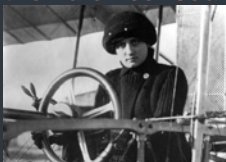
Please note the venue for the October Event has been changed and will now be held at the BAE Systems Australia office at Level 6, 277 William St, Melbourne. BAE Systems is Australia's largest defence company and delivers advanced military through-life support air capability to the Australian Defence Force by providing systems integration and sustainment solutions to Australia's current and future military air platforms. We thank BAE Systems for providing us the venue for this unique and insightful lecture into Boeing's Long-Range Commercial Jetliners, that will provide a great talking point amongst all.

Don't forget to register for the 2009 Lawrence Hargrave lecture and dinner to be held next month using the form attached. The CEO of Qantas, Alan Joyce, is our distinguished lecturer for this event which is not to be missed! The Hargrave lecture will attract a wide variety of people from the aviation industry making this a great networking opportunity! Hope to see you all there!

Best Regards,

Karen Trezise
Newsletter Editor

First female licensed pilot



Elise Deroche (also known as Baroness Raymonde de la Roche) became the first licensed female pilot in the world when she gained her ticket from the Aero Club of France. In 1909, while the Baroness Raymonde de la Roche was dining with Charles Voisin, he suggested that she learn to fly an airplane. She was taught by Voisin himself and gained the first pilot's licence awarded to a woman. In the same year, as the only female participant in the Air-Meet at Reims, she was seriously injured in a crash. After a lengthy recovery, she went on to win the Femina Cup for a non-stop flight of 4 hours. In 1919, the Baroness set a women's altitude record of 15,700 ft. In the summer of 1919, de la Roche, who was also a talented engineer, reported to the airfield at Le Crotoy to co-pilot a new aircraft in hopes of becoming the first female test pilot. Unfortunately, the aircraft went into a dive on its landing approach and both the Baroness and the pilot were killed. Millicent Bryant was Australia's first woman to gain a pilot's licence on 28 March 1927.



October Event Connecting the World: Boeing's Long-Range Commercial Jetliners

Presenter: John Roundhill,
Former Vice President of Product Development and Strategy, Boeing Commercial
When: Tuesday 20th October 2009
Time: 6.00pm for a 6.30pm start
Where: BAE Systems Australia, Level 6, 277 William St, Melbourne
(next to Flagstaff Station, near corner LaTrobe and William St)
Free - everyone welcome! No registration required.

Since retiring in 2002, John Roundhill has continued to support Boeing by providing product development consulting for various Boeing programs including the 747-8, 787 and other new airplane programs. From 1997 until 2002, Mr. Roundhill served as Vice-President of Product Strategy and Development, including product development, enabling technologies, the Airplane Creation Process Strategy Team and research coordination. Out of this work, came the Sonic Cruiser concept and the 787 Dreamliner. Prior to this assignment, he was director of Engineering for the 737/757 programs.

Since the entry into service of the 707 by QANTAS in 1959, Boeing long-range commercial jetliners have been literally connecting the world. Mr. Roundhill will speak about the technological progress in weight, airplane drag and engine efficiencies that are the underpinnings of the remarkable improvements in range capability, environmental performance and economic efficiency over the past 50 years. A relatively detailed look at the enduring 747 (including the derivative 747-8), the popular 777 family and the all-new 787 Dreamliner will be included, with some consideration of future trends in commercial jet aviation.

Next Month - November Event

2009 Hargrave Lecture and Dinner
Driving innovation – Qantas and the aviation future

Exploring the role that innovation has played in the continuing success of Qantas, and outlining how.

Presenter: Mr Alan Joyce,
CEO and Managing Director, Qantas
When: Wednesday 4th November 2009
Time: 6.00pm for a 6.30pm start
Where: RACV Club, 501 Bourke St, Melbourne
Registration: See registration form on [page 3](#).

Don't miss out! Register now!

this issue

October Event – Boeing's Long Range Commercial Jetliners
2009 Lawrence Hargrave Lecture & Dinner – Reservation form
First female licensed pilot
Join the RAeS – the benefits are enormous!
Minimizing Weight – GLARE
Nature solves engineering problems – Nano Air Vehicles
Why rotary engines?
Upcoming Events / Websites of interest

Join the RAeS

the benefits are enormous!

We thoroughly encourage people who are not members of the RAeS to join the Society.

Membership of the Society gives you worldwide professional recognition and the right to use post-nominal designations at the appropriate grades.

Aerospace International is the Society's monthly magazine packed with in-depth news, topical articles, conference reports, and is delivered to all members *free of charge*.

Valuable Professional Development is derived from the Society's international Conference and Lecture Program. The Society attracts high profile delegates and speakers from a wide range of backgrounds – industry, government and academia, in both civil and military arenas.

The Society provides numerous opportunities for networking and exchange of views with other like-minded professionals.

NOTE that if you join the society *now*, the membership rate is 50% of the annual rate! Visit <http://raes.org.au/become-a-member/> to download an application form today.

Nature solves engineering problems - Nano Air Vehicles

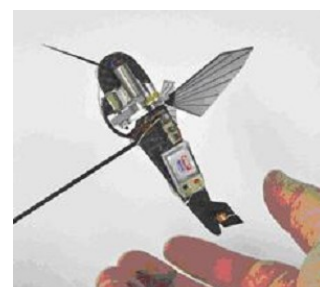
One of the smallest ever self-powered, rudderless aircraft to hover and climb with flapping wings has taken off at aerospace firm AeroVironment (AV) in California. The Nano Air Vehicle (NAV) is modelled after a large insect or small bird, such as a hummingbird. It can hover indoors under radio control and without wires. It is reported to be capable of climbing and descending vertically, flying sideways left and right, as well as forward and backward.

The NAV carries its own power supply and operates by using two flapping wings, which also function as the rudder, elevators, ailerons and engine. AV has reported it was an extremely complicated and technical challenge to come up with ways to control an aircraft with two flapping wings, but this is the closest anyone has come to a rudderless, flapping aircraft.

The aerospace company is tight-lipped about the exact mechanics of the wings, citing its confidentiality agreement with the Defense Advanced Research Projects Agency (DARPA), the project's sponsor. At present, the flying object can hover for only 20 seconds and has limited maneuverability, but AV is on the right track to create a new class of vehicle systems that employ biological mimicry at an extremely small scale that can provide for new reconnaissance and surveillance capabilities in urban environments.

DARPA recently awarded AV with an extended contract for accomplishing their latest technical milestone, citing the NAV program will push the limits of aerodynamic and power conversion efficiency, endurance, and maneuverability for very small, flapping wing air vehicle systems. DARPA wants a 10-gram aircraft with a 7.5-centimeter wingspan that can explore caves and other hiding places, relaying GPS data and images to base. The requirements stating it will need to fly at 10 metres per second and withstand 2.5-metre-per-second gusts of wind.

The micro-ornithopter/robot-insect concept has plenty of precedents in science fiction, and is another example of engineers borrowing from nature to solve engineering problems.



Minimising Weight

GLARE

The A380, the largest passenger airliner, minimised the unladen weight by incorporating a range of new materials. Carbon fibre-reinforced plastic is used for the central box of the wings, the horizontal stabilisers, the fin, the rear fuselage section and for ceiling beams. A new material, Glare (Glass Reinforced Aluminium), that is highly resistant to fatigue, is used in the construction of the panels for the upper fuselage (not used on centre fuselage sections because of high shear loads). The aluminium and fibreglass layers of Glare do not allow propagation of cracks; it is much lighter than conventional materials and represents a weight saving of about 500kg in the construction.

Glare consists of alternating layers of thin aluminium alloy sheets (0.38mm) and prepreg made of strong glass fibres and epoxy adhesive. The material was developed jointly with the Delft University of Technology and the National Aerospace Laboratory in the Netherlands. Thanks to its unique combination of the best properties of metals and composites, the material is lighter (by up to 25%) and stronger than aluminium, offers higher resistance to corrosion, fire and impact resistance properties and excellent fatigue properties since each fibreglass layer functions as a crackstopper.

The current A380 configuration uses aluminium stringers riveted to Glare skins, but the use of Glare stringers and buttstraps is also being evaluated. The future applications of Glare are abundant and there is the potential for additional weight reduction as the material's properties are refined. Glare has also been used in manufacturing of the cargo doors of the latest models of the C-17 Globemaster III.

The Melbourne Branch of the Royal Aeronautical Society presents

2009 Hargrave Lecture and Dinner

Driving Innovation: Qantas and the aviation future

Exploring the role that innovation has played in the continuing success of Qantas, and outlining how the Group plans to drive innovation to achieve long term, sustainable success.

Presented by

Mr Alan Joyce

Chief Executive Officer — Qantas Airways Ltd



Wednesday 4 November 2009

6pm for a 6.30pm start

RACV Club, 501 Bourke Street, Melbourne

About Mr Alan Joyce



Alan Joyce was appointed Chief Executive Officer and Managing Director of Qantas on 28 November 2008. He is a former Director of Orangestar Investment Holdings Pte Limited (holding company of Singapore-based Jetstar Asia and Valuair) and Jetstar Pacific Airlines Aviation Joint Stock Company (in Vietnam). Mr Joyce previously served as Chief Executive Officer of Jetstar for five years from October 2003, a period that included the commencement of the airline's domestic and international operations. Prior to his appointment at Jetstar, Mr Joyce spent over 15 years in leadership positions for full service carriers Qantas, Ansett and Aer Lingus. At both Qantas and Ansett, he led the Network Planning, Schedules Planning and Network Strategy functions. Mr Joyce holds a Bachelor of Science in Applied Science (Physics and Mathematics) (Honours) and a Master of Science in Management Science. He is also a Fellow of the Royal Aeronautical Society.

Dinner Reservation and

Payment Slip

**Hargrave Lecture and Dinner
4 November 2009**

\$ 75 RAeS members
\$ 120 non members
\$ 50 full-time students
(incl. GST)

Name: _____

Email: _____ Ph. _____

Amount: \$ _____ RAeS membership number: _____

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(Global Website)

<http://www.aerosociety.com>

* Opinions expressed in this newsletter do not necessarily represent those of RAeS, the Melbourne Branch or the Editor.

Websites of interest

The Defense Sciences Office identifies and advances radically new technologies that promise to revolutionize military capabilities:

<http://www.darpa.mil/dso/thrusts/index.htm>

New Zealand restoration and manufacturing of WW1 aircraft, engines and propellers to the same standard they were over 90 years ago:

<http://thevintageaviator.co.nz/>

Forthcoming Events

Planned future events to make a note of:

Gippsland Aeronautics *The development of the GA-200 agricultural, GA8 utility and the ex-GAF Nomad aircraft*

Keith Mans – December
(recently retired RAeS CEO)

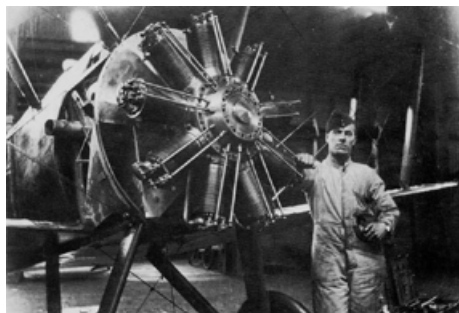
Details of the program provided once events are finalised. Visit our website for further details.

Why rotary engines?

Why did engineers construct an engine that seems so illogical by today's standards? Considering that powered flight had only begun a decade before WW1 and practical powered flight only in 1909, it becomes clear that a lot of inventive ideas were being tried at the time. The first aircraft engines were adaptations of motor vehicle engines, where weight was not a major consideration; liquid-cooled V-8 aircraft engines by Curtiss, and by Renault were heavy and unreliable. For the fighter aircraft designer, it was imperative to have an engine with high power for the lowest possible weight. The Rotary engine was able to meet these demands and weighed less than inline engines.

Rotary engines were commonly used to power single-engined aircraft between 1913 and 1920. During the 1920s, they became obsolete as other types, especially radials, achieved better power to weight ratios and were easier to manage during flight. Rotary engines were built 'backward'. Where a normal engine has its crank case bolted to the aeroplane and the propeller attached to its crankshaft, the rotary had its crankshaft attached to the aeroplane and the propeller bolted to the crank case. The whole engine spun with the propeller. Rotaries were much lighter for their power output than other types of aero engines and could turn a very large propeller at fairly slow speeds (1300 rpm was a typical maximum engine speed). This was beneficial because a large, slow turning prop is very efficient. By contrast, most large inline and radial engines had to be geared down to match the engine to the most efficient propeller and this required a heavy gear box. The low RPM resulted in large pulsations from each power stroke. One method of damping this out was to use a flywheel. However, in the Rotary, the rotating cylinders and propeller acted as a flywheel, thus saving weight. Another advantage of the Rotary design was that the cylinders were cooled by the passing airflow even when the aircraft was stationary. With the state of the development of engines at this time, it was difficult to find metals that would not distort with the heat required for high power engines. An additional benefit was that rotaries are almost vibration-free in operation; they are the smoothest of all piston engines. The consequence of fixing the crankshaft to the airframe is that the pistons do not move in relation to the airframe while the rest of the engine just rotates. As a result, there are no oscillating motions within the engine and so very little vibration is generated. The favourable power-to-weight ratio of the rotaries was their greatest advantage. While larger, heavier aircraft relied almost exclusively on conventional in-line engines, many fighter aircraft designers preferred rotaries right up to the end of the war.

Rotaries had a number of disadvantages, notably very high fuel consumption (partially because the engine was typically run at full throttle) and also because the valve timing was often less than ideal. The rotating mass of the engine also made it, in effect, a large gyroscope. During level flight, the effect was not especially apparent, however under turning it was far more pronounced. Due to the direction of the force, left-turns required some degree of effort and happened relatively slowly, combined with a tendency to nose-up, while right-turns were almost instantaneous, with a tendency for the nose to drop. In some aircraft, this could be advantageous in situations such as dogfights, while the Sopwith Camel suffered to such an extent that it required left rudder for both left and right turns and could be extremely hazardous if full power was used over the top of a loop at low airspeeds. Trainee Camel pilots were warned to attempt their first hard right turns only at altitudes above 1,000ft (300m).



Melbourne Branch of the Royal Aeronautical Society

October 2009

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