THE MOSQUITO AIRCRAFT ASSOCIATION OF AUSTRALIA

# The Aussie Mossie

NUMBER 37

SEPTEMBER 2003

# The President's Log—by Alan Middleton

Welcome to another edition of the Bulletin, I would ask you to read the President's report enclosed which is the one I presented to the Annual General Meeting as I would only repeat myself here.

Regards Alan.

# Annual General Meeting

The Eleventh AGM was held on 16th August 2003 in the Boardroom at the Caulfield Returned & Services League Club, Elsternwick, Victoria.

Seventeen people attended including MAAA members, a representative from the RAAF Museum and several guests.

The Minutes and Reports are included with this Bulletin for you to view.

# The New Navigator — Brett Clowes

***Member Terry Burke interviewed the new A52-600 restoration Project Manager—Brett Clowes, providing an insight into what makes Brett tick and how the restoration will progress.***

Brett Clowes is Project Manager of the RAAF Museum's Mosquito restoration; and the star of the show is an English-built De Havilland DH 98 Mosquito, photo-reconnaissance type PR Mark XVI, RAAF registration A52-600. Brett's a project leader in his late thirties who solves dozens of brand new problems each day at work and is busier than a one armed paper hanger! In other words he's exactly the right man for this job. So where's the project at the moment? Here are some of Brett's comments taken from a couple of recent conversations.

Right below the public-access catwalk in the Restoration Hangar, the tailplane's taking shape on a specially constructed jig, .. . . , which allows us to rebuild it to its original specifications maintaining precise dimensions and the alignment of various attachment fittings.  The aircraft's actual structure is the visible tip of an iceberg.  That jig's part of the iceberg; over time, we've acquired sets of drawings not just of the aircraft itself but also for the jigs, fixtures and tooling aids on which the original aircraft were built. So the horizontal stabiliser jig is the first of many heavy fabrications we will need to construct during the restoration of the Mosquito. Additionally, adapting the workshop for aircraft woodworking is absorbing a lot of energy. We purchased dozens of different clamps to hold the glued joints together, then found we needed trolleys to keep them readily available as and when we need them. The list goes on and on; we'll need shadow boards for special woodworking tools we are acquiring, more racks for hundreds more clamps, and so on.

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Evidence has been found that William Tell and his family were avid bowlers. However, all the league records were unfortunately destroyed in a fire. Thus we'll never know for whom the Tells bowled.

# The New Navigator — Brett Clowes—cont'd

*(Continued from page 2)*

Why did we start on the tailplane? Basically, because this is a bite-sized chunk of the project that's reasonably compact. We know we have a lot to learn, and we'll do better with a simpler section to learn on-the-job. We'd normally start with the fuselage, because it then becomes a convenient storage space on which to hang everything else once it's completed. Starting on the tailplane brought us face to face with one of those "chicken or the egg" sorts of puzzles, too. Our Restoration and Conservation Policies require us to restore the aircraft using as much of the original structure as possible, to either an airworthy condition or as near to it as possible. The restoration policy goes on to stipulate that the restoration should be good for a hundred years (or preferably indefinitely) when hangared and displayed with due care.

The biggest problem with the structure of A52-600 is the original glued joints. After early problems with casein glue Mosquito production moved to using a then relatively new synthetic resin glue, urea formaldehyde. Urea-formaldehyde resins became a significant factor in the design of the 'Wooden Wonder', a period documentary describing it as "a cement that will last forever". Unfortunately this is not true, with time urea formaldehyde crystallises and looses most of its adhesive qualities and this is accelerated by exposure to hot humid conditions. Testing of samples taken from A52-600 by DSTO confirmed that we were dealing with urea formaldehyde. At almost sixty years of age, most of the glued joints are no longer structurally sound and can be separated with finger pressure. Sure, there were still brass screws and nails holding things together, but these were suffering zinc depletion in many cases, leaving only a honeycomb of copper to do the job. Incidentally, I'd love a spruce plank for every hour I spent trying to source the correct quality, quantity, size etc. countersunk head slotted brass wood screws! (But he got there! Ed.).

Brett pondering over one of the many drawings.

Back to the tailplane. The original certainly looked fine, but knowing the glued joints were structurally unsound, we took it apart and removed the faces off the spars. The joints in the spar booms laminations were in fact OK (laminating used a different process), but there were small areas of localised rot around some of the boltholes. We also found that some of the plywood rib webs had become brittle and in some cases delaminated. An inspection of the fuselage showed that it is suffering from the same problems.

To restore A52-600's structure to airworthy condition would therefore require complete replacement of all timber and plywood, losing much of the aircraft's originality in the process. It is worth noting here that as much as we'd all love to see it fly, Museum policy precludes considering an original aircraft for flying unless the Museum holds a second example. As a consequence, the decision was made to restore A52-600 using as much original material as possible and still be structurally sound.

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A man rushed into the doctor's office and shouted, "Doctor! I think I'm shrinking!"

The doctor calmly responded, "Now, settle down. You'll just have to be a little patient."

# The New Navigator — Brett Clowes—cont'd

On the whole, we work to manufacturers standards, and when making or repairing parts we use material to the original specifications or if it is no longer available, the closest modern equivalent. The exception to this is when original materials are unacceptable as they lack longevity, have safety issues etc. A perfect example of this is the glue. Repairing the aeroplane with urea formaldehyde would obviously be a foolish thing to do, so when we're re-gluing components we use a more reliable adhesive. No, we don't use the modern PVA-type (white) glues. These have some issues with cold creep, water resistance and so on. 'Cold creep' means that a joint, under constant load and over a period of time, may well move. The so called 'yellow' wood glues are an improvement but have very short open joint times (the open joint time is how long you have after spreading glue on two parts before you must bring them together and 'close' the joint).

Modern epoxies have proven very durable. We're using the West system epoxy glues originally developed in the early seventies for building and repairing wooden watercraft. The marine environment is very demanding and thirty years of commercial success gives us great confidence in it. It is also easy to use. We stabilise the small areas of local rot with a wood-densifying epoxy, which incorporates a fungicide. No, it's not an airworthy fix, but as mentioned before it fits the intent of our policy. The structure of the tailplane will certainly look as good as new, and just so everyone can admire all this work the Director has decreed that we will cover the top of the right hand side with clear acrylic sheet in lieu of the plywood.

Yes, the learning curve has been steep. We're combining modern and traditional techniques, for instance using a modern router to cut traditional 1:20 scarf joints in the plywood tailplane skins. Our new thicknesser is another case in point: we need to get the thickness of various structural timber members accurate to a tolerance of plus or minus five thousandths of an inch. Doesn't sound too hard? That's one quarter the thickness of an old-style razor blade! Try getting a cabinetmaker to work to those tolerances! We're having to establish our own techniques and procedures; as we come to a problem, we'd rather pause the restoration process to get the fundamentals right. This may be something as simple as a make-up table, a work stand or whatever. If we get these procedures nailed now, we'll be quids in when we get to the larger, more complex structures (like fuselage and wings). So, we're proving the wood-working capabilities of the shop on the tailplane first. And the further we go, the further our admiration for the people who designed and built these ships originally grows too. They had a few more workers, though!

**Author: Terry Burke preparing a propeller stand for one of A52-600's Merlins**

We're a small and tight-knit group, often on deck on weekends as well as 'normal' workdays. We do get to take some time off at other times, of course. Alongside me, volunteers Geoff Matthews Snr and Ron Gretton, are just about full time on the restoration, with Technical Curator David Jones keeping an eye on things and lending a hand when needed. Brett Redway (B2) helps out whenever possible. Bear in mind

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A sceptical anthropologist was cataloguing South American folk remedies with the assistance of a tribal brujo who indicated that the leaves of a particular fern were a sure cure for any case of constipation. When the anthropologist expressed his doubts, the brujo looked him in the eye and said, "Let me tell you, with fronds like these, who needs enemas?"

# Building Aussie Mossies

## MANUFACTURE OF MOSQUITO AIRCRAFT DURING WORLD WAR 2 FOR SERVICE IN NEW GUINEA.

By Arthur S Edwards FIE Aust, AACE, CCE Emeritus.
A member of the original engineering team charged with getting this remarkable aircraft into production and into service.

*ABSTRACT:*

During WW2, various fighter aircraft were available to the Allies, in Europe the best known were the Spitfire and the Hurricane, and in the South West Pacific it was the Kitty Hawk and the Beaufighter.

Then a new Aircraft in the form of the De Havilland Mosquito, a twin engined all timber (except for the engines which were Rolls Royce Merlins) aircraft capable of being used as a bomber or a fighter came into service in Europe.

*INTRODUCTION:*

**With a top speed of over 400 mph and a ceiling in excess of 35,000 ft, no German fighter could get near it. In Europe, it operated with near impunity making two bombing raids over Berlin each night with change of crew and with an overall loss rate of 0.65% as compared to the Lancaster's minimum 20% loss rate often as high as one in two.**

It was against this background that General Macarthur SPCSWPA – (Supreme Commander South West Pacific Area) took over the defence of Australia at the request of our Prime Minister John Curtin in 1942. Macarthur decided he wanted an aircraft, which could climb much faster than the two at his disposal to intercept the Japanese.

Thus the order was given to put the Mosquito into production in Australia and to give it the necessary authority Macarthur gave the project No2 priority Aircraft Production.

*Note 1: Aircraft statistics and service Ref: The Hardest Victory Denis Richards 1994 RAF Bomber Command in the Second World War Chpt.24 Retrospect Page 294.*

In early 1942 the decision was taken to put the Mosquito aircraft into production in Australia. The author was flat out studying a compressed engineering course at the Sydney College of Engineering at the direction of the manpower authority, not known at this stage to be posted to the newly set up Engineering Team being formed for this purpose upon successful completion. I was determined to do well.

*Note 2: I will rely on the following ref for early sequence of events: Mosquito Monograph David Vincent A History of Mosquitoes in Australia and RAAF Operations. Chap 1 page 7. " At the inaugural Meeting of the Aircraft Advisory Committee, held on 13 January 1942 'it was noted that the company had despatched two of its officers abroad at its own expense to investigate production'.*

*At the seventh meeting of the Committee Mr David McVey, Secretary Department of Aircraft Production, advised that on the 23 February he had sent a memorandum to the Department of Air 'stressing the view that no time should be lost in making arrangements for the construction of these aircraft'*

Thus the project was underway, albeit subject to many delays and did not for all practical purposes get under way until the second half of 1942.

However, this enabled time to set up an Engineering Production Office in the De Havilland offices on the corner of Missenden Road and Parramatta Road, Camperdown, Sydney NSW. This office comprised of engineers, some in RAAF Officer uniform and some civilian, one specialist mathematician, draftsmen in RAAF uniform, sergeants rank and two female tracers for tracing master plans onto linen, and end of Nov 1942 junior engineers fresh from College, total 66 men under the control of Chief Engineer Ray James.

In addition, two complete sets of parts sufficient to assemble two complete aircraft were ordered from England, but as this was a time of maximum activity by German U Boats, a goodly number of these parts, which were to be used as templates for jigs and fixtures, were lost at sea necessitating local design to fill the gaps.

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Back in the 1800's the Tates Watch Company of Massachusetts wanted to produce other products and, since they already made the cases for pocket watches, decided to market compasses for the pioneers travelling west. It turned out that although their watches were of finest quality, their compasses were so bad that people often ended up in Canada or Mexico rather than California. This, of course, is the origin of the expression; "He who has a Tates is lost!"

# Building Aussie Mossies—contd

*(Continued from page 5)*

My initial duties involved design of jigs and fixtures for production of parts and the design of simple connections lost at sea. Then I was provided with a Standard 10 motor vehicle and instructed to visit the subcontractors, fuselages at Beales the piano people at Camperdown, wings all in one piece at General Motors Holden at Pagewood, tail assemblies at Butler Air Transport at Mascot – full assembly of complete aircraft on two production lines at Bankstown Aerodrome.

*Note 3: At the next meeting held the following week Mr McVey stated that, in anticipation of the project being proceeded with, approval had been given ---- that the necessary fuselage jigs, spar glue presses, spar assembly jigs and main wing assembly jigs be ordered immediately. "The Air Staff had advised that they were satisfied with the operational characteristics of the DH 98 but -------- felt that any planning for the manufacture of this type of aircraft should not proceed until there was some assurance of the likelihood of complete satisfactory manufacture. In the light of the subsequent history of Mosquito production in Australia, this was a very farsighted statement, however at this time it was based solely on a comment made by the Air Ministry, which implied structural weaknesses in the aircraft in tropical conditions --- failure of the wing main spar. Mosquito Monograph David Vincent.*

Nevertheless, production proceeded. The first six aircraft crashed, four over Bankstown failing to pull out of a dive (wing broke off) and two collided over Stanmore killing RAAF test pilots. De Havilland head office in England claimed inferior workmanship by Australians on the wing spar, which was all in one piece from wingtip to wingtip, and laminated for strength, however as it turned out unsuitable design for tropical conditions was the cause. Engineers/ mathematicians redesigned the wing spar locally and no more problems arose.

Production continued throughout 1943, 1944 and 1945 until sufficient aircraft were produced for active service and to equip all OTUs in Australia (Williamtown etc. were fully equipped after the war).

Some unpleasantness arose within the team – civilian personnel were required to work from 8am to 6pm six days/week, whereas RAAF personnel worked 9am to 5pm before returning to base. This made me determined to join RAAF Aircrew when I turned 18 in June 1943, however the manpower authorities refused a release and that put an end to that after a second visit to Woolloomooloo RAAF recruiting centre – I tried to enlist as a Navigator, however after passing the medical I was graded for pilot training, but all came to naught.

Occasionally, I would return to my home town on a Saturday night via one of two expresses, the Melbourne Express or the Riverina Express, alighting on the wrong side of the tracks at Cootamundra at about midnight and walking across to a little goods train which terminated in Temora, going to sleep and waking up next morning and walking home. As I had no money (my salary was two pounds fifteen shillings per week of which two pounds went on board & lodging, six shillings on a weekly train ticket and the balance on personal sustenance and entertainment) so it was necessary to hide up on a rack in the centre of the carriage and hope to not get caught by the conductor.

Returning on Sunday night to Sydney by dogbox mail train, sometimes cuddling up to buxom country girls who boarded the train at Harden, Murrimbah or other station, cuddling up under a blanket.

I made one of these trips straight after my 17$^{th}$ birthday to go to the local police station and apply for a driver's licence (I had been driving Dad's car and wheat trucks since age 12 and the local sergeant knew me) Asked what I wanted, I said "I would like a driver's licence please" The sergeant typed out the particulars and said "that will be ten shillings please" and so I became a licensed driver.

How this relates to the Mosquito production is as follows: After the main assembly jigs had been in use for some time, guide holes began to elongate with wear making for difficult assembly on line, and other faults developed, so as I was the youngest member of the team with engineering training and a driver's licence, I was made an inspector responsible for visiting the subcontractors and ensuring that timely repairs were made to the Jigs and other equipment to ensure their continued serviceability, this included the main assembly lines at Bankstown aerodrome.

Inspection duties together with some design of Jigs and Fixtures, basic bits and pieces became the pattern of my service throughout 1943, 1944 and 1945. Occasionally, I would move away from my desk to talk to one of the other Junior Engineers and in no time Ray would be on my back. Eventually I decided to front him in his office

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A thief broke into the local Constabulary and stole all the lavatory equipment.

A spokesperson was quoted as saying, "We have absolutely nothing to go on."

# Volunteer Profile

### LINDSAY COLLINS

Joined the Reserve in 1940 and called up in 1941. Initial training in Tiger Moths at Benalla then Wirraways at Point Cook and Forest Hill – Wagga and Fairey Battles at Evans Head. At Maryborough in Queensland did Wireless Operator and Air Gunner courses in Wacketts.

Instructed with CFS at Tamworth and also at Naranderra. Then Tamworth again to commence Service Training before moving to Point Cook and Malalla training on Ansons and Oxfords.

Operational Training commenced at East Sale on Beauforts then moved to Mosquitos at Williamtown and was a founding member of 94 Squadron at Castlereigh in NSW.

Lindsay has about 80 hours on Mosquitoes and finished his service as Flight Leiutenant.

Lindsay and John going through the painstaking effort of identifying some of the small components from Mosquito A52-600.

### JOHN COLLINS
### (no relation)

Served from 1943 to 1946 with initial training at Somers and Ballarat. Trained as Navigator at Mt Gambier. Completed other courses in Aviation Medicine, and Armaments and Weapons.

Shipped to Monkton Newfoundland Canada for Mosquito training and then to England with 2nd TAF just as the war ended.

John has about 80 hours also in Mosquitoes and finished as Warrant Officer.

# Building Aussie Mossies—contd

*(Continued from page 6)*
and ask why he was riding me? He replied, "You are the only one worth worrying about – one of these days you will make a damn fine engineer". We missed the end Pacific War celebrations, as we were hard at work building Mosquitos to equip OTUs throughout Australia, which extended into 1946. A total of 230 aircraft were built.

*Note 4: for a history of individual Mosquitos, which saw active service with the RAAF ref: MOSQUITO MONOGRAPH by David Vincent. Available from The Australian War Memorial Library Canberra ACT.*

After the team disbanded, Ray James became Chief Engineer for Nestlé's Post War Reconstruction program and he rang me up and offered me a job, which I happily accepted. Among other duties I handled all the calculus problems relating to the design of the machinery where there were two or more variables in the Equation.

***Arthur S Edwards 2003-03-23***

An Indian chief was feeling very sick, so he summoned the medicine man. After a brief examination, the medicine man took out a long, thin strip of elk hide and gave it to the chief, instructing him to bite off, chew and swallow one inch of the leather every day. After a month, the medicine man returned to see how the chief was feeling. The chief shrugged and said, "The thong is ended, but the malady lingers on."

# The New Navigator — Brett Clowes—cont'd

*(Continued from page 4)*

that we're all required at various times to support the interactive (flying) displays, keep the maintenance of the Museum's fleet up-to-date, security duties, work front-of-house in the shop, give impromptu speeches or explanations to visitors, and so on. Small workforce, big job!

The tailplane would not dare move during restoration — in this slightly over-engineered jig.

Let's not undersell the volunteers from the Mossie Association and the Friends of the RAAF Museum. Without their input, we'd have much further to go than we do at present; the ground work put in to get our drawings catalogued, data bases established, through to engine stand modifications and simple but necessary chores like sorting out what hardware we have and what we still need all take a load off the full-timers' shoulders.


The tailplane is now ready to have its skin reattached.

There is no 'them and us' division; the volunteers are simply part of the team.

What's next? Well as you've just heard we do have a bit on our plate at the moment! However the short-term goals are simple and achievable; complete the tailplane (re-skinned, ready to re-assemble to the fuselage), do the same job on the fin, and have both finished by the end of this year. Next, start on the fuselage itself. Then the fun really starts……

A famous Viking explorer returned home from a voyage and found his name missing from the town register. His wife insisted on complaining to the local civic official who apologized profusely saying, "I must have taken Leif off my census."

# Air Accidents Investigation Report on RR299

This is a précis of the Investigation Branch Report into the crash of Mosquito RR299 in 1996.
If you would like the entire report please email or write to the editor requesting a full copy.

AAIB Bulletin No: 6/97 Ref: EW/C96/7/9 Category: 1.1
Aircraft Type and Registration: De Havilland DH98 Mosquito T3, G-ASKH
No & Type of Engines: Rolls Royce Merlins: left; Mk 25, right; Mk 502
Year of Manufacture: 1945
Date & Time (UTC): 21 July 1996 at 1201 hrs
Location: Near Barton Airfield, Manchester
Type of Flight: Air Display
Persons on Board: Crew - 1 - Passengers - 1
Injuries: Crew - Fatal - Passengers - Fatal
Nature of Damage: Aircraft destroyed
Commander's Licence: Airline Transport Pilot's Licence
Commander's Age: 50 years
Commander's Flying Experience: 10,395 hours (of which 72 were on type)
Last 90 days - 118 hours
Last 28 days - 74 hours
Information Source: AAIB Field Investigation

### *History of the flight*

On 17 July the aircraft took on 275 gallons of Avgas at RAF Valley before returning to its base at Hawarden Airfield. It did not fly again until the day of the accident. It was defuelled to approximately 160 gallons on 19 July to bring the weight down to a level appropriate to display flying.

The aircraft left Hawarden at 1130 hrs on 21 July and flew to Barton Airfield where, after a short period holding off, the pilot started his display routine at 1156 hrs. The main display axis was along Runway 09/27. The routine consisted of a series of non-aerobatic manoeuvres such as climbs, descents, medium turns, level flight at 220 to 240 kt along the display axis not below 100 feet agl and 'wingovers'; the latter is a manoeuvre which involves the aircraft reversing its course by climbing and rolling to the left or right. The weather was fine, the surface wind was generally from the south at 9 kt and the temperature was 26°C; the wind at 2,000 feet was 240°/10 kt. The display was nearing its conclusion with a fly past along the display axis from east to west followed by a steep climb into a 'wingover' to the right during which control of the aircraft was lost. The aircraft was then observed to complete a number of uncontrolled manoeuvres before control appeared to have been regained, but at too low a height to prevent impact with the ground.

### *Accident site details*

The aircraft crashed into a small, dense wood approximately one mile west of the airfield. There had been an impact fireball, with burning wreckage being scattered throughout the wood and into a potato field beyond. The wreckage trail extended approximately 80 metres from the point of impact.

The wood consisted predominantly of oak and birch trees, with dense undergrowth, growing on a peat bog. The main impact area had become water-logged and unstable. The aircraft had come down through the trees at an angle of approximately 40°, with both propellers severing substantial branches. The impact points of both engines could be discerned in the ground, although the engines themselves had travelled a further 10 metres, tunnelling through the peat to become completely buried. The left propeller had become detached early in the impact sequence and was found buried aft of the engine. The right propeller was found in undergrowth some 10 metres to the right and forward of the right engine. The blades from both propellers were found to have sustained similar amounts of damage, thus providing a tentative indication of nominally symmetrical engine power at impact. The wooden airframe was highly fragmented, with much of the fuselage structure being consumed by a

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There were three Indian squaws. One slept on a deerskin, one slept on an elk skin and the third slept on a hippopotamus skin. All three became pregnant and the first two each had a baby boy. The one who slept on the hippopotamus skin had twin boys. This goes to prove that the squaw of the hippopotamus is equal to the sons of the squaws of the other two hides.

# Air Accidents Investigation Report on RR299—contd

*(Continued from page 9)*

post-impact fire. Some of the fuel cells, located in the inboard and outboard wing sections, and which had been released on impact, had also been badly fire affected. The debris found in the potato field included some cockpit items, the cockpit canopy structure and the radiator shutters located on the lower surfaces of the inboard leading edge wing sections.

The primary flying control operating cables were lying in the centre of the main wreckage area and had retained their basic cruciform layout, although there was considerable disruption in the cockpit area. Many of the fittings had remained attached to substantial sections of structure, and it was possible to verify the pre-impact integrity of much of the flying controls before the wreckage was removed from the site.

Following an on-site examination the wreckage was recovered to the AAIB Farnborough. The recovery entailed cutting a clearing in the wood to allow space for recovery vehicles. A mechanical excavator was used to dig around the main wreckage area, each scoopful of earth being sifted for items of wreckage.

***Video analysis***

The best evidence of the event was obtained from analysis of several video recordings obtained from members of the public. The display proceeded normally with steep turns and wingovers to the left and right being completed without evidence of any difficulty. The bank angle used during the steep turns was estimated to be 60° and the wingovers reaching approximately 90°. On several of the fly pasts the speed of the aircraft was assessed by measuring the movement of the aircraft against background objects frame by frame. These were not exact measurements but the results showed that the aircraft groundspeeds were within the range of 220 to 240 kt. The speed during the final fly past was similarly assessed and, by repeating the process with several of the recordings, it was possible to say with a high degree of confidence that the groundspeed on this occasion was close to 240 kt. With the light crosswind at the time there would have been little difference between airspeed and groundspeed. Without adequate background reference it was not possible to estimate the height and speed of the aircraft at the apex of the wingovers. The other pilot who shared the display flying on the Mosquito suggested that the airspeed would be 140 kt or more at the apex. Eye witnesses to the accident estimated the height to be about 1,500 feet at the apex of the final wingover.

The video soundtrack of one of the recordings of the final fly past was subjected to a spectral analysis, which gave an RPM of 2,660, averaged for the two engines. This accords with typical engine RPM used for display flying of 2,600. The boost setting is assumed to have been selected to the usual value of around +7 psi.

On one recording, the rotation of the propellers had been slowed by the strobe effect which resulted from the propeller blade passing frequency being a harmonic of the camera shutter speed. Calculations made on a frame by frame basis suggested that the left propeller was operating generally 20 to 40 RPM lower than the right. This is considered to be of no particular significance as there is no automatic propeller synchronisation system on the aircraft.

The final part of the display was examined in greater detail. The aircraft flew from right to left along the display line at about 240 kt and entered a straight climb. During the initial climb the RPM of both propellers reduced slightly, probably as a function of reducing airspeed. The aircraft rolled to the right and the bank angle increased to about 90°. Shortly before the aircraft reached the apex of the 'wingover', the speed of the left propeller appeared to slow relative to the right and continued to slow until, at the apex, it appeared to stop completely. The roll continued until reaching an estimated 100° to 110°. The aircraft yawed to the left and rapidly lost airspeed; the nose then pitched down, relative to the lateral axis and the aircraft began to fall. The bank angle reduced and the aircraft began to yaw to the left. There was little or no forward speed as the wings levelled and the aircraft nose pitched down violently. The aircraft then entered what appeared to be a spin to the left from which it recovered briefly before entering a spin to the right. Shortly before impact the aircraft appeared to recover from the spin in a steep nose down attitude but this was followed by a violent yaw to the right from which it had insufficient height to recover.

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A wealthy man decided to have himself cloned. The clone was his exact duplicate, except that he used only profane language. After several months, the man was fed up. He took his clone to the mountains and climbed to the edge of a steep cliff.

The man looked around and, when he didn't see anyone, he pushed the clone over the cliff.

Just then, a policeman stepped out from behind some bushes and said, "I'm going to have to put you under arrest."

"What for?" the man asked. "For making an obscene clone fall," the officer replied.

# From the Mailbag

During Easter, member and artist Max Ordinall made the trip down from Sydney to have a look around Point Cook and snap a few shots of the aircraft on display.

He created the montage of A52-600 seen on the right from the visitors gallery, no mean feat when you consider the security fencing around the gallery.

As detailed in another article in this Bulletin, the tailplane can be seen laid out on the table awaiting the preparation of a jig to hold it prior to it's restoration.

All woodwork restoration will be visible from the gallery, while the restoration of the propellers and tail wheel are occurring on the opposite side of the fuselage and is not visible. This precaution has been taken so that oil and grease will not come in contact with wooden parts.

For those people who worked on A52-600 at Richmond you will notice that she has been moved backward on the yellow base and one of the rollover rings has been removed.

Planning is underway on how to level and support the fuselage so that the entire outer skin can be refurbished without any obstructions.

Max still has some signed and numbered prints of the "Aarhus Mosquitos" for sale—refer to the enclosed brochure.

Thanks to Max for sending the montage.


"In the present state of science, there is no known facts by which one could predict any commercial future for aerial navigation", Thomas Edison, 1902.

# Air Accidents Investigation Report on RR299—contd

*(Continued from page 10)*

The apparent slowing of the left propeller indicated only a change in RPM. However, the subsequent behaviour of the aircraft, namely the left yaw and the autorotative manoeuvre at low airspeed, was strongly indicative of an asymmetric condition caused by a large reduction of power from the left engine. It is thus probable that the observed RPM change was indeed a reduction. The fact that the right-hand propeller continued to rotate at the same speed was considered significant in that it suggested that the pilot was not making any adjustments to the engine controls at the time. Similarly, boost lever movement would initially result in an RPM excursion; this would be detected by the propeller control unit which would cause the blade pitch to alter such that the RPM returned to the selected value. It was therefore concluded that unless the pilot inexplicably reduced the power on the left engine, the observed propeller RPM change was symptomatic of a power loss.

On another video recording, a puff of smoke, with an accompanying 'bang' was apparent when the nose of the aircraft was pointing at the ground following the initial loss of control. It is believed that this puff of smoke came from the left engine although the evidence was not conclusive. This event may have been due to rapid throttle (ie boost lever) closure by the pilot as part of the recovery procedure, 'bangs' or 'crackles' being a characteristic engine response to such action. It is noteworthy that no smoke was visible from the left engine at the time of the observed propeller RPM reduction prior to the loss of control. This suggested that the cause of the propeller RPM reduction was not due to an excessively rich mixture.

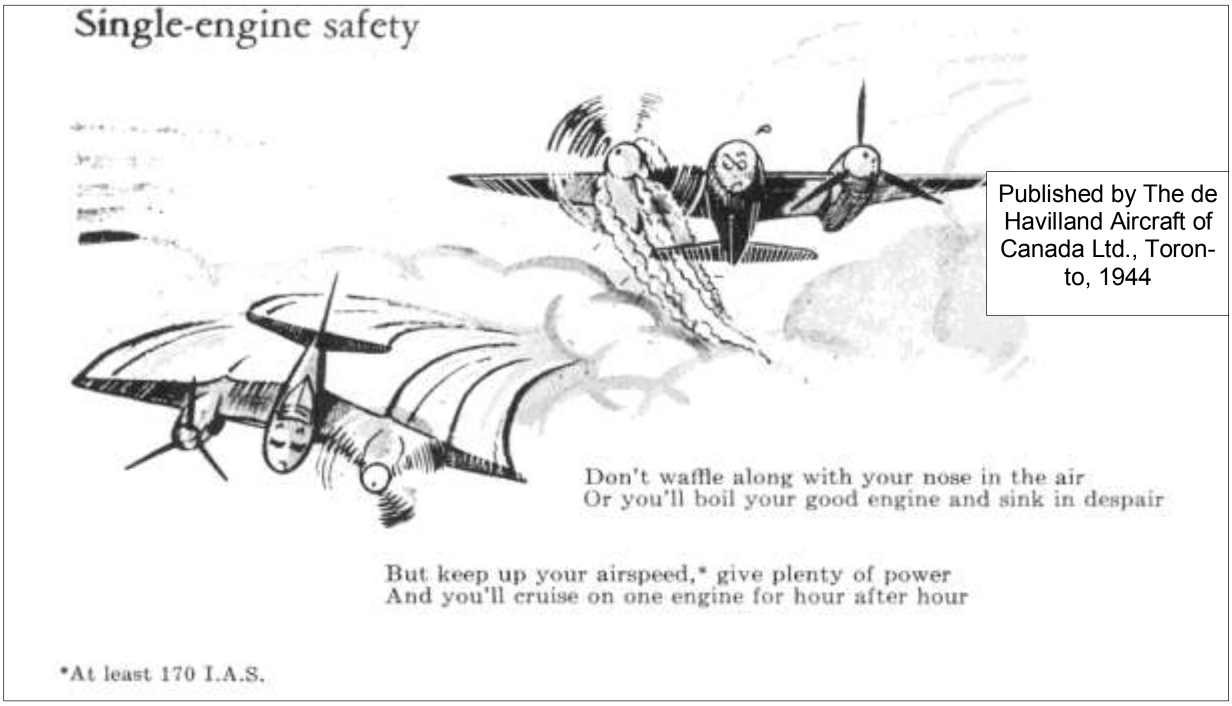
Most of the recordings showed the yaw to the right during the descent, as noted earlier. This could have been caused by a restoration of power on the left engine, and could explain the indications of symmetrical power at impact.

***History of the aircraft***

This aircraft had the military serial number RR299 and was built as an unarmed, dual control trainer at Leavesden in 1945. It served in the Middle East until 1949, when it returned to the United Kingdom. It then served with a variety of RAF units, this service being interspersed with periods in storage. The aircraft was retired from the RAF in 1963 and was acquired by Hawker Siddeley Aviation (now British Aerospace) at Chester. The first Permit to Fly was issued on 9 September 1963. The aircraft continued to be based and maintained at Chester and typically flew around 50 hours per year.

***Powerplant description***

*(Continued on page 13)*




Published by The de Havilland Aircraft of Canada Ltd., Toronto, 1944

"Animals, which move, have limbs and muscles; the Earth has no limbs and muscles, hence it does not move".

Scipio Chiaramonti, Professor of Mathematics, University of Pisa - 1633.

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The left engine was a Rolls Royce Merlin Mark 25, with a Merlin Mark 502, which differed only in installational details from the Merlin 25, being fitted in the right-hand position. The engines were liquid cooled, 12 cylinder units, equipped with single stage, two-speed superchargers. The high-speed mode had been disabled, mainly because its use was not necessary at the low altitudes at which this aircraft was operated, but also in the interest of avoiding high boost settings which could accelerate both airframe and engine wear.

The carburettors were SU AVT40, twin-choke, updraught units, which were attached to the supercharger intakes. Each carburettor has two float chambers, with a needle valve in each chamber controlling the fuel delivery. Each needle valve is in turn controlled by a pressure sensitive capsule, ie an evacuated bellows assembly. The needle valve in one chamber responds to changes in atmospheric pressure. The needle valve in the other responds to changes in boost pressure (which is dependant on the throttle butterfly position controlling the flow of air into the supercharger), as selected by the pilot operated boost lever in the cockpit. The dimensional changes of the capsules result in needle valve movement such that they alter the flow of fuel, thereby maintaining the correct fuel/air ratio.

The carburettors were supplied with fuel by means of engine-driven fuel pumps. Unlike many Merlin installations, there was no separate pressure regulating valve between the pumps and carburettors, the regulating function being performed within the pumps themselves.

The fuel tanks on this aircraft are arranged into inboard (or main supply) and outboard wing groups. Fuselage tanks were also fitted at one time, but these had been removed. Fuel from the inboard groups is fed to a gallery, or manifold, in the fuselage, and thence to the engines via a fuel valve on each engine firewall. The outboard tanks are connected directly to the fuel valves, by-passing the central gallery. Fuel tank selection is by means of two selectors, left and right, in the cockpit, each one being selectable to 'outer tanks', 'main supply' (ie inboard tanks) and 'off'. A cable loop links chain and sprocket assemblies mounted on the backs of both the valves and the selector handles.

An additional feature of engine operation was an automatic boost control system. This consists of a separate housing containing another pressure sensitive capsule, and is connected to the throttle butterflies via a mechanical differential linkage. The system is designed to maintain the boost at the value set by the pilot. In simple terms, the capsule detects any change in boost pressure, the resulting movement operating a spool valve. This ports pneumatic pressure to a piston, the output arm of which moves the butterflies, via the differential linkage, such that the boost setting is restored.

The engines drove three-bladed,

(Continued on page 14)

"I must confess that my imagination refuses to see any sort of submarine doing anything except suffocating its crew and floundering at sea". H G Wells - 1902.

# Air Accidents Investigation Report on RR299—contd

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variable pitch Hamilton Standard propellers via reduction gears. RPM control was by means of propeller control units (PCUs) which use engine oil pressure to operate the blade pitch change mechanism within the hubs.

### *Carburettor problems: historical aspects*

Early on in the Second World War, it was found that Merlin powered RAF aircraft were disadvantaged when taking evasive action due to a tendency for the engine(s) to cut under negative g conditions. Essentially, this was a two-stage phenomenon. Initially, the onset of negative g resulted in the fuel moving to the top of the float chambers, thus starving the jet well (ie the entrance to the needle valve assembly) and causing a 'weak cut'. This was followed by a 'rich cut' as fuel, under pump pressure, flooded into the chamber through the fully open float valve, the floats having adopted their lowest position.

The SU company, in conjunction with the Royal Aircraft Establishment (RAE), developed a modification which led to the 'RAE Anti g Carburettor'. Both carburettors in G-ASKH were found to be of this type. The salient features of the float chamber are shown in the sketch at Figure 1, and it can be seen that the principal element of the modification is the stand pipe or shroud tube assembly. The fuel off-take to the jet well is via the tops of the tubes, which remain immersed in fuel regardless of whether the g forces are positive or negative. Whilst this addressed the problem of the 'weak cut', it did nothing to solve the subsequent 'rich cut'. An initial remedy was the incorporation of a restrictor in the fuel line to the carburettor, which limited the fuel flow to a value approximating to the engine demand at maximum power. However the final solution was the addition of a pintle on the float valve stem, - item G in Figure 1. This is shaped like a small nail head, and, whilst it has no effect in normal flight conditions, it imposes an increasing restriction on the fuel flow as it approaches the valve orifice. The maximum restriction occurs with the floats in the lowest position, which is set by the adjustable stop 'H' in Figure 1. A Rolls Royce instruction manual of the time contains requirements for bench testing the carburettors, using a fuel flow rig, in which the minimum fuel flow with the floats in the fully down position should be set up at 330-350 pints/hour for each float chamber. These instructions are reproduced in an RAF Air Publication (AP), but neither document explains the consequences of incorrect adjustment. The sketches at Figure 3 (i) and (ii) show the valve operation in more detail.

The diameter of the pintle is slightly less than that of the valve orifice, with the result that in the event that the adjustable stop 'H' is set too high, the pintle can enter the float valve orifice, leaving only a small annular area for the fuel to pass through. In such a condition, it will be appreciated that the inlet fuel pressure is now acting on the lower face of the pintle, thus giving rise to a force which opposes the natural float buoyancy.

### *Summary and discussion*

The investigation established that the accident resulted from a loss of control of the aircraft associated with a temporary loss of power from the left engine. The nature of the accident site, plus the high degree of fragmentation of the wreckage meant that some potentially useful items, such as the fuel filters and the left engine propeller control unit, were not recovered. Thus, although the possibility of fuel line or fuel filter blockage could not be ruled out, such an event would more probably manifest itself at higher fuel flows, such as during takeoff or climb to altitude. A PCU malfunction may have caused the observed RPM excursion of the left-hand propeller close to the apex of the final wingover, but it is unlikely this would have resulted in an immediate power reduction to the observed extent indicated by the left yaw.

The left engine ignition harness was found to be below the specified insulation requirements; however, this was most probably due to the effects of moisture ingress as a result of being buried in the peat bog. In any event, an HT failure is likely to be progressive, accompanied by a series of backfires, and is more likely to occur at a high boost setting. The available evidence did not suggest any failure within either of the left-hand engine's magnetos, both of which would have had to have failed after the aircraft took off from Hawarden, in order to produce an engine failure.

It was not possible to exclude fuel starvation due to the left outboard tank being selected, although this would have meant an asymmetric fuel selection, as the evidence suggested that the right engine was selected to the inboard (main supply) tanks. Similarly, the possibility of a tank fuel outlet becoming exposed whilst manoeuvring, thus entraining air into the fuel system, also could not be excluded.

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"The horse is here to stay, but the automobile is a only a novelty - a fad".
Marshall Ferdinand Foch, French military strategist - 1911.

# Air Accidents Investigation Report on RR299—contd

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A worn universal joint that connected the capsule output shaft and spool valve was found in the automatic boost control assembly. The engine manufacturer considered that this had no bearing on the engine problem. However, small boost variations around the selected value would have resulted in correspondingly small capsule movements that would not have been transmitted to the spool valve. There was therefore a possibility that this free play may have contributed to a minor difficulty in synchronising left and right propeller RPM as was apparent on the video recording.

The investigation of the carburettors revealed that neither unit met the specified fuel flow requirements under negative g conditions, as the adjustable stops that controlled the float height (which in turn controlled the float valve) were not even contacting the valve links. As noted earlier, these stops should have been set at overhaul, and not touched by the operator. As a result, it was found that the fuel flows for the one float valve of each carburettor that was capable of being tested were reduced to approximately 10% and 50% of the required values for the left and right units respectively. Assuming both float valves of each carburettor were in similar states, it is probable that with either or both floats in their fully depressed positions, the reduced fuel flow would not sustain the left engine at moderate power settings. It is rather more difficult however, to relate the as-found condition of the carburettors to the likely effects on the engines during the wingover manoeuvre that preceded the accident. The display sequence was similar to countless others, although the display line was perhaps shorter than most, with an attendant possibility of steeper manoeuvres at either end.


In deference to the age of the aircraft, the display pilots never intentionally applied negative g, although reduced positive g (ie less than 1 g) would have occurred to varying degrees. Apart from g loadings experienced on the aircraft centreline, each carburettor might be subjected to greater or lesser accelerations due to engine vibration, turbulence, sideslip, and rolling motion about the aircraft longitudinal axis. For example, the left carburettor could experience reduced or negative g if a roll to the left were initiated, or a roll to the right arrested, while the right carburettor would see positive g. The movement of the fuel within the float chambers ('slosh'), and in consequence the float behaviour, therefore is a function of complex dynamic conditions. In the event that the combined dynamics of the aircraft and float chamber fuel mass caused the floats to be forced towards their fully depressed conditions, then it is likely that the ensuing restricted fuel flow could cause a loss of engine power, as the residual fuel in the chamber would last only a few seconds. Although it could not be concluded

*(Continued on page 16)*

"Nature intended women to be slaves. They are our property. What a mad idea to demand equality for women! Women are nothing but machines for producing children". Napoleon Bonparte.

# Vale

It is with regret that the Association must relay the passing of another of our members:

**FM (Flora) READ**
of WODONGA, Victoria

LV (Leo) Morrissy
of BOX HILL SOUTH, Victoria

Our condolences to their familes.

# New Members

The Association is pleased to announce and welcome the following people who have joined as members since the last Bulletin was published:

**DR (David) Castle**
WANTIRNA, Victoria

**AS (Arthur) Edwards**
WYOMING, New South Wales

**HC (Harry) Middleton**
NOOSA, Queensland

**BF (Robert) Robinson**
LANCELIN, Western Australia

Welcome to all, we hope you all have a long, enjoyable association and take an active interest in the restoration of A52-600.

# Report on RR299—contd

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that this caused a power loss, it was considered that the as-found adjustment states of the carburettors were capable of producing it under certain conditions. The fact that the restriction of flow in the left carburettor was more severe than the right (based upon the results of bench testing one chamber from each carburettor), might indicate a greater susceptibility of the left engine to cut. Nevertheless, the number of variables involved in creating a restricted flow condition also suggested that actual occurrence could be of an unpredictable nature. This might explain why the symptoms could not be reproduced following the Lille incident, when the pilot deliberately put the aircraft through a series of reduced g manoeuvres.

The Merlin's reputation for cutting under negative g conditions had endured since the beginning of the Second World War. Curiously, the fact that a successful carburettor modification had been developed (and incorporated on the subject aircraft) to remedy the problem had largely been forgotten.

With the benefit of hindsight it is appreciated that gasket thickness can have a critical effect on the dimensional relationship between the float valve pintle and the associated valve orifice. Accordingly it would be advisable to recheck the restricted flow rate through the carburettor following disturbance or replacement of the gasket. No such requirement was contained within the maintenance manuals which were examined.

End Report.


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Funny in-flight comment:

"Weather at our destination is 28 degrees with some broken clouds, but we'll try to have them fixed before we arrive. Thank you, and remember, nobody loves you or your money, more than Virgin Airlines."