

= Air @-@ tractor sledge =

Sir Douglas Mawson 's air @-@ tractor sledge was a converted fixed @-@ wing aircraft taken on the 1911 ? 14 Australasian Antarctic Expedition , the first plane to be taken to the Antarctic . Expedition leader Douglas Mawson had planned to use the Vickers R.E.P. Type Monoplane as a reconnaissance and search and rescue tool , and to assist in publicity , but the aircraft crashed heavily during a test flight in Adelaide , Australia , only two months before Mawson 's scheduled departure date . The plane was nevertheless sent south with the expedition , after having been stripped of its wings and metal sheathing from the fuselage . Engineer Frank Bickerton spent most of the 1912 winter working to convert it to a sledge , fashioning brakes from a pair of geological drills and a steering system from the plane 's landing gear . It was first tested on 15 November 1912 and subsequently assisted in laying depots for the summer sledging parties , but its use during the expedition was minimal .

Towing a train of four sledges , the air @-@ tractor accompanied a party led by Bickerton to explore the area to the west of the expedition 's base at Cape Denison . The freezing conditions resulted in the jamming of the engine 's pistons after just 10 miles (16 km) , and the air @-@ tractor was left behind . Some time later it was dragged back to Cape Denison , and its frame was left on the ice when the expedition returned home in 1913 . In 2008 a team from the Mawson 's Huts Foundation began searching for the remains of the air @-@ tractor sledge ; a seat was found in 2009 , and fragments of the tail assembly a year later .

The Mawson 's Huts Foundation has undertaken extensive investigation using sophisticated equipment in 2009 and 2010 . Results indicate that the air tractor , or parts of it , is still buried under 3m of ice where it was abandoned at Cape Denison .

= = Background = =

Douglas Mawson had accompanied Ernest Shackleton 's 1907 ? 09 British Antarctic Expedition . Along with Edgeworth David and Alistair Mackay , he had been part of a man @-@ hauled sledging expedition , the first to reach the area of the South Magnetic Pole . Upon his return from Antarctica , he recommenced to his post as geology lecturer at the University of Adelaide . Despite an offer from Robert Falcon Scott to join his Terra Nova Expedition to reach the Geographic South Pole , Mawson began planning his own Antarctic expedition . Mawson 's plan , which led to the Australasian Antarctic Expedition , envisaged three bases on the Antarctic continent , collectively surveying much of the coast directly south of Australia . He approached Shackleton , who not only approved of his plan but was prepared to lead the expedition himself . Although Shackleton withdrew from the expedition in December 1910 , he continued to assist Mawson with publicity and fund @-@ raising .

= = = Purchase = = =

Mawson travelled to Britain in early 1911 to raise funds , hire crew , and purchase equipment . He considered taking a plane to the Antarctic , which could work as a reconnaissance tool , transport cargo , and assist with search and rescue . Crucially , as no plane had yet been taken to the continent , it could also be used to generate publicity . Unsure of the type of plane he should take , but considering a Blériot , Mawson mentioned his plans to Scott 's wife Kathleen Scott , an aircraft enthusiast . She recommended he take a monoplane , and conveyed his interest to Lieutenant Hugh Evelyn Watkins of the Essex Regiment . Watkins had connections with the ship and aircraft manufacturer Vickers Limited , which had recently entered into a licence agreement to build and sell aircraft in Britain designed by the Frenchman Robert Esnault @-@ Pelterie . In a letter to Mawson on 18 May , Kathleen wrote :

I believe I can help you about aeroplanes . I think you can do far better than a Bleriot ... There is a machine that the Vickers people have bought which is infinitely more stable , heavier and more solid and will carry more weight . Its cost is £ 1000 , but I think it could be worked to get it for £ 700 or even less ... A man I know who had only before driven biplanes , drove it and it stayed up half an

hour , which speaks very well for its stability ... If you think it 's worth considering , I can let you meet the man concerned early next week and he can show you the machine and take you up in it .

On Kathleen Scott 's advice , Mawson purchased a Vickers R.E.P. Type Monoplane , one of only eight built . It was fitted with a five @-@ cylinder R.E.P. engine developing 60 horsepower (45 kW) , and had a maximum range of 300 miles (480 km) at a cruising speed of 48 knots (89 km / h ; 55 mph) . Its wingspan was 47 feet (14 m) , and its length 36 feet (11 m) . The pilot used a joystick for pitch and roll , with lateral control by wing warping . Mawson opted for a two @-@ seater version , in a tandem arrangement , with a spare ski undercarriage . The total bill , dated 17 August 1911 , came to £ 955 4s 8d . Mawson hired Watkins to fly the plane , and Frank Bickerton to accompany as engineer . After Vickers tested the aircraft at Dartford and Brooklands , P & O shipped the plane to Adelaide aboard the steamship Macedonia , at half the usual rate of freight .

= = = Crash = = =

A series of public demonstrations were planned in Australia to assist in fund @-@ raising , the first of which was scheduled for 5 October 1911 at the Cheltenham Racecourse in Adelaide . During a test flight the day before , excessive pressure in the fuel tank caused it to rupture , almost blinding Watkins . That problem resolved , Watkins took Frank Wild , whom Mawson had hired to command a support base during the expedition , on another test flight the morning of the demonstration . In Watkins ' account , which he addressed to Vickers ' Aviation Department , he wrote : " [we were] about 200 ft. up . I got into a fierce tremor , and then into an air pocket , and was brought down about 100 ft . , got straight , and dropped into another , almost a vacuum . That finished it . We hit the ground with an awful crash , both wings damaged , one cylinder broken , and the Nose bent up , the tail in half , etc . "

Although the two men were only slightly injured , the plane was damaged beyond repair . Mawson decided to salvage the plane by converting it into a motorised sledge . He fitted the skis , and removed the wings and most of the sheathing to save weight . In his official account of the expedition , The Home of the Blizzard , Mawson wrote that the advantages of this " air @-@ tractor sledge " were expected to be " speed , steering control , and comparative safety from crevasses owing to the great length of the runners " . No longer needing a pilot , and believing him to be responsible for the crash , Mawson dismissed Watkins .

The air @-@ tractor sledge was taken to Hobart , where the expedition ship SY Aurora was being loaded . It was secured on board in a crate lined with tin , which weighed far more than the sledge itself , on top of the ship 's forecastle and two boat @-@ skids . To fuel the sledge , along with the motor launch and the wireless equipment , the Aurora also carried 4 @,@ 000 imperial gallons (18 @,@ 000 L) of benzine and 1 @,@ 300 imperial gallons (5 @,@ 900 L) of kerosene . Fully loaded , the ship left Hobart on 2 December 1911 .

= = In Antarctica = =

The Aurora reached the Antarctic mainland on 8 January 1912 , after a two @-@ week stop on Macquarie Island to establish a wireless relay station and research base . The expedition 's main base was established in Adélie Land , at Cape Denison in Commonwealth Bay . While the Aurora was unloading , a violent whirlwind lifted the 300 @-@ pound (140 kg) lid off the air @-@ tractor 's crate , throwing it 50 yards (46 m) . The main hut was erected immediately , but the strong winds meant that work on the air @-@ tractor 's hangar was delayed until March . When the winds abated , a 10 @-@ foot (3 @.@ 0 m) by 35 @-@ foot (11 m) hangar was constructed next to the main hut , from empty packing cases .

Bickerton began work on the air @-@ tractor sledge on 14 April 1912 . His first job was to repair the sledge , which had been damaged in transit when a violent storm hit the Aurora . A giant wave had slammed into the crate containing the sledge , driving the fuselage 4 feet (1 @.@ 2 m) through its side . With the repair completed , Bickerton began the serious work of converting the plane into a sledge . He constructed brakes from a pair of geological drills , and a steering system from the

landing gear . Bickerton painted the engine and fuel tank black to absorb heat better and protect them from freezing . By June he had the engine running properly , and during a lull in the winds in early September he fitted the skis . Finally , he raised the fuselage 5 feet (1 @. @ 5 m) off the ground to allow the propeller free movement .

On 27 October 1912 , Mawson outlined the summer sledging program . Seven sledging parties would depart from Cape Denison , surveying the coast and interior of Adélie Land and neighbouring King George V Land . They were required to return to the base by 15 January , when the Aurora was due to depart ; any later , it was feared , and she would be trapped by ice . Bickerton was to lead one of the parties , which would use the air @-@ tractor to haul four sledges and explore the coast to the west of the hut . Most of the parties left in early November , but Bickerton 's Western party delayed until December , in the hope of avoiding the ferocious winter winds . Work on the air @-@ tractor sledge was delayed by the fierce winds , and the first trial took place on 15 November , between the main base and Aladdin 's Cave ? a depot which had been established on the plateau above Cape Denison . The air @-@ tractor reached a speed of 20 miles per hour (32 km / h) , covering the 5 miles (8 @. @ 0 km) , expedition member Charles Laserson recorded , " in great style " . Soon , the sledge began hauling cargo up the slope , laying depots for the summer sledging parties .

= = = Broken = = =

The Western party left Cape Denison on 3 December 1912 . Accompanying Bickerton and the air @-@ tractor were cartographer Alfred Hodgeman and surgeon Leslie Whetter . The air @-@ tractor made slow progress hauling its train of sledges , and about 10 miles (16 km) out from the base its engine began experiencing difficulty . Bickerton shut it down and the three set up camp . At 4 am the next morning the party set off again , but the engine continued to struggle ; oil ejected from an idle cylinder and the cylinder 's lack of compression led Bickerton to suspect broken piston rings to be the root of the problem . This would take only a matter of hours to fix . As he later recorded , " These thoughts were brought to a sudden close by the engine , without any warning , pulling up with such a jerk that the propeller was smashed . On moving the latter , something fell into the oil in the crank @-@ case and fizzled , while the propeller could only be swung through an angle of about 30 [degrees] . "

The party continued without the air @-@ tractor , man @-@ hauling the sledges to a point 158 miles (254 km) west of Cape Denison , and returned to base on 18 January 1913 . Mawson 's Far Eastern Party failed to return , and six men , including Bickerton , remained for an extra winter . On 8 February , just hours after Aurora left Commonwealth Bay after waiting for three weeks , Mawson staggered alone into base , his colleagues Belgrave Edward Sutton Ninnis and Xavier Mertz dead . As Mawson was being nursed back to health , Bickerton dragged the air @-@ tractor sledge back to base to diagnose the reason for its failure . He found that the freezing conditions had caused the engine oil to congeal , jamming the pistons . He abandoned the sledge at Boat Harbour , next to the base . When Aurora returned to Cape Denison for the final time on 13 December 1913 , only the engine and propeller were taken back to Australia .

= = Recovery efforts = =

The bill for the plane remained unpaid . In 1914 Vickers reminded Mawson , who had apparently forgotten the outstanding debt . Mawson wrote to Vickers director Sir Trevor Dawson in November 1916 , requesting the company write off the bill as a donation . His company buoyed by armaments contracts , Dawson agreed . The next expedition to take a plane to the Antarctic was Shackleton 's 1921 ? 22 Quest Expedition , but the Avro Baby remained grounded owing to missing parts . Not until 16 November 1928 ? when Hubert Wilkins and Carl Ben Eielson flew for 20 minutes around Deception Island , just over a year before Admiral Richard Evelyn Byrd 's first flight over the South Pole ? was a plane airborne in the Antarctic .

The frame of the air @-@ tractor sledge remained on the ice at Boat Harbour where Bickerton had

left it . The last expedition to Cape Denison to see the frame was in 1976 ; the next expedition , in 1981 , could find no trace of it . The ice in that location does not move , and the implication is that the frame sank through the ice . It is therefore possible the frame is still there .

In 2007 @-@ 8 a team from the Mawson 's Huts Foundation began to search for the remnants of the plane . Using photographs from 1913 , 1931 and 1976 it was possible to derive transits between the frame and distant objects which located the frame to a small area of ice about 50 m from the hut . Comparison with a 1931 photograph by Frank Hurley confirmed this location .

The following summer (2008 ? 9) , the team extensively surveyed the area where they believed the air @-@ tractor to be , using ground @-@ penetrating radar . A 3 metre deep trench was dug in a promising area , but nothing was found except fragments of seaweed indicating the overlying ice must have melted sometime in the past . Temperature records from the nearby Dumont d 'Urville Station showed that there had been extended periods (each of about six weeks) of above average temperatures in 1976 and 1981 , suggesting the ice around the harbour could have melted . Dr Chris Henderson , the leader of the team , believes " the frame sank in situ to the rock surface , three metres below the present ice surface " .

Next year (the 2009 ? 10 season) further search was undertaken using differential GPS , bathymetry equipment , ice augers , a magnetometer and a metal detector (whose sensor was placed down the ice auger holes after drilling) . The ice showed signs of having extensively melted in the past , was about 3 metres thick and covering smooth rock which extended Northwards to become the harbour bottom . Visual examination of the harbour bottom during the bathymetry survey did not reveal any fragments of the frame in the first 30 metres of the harbour .

The most significant findings from the ice survey were a positive reading from the metal detector , coupled with a significant echo from the Ground Penetrating Radar , both from the small area where the frame is assumed to have sunk .

Parts of the Air Tractor are already known to exist : The Australian Antarctic Division has one wheel from the frame , and its ice @-@ rudder ? both of which were found in the harbour . In January 2009 the remains of a seat from the air @-@ tractor were found in rocks near the hut , about 200 metres (660 ft) from where the team believes the frame to be buried . On 1 January 2010 , a day of unusually low tide , 4 small capping pieces from the end section of the tail were found by the edge of the harbour . The tail and a section of fuselage had been removed from the rest of the air @-@ tractor before it was abandoned in 1913 , therefore this discovery did not shed much light on the location of the rest of the frame , but it suggests that " the frame , or parts of it , can survive for nearly 100 years in this environment " .

The team returned to Cape Denison over the 2010 ? 11 summer , but the crash of a French helicopter near Dumont d 'Urville Station in October 2010 forced deployment of a much reduced team with no resources to continue the search .

The findings to date (2011) suggest that metal object (s) exist at a depth of 3 metres , on rock , in the location where the frame was last known to have been seen in 1976 . This is likely to be the remains of Mawson 's Air Tractor , but confirmation awaits a future opportunity .