



# AVIATION HISTORICAL SOCIETY OF AUSTRALIA (NSW) Inc

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13/40A ROSLYN GARDENS RUSHCUTTERS BAY NSW 2011

## Southern Skies

THE NEWSLETTER OF AHSAN (NSW) Inc

**AUGUST 2019 ~ No 541**

Honorary Life Member AHSAN (NSW) Inc: Ian Debenham

**THE AUGUST AHSAN (NSW) Inc MEETING  
WILL BE HELD ON WEDNESDAY 7th COMMENCING at 8:00 pm.**

**PLEASE NOTE THE VENUE IN THE LOWER  
FLOOR CONFERENCE ROOM AT THE  
NORTH RYDE RSL COMMUNITY CLUB.**

The club is located at the corner of Pittwater and Magdala Roads, North Ryde. There is ample free parking and visitors are most welcome. The facilities of the club are available to members and visitors for pre and post meeting refreshment and conversation.

**MEMBERS MEET FOR DINNER IN THE RIVERVIEWS  
RESTAURANT ON THE TOP FLOOR AT 6.30 pm.**

**OUR REGULAR "THREE AMIGO'S " TALK** will this year be conducted by three members:

- **Bill Holswich**, whose subject will be "Two Study Books" - about two WW2 Air Force pilots who were the original owners of the study books which were passed on to Bill's father, who used them for his Air Force exam studies.
- **Mike McGree's** topic is about aviation before, during and after the Wright Brothers.
- Finally, **John Scott** will discuss aero philately, particularly in connection with the previous stamp issues for the Ross and Keith Smith anniversaries of their flight from England to Australia.

**THE JULY MEETING** of the AHSAN (NSW) Inc was a well attended meeting with one of our newest members, ANNA CHRISTINE GEBELS, a PhD Candidate, Museum and Heritage Studies, University of Sydney, giving a talk about the Empire Air Training Scheme and its heritage.

**The Empire Air Training Scheme (EATS)** was a policy designed to train Royal Australian Air Force pilots for eventual transfer into the Royal Air Force during World War II. The policy, dubbed the Empire Air Training Scheme in Australia, was envisioned after the British Empire was unable to supply enough pilots and aircraft for the Royal Air force. In Australia the scheme would eventually branch out and provide the training of pilots for deployment in the Pacific War.

The presentation was supported with interesting maps and aerial photographs of the various airfields that were commissioned for this task, including Temora NSW. A most interesting evening.

*MEMBERS OF THE AHSAN  
ARE INVITED TO ATTEND A LUNCHEON  
TO CELEBRATE THE RECENT AWARDED  
OF HONORARY LIFE MEMBERSHIP*

*to*

*RON HOUGHTON and SENJA ROBEY*

*The venue for the luncheon will be  
The Watergrill, Sydney Rowing Club,  
Great North Road, Abbotsford  
on Thursday 1<sup>st</sup> August 2019  
at 12-30pm for 1-00pm.*

*Meals & drinks at member's own expense;  
choose from the menu at the servery  
RSVP Paul Ewoldt Phone 8356 9583  
Email paul.ewoldt@hotmail.com*

SENJA ROBEY was our Arthur Butler Speaker on November 3, 1999. She named her talk, "The Contribution of Women to Commercial and Military Aviation in Australia".

**Back** in 1999 we reported that Senja was awarded the British Empire Medal in June 1976; the Nancy Bird Trophy in 1962, and again in 1976; the Paul Tissandier Diploma from the FAI in 1975.

**GAPAN** awarded her a Master Air Pilot Certificate in 1989. In November 1996 Senja received the 'Australian Bi-Centennial Award 1995' for services to aviation at GAPAN's Trophies and Awards Banquet in the Guildhall, London.

**There** have been other awards since including her induction to The Australian Aviation Hall of Fame in 2014 at Wagga Wagga, NSW.

**The** Aviation Historical Society of Australia (NSW) Inc recognises Senja's professional commitment to many facets of aviation in awarding Honorary Life Membership.



## AERIAL REFUELLING

### First practical aerial refuelling SYSTEMS

*Continued from July issue*

Two different methods are used to connect tanker to receiver: the *flying boom* system (sometimes called *boom and receptacle*) and the *probe-and-drogue* system. The less popular *wing-to-wing* system is no longer used.

#### Flying boom



A USAF C-5 approaches a KC-135R



Aerial refueling of F-15 Eagle

The flying boom is a rigid, telescoping tube with movable flight control surfaces that a boom operator on the tanker aircraft extends and inserts into a receptacle on the receiving aircraft. All boom-equipped tankers (e.g. *KC-135 Stratotanker*, *KC-10 Extender*) have a single boom, and can refuel one aircraft at a time with this mechanism.

#### History

In the late 1940s, General Curtis LeMay, commander of the Strategic Air Command (SAC), asked Boeing to develop a refuelling system that could transfer fuel at a higher rate than had been possible with earlier systems using flexible hoses. It resulted in the flying boom system.

The B-29 was the first to employ the boom, and between 1950 and 1951, 116 original B-29s, designated KB-29Ps, were converted at the Boeing plant at Renton, Washington. Boeing went on to develop the world's first production aerial tanker, the *KC-97 Stratofreighter*, a piston-engined *Boeing Stratocruiser* (USAF designation *C-97 Stratofreighter*) with a Boeing-developed flying boom and extra kerosene (jet fuel) tanks feeding the boom. The Stratocruiser airliner itself was developed from the B-29 bomber after World War II. In the KC-97, the mixed gasoline/kerosene fuel system was clearly not desirable and it was obvious that a jet-powered tanker aircraft would be the next development, having a single type of fuel for both its own engines and for passing to receiver aircraft. The 230 mph (370 km/h) cruise speed of the slower, piston-engined KC-97 was also a serious issue, as using it as an aerial tanker forced the newer jet-powered military aircraft to slow down to mate with the tanker's boom, a highly

serious issue with the newer supersonic aircraft coming into service at that time, which could force such receiving aircraft in some situations to slow down enough to approach their stall speed during the approach to the tanker. It was no surprise that, after the KC-97, Boeing began receiving contracts from the USAF to build jet tankers based on the Boeing 367-80 (Dash-80) airframe. The result was the Boeing *KC-135 Stratotanker*, of which 732 were built.

#### Operation



USAF KC-135 boom operator view



Aerial refuelling of

F-22 Raptor from the boom pod.

The flying boom is attached to the rear of the tanker aircraft. The attachment is gimballed, allowing the boom to move with the receiver aircraft. The boom contains a rigid pipe to transfer fuel. The fuel pipe ends in a nozzle with a flexible ball joint. The nozzle mates to the "receptacle" in the receiver aircraft during fuel transfer. A poppet valve in the end of the nozzle prevents fuel from exiting the tube until the nozzle properly mates with the receiver's refuelling receptacle. Once properly mated toggles in the receptacle engage the nozzle, holding it locked during fuel transfer.

The "flying" boom is so named because flight control surfaces, small movable airfoils that are often in a V-tail configuration, are used to move the boom by creating aerodynamic forces. They are actuated hydraulically and controlled by the boom operator using a control stick. The boom operator also telescopes the boom to make the connection with the receiver's receptacle.

To complete an aerial refuelling, the tanker and receiver aircraft rendezvous, flying in formation. The receiver moves to a position behind the tanker, within safe limits of travel for the boom, aided by director lights or directions radioed by the boom operator. Once in position, the operator extends the boom to make contact with the receiver aircraft. Once in contact, fuel is pumped through the boom into the receiver aircraft.

A USAF B-52 being refuelled by a KC-135 at a high bank angle. Cameras in place of a visual boom control station as used on an Australian KC-30A.



**While** in contact, the receiver pilot must continue to fly within the "air refuelling envelope," the area in which contact with the boom is safe. Moving outside of this envelope can damage the boom or lead to mid-air collision, eg the 1966 Palomares B-52 crash. If the receiving aircraft approaches the outer limits of the envelope, the boom operator will command the receiver pilot to correct his position and disconnect the boom if necessary.

When the desired amount of fuel has been transferred, the two aircraft disconnect and the receiver aircraft departs the formation. When not in use, the boom is stored flush with the bottom of the tanker's fuselage to minimize drag.

### Systems in service

**US** Air Force fixed-wing aircraft use the flying boom system. Typically countries operating F-16 or F-15 variants have had a need for boom equipped tankers. Therefore, in addition to the USAF, the boom system is used by Australia (KC-30A), the Netherlands (KDC-10), Israel (modified Boeing 707), Turkey (surplus US KC-135Rs), and Iran (Boeing 747).

### Advantages

- Higher fuel flow rates (up to 1,000 US gallons (3,800 l) / 6,500 pounds (2,900 kg) per minute for the KC-135 tanker) can be achieved with the large diameter of the pipe in the flying boom, requiring less time to complete refueling operations than probe-and-drogue systems.
- Less susceptible to receiving aircraft pilot error and fatigue.[citation needed]
- Less susceptible to adverse weather conditions.[citation needed]
- Boom equipped tankers are readily convertible to multisystem refuel methods.

### Disadvantages

- Requires a boom operator.
- Added complexity of modification with attaching a boom to an aircraft.
- Boom only allows for one receiver at a time.
- Fighter aircraft cannot accept fuel at the boom's maximum flow rate, requiring a reduction in refuelling pressure when servicing these aircraft, reducing (but not eliminating) the flying boom's advantage over the drogue system when refuelling fighter aircraft.

## Probe-and-drogue



F-35 refuelling  
by KC-130

**The** probe-and-drogue refuelling method employs a flexible hose that trails from the tanker aircraft. The *drogue* (or *para-drogue*), sometimes called a *basket*, is a fitting resembling a shuttlecock, attached at its narrow end (like the "cork" nose of a shuttlecock) with a valve to a flexible hose. The drogue stabilizes the hose in flight and provides a funnel to aid insertion of the receiver aircraft probe into the hose. The hose connects to a Hose Drum Unit (HDU). When not in use, the hose/drogue is reeled completely into the HDU. The receiver has a *probe*, which is a rigid, protruding or pivoted retractable arm placed on the aircraft's nose or fuselage to make the connection. Most modern versions of the probe are usually designed to be retractable, and are retracted when not in use, particularly on high speed aircraft.

**At** the end of the probe is a valve that is closed until it mates with the drogue's forward internal receptacle, after which it opens and allows fuel to pass from tanker to receiver.[citation needed] The valves in the probe and drogue that are most commonly used are to a NATO standard and were originally developed by the company Flight Refuelling Limited in the UK and deployed in the late 1940s and 1950s. This standardization allows drogue-equipped tanker aircraft from many nations the ability to refuel probe-equipped aircraft from other nations. The NATO standard probe system incorporates shear rivets that attach the refuelling valve to the end of the probe. This is so that if a large side or vertical load develops while in contact with the drogue, the rivets shear and the fuel valve breaks off, rather than the probe or receiver aircraft suffering structural damage. A so-called "broken probe" (actually a broken fuel valve, as described above) may happen if poor flying technique is used by the receiver pilot, or in turbulence.[citation needed] Sometimes the valve is retained in the tanker drogue and prevents further refuelling from that drogue until removed during ground maintenance.

### Buddy store

**A** "buddy store" or "buddy pod" is an external pod loaded on an aircraft hardpoint that contains a hose and drogue system (HDU). Buddy stores allow fighter / bomber aircraft to be reconfigured for "buddy tanking" other aircraft. This allows an air combat force without dedicated/specialized tanker support (for instance, a carrier air wing) to extend the range of its strike aircraft. In other cases, using the buddy store method allows a carrier-based aircraft to take-off with a heavier than usual load, the aircraft then being topped-up with fuel from a HDU-equipped "buddy" tanker, a method previously used by the Royal Navy in operating its *Supermarine Scimitar*, *de Havilland Sea Vixen* and *Blackburn Buccaneers* in the *Buccaneer's* case using a bomb-bay-mounted tank and HDU.

## Operation



An RAF Victor K2 trails its three hose lines – standard operations would usually see small aircraft refuelling from the two wing hoses, while larger aircraft would use the longer belly hose.

The tanker aircraft flies straight and level and extends the hose/drogue which is allowed to trail out behind and below the tanker under normal aerodynamic forces. The pilot of the receiver aircraft extends his probe (if required) and uses normal flight controls to "fly" the refuelling probe directly into the basket. This requires a closure rate of approximately two knots (walking speed) in order to establish solid probe/drogue coupling and push the hose several feet into the HDU. Too little closure will cause an incomplete connection and no fuel flow (or occasionally leaking fuel). Too much closure is dangerous because it can trigger a strong transverse oscillation in the hose, severing the probe tip. Another significant danger is that the drogue may hit the recipient aircraft and damage it—instances have occurred in which the drogue has shattered the canopy of a fighter aircraft, causing great danger to its pilot.

The optimal approach is from behind and below (not level with) the drogue. Because the drogue is relatively light (typically soft canvas webbing) and subject to aerodynamic forces, it can be pushed around by the bow wave of approaching aircraft, exacerbating engagement even in smooth air. After initial contact, the hose and drogue is pushed forward by the receiver a certain distance (typically, a few feet), and the hose is reeled slowly back onto its drum in the HDU. This opens the tanker's main refuelling valve allowing fuel to flow to the drogue under the appropriate pressure (assuming the tanker crew has energized the pump). Tension on the hose is aerodynamically 'balanced' by a motor in the HDU so that as the receiver aircraft moves fore and aft, the hose retracts and extends, thus preventing bends in the hose that would cause undue side loads on the probe. Fuel flow is typically indicated by illumination of a green light near the HDU. If the hose is pushed in too far or not far enough, a cutoff switch will inhibit fuel flow, which is typically accompanied by an amber light. Disengagement is commanded by the tanker pilot with a red light.

Citations per 'Aerial Refuelling', Wikapaedia

## ONE HUNDRED YEARS AGO

AUGUST 1919 - 2019

Chronology GL

**01** Polish border troops shoot down a giant German Zeppelin-Staaken R.VI bomber making a clandestine night diplomatic flight between the Ukraine and Germany. It is the last of only three R.IV bombers lost to enemy action, and the only one shot down by enemy forces after World War I.

- The Women's Royal Air Force contingent in Germany is ordered to close down.

**02** In Italy's first civil aviation disaster, a Caproni Ca.48 airliner crashes near Verona, killing all on board. Sources differ on the death toll, placing it at 14,15,&17

**03** In the Russian Civil War, four Royal Air Force *Fairey III C* seaplanes attack three Bolshevik steamboats on Russia's Lake Onega, causing their crews to panic and allowing Royal Navy submarine chasers to capture them easily.

**05** Italian aviator Antonio Locatelli completes the first roundtrip crossing of the Andes, in a single-seater Ansaldo SVA.5.

**07** To protest against pilots having had to parade on foot at the July 14 Bastille Day World War I victory parade on the Champs-Élysées in Paris, French pilot Charles Godefroy flies his Nieuport fighter under the arches of the Arc de Triomphe, the first time this has been accomplished. Although the stunt is unauthorized, French authorities let him off with a warning.


- Captain Ernest Charles Hoy makes the first aircraft crossing of the Rocky Mountains, flying from Vancouver, British Columbia, Canada, to Calgary, Alberta, Canada, in a Curtiss JN-4 "Jenny" in 16 hours and 42 minutes. He travels 1,400 kilometers (869 miles) with a total time in the air of 12 hours 24 minutes.

**11** The *Felixstowe Fury*, also known as the Porte Super-Baby, crashes in Plymouth Sound off Plymouth, England, on the eve of its planned flight to South Africa, killing one of its seven crew members.

- A *Farman F.60 Goliath* airliner flies eight passengers and a ton of supplies from Paris, France, via Casablanca, French Morocco, and Mogador, French Morocco, to Koufa, Senegal, flying more than 4,500 kilometers (2,795 miles).

**15** France reports that 60 percent of its aviators were killed or wounded during World War I.

**18** Royal Air Force aircraft based at Bjorko, Finland, under the command of Squadron Leader Grahame Donald, bomb and strafe the Bolshevik naval warships there during the Baltic campaign of the Russian civil War.

**19** The United States readopts its pre-January 1918 official national insignia for U.S. Army, U.S. Navy, and U.S. Marine Corps aircraft, a white star centered in a blue circle with a red disc centered within the star . The marking will remain in use until June 1, 1942.

**23** With the Polish head of state, Marshal Józef Piłsudski, looking on, the first aircraft built in a free Poland – a CWL Słowik, a copy of the German Hannover CL.II – crashes during a public ceremonial flight due to faulty bracing wires, killing its two crewmen. The aircraft's constructor, Karol Słowik, is one of the dead.

**25** The first regularly scheduled airline service between London and Paris begins, with the British Aircraft Transport and Travel company flying a *de Havilland DH.16* between Hounslow Heath Aerodrome and Paris - Le Bourget Airport .




Instone Air 1919


**29** The first flight of the Avro 539. *The Avro 539* was a British single-seat racing biplane built by Avro for the **1919 Schneider Trophy**. \*

\* The Avro 539 (later 539A) was a single-seat floatplane first flown on 29 August 1919. It was a single-bay, unstaggered biplane with a nose-mounted 240 hp (180 kW) Siddeley Puma piston engine and twin wooden floats. It had a single open cockpit for the pilot aft of the wings. Registered *G-EALG* it was modified before the race with a balanced rudder and elongated fin. **The Schneider Trophy** was held on 10 September 1919 but the 539 was eliminated. It was later modified as a landplane with a smaller fin and flown at the Aerial Derby in July 1920. The aircraft forced landed but was rebuilt as the Avro 539B for the 1921 Aerial Derby with a 450 hp (340 kW) Napier Lion and revised landing gear and registered *G-EAXM*. It was destroyed in a landing accident at Hamble on 15 July 1921 on the eve of the race.



## INTERSTATE NEWS

 **MELBOURNE MEETINGS** are held on the fourth Wednesday of the month in the auditorium of the RAAF Association, 24 Camberwell Rd, Hawthorn East. Parking is available under the building - enter from the lane at the south end. The meetings start at 7.30pm - ring the bell if the front door is shut. A number of members meet casually for dinner from 6.00pm at the Tower Hotel opposite the RAAFA. Visitors are welcome. Website <http://www.ahsa.org.au/> Contact Dave Prossor, President, [president@ahsa.org.com](mailto:president@ahsa.org.com)

 **BRISBANE MEETINGS** are held on the last Friday of each month in the Lounge Area, Terminal Building, Archerfield Airport, Brisbane. Visitors are welcome. Next Meeting: Friday 30th August 2019 - 7:00 for 7:30pm Peter Dunn, Secretary, advised that the AHSA Q'land web site links to Victoria Museum's Facebook page - <http://ahsaqld.org.au/> Contact [ahsaqld@gmail.com](mailto:ahsaqld@gmail.com) or Warwick Henry at 0417 771 563

## CALENDAR OF EVENTS : 2019

### THE TEMORA AVIATION MUSEUM'S AIRCRAFT DISPLAYS

Email: [info@aviationmuseum.com.au](mailto:info@aviationmuseum.com.au)

Website:

<http://www.aviationmuseum.com.au/event/aircraft-showcase>

### SMITH FLIGHT CENTENARY COMMEMORATIONS PROGRESS REPORT

**The South Australian** people have published two major books: a reprint, with some additions, of Ross Smith's book *14,000 Miles Through the Air*, describing the 1919 flight, and *Long Flight Home*, a historical novel in which the narrator is Wally Shiers, written by Lainie Anderson, who spoke at the last Aviation Futures conference. Thanks to a Churchill Fellowship she has made a major study of the Smith flight. Her book is very accurate and a good read. She has provided good notes of the sources of her information and ideas.

**The books** are available from Wakefield Press in Adelaide, ordered from their website.

Tom Lockley



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Thank you, Gordon Lasslett, John Scott, Paul & Christine Ewoldt, Tom Lockley, and aviation friends for submissions to this newsletter.

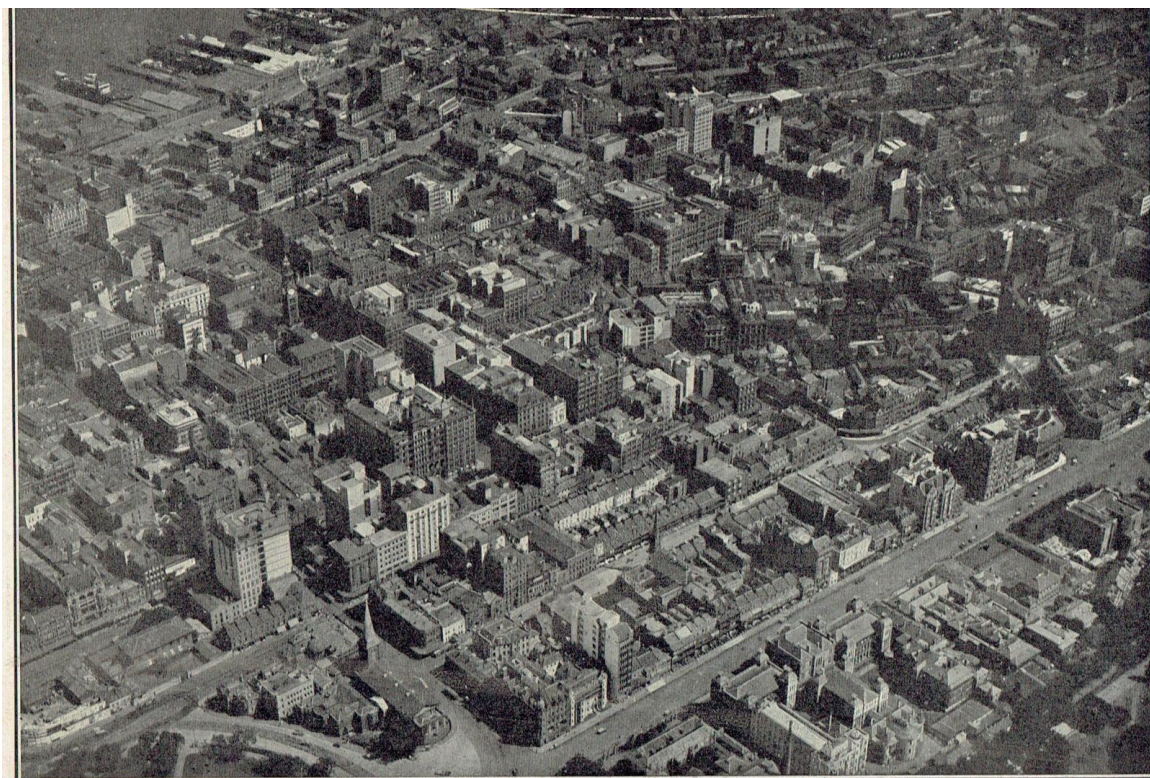
Contributions should be sent to the Newsletter Editor:  
[judyrainsford@hotmail.com](mailto:judyrainsford@hotmail.com) **jr71 AHSA (NSW)**

Countdown to the Smith Flight Centenary Commemorations



## Smith flight: the pictures of Frank Hurley.

Lots of things are happening re the Smith Flight Centenary, and I hope to have the basic information out with this newsletter. But in case this cannot be done, this month we have a selection of the photos taken by noted photographer Frank Hurley, (1885-1962) from his book published in 1920.



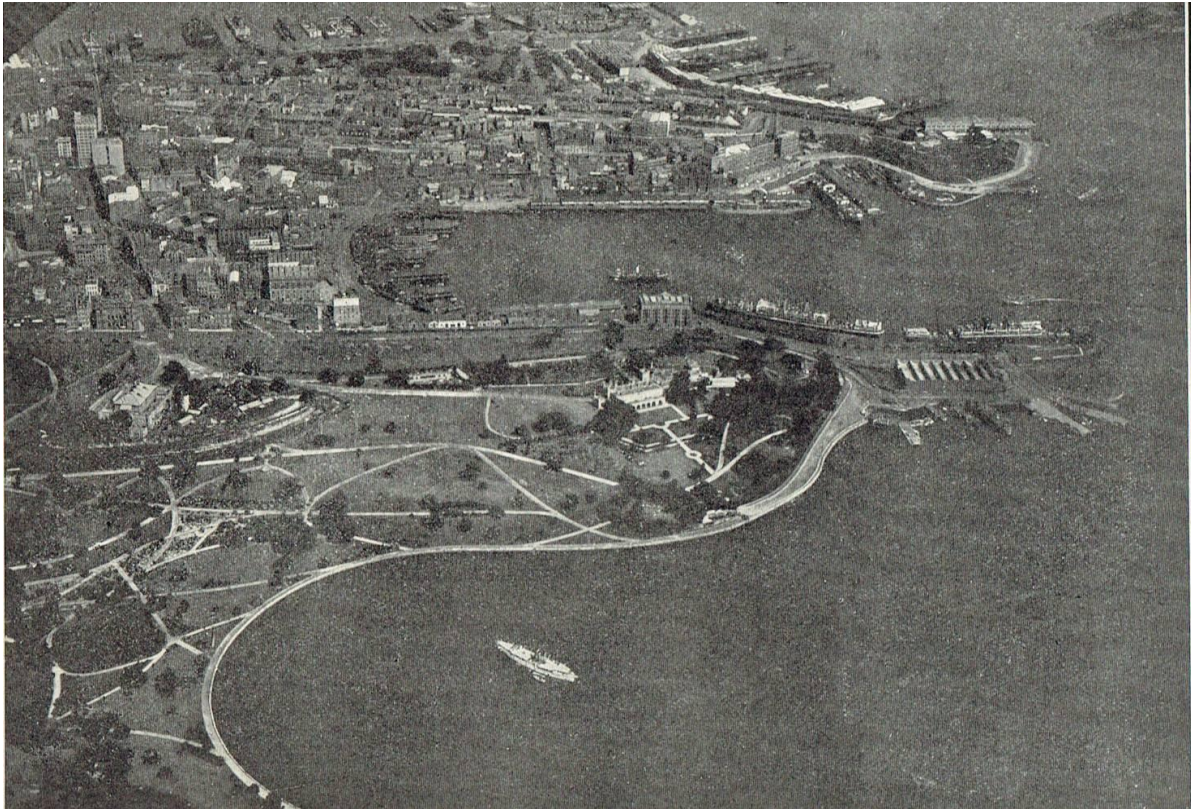
The city from Hyde Park to the Erskine St wharves. Note the GPO clocktower (Martin Place) and St James church in the foreground

SYDNEY, LOOKING NORTH-WEST FROM OVER HYDE PARK

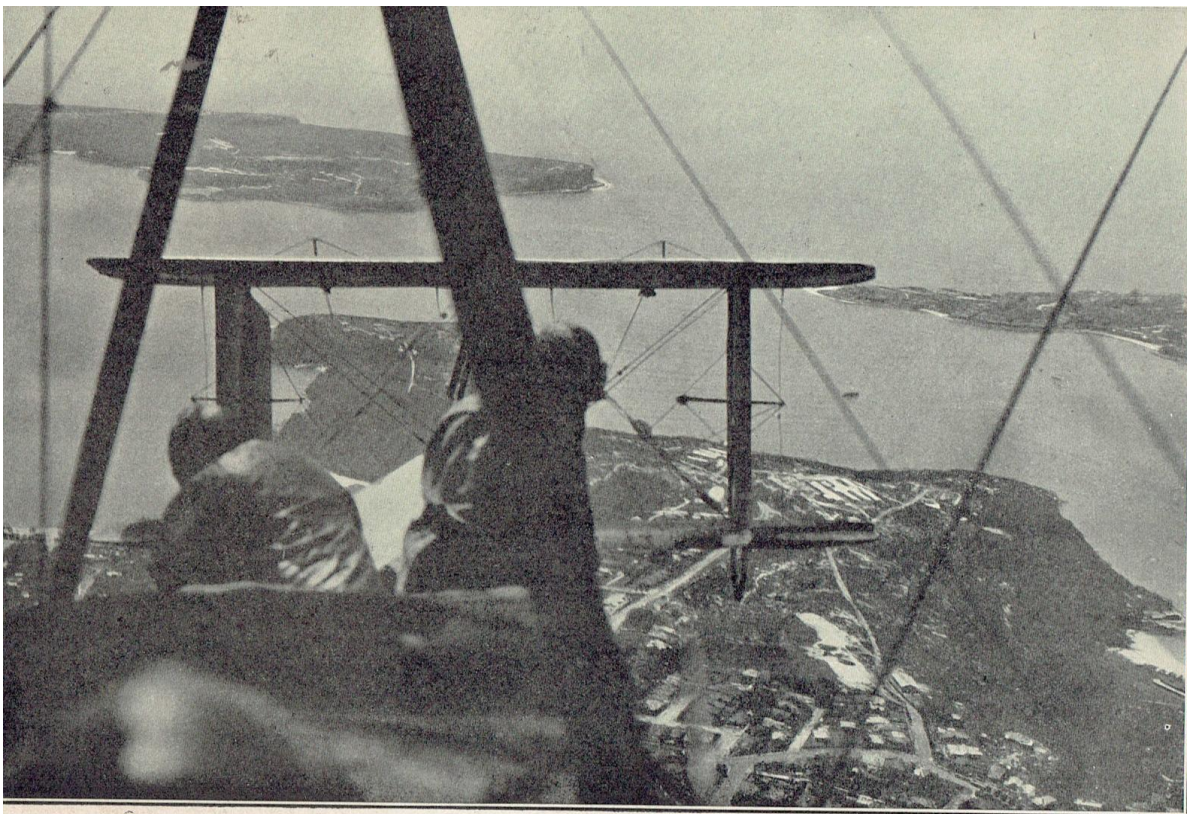


A cropped view of Garden Island and the Domain from over Potts Point.

Note Garden Island has not been reclaimed to the Woolloomooloo area.



Farm Cove, the Botanical Gardens and Circular Quay. Bennelong Point tramsheds and Government House are visible.



Probably the most famous photo – the Vimy flying up Sydney Harbour.

THE VIMY APPROACHING SYDNEY  
North Head on the left ; South Head on the right