



THE DUXFORD RADIO SOCIETY

The Radio Section of the Duxford Aviation Society

Imperial War Museum, Duxford, Cambridge

Equipment History Summary File

Transmitter T1154/Receiver R1155 (British RAF 1941)

“One of the Wireless Sets which won the war”



T1154/R1155 in the IWM Duxford Lancaster



T1154/R1155 installation in a Shackleton

1. Application

Transmitter type T1154 and Receiver type R1155 were originally designed to provide long- range, high-frequency (HF) radio communications and navigation facilities for British bomber aircraft in the Second World War. The equipment was also installed in RAF Air-Sea Rescue launches, used in ground stations and in some ground radio vehicles. The first version of the receiver was the R1155, and later variants were designated R1155A, B, C, D, E, F, L, M, and N. A similar number of variants of the T1154 transmitter were also produced.

The radio installation comprising the T1154 transmitter (often abbreviated to TX) and R1155 receiver (often abbreviated to RX) operated using amplitude modulation (AM) for speech, and a continuous wave (CW) or modulated continuous wave (MCW) for Morse code transmission. A direction-finding (DF) facility was incorporated into the receiver which used a rotatable loop antenna to determine the aircraft position.

The in-service life was from 1941 to 1950. The T1154/R1155 TX/RX combination replaced the pre-war T1083/R1082 and T1115/R1116 equipment.

2. Description

The R1155 was a conventional superhetrodyne type receiver (Superhet) using thermionic valves (called tubes in the USA), and covered the frequency range 75 kHz to 18.5 MHz in five switched bands. These bands differed according to the model variant. Both modulated and unmodulated signals could be received on all frequency bands and provision was made to operate with a rotatable direction-finding (DF) loop aerial on some bands. The Wireless Operator could take direction-finding bearings by either visual means from his instruments, or by aural means from signals heard in his headphones.



For reception of communications signals, the receiver could be connected to either fixed wire aerials mounted on the aircraft or long trailing line aerials. A fixed aerial was normally used for the HF ranges, and the trailing aerial on the medium frequency (MF) ranges. The DF loop aerial, such as an Air Ministry Type 3 or 4, was the standard fit for the direction-finding facility.

The transmitter T1154 was a variable frequency, master oscillator/power amplifier type of transmitter and was capable of generating a radio frequency (RF) output power of 40-70 Watts on

CW and 10-17.5 Watts on speech or MCW (according to model). It had slightly different frequency coverage to the receiver using three or four switched bands. In airborne installations, both receiver and transmitter were powered by two rotary transformer power supplies which were driven from the aircraft electrical system of 12 Volts or 24 Volts. One transformer unit provided the high tension (HT) and low tension (LT) supply for the R1155 receiver and the LT supply for the associated transmitter T1154. The high voltage HT supplies for the transmitter were provided by a separate rotary transformer unit. For ground installations, two separate power units were again used, each operating directly from 230 Volt, 50 cycles alternating current (AC) mains.



As mentioned above, during the course of the Second World War, a number of different variant models of the T1154/R1155 station were created for different applications, some manufactured from steel, some from aluminium and some with different frequency ranges. However by August 1944 the number of variants in production was reduced to just four types. The type R1155A (aluminium construction) was used for the Halifax bomber aircraft, and the R1155F (aluminium) for all bomber aircraft other than the Halifax, and for other types of aircraft that required aluminium cased versions to lessen interference with the magnetic compass. The type R1155L (aluminium cased version of the R

R1155N originally designed for RAF Coastal Command) was for general-purpose airborne use, and the R1155N (steel) for all other general use, except in bomber aircraft.

3. Equipment History

Marconi's Wireless Telegraph Company (MWTC) had long been recognised as the pioneers of trans-oceanic and maritime wireless services, and by 1921 evolved the only aircraft radiotelephone organisation in the world, giving commercial aviation the long-range communications facilities which were essential for its development.

In addition to radio communications, a reliable system of direction-finding for aircraft was also needed in order that aircrew could determine their exact position at any time. Two methods of direction-finding were available at the time; direction-finding carried out in the aircraft, or transmission to the pilot of bearings obtained by a ground station. In the 1920s, the needs of the day were usually fulfilled by the latter method. Marconi had, in addition, developed a new portable direction-finder of small dimensions, which was specially suited to aircraft installations.

During 1930, Marconi introduced the AD18; the world's first airborne transmitter to be controlled by a variable-frequency master oscillator. In 1932, after six months of exhaustive experiments over the Cape-Cairo route, Marconi had produced the first combined HF/MF transmitter-receiver, the AD37-38, with the AD32 direction finder. This was used by the Imperial Airways aircraft *Atalanta*. By 1935 Marconi had evolved a combined equipment, AD57-38 which gave HF/MF reception, plus direction finding facilities, for the Empire Class flying-boats. In July 1937 the latest version of this equipment, the AD67-68-72 enabled the flying-boat *Caledonian* to keep in touch with the UK Foynes ground station during the whole of its 14-hour trans-ocean flight.

When war threatened in the late 1930s, the RAF was still using the transmitter type T1083 and receiver type R1082 which had very limited facilities. Fleet Air Arm aircraft were still using the T1115/R1116. For the purposes of warfare it was imperative to obtain quickly a more modern type of airborne communications and direction-finding equipment which would have a wider frequency range, improved performance and ease of use compared to the T1083/R1082.

Equipment specifications and a contract were given to Marconi in October 1939 to develop the required system as quickly as possible. This was given the Air Ministry nomenclature T1154/R1155. Marconi was appointed the main contractor for design and production of both equipments. The design team was lead by one of the chief designers (later Sir) Christopher Cockerell (of Hovercraft fame), then a senior engineer with the Marconi Company.

The resulting T1154 transmitter was developed from the AD67 and AD77 transmitters at the Marconi aeronautical laboratory at Writtle near Chelmsford. The R1155 receiver was developed from the AD68-72 receivers, jointly by E.K. Cole Ltd (Ekco) and Marconi staff, sharing the laboratory, drawing office and engineering facilities of E.K. Cole at their Southend-on-Sea establishment.

By January 1940 models of both the equipment had been flown and approved. The first production equipments were manufactured at Marconi Air-Radio Works at Hackbridge, Surrey under the direction of Mr R. Telford (later Sir R. Telford, managing director of GEC-Marconi). These initial production equipments were fitted into Bomber Command aircraft five months later in June 1940 by engineering teams from Marconi, a notable achievement for all who worked on the project in such a short space of time.

Because of the large number of orders placed for the new equipment, four other companies were also contracted to work in a 'parent-daughter' relationship in order to share the production load with Marconi. These were E. K. Cole, Plessey, Mullard (at the Philips Lamps factory) and E.M.I. As the 'parent company', Marconi was responsible for overall co-ordination of the manufacture by all five companies.

Over 80,000 T1154/R1155 equipments were manufactured during the war, the majority of them being used by RAF and the other Commonwealth air forces. Some variants were also produced for the Royal Navy. Marconi also engineered the radio installation for the Wellington, Whitley, Blenheim, and Hampden aircraft of Bomber Command, and re-equipped the squadrons in the field. It ran a training school where hundreds of RAF personnel were trained. The equipment was also installed in numerous fighter-bombers, flying-boats, ground stations, vehicles and RAF Air-Sea Rescue launches.

4. Brief Technical Specification

Frequency range:	Receiver R1155 - varied according to model: 0.075 - 0.2 MHz (not L and N models), 0.2 - 0.5 MHz, 0.6 - 1.5 MHz, 1.5 - 3 MHz (L and N models only), 3 - 7.5 MHz, 7.5 - 18.5 MHz, in five switched ranges. Transmitter T1154 - varied according to model: T1154, A, B, J, N 0.2 - 0.5 MHz, 3.0 - 5.5 MHz, 5.5 - 10 MHz, T1154 C, F, H, K, M 200 - 500 MHz, 2.5 - 4.5 MHz, 4.5 - 8.7 MHz, 8.7 - 16.7 MHz, T1154D, E 0.2 - 0.5 MHz, 2.5 - 4.5 MHz, 4.5 - 80 MHz, T1154L 0.2 - 0.5 MHz, 1.5 - 3.0 MHz, 3.0 - 5.5 MHz,
Receiver sensitivity:	Approximately 10 micro-Volts input gave an audio output of greater than 50 milli-Watts
Receiver IF:	Receiver Intermediate Frequency (IF) 560KHz
Receiver selectivity:	Approximately 4 to 6 KHz at 6dB points
Receiver Audio output:	Maximum 200 milli-Watts into 5,000 Ohms
Transmitter RF output:	40 - 70 Watts CW, 10 - 1.5 Watts speech and MCW
TX Modulation modes:	Varied by model: Amplitude Modulation (AM) for speech, Continuous Wave (CW) and Modulated Continuous Wave (MCW) for Morse code transmission, T1154A and E models CW only.
Number of valves	Receiver - 10 thermionic valves (termed tubes in the USA) Transmitter - 4 thermionic valves (termed tubes in the USA)
Size/weight:	R1155 - aluminium versions - approximately 26 lb - steel versions - approximately 32 lb - 16 7/16" wide, 9 3/4" high, 11 3/8" deep T1154 - size 46 lb 10oz, weight 17 1/2" wide, 16 3/8" high, 11 1/4" deep
Power Supply:	12 Volt or 24 Volt rotary transformer power units for airborne installations, AC mains power units for ground based applications.
Antenna System:	HF frequency ranges - fixed wire aerial MF frequency ranges - long wire trailing aerial DF purposes - rotatable loop

5. References & Sources of Further Information

1. Section 3 Equipment History; based on an article by G.E. Rawlings G8CUN, former member of the Duxford Radio Society, (formerly a member of the engineering staff in the Aeronautical Division of MWTC 1959-1969)

2. Sections 1, 2, 4 and 5; Copyright R. Howes, Duxford Radio Society.

3. Further useful technical information can be found on the Internet;

see www.vk2bv.org/radio/r1155.htm for more technical and historical details.

see www.duxfordradiosociety.org for detailed internal photographs.