



Installation Problems

By M P KITSON

Mr Kitson, of Murphy Radio Ltd, joined their Electronics Division in 1956. He served in the R A F on signals duties in the last war and until 1956 had been with Aviation Traders Ltd, working on aircraft radio maintenance.

The problem of installing a V H F communications equipment in a helicopter is the fitting into the aircraft of a transmitting and receiving unit and associated parts. The installation should be planned with three considerations in mind, namely, operating efficiency, crew comfort and maintenance. I intend to amplify these three considerations but before doing so let us look at two examples of modern V H F equipment on display here tonight.

Outwardly they are of similar pattern and in both cases consist of a rack-mounted, quickly detachable, transmitter/receiver unit, which incorporates the frequency selector switch, an aerial and various types of cable connector. The Murphy MR 80, MR 100 equipment has a backplate or junction box attached to the rear of the rack into which the main unit slides. All control unit, aerial, and battery cable connections terminate in the backplate.

The Standard Telephones STR9X is of similar form except that the cable connectors terminate on the front of the main unit.

OPERATING EFFICIENCY

The size, shape, and weight of these units and the amount of space available largely govern the final position they will occupy in the aircraft, but to ensure operational efficiency certain requirements have to be met. Anti-vibration mounted units must have sufficient clearance all round to allow for normal movement. Vibration is a significant characteristic of most current helicopters and whilst standard anti-vibration mountings safeguard the main equipment adequately, lightweight units may require special attention. As the main rotor speed, at cruising rate, is of the order of two hundred cycles per minute, flexible mounts with a natural frequency at this or its second or third harmonic should be avoided, otherwise the vibratory oscillations will tend to build up and failure may result. The majority of transmitter-receiver units incorporate a method of fan cooling and adequate space must be provided at the outlet and inlet apertures. Cable connections must be firmly secured at frequent intervals and sharp bends avoided. The aerial installation constitutes a separate problem altogether and Mr Burberry, of Standard Telephones and Cables, will deal more fully with this matter. The ideal position for the V H F aerial on a helicopter is on the underside.

of the aircraft. This is usually the only place where an adequate ground plane is available and alternative positions will result in varying degrees of rotor modulation which manifests itself as a noise in the headphones and is liable to cause interference with reception. The final location of the aerial is a matter of compromise taking into account available fuselage area, rotor modulation effect, and the possibility of damage when the aircraft is on the ground.

CREW COMFORT

Crew comfort is not pandering to the social seating of pilots. Crew comfort means efficiency and safety. It involves the disposition of control units, switches, levers, and like devices so that they can be operated with the minimum amount of physical and mental acrobatics. In a helicopter with frequent landing and take off procedures, the V H F will be operated almost continuously, and it is essential that the pilot be able to do this, without encumbering his already fully occupied mental processes. If you bear in mind that a typical descent from an altitude of 1,000 ft to touch down takes only slightly more than 60 seconds, you will realise that the correct positioning of manually operated controls used during this procedure is of paramount importance.

Press to talk buttons should be built into the control column and usable by the single pressure or at the most a small movement of one finger or thumb. Microphones should be attached to the user in such a way that it is always ready for use. Of the four current types, hand, throat, mask and boom, the throat and boom types are the most likely to meet the requirement, and the crew members personal choice may well be the final decider. Microphones and headsets normally terminate in a junction box or plug and socket arrangement and this item should be so situated that loose leads do not foul controls or impede movement. The positioning of the control unit containing the frequency selector switch is important but this item of equipment is normally operated under less strenuous flight conditions and more time is available. It must, however, be visible from a normal seated position and within handy reach.

MAINTENANCE

The problem of radio stations maintenance can be greatly eased by an intelligent installation, and less man hours spent on servicing mean a quicker turn round. The best place to service radio is on the bench in the workshop, so it is essential that units are accessible for quick replacement in the event of a fault. All radio equipment main units are designed to fit into racks and removal and replacement, therefore, is usually a matter of minutes, providing one can get at them. The aircraft radio engineer is, on the whole well catered for in this respect, and helicopters do not present any particular difficulties of their own. The backplate into which the main units fix and which form the junction box for the control unit, power, headset and aerial cables, should be in a fairly accessible position since fault finding in a complete installation necessitates the removal and visual inspection of these plug and socket terminations and some backplates or junction boxes do contain working parts and are little black boxes in themselves. Cabling, except at its extremities, seldom requires attention. Replacement of control units

presents no problems for the obvious reason of their being accessible by their very use V H F whip aerial bases should be capable of visual inspection and quick replacement Under icing conditions aerial damage is not uncommon

CONCLUSION

The foregoing are the fundamental requirements for a radio communications installation and most of the points I have raised apply to radio equipment generally In the past, it has been the custom to design and build an aircraft and then endeavour to fit the radio in as best possible This system is technically frustrating and economically unsound Aircraft radio has for too long laboured under the derogatory misnomer of an ancillary equipment The dictionary definition of ancillary is "subservient" and although in the early days radio was not essential and was considered a luxury perhaps, it is now part and parcel of aircraft operation and its integration into the design pattern of an aircraft should be considered at a very early stage Not being aircraft designers ourselves we cannot precisely specify the how and the where of a particular installation, but we do pass to you our recommendations for successful radio operating for your contemplation, comment, and we trust co-operation



Aerial Systems *

By R A BURBERRY

Mr Burberry has been with Standard Telephones and Cables Ltd since 1947 in charge of a group working on aircraft aerials Previously he had been with Telecommunications Research Establishment He has been continuously engaged on the design and development of aircraft aerials

Without a good aerial system an Aircraft Radio Equipment is about as useful as a helicopter without a rotor and yet it still happens that the proper provision and siting of aerials is neglected The intention of this paper is to outline the basic requirements of aerials for the radio systems in general used on helicopters and to show how the difficulties peculiar to this class of aircraft can be overcome

CLASSIFICATION

For the purposes of this discussion three broad categories of radio equipment can be distinguished These are

- 1 Low frequency—i.e., up to 2 Mc/s or wavelengths greater than 150

* This paper embodies material gathered by the author in the course of his work at Standard Telephones and Cables to whom the author's thanks are due