International Civil Aviation Organisation
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Agenda Item 5: Radio Navigation Aids Maintenance of conventional systems

EXTENDING LIFE AND MAINTAINING CONVENTIONAL NAVAID SYSTEMS

(Presented by Australia)

SUMMARY

Continued maintenance of conventional navigation aids will be required until transition can be achieved to GNSS based applications. This paper discusses issues with conventional navaids and asks the meeting to consider how cooperation can be facilitated between States.

1. BACKGROUND

1.1 Navigation aids in Australia for civil aviation are provided by three groups, these groups being Airservices Australia, Department of Defence and private owners. With the exception of a number of Defence facilities all are maintained by Airservices Australia.

1.2 The Australian navigation aid network consists of the following facilities:

ILS	39
DME	73
NDB	285
VOR	93

1.3 GNSS (GPS) non-precision approach procedures have been implemented at 260 aerodromes with the number of aerodromes increasing to 290 by the end of 2002. Each non-precision approach based on a conventional navigation aid is supplemented by a GPS based procedure. GNSS is accepted in Australia as a primary means of enroute navigation and as a supplementary means of navigation for non-precision approaches.

1.4 Continued operation of the conventional navaid network is essential for the support of aviation in Australia. Future planning sees a transition to GNSS applications.

2. MAINTENANCE ISSUES

2.1 Equipment Age

2.1.1 The age profile of equipment ranges from equipment installed in the last year to equipment that is in excess of thirty years old. With age come problems of obsolete designs, no manufacturer support, general deterioration of modules, chassis and antennas and difficulties in sourcing replacement component parts.

2.1.2 To manage the problem of aging equipment Airservices Australia adopts a system engineering approach that includes the assignment of in-house engineering authority with full design authority for legacy systems and periodic systems reviews.

2.1.3 The outcomes of the system engineering approach have been;

a) the strategic replacement of equipment types,
b) cannibalisation of decommissioned facilities to provide additional spares, and
c) life extension by refurbishment and /or exchange of assemblies with new assemblies designed and manufactured in-house using current components.

2.1.4 Airservices Australia operates a central module repair depot (CMRD). CMRD has the capability of module repair and modification, testing in repair jigs and environmental testing. The use of CMRD gives Airservices Australia the ability to provide original equipment manufacturer type support for obsolescent equipment.

2.2 Spare and Replacement Parts

2.2.1 As discussed under the title of Equipment Age (para 2.1) spare and replacement parts are difficult to obtain. This problem is made worse due to the special nature and relatively small production runs of navaid equipment.

2.2.2 At the time of initial purchase recommended spares holdings are obtained from the equipment manufacturer. Reviews of failures and usage rate of spares are monitored so that support arrangements for the remaining life of the equipment can be determined. An outcome of the review has been the procurement where necessary of additional spares from the original manufacture before the closure of production facilities.

2.3 Sourcing New Equipment

2.3.1 Despite the belief that conventional navaids are a thing of the past, Airservices Australia has found a competitive and capable market place for new equipment. Recent purchases of ILS saw three competitive suppliers. The same was the case for NDBs.

2.3.2 New equipment designs utilise modern components and incorporate maintenance and diagnostic facilities to aid in maintaining the equipment.

2.4 Technician Skills

2.4.1 Long term equipment stability and minimisation of intervention has created a challenge in maintain technician skills. Airservices Australia operates a competency program for technicians to assure that maintenance and certification actions are appropriate for the safety of the system. The difficulty is maintaining sufficient numbers of technicians to minimise restoration times whilst ensuring each technician has sufficient exposure to the equipment to maintain the required level of skill.

2.5 Site Constraints

2.5.1 Conventional navigation aids require careful site management to ensure that the performance of the facility is not degraded by development encroaching into the protection area around the aid. Protection areas can represent significant cost in terms of lost opportunity for the development of aerodrome support facilities such as terminals, maintenance hangars and cargo terminals.

2.6 Flight Inspection

2.6.1 Regular flight inspection of conventional navigation aids contributes to the ongoing cost of operation. In Australia the challenge to minimise cost whilst maintaining the quality of flight inspection has been addressed by employing efficient aircraft with comprehensive and fully integrated airborne test equipment. The sharing of flight inspections services with other States is creating win-win situations.

2.7 Maintenance Tracking and Performance Analysis

2.7.1 The collection of reliable and accurate data is an important corner stone in the analysis of system performance. Analysis can indicate developing maintenance concerns by looking at indicators such as fault occurrence and time to repair. Costing information collected along with the technical details can be employed to develop cost-benefit studies necessary to justify significant maintenance or replacement proposals.

2.7.2 Efforts by Airservices Australia to involve maintenance staff in whole of system management is giving significant return in providing comprehensive, accurate and timely information on the effectiveness of the support arrangement. An organisation wide direct entry computer base maintenance tool collects information from staff. The tool also allows staff to create reports of local and combined data.

2.8 Test Equipment

2.8.1 Test equipment is an essential element of any maintenance regime. In general test equipment has improved with automated and integrated functionality contained with a single portable box. A problem may be that the test equipment is overly complex.

2.8.2 Test equipment management within Airservices Australia is through its Test Equipment Maintenance and Calibration Centre (TEMACC). TEMACC has the capability of maintaining a large range of aviation specialist test equipment and is certified against national standards for calibration tasks. The advice of TEMACC is sought in the selection and retention of test equipment.

3. CONSIDERATIONS

3.1 The continued operations of the conventional navigation aid network will be required until successful transition to a GNSS based system. Continued operation will require maintenance, refurbishment or replacement of equipment.

3.2 Within the Asia/Pacific Region there are States with considerable expertise and support infrastructure to enable them to maintain and refurbish current and obsolescent navigation aids. Knowledge of States with this capability and the capacity to assist others would be an advantage to other States looking for support. The information could be distributed via a list maintained at the Regional Office.

4. RECOMMENDATION

4.1 That the meeting considers the issues raised in the paper and suggests methods to facilitate cooperation between States to achieve beneficial outcomes in the continued operation of conventional navigation aids.

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