International Civil Aviation Organization

NINTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/9)

Bangkok, Thailand, 11–15 July 2005

Agenda Item 4: Aeronautical Mobile Service

2) review air-ground communication system

HF AND VHF AIR-GROUND COMMUNICATIONS SYSTEMS UPGRADE IN AUSTRALIA

(Presented by Australia)

SUMMARY

This paper provides an update of rationalisation and modernisation works currently being implemented in Australia on the equipment providing the air-ground-air VHF and HF voice communications.

1. INTRODUCTION

1.1 Australia has an ATM Strategic Plan developed through collaboration of aviation stakeholders that form the ASTRA group1. Volume 3 of the Plan describes the strategic direction for communication services for all classes of aircraft and all classes of operation through to the year 2020.

1.2 Summarily, the primary communications method for the majority of aircraft within the Australian FIR and in the Enroute, Terminal and Approach phase of flight is envisaged to remain for the next ten to fifteen years to be via Very High Frequency (VHF) voice and High Frequency (HF) voice communications.

1.3 As a consequence of this restated requirement and the state of the extant infrastructure following little investment over the past 20 to 25 years, Airservices Australia is undertaking a major renewal and rationalisation program on its communications infrastructure.

2. VHF

2.1 Enroute and terminal VHF facilities make up the largest proportion of equipment supporting air-ground communications in Australia. Approximately 150 sites (Figure 1), located at major centres and remote locations across Australia provide an enroute nation-wide coverage of VHF voice services down to around 20,000 ft with many areas better covered down to 10,000 ft and often ground. A

[1] http://www.astra.aero/

mixture of ageing AM radio transmitters and receivers are connected via switches and relays to various types of (mainly) analog bearers (landlines, microwave links and satellite ground stations) back to the two main (TAAATS) enroute air traffic control centres (in Melbourne and Brisbane) and terminal control units (in Sydney, Adelaide, Perth and Cairns).

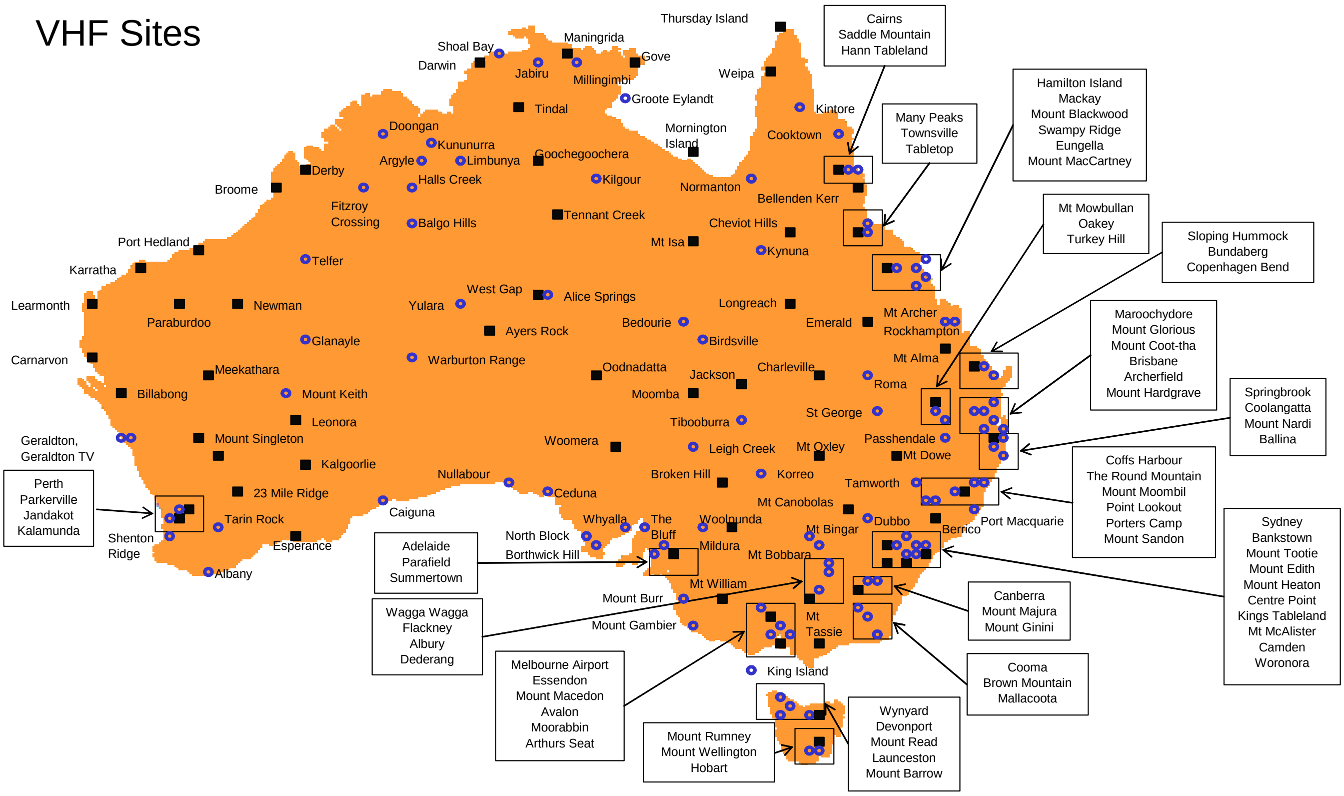


Figure 1: VHF Communications Sites

2.2 With the large proportion of the radio equipment at end of life, the opportunity has been taken to modernise and upgrade the entire end to end communications system. Excepting the existing Voice Switching and Control System (VSCS) at the major centres, all elements of the service will be upgraded taking advantage in particular of modern digital switching and communications technology. The highlights of the new system design – depicted below in Figure 2 are;

- Removal of common mode failure elements such as analog switches results in increased system reliability and availability
- Significantly enhanced remote control and monitoring capability reduces fault diagnosis and restoration times
- Upgrade to modern high performance radio equipment and RF design reduces susceptibility to radio frequency interference
- Standard design is modular allowing increased flexibility and requires less spares holdings and reduced maintenance effort
- Use of modern digital communications bearers allows higher integrity monitoring and more cost effective service delivery using modern voice compression and digital signalling techniques.

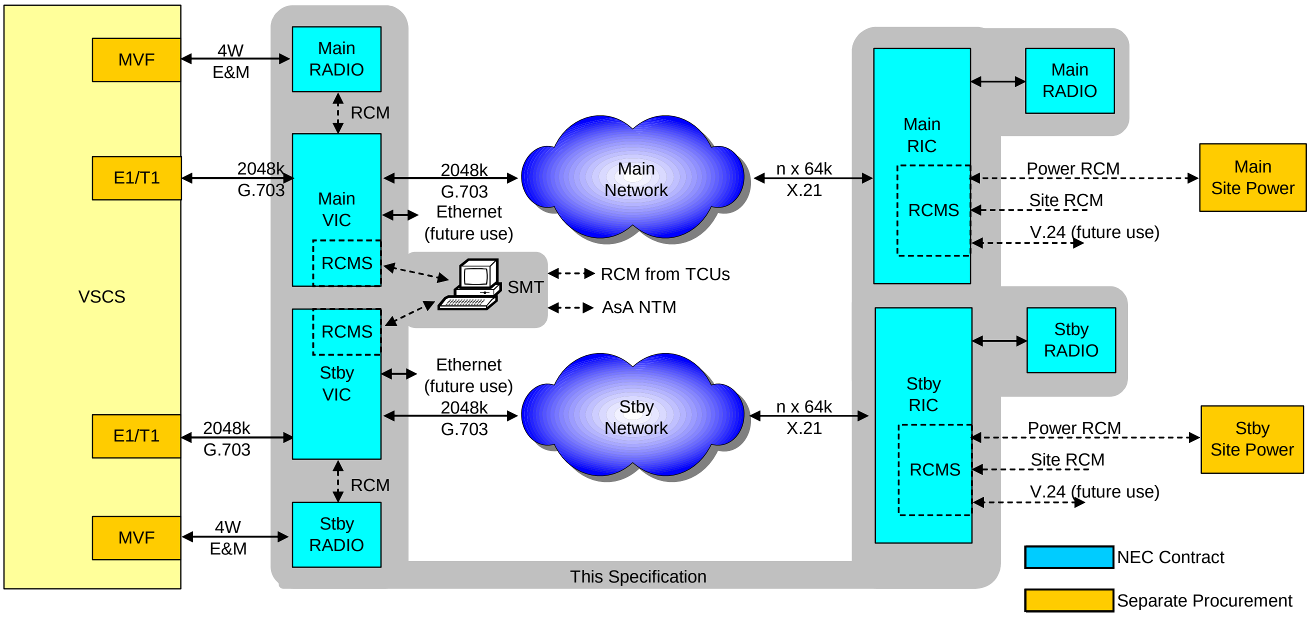


Figure 2: New VHF System Design

VHF Project Status:

2.3 The Upgrade project is well advanced with the pilot network and first sites installed and under test. NEC Australia as prime equipment supplier is providing the Frequentis (Austria) VIC (VSCS Interface Controller) and RIC (Remote Interface Controller) digital interface equipment and Rhode & Schwarz (Germany) the VHF Transceiver radio equipment. Optus Australia is the prime contractor responsible for delivering the majority of digital connectivity to the remote sites (which will be combination of landlines, microwave links and satellite bearers). The project is scheduled for completion in mid to late 2006.

VHF Channel Spacing:

2.4 Coincident with the VHF system upgrade, Airservices Australia will begin assigning Air-Ground band (117.975 to 137 MHz) frequencies with 25 kHz channel spacing in lieu of the current 50 kHz spacing. This closer spacing assignment is necessary to provide sufficient interference free frequencies for ATS. It will be complemented by new CASA (Civil Aviation Safety Authority) standards mandating in Australia a frequency tolerance of 0.003% for all aeromobile VHF transmitters from November 2009.

2.5 25 kHz channel assignments will be introduced in stages for different classes of airspace: November 2005 for Class A airspace, November 2006 for Class C, D and E airspace, with Class G delayed until other frequency planning options are exhausted.

3. HF

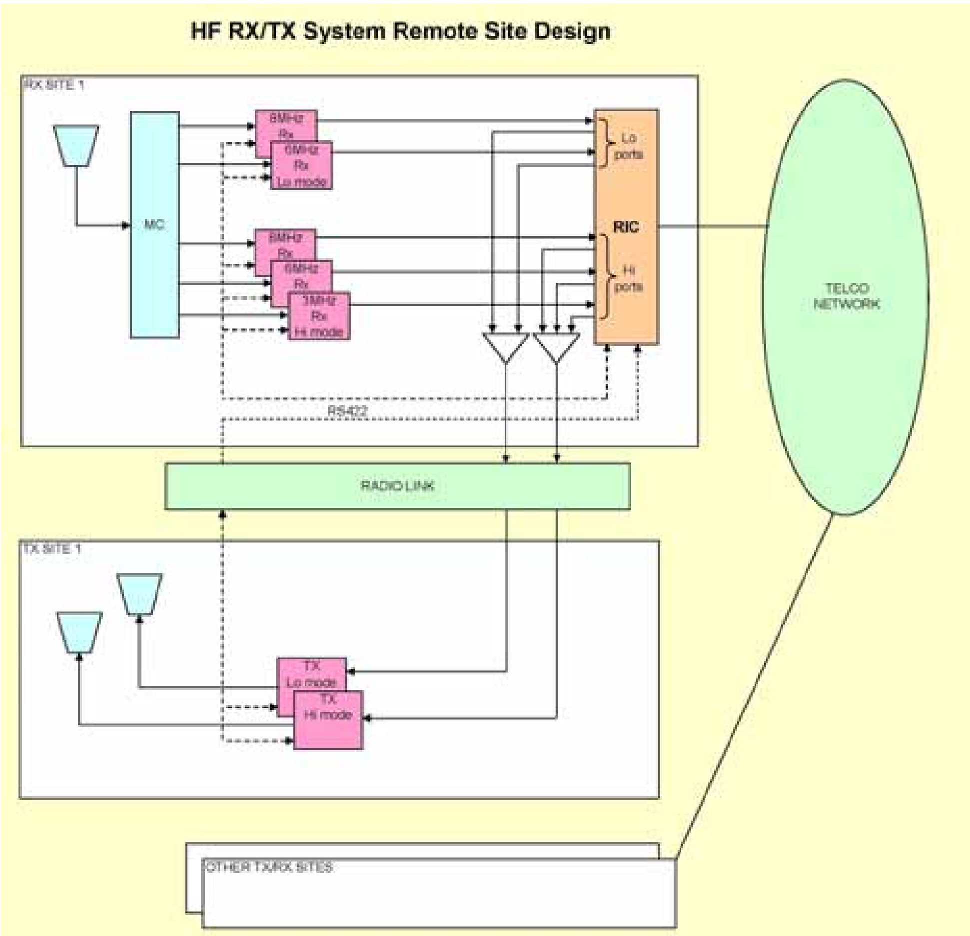
3.1 Current HF MWARA and RDARA services are provided from 18 separate HF transmitter and receiver sites (total 36 sites). Similar to the VHF network, little investment had been made over the last three decades and an opportunity to significantly rationalise the number of sites was available with the use of modern technology.

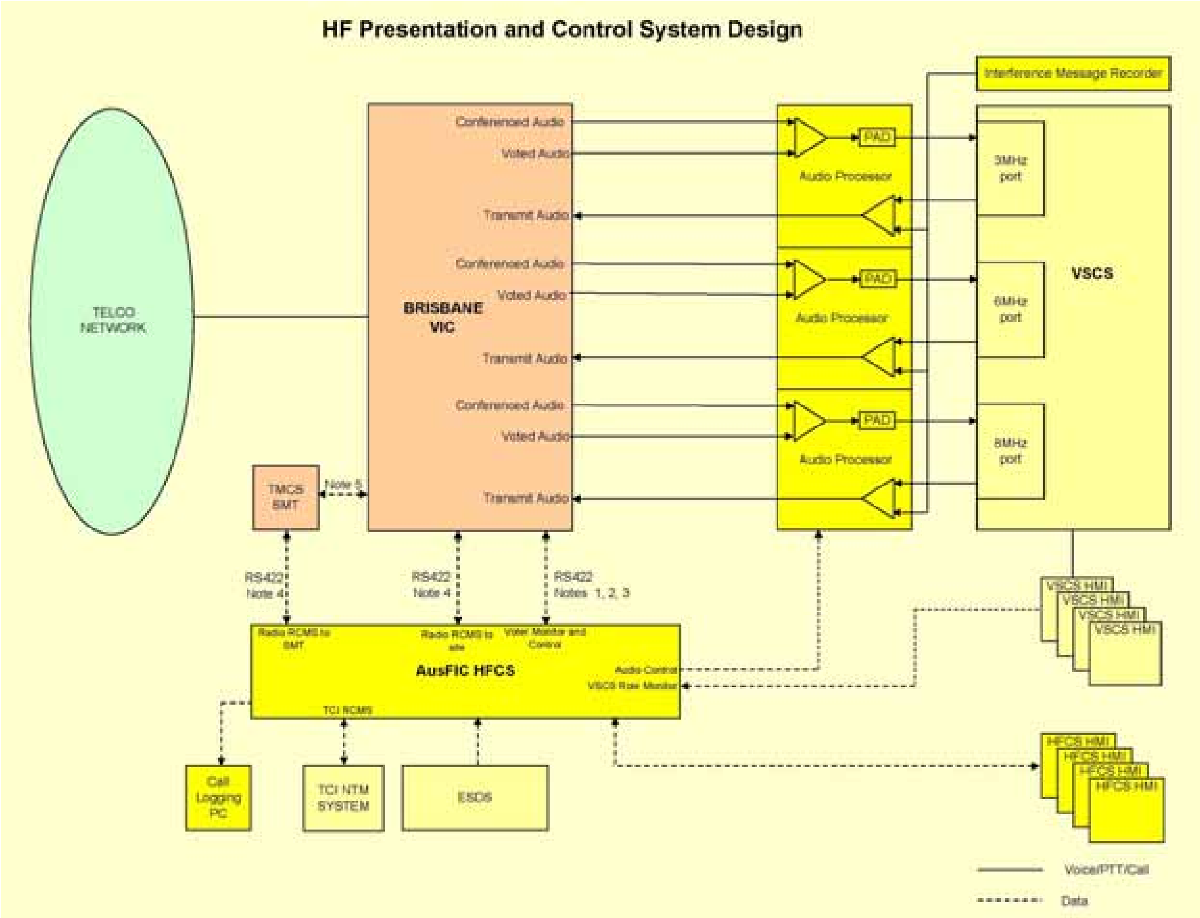
3.2 The central element of Australian civil aviation's new HF communications system, which is scheduled to be commissioned by August 2005, is the use of high gain multi-modal antennas combined with modern receivers and voting technology. This has allowed the rationalisation of sites down to 6 transmitter and receiver sites from the current 18. The new system design depicted in Figures 3 and 4, incorporates the following key features and benefits;

- Coverage requirements met by use of High Gain Multimodal Spiracone (*Andrew*) antennas
- Best signal delivered to operators by use of Signal-to-Noise Ratio (SNR) voters *(Frequentis)* and voice detection squelch in the digital receivers *(Cubic)*.
- 1 kW solid state transmitters *(Cubic)*
- Efficient use of digital communications bearers
- Significantly enhanced remote control and monitoring system reduces fault diagnosis and restoration times
- New Human Machine Interface (touch screen) with increased flexibility to deal with both high and low workload situations – designed and built by Airservices' Aviation Systems Group.

Figure 3: New HF Remote System Design

Figure 4: New HF Presentation and Control System Design





Project Status:

3.3 The project is nearing completion, with all remote site equipment installed, digital bearer connectivity achieved and new Operator HMI undergoing final testing.

4. CONCLUSION

4.1 The meeting is invited to note the works being undertaken to modernise and rationalise VHF and HF communications services in Australia.

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