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## **Ministry of Defence Headquarters in 1964 and beyond– The Defence Communication Centre (DCC) AMRAD story.**

### **Background:**

Before reviewing the AMRAD (Automated Message Routing and Distribution) project we need to look at how the formation of the Ministry of Defence (MOD) in Whitehall Main Building in 1964 had to be pre-planned, with its related need for a large integrated communication centre and message handling facility to serve Single Service and MOD Central staffs.

Planning started in 1962, and in 1963 a report by the Sub Committee on Communications Organisation (COS((WP) (C) 5/63 (known as the Mc Crum report) outlined the requirement to support the new MOD HQ. This led to the South Citadel below the MOD Main Building being extensively fitted out with related facilities, such as on the lower level, Traffic Halls for message preparation and transmission to communications networks and point to point circuits; Secure Teleprinter based Conference facilities (also connected to the wired secure CCTV facilities in various MOD and other offices) giving access to Command HQs such as then located in the Far East, albeit at limited speed as at senior staff at each end had to instruct an operator, supervised by a Communications Staff manager, who then transmitted the wording by teleprinter; On line Crypto equipment; Off Line Coding/Decoding Rooms and equipment.

The upper-level was fitted out for Message Control, a large message reception and distribution facility (then known as Room 039) equipped with a Sovex conveyor delivery system, circulating continually around the perimeter, which was used to pass the messages to the appropriate section desks for processing – each circulating tray had a key selection system which enabled delivery to any given section . There was an extensive system of Lamson tubes to avoid manual delivery of messages into and out of the Citadel to Central Registries in The Main Building; The Admiralty Building; The War Office, and elsewhere. and also between the upper and lower levels of the Citadel. This facility included both a large diameter system (four inch) which was point to point for larger

envelopes and their contents and a selectable (two inch) system which could be dialled up to deliver messages in locked, or unlocked, containers direct to operationally oriented branches and many others in the MOD Main Building (MB) .

There were banks of duplicating (role off and messy, replaced quickly with the latest Xerox) machines, a typing pool some local circuits to such as to Bath and other supporting management offices on the same floor.

There were no lifts (not contemplated in the Cold War era) , or means of transporting teleprinter tapes and rolls, or any other stationery items needed to operate the whole site. When coming on shift the more able staff helped carry such essentials down the many steps, until such time as a chute was provided running around the walls of one of the two access staircases. 1964 was hard going but things had settled down by the end of 1965.

**This Citadel facility was known as The Interim Manual Defence Communication Centre (DCC)** and was initially staffed by both Service and Civilian staff, but soon became Civilian staff only. As one might expect in the Cold War era the facility had its own diesel generators and no-break power supplies and a number of bunks etc. The projected number of staff required to operate this facility by 1970 was assessed to be over six hundred – of which the majority were shift workers – hence the pressing need to investigate some form of automated assistance, or replacement.

**Figures 1 and 2** show Message Control as a terminus for Lamson tubes and a conveyor system, and one of the traffic hall areas for message preparation and transmission. All was vacated by DCC once AMRAD was fully in service, but initially kept in fall back mode and used again when AMRAD was taken off air for rectification action in August 1972, before final commissioning in late 1974.

### Planning for AMRAD:

I joined the Project team (one Squadron Leader – later a Lieutenant Commander - and one Army Communications specialist Sergeant) as a message distribution specialist in 1967 and the Project had already been endorsed as Defence Staff Requirement (DSR) 2000 (February 1965) and a Design Authority (HQ Signals Command – 90 Group RAF Medmenham, Specification HQSC 1783) appointed. The initial target was to let a contract by 1967 with an in service date of 1969. It was clear to those who understood at least some of the complexity, that such a date was totally unrealistic, as both semi-automated and automated solutions had been investigated by communications engineers, rather than with highly trained communication operators and message distribution staffs and without the detailed systems analysis of the procedures that needed to be embedded in the software of any new system.

It was said by some at the time that this project was purely building on the recent introduction of TARE (Telegraphic Automatic Relay Equipment) as manufactured by Standard Telephones and Cable (STC) and commissioned in Whitehall Wireless by Maurice Foley MP in October 1967.

The lead-in period saw both MOD and Treasury reviews (the latter as the project was regarded as novel – as indeed it was, as the first of its kind). The then Ministry of Aviation (MOA) took on the procurement role and in August 1967 issued target dates of 1967 for contract letting and an in service date of August 1969. However, there was a major Defence Review in 1967 (White Paper Command 3357) which required a review of the project and the processing capability was reduced from handling **ten thousand messages per day to seven thousand** and a reduction in connectivity and terminals around London Defence related buildings. In 1968 the Treasury insisted on a further financial review and the project was eventually placed with Marconi (Writtle Essex) on 26<sup>th</sup> June 1968 with cutover set at September 1970, with the Treasury agreeing a system cost of £931, 000, some £200.000 above the initial estimates.

Once Marconi started on the task it was clear that there were going to be a number of slippages and removal of some of the desired facilities, such as an interface to Telex. Major problems were encountered with peripheral devices (unattended in silent hours, teleprinters locked in secure containers running on fanfold paper that jammed and led to the loss of signals etc.,) and serious delays in software development. Recognition that the system in service would need a new type of technical staff, as well as operators, the Defence Signals Board (DSB) Agent (support authority) at the time the Royal Air Force, was unable to provide the related manpower. As The Royal Navy had bases closing overseas and there were thus spare technical staff available on Admiralty books under Dockyard auspices – in the form of Chief Executive Dockyard (Tels) - their staff became responsible for AMRAD system maintenance, together with Marconi and other support staff. Director Naval Signals (DNS) took over as the DSB Agent for support and sponsorship of the new DCC as a whole. All DCC operating staff were moved into a new communications grade structure, with the exception of those who wished to leave and pursue careers in other Civil Service grades.

In 1972 I was directed (whilst there was an AMRAD rectification programme investigation following the failure of system trials, and parallel running with the manual DCC) to visit all UK Command HQs communications staffs and communications training establishments, such as HMS Mercury, to deliver a presentation about AMRAD and remind of the need to ensure that communication procedures were rigorously applied to avoid major levels of message rejection to manual handling and overloading of the MOD AMRAD system. Some of that presentation content has been used to outline the system configuration and those in MOD and elsewhere that it served. Eventually the system came into service in late 1974, some four years later than planned in 1968.

### AMRAD Design and connectivity:

Overall Design Objectives using computer-based techniques:

- a. Enable the input of messages in a simple format via Local Distribution Points (LDPs) located within MOD buildings in Whitehall and elsewhere. (Format D newly named for Defence)
- b. Using pre-stored lists of Signal Message Addresses (SMAs) to automatically process outgoing messages in a form as required by Defence communications networks (ACP 127 rules) and others worldwide.
- c. Electronic Distribute of incoming messages based on stored lists of branches geared to the textual codes of the Delivery Indicator Group (DIG) system direct to some branches via Supplementary Receive Points (SRPs) and LDPs in Format D, stripping out all communications (ACP 127) related procedural notation. **See Figure 6**
- d. Reduce the need for so many highly trained communications staff.

The development and manufacture of such a system was via a contract awarded to Marconi, but it also involved provision of a complete new environment of a large computer room; four separate air conditioning/filtration systems; No-Break power supplies with large battery room needed to auto start the diesel generators; faraday type electronic security, and operating and technical support staff areas, to be provided within the North end of MOD MB. The two tasks proceeded in parallel, each presenting a considerable number of challenges.

### The computer configuration.

The system comprised four Marconi Myriad computers (two computers each, per main and backup system) in normal circumstances both systems would be operating in what was termed Dual Mode, however it was often more effective to operate with a single system due to the impact of computer cross checking overheads. This involved risk however, and should the system be in Single Mode and fail necessitating the need to establish the time of failure and seek re-runs of messages from external networks (TARE staff and other commcen staffs were not impressed if this happened too often). An outline of this technical configuration (half the full system is at **Figure 3**

**Connectivity Outline – see Figure 4****External Circuits**

Whitehall Wireless TARE (Telegraphic Automatic Relay Equipment )

Boddington TARE

Northwood TARE

Point to point National circuits.

Point to point NATO circuits

Telegraphic Automatic Switching System (TASS)

**MOD HQ circuits – LDPs and SRP (Format D) locations**

**see Figure 5**

**Message Handling In and Out etc. – capacity design**

**See Figure 7**

### Library of information contained in AMRAD

The following stored information was required for AMRAD processing of messages as presented to external networks and distribution to MOD.

Routing Indicator List            1,200

Signal Message Address List 4,100

AIG list (a method of reaching a group of SMAs) 180 with a maximum of 100 SMAs per AIG)

Delivery Indicator List (DIGs) 4,000

Standard Distribution Lists    6,500

MOD Branch Title List           2,000

All of these lists had to be kept up to date including the ZOU list relating to ship movements. Initially all of this information for loading the lists content was prepared by using Defence Data Processing Staff, at the time located in Metropole Building, Northumberland Avenue and others based at Stanmore.

### Message delivery to branches and Duty Officers:

The SRP was a secure receive only installation designed to operate within the non-communicator environment of a branch registry or operations cell. There was, unlike the LDP, no send facility. SRPs were housed in secure containers and were cleared to receive up to Secret messages. LDPs had the same receive equipment fit, but were operated by DCC staff in terms of message transmission and delivery to branches by messengers.

Both SRPS and LDPs had the following facets:

Unattended operation during silent hours and weekends with automatic additional message delivery to respective MOD Duty Offices (eleven of them) of Priority or above messages arriving at action branch SRPs or LDPs.

Input and output computer controlled, automatic precedence break in and re-runs etc.

System automatically Loop Checks each channel every thirty minutes and prior to any transmission, checking for paper out etc.

Delivery of messages on 4-ply fanfold type continuous stationery. Some MOD branches would have devoured a normal forty-foot teleprinter roll in forty minutes

### The Main Operating Area

Whilst a considerable number of messages passed through AMRAD automatically, many rejected for manual intervention by communications operators for a variety of reason, some purely due to format errors, others due to the sending authority not being Defence oriented and not communicating in compliance with the rules laid out in ACP 127. To process such messages the Main Operating Area had the following equipment:

Distribution Rejection and Queries	Six VDUS
Route Send (outgoing rejection)	Four VDUs
Service Message Handling.	Three VDUs
Format Reassembly	Two VDUs
TASS semi-automatic position	One VDU
Special Handling Cell (separate room)	Four VDUs

### System Management (position located in Main Operating Area)

The Controller – a more senior communications member of each shift was provided with two VDUS to manage the system as a whole and had a vast number of commands available. This person had to keep watch for excessive queues and system overloads and act accordingly. The four computers known as AA, AB, AC and AD operated in pairs - AA/AC and AB/AD - and each pair was either in Main or Standby mode – or if one pair is off air – then the system was in Single Mode as mentioned earlier running on just either AA/AC or AB/AD. Should there be high message rates risking overloads from messages from TARES, action would be taken to request reduction in message flow to MOD, such as hold back routine messages. During AMRAD extensive trials and later cutover attempts for full live operation this was a very busy and demanding task.



### AMRAD in full operation.

From 1975 AMRAD provided a reliable system, albeit with a number of technical enhancements during the following few years, such as the addition of some Honeywell computers to ease the load on the Myriad based system. The requirement to change from the National Delivery Indicator (DIG) System codes for automatic message distribution, to the NATO introduced Subject Indicator Code (SIC) system codes meant a complete restructure of the Delivery Indicator lists and the related Standard Distribution Lists, to orientate to the NATO SIC codes as contained in the first line of message texts. The DCC operating staff had new pleasant accommodation much improved from that they had worked in during the Interim Manual DCC, and the number of staff needed was substantially reduced. DCC also provided the staff for operating the LDPs where they became better known to the branches they served.

### AMRAD Life Cycle

By 1985 after some ten years in full operational service and some seventeen years since contract award in 1968, Chief Naval Signals Officer (CNSO) as Defence Command, Control, Communications Board (DCISB) Agent for the DCC, advised that the AMRAD system needed to be replaced but there was no financial provision at the time for such action. OPCON the RN Command and Control System at Northwood was also needing investment, both in the National and NATO HQ roles. As time passed many of the Defence related staff in buildings around London moved out to Command locations, or indeed ceased to exist, as Defence activity shrank and the procurement activity was to be centred at Bristol. By 1991 there was active staffing with industry by MOD(PE) of a preproposal to replace AMRAD, but by this stage new computer systems were being introduced at MOD and elsewhere and thus the requirement had to be addressed in a new setting, where interoperability across Defence systems was becoming a pressing problem to resolve, and soon most staff were to have computing power, with communications capability, on their desks rather than being served by remote so called Main Frame systems and paper based output of the past decades.

The writer had moved on from Trials and Operations Manager DCC to other roles in 1975 (for some time visiting NATO HQ Brussels and Supreme Headquarters Allied Powers Europe (SHAPE) as part of a two-person team from

MOD UK dealing with the drafting of the NATO SIC system subject listings) , but the DCC/AMRAD project was never far away from his several subsequent MOD appointments . Subsequent to UK AMRAD commissioning, NATO authorities let a contract with a Danish Company in the late 1970s to produce a terminal message system known as CAMPS (Computer Assisted Message Processing System) not as complex as AMRAD, but it also ran into a number of development problems. The USA authorities had already invested in their AUTODIN system, deployed from 1966 onwards with many upgrades over the years to handle both data and signal messages, which did present some message rejections at AMRAD due to format variations, despite an interface between AUTODIN and a UK military communication centre elsewhere.

## Conclusions

AMRAD'S role into the 1990s is not considered in this article. However, MOD let a Private Finance Initiative (PFI) based contract for MOD Main Building (MB) major refurbishment in 2002, to run for thirty years from 2004. So clearly the AMRAD MB site, specially built and fitted out in the 1966-71 period had to be vacated as the building was emptied for major works. One can only imagine that The King Henry VIII Wine Cellar ghosts took note of the departure of a near neighbour, the AMRAD complex and its staff, at some stage.

## Appendices

Figure 1 UK Ministry of Defence © Crown copyright 1964



Figure 2 UK Ministry of Defence © Crown copyright 1964





Figure 3 UK Ministry of Defence © Crown copyright 1969

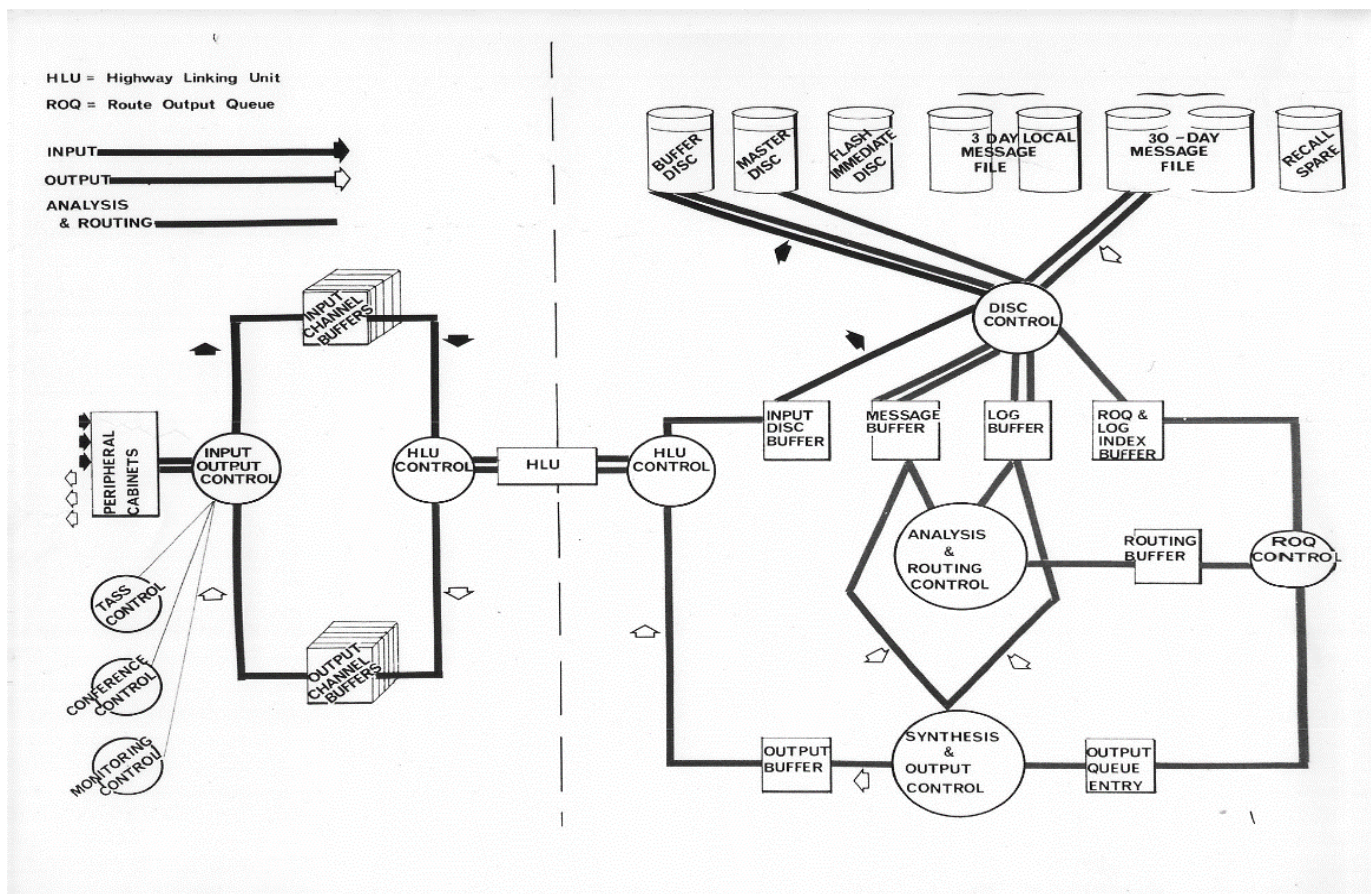


Figure 4 UK Ministry of Defence © Crown copyright 1972

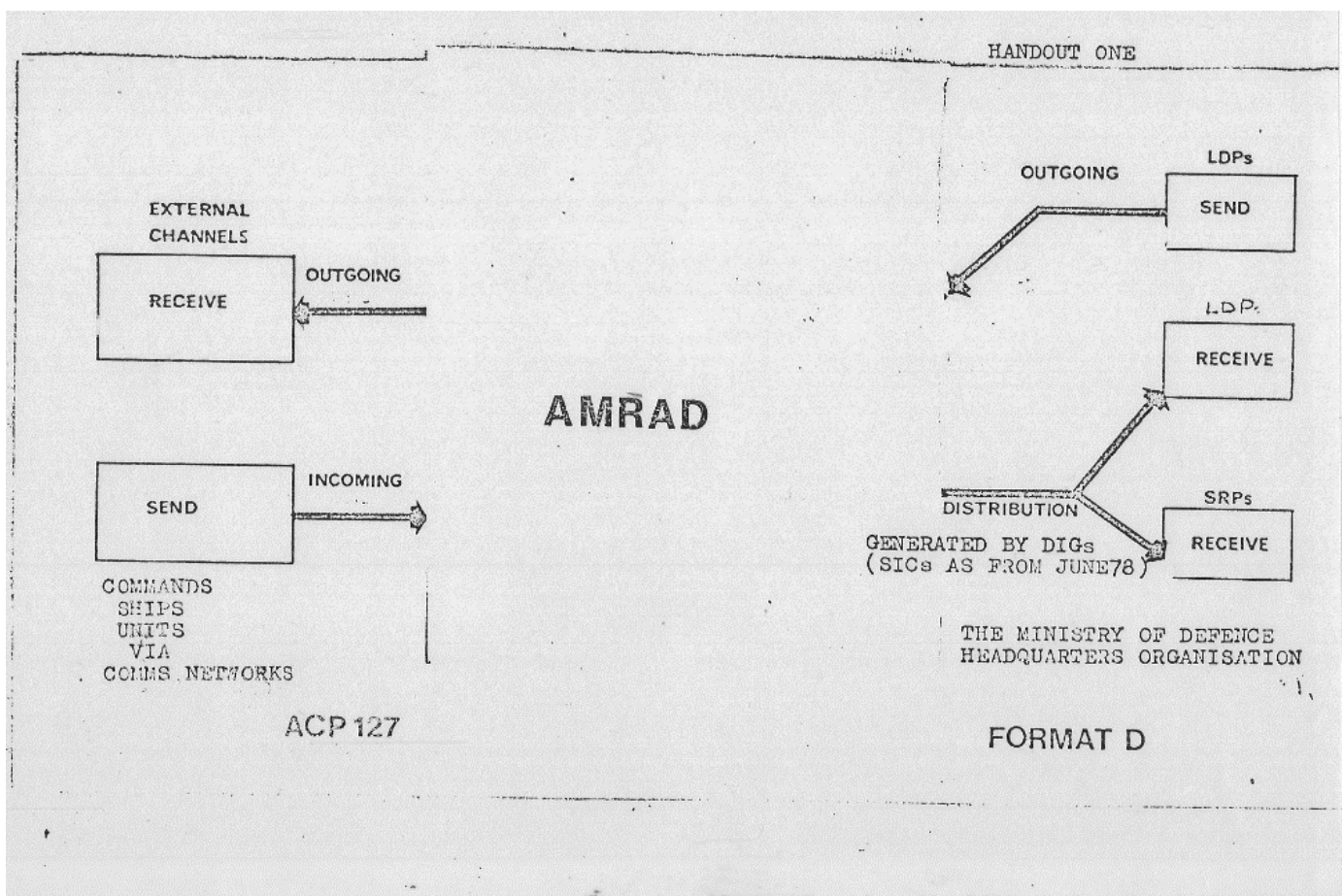




Figure 5 UK Ministry of Defence © Crown copyright 1972

LOCAL DISTRIBUTION POINTS (LDPS)		BRANCH RECEIVE ONLY POINT. (SRPS)	
Main Building	Room 7292	Main Building	CED Room 9385
"	" " 5292		DS 5 " 8373
"	" " 3292		QMG Sec 7306
"	" " 1292		DS 11/12 7327
"	" " C/033 DCC LDP	* " "	C of N 7121
Taunton			CFS 7108
Bath Foxhill			Q Mov 2 7184
Bath Ensleigh			ACNS(0) 6373
Earls Court			VCAS 6228
Copenacre			VCDS 6164
Whitehall, Old Admiralty Building			VCNS 6112
" " War Office Room 133			VCGS 6198
" " " " " 333			DS 4/7 6271
" Metropole Building			DNOT 5354
Holborn, Adastral House			AFOR 5174
Berkley Square, Lansdowne House			DOC 5256
Stanmore			DN Plans 5386
			MovOps 5178
			M O 1 Sec 5148
			DNW 4327
			DNOR 4370
			Duty Cdr 5327
			Army Ops 5278 (Res)
			ACAS Ops 3192
			DNAP 5377
			DIC 3269
			DNAW 4319
			DSS
			DNS 1302
			CPR 0363
			STP(N) 0197
		Holborn Adastral	PDO RAF 620

Figure 6 UK Message Formats . Ministry of Defence © Crown copyright 1969

MESSAGE AS RECEIVED FROM EXTERNAL STATION

STA045  
 PP RBDWC  
 DE RBDTKK 215 17/1330Z  
 P R 171230Z JUN  
 FM HQ ASC  
 TO RBDWC/MOD AIR  
 INFO RBDSFW/HQ 90 GP  
 BT  
 UNCLAS  
 DIG CDT  
 YOUR CDT421 161030Z JUN  
 THIRD ITEM CLEARED ON 15 JUN  
 BT

NNNN

MESSAGE AS DISTRIBUTED

UNCLASSIFIED

LDA127 JUN 1731452

PRIORITY 171230Z JUN

FROM HQ ASC  
 TO MOD AIR  
 INFO HQ 90 GP

UNCLAS  
 DIG CDT  
 YOUR CDT421 161030Z JUN  
 THIRD ITEM CLEARED ON 15 JUN

DISTRIBUTION CDT

LDA	3	ACDS(SIGS)
	10	D SIGS (CO-ORD)
	1	D TELS
LDK	15	F1(AIR)
LSF	2	D OF E2(AIR)

Figure 7 UK Ministry of Defence © Crown copyright 1969

# MAXIMUM NUMBER OF TRANSMISSIONS PER DAY & TRAFFIC FLOW

IN	3150
OUT	1650
THRU	200
LOCAL	2000

