



# ***e-DEFENCE ELECTRONICS NEWSLETTER***

The e-NEWSLETTER OF THE DEFENCE ELECTRONICS HISTORY SOCIETY  
No 93: April 2020 Part I



## **RUBICON - and A CRYPTO DAY?**

No, **Rubicon** here does not refer to **Covid19**; your Editor presumes that readers will have heard, and be hearing, quite enough about that! Above, UK members will see a different 'Boris' - **Boris Hagelin**, with an M-209, and as DEHS members in many countries may be looking for interesting reading just now, I am signposting you to the website of those good friends of DEHS, the **CryptoMuseum**, <https://www.cryptomuseum.com/intel/cia/rubicon.htm>, known to us for their stunning displays of crypto and related technologies at **Arthur Bauer's** excellent '**Secret Communications**' events. On that website, **Paul Reuvers** and **Marc Simons** have written an outstanding article on **Rubicon**, the **CIA and the BND (German Secret Services) covert purchase and management of Hagelin's Crypto AG**; the article following an investigation in which Paul and Marc took a very active part. Read it, and also explore Arthur's own superb website, [www.cdvandt.org](http://www.cdvandt.org).

Following the great success of our **Science Museum 'Science and Security'** event organised by **Keith Thrower** and **Dr Liz Bruton**, your Editor has received suggestions that DEHS organise a '**Crypto Day**', and remarkably two members independently wrote to suggest themselves as speakers on Enigma, Colossus, Typex etc topics! Clearly a Crypto Day is 'meant to be', though in present circumstances your Editor is thinking of 2021 as a sensible planning date and will be contacting societies and organisations who are likely to have a common interest in the topic.

Bearing in mind the current 'more time to read', I am delighted that Part II of this bumper 'First Covid19 Issue' of **eDEN** comprises a remarkable monograph, contributed by **Mike Dean**, which is a special study of **Chain Home – AMES 1** – and its little researched, 'afterlife' in the **1950s**. Mike has unearthed and preserved two papers by **Archibald Stewart** of Chain Home in those years – one a quite fascinating contemporary paper on how Chain Home, with only a modest amount of work, could have made a quite effective UK air defence in that period. A thought-provoking read on what might have been, with much supporting material by Mike.

In Part I, **eDEN #93** as usual, spans Army, Navy, Air Force and clandestine applications of military electronics of all vintages, and we begin (appropriately) your Editor's advice on 'Writing for eDEN'! I try to answer various questions I've received, starting with 'Is there a style guide?' (No!) before delving into the maths of **Wasserfall** scientist **Dr Schirmacher**. **Tony Waller** poses the challenging question 'To restore or not to restore?', while **Brian Austin**, stimulated by **Keith Thrower's** descriptions of **Squadcal** and **Syncal** last month, describes the 'prequel' in 'Racal in Africa: A Tribute to Horace Dainty (1916-2006)'. This year is the 80<sup>th</sup> anniversary of the development of the **resonant cavity magnetron in Birmingham**, on which much has been written – but oddly little about the element which gives magnetron its name, the **permanent magnet**! Thanks to the **Newcomen Society** and member **David Eaton**, a display will (we hope) open in July in **Sheffield**, from which British magnets came; two key Sheffield firms were **Jessop's** and **Saville's**, and we reprint extracts from their 1950 booklet, counterpointing it with 1935 articles by **Wireless World** reviewing the industry as it then stood, supplying loudspeaker magnets. **Bill Purser's** articles on 'Moonshine' and TRE Malvern featured in recent eDENs, and **Graham Murchie** of **Bawdsey Radar Trust** e-mailed a further article from Bill, printed in this issue, detailing Bill's varied and wide-ranging career.

Your Editor has noted that many questions raised with him by members have been answered in long-ago articles in **Transmission Lines**, but of course most members of DEHS have joined in more recent years and so may not be aware of the value of those articles, many of which were written from personal knowledge by members now sadly no longer with us. In recent issues of **eDEN** we have reprinted several of these interesting early articles, and this month we reproduce several from **2004**, starting with two articles on a subject we have not covered for some time – **PoW radio**; **Anthony Lister** tells us of **Radio Reception in a German PoW camp (1942-45)**, while an interview of **Lieutenant Colonel R G Wells** by **Brian James** details the astonishing efforts made on **Radio Reception in a Japanese POW Camp** - quite a triumph of the human spirit. **John W Butcher MBE** next details the postwar development of **FACE, Field Artillery Computing Equipment**, in **Push Button Artillery**, and our President **Keith Thrower OBE** continues his series of articles on **Valves for VHF and UHF**. **George May** then introduces the contribution of **Dr A C Bartlett** to wartime British **VHF Radio**, and then describes its use in **Fighter Direction on D-Day**.

Finally, we reprint from the August 1945 **US Navy Airborne Electronics Digest** for maintenance technicians four articles which illustrate the width and depth of communication in that service – the first, on the radar absorbent material **HARP**; the second, on 'Britain's Radio Wrens'; the third, the **AN/ARR-16 Sonobuoy Receiver** with, from his recent obituary, **AVM John Lawrence's sinking of U-396**; and the last on the **US Navy Radar Bombsight AN/APQ-5B**. We hear that the tireless **Prof. Simon Watts** will contribute another excellent article on early ASV to **June's Transmission Lines**, and whet members' appetites this by reprinting **Hans Jucker's 2004 piece on Hohentweil: Early German ASV Radar Transmitter Technology**, and **Tailpiece** then peeks at the surprising places where **members read their eDEN** – extreme locations, anyone?

Part II also rounds off with a **Tailpiece**, in this case looking at the impact the natural disaster of Australia's bushfires had on one family known to us, that of **Margret Doring, Editor of EHA Magazine (EHA = Engineering Heritage Australia)**, who was most helpful to us when we wished to reprint our recent article on 'aircraft black boxes' from her magazine. There are other disasters than a virus in today's world ...

Particular thanks this month to **Mike Dean** for his tour de force in Part II's article, and for much other support. Suggestions for improvements, offers of articles and all general comments to me please at [philjudkins@btinternet.com](mailto:philjudkins@btinternet.com) or [info@dehs.org.uk](mailto:info@dehs.org.uk).

Warmest regards all, and keep safe,

Phil

Dr Phil Judkins, DEHS Chairman.

# INDEX

Editorial: Rubicon - and an Enigma Day?	1
Index	3
Ops Board: Derk Rouwhorst: Newcomen Society Centenary	4
Writing for eDEN <i>eDEN Editor</i>	5
Naval Computing – A Reminiscence <i>Mike Ellis</i>	6
To Restore or Not to Restore, <i>THAT</i> is the Question! <i>Tony Waller</i>	8
Racal in Africa: A Tribute to Horace Dainty (1916-2006) <i>Brian Austin</i>	11
Magnets for the Magnetron: <i>Jessop's &amp; Sons/ J.J. Saville, Sheffield, 1950s</i>	23
Permanent Magnets and Sheffield <i>Wireless World Staff, 1935</i>	37
The Radar Man <i>Bill Purser via Graham Murchie/ Bawdsey Radar Trust</i>	60
Radio Reception in a German PoW Camp (1942-45) <i>Anthony Lister</i>	65
Radio Reception in a Japanese PoW Camp <i>Lt Colonel R G Wells Via Brian James</i>	71
FACE: Push Button Artillery <i>John W Butcher MBE</i>	77
Valves for VHF and UHF Parts II & III <i>Keith Thrower OBE</i>	83
Dr A C Bartlett and VHF Radio <i>George May</i>	91
Fighter Direction on D-Day <i>George May</i>	92
HARP: Stealth Material <i>US Navy Airborne Electronics Digest, August 1945</i>	94
Britain's Radio Wrens <i>USN Digest</i>	97
Sonobuoys: The Continuing Story I: AN/ARR-16 Receiver <i>USN Digest</i>	99
Sonobuoys: The Continuing Story II: AVM John Lawrence and U-396	101
US Navy ASV Radar Bombsight AN/APQ-5B <i>USN Digest</i>	102
Early German ASV Radar Transmitter Technology: Hohentweil <i>Hans H Jucker</i>	107
Spaceport Shetland! <i>Shetland News</i>	113
Tailpiece: Where in the World - do members read eDEN!	114
<b>Part II:</b> Chain Home AMES 1 in the 1950s	115
Chain Home AMES 1 in the 1950s <i>Mike Dean/ Archibald Stewart</i>	116
Chain Home Trainers, Consoles and Automatic Message Recorder <i>Mike Dean</i>	173
Chain Home and its Development Potential <i>Mike Dean/ Archibald Stewart</i>	190
Tailpiece 2: Bushfires, Australia <i>Margret J. Doring, Engineering Heritage Australia</i>	205

## OPS BOARD

### 2020: THE RESONANT CAVITY MAGNETRON IS 80

**June 6<sup>th</sup> 10.00 to 14.00 DEHS member Derk Rouwhorst** is hoping to hold an exhibition of his 50 magnetron tubes in Health Center Hoenderdaal, Hoendersteeg 7 in Driebergen near Utrecht, Netherlands.

Derk will at the same time publish an article called **MAGNETRON - 80 YEARS** in the Dutch Historical Radio Society magazine '*Radio Historisch Tijdschrift*'. That article, in Dutch, will focus on the work of Klaas Posthumus who contributed much to the explanation of the complex magnetron before the war; Derk has promised us copy for *eDEN*. Derk will highlight the importance of the magnetron developments at Birmingham under Randall and Boot, working with Megaw at GEC, and the significant contributions of Gutton and of Sayers. **Check before travel with eDEN Editor – [philjudkins@btinternet.com](mailto:philjudkins@btinternet.com)**.

**July onwards. Sheffield's Kelham Island Museum** will, it is hoped, have a display by **DEHS and Newcomen member David Eaton** to mark the city's contribution to the magnetron –permanent magnets for British magnetrons were made by Sheffield firms led by **Jessop's and Darwin's**, to calculations by **Professor Willie Sucksmith** of Sheffield University. **Again, please check latest status with eDEN Editor**

### THE NEWCOMEN CENTENARY 2020

The **Newcomen Society** was founded as a result of the James Watt (1736-1819) Centenary Celebrations in Birmingham in 1919. Its aim was to encourage study and research into the history of engineering and technology and to support the preservation of technical and biographical records. The Society took its name from Thomas Newcomen (1663-1729), who was widely regarded as the father of the steam engine. From the outset, the Newcomen Society has maintained close links with organisations with similar interests and the original aims of the founders remain refreshingly relevant. The Newcomen planned a series of events which are listed below, but **please check the Newcomen website for the latest status**.

#### Centenary Programme - events for members and their guests:

##### **Crofton Picnic, Friday 26 June, 10.30-16.30**

A picnic at **Crofton Pumping Station on the Kennet and Avon Canal in Wiltshire, in steam**. An exclusive and informal day for Newcomen members and guests, with full access to the working beam engines, an expert talk and demonstrations. and a chance to picnic by the canal.

##### **Summer Meeting, South Yorkshire, Wednesday 15 - Sunday 19 July.**

A Summer Meeting to remember, based in Sheffield, focussing on modern technology and industries in an area of vibrant manufacturing activity. Visits are planned to: **AMRC, Advanced Manufacturing Research Centre; AESSEAL, manufactures of advanced metal on metal seals; JRI, manufacturers of hip joints; Sheffield Assay Office; Vulcan to the Sky, Annual Engine test; South Yorkshire Aircraft Museum, early radar sets; the Newcomen Engine at Elsecar and Wortley Forge**. More visits are still being planned.

#### Prestige Lectures

##### **Wednesday 13 May at 17.45**

The Dickinson Memorial Lecture, in the Hans Rausing Lecture Theatre, The Science Museum, London SW7 2DD. **Prof Steve Furber**, one of the developers of the Reduced Instruction Set Chip used extensively in the mobile phone, will discuss ***the history of ARM and recent trends in Artificial Intelligence***.

##### **Wednesday 11 November at 17.45**

**Centenary Lecture** in the Dana Studio, Wellcome Wolfson Building, 165 Queens Gate, London SW7 5HD. **Julia Elton will lecture on *Engineering Literature***.

**The Newcomen Society's website is at [www.newcomen.com](http://www.newcomen.com)**

# WRITING FOR eDEN

## eDEN Editor

Having been asked several times in the last few months **if there is a style guide for writers to eDEN, the short answer is NO, THERE ISN'T!**

Those familiar with Learned Society Journals may find this surprising, but it is a deliberate policy designed to encourage as wide and inclusive a group of writers as possible. Your Editor is concerned with the facts or opinions you wish to convey, not whether you can write prose to the level of Hilary Mantel or whoever is your model, and will take the responsibility of bringing contributions to a common standard.

**However, if you wish to save your Editor's time (thank you!) then it would be useful if you could:**

- **Send your contribution in Word, and if you can easily do so, in the Arial 11-point font;**
- **Please don't use Apple-only applications such as .cwk etc;**
- **Let me know the origin of your images, whether photo or graphic. In an ideal world, this would be the Journal or book providing those images with as much information about them as possible;**
- **If you are taking extracts from a book or Journal, the same applies. For example – we all make mistakes! - last month I omitted the details of the origin of the paper on Dr Elizabeth Alexander, and Bill Liles rightly corrected me – I should have cited this, and it is “Dr Elizabeth Alexander: First Female Radio Astronomer” by Wayne Orchiston, which is pp.71-92 in the book: ‘The New Astronomy: Opening the Electromagnetic Window and Expanding Our View of Planet Earth’ edited by (the same) Wayne Orchiston, and published by Springer as ISBN-10: 1402037236 and ISBN-13: 978-1402037238.**

## WAS DR SCHIRRMACHER RIGHT?

One of the endless debates in reproducing earlier articles is how accurate to make the reproduction; for example, some images were almost unreadable in the original - should these be reproduced, or new images found? (Our practice is to reproduce the originals as far as we possibly can, but sometimes the results are ridiculous and we do source new images).

Correcting typos we do generally implement, but a more complex issue arises where there are, or may be, faults in the original article. We normally leave these unamended, but for the future will call attention to the potential fault for discussion by members.

A recent example raised with me was the statement of Dr Schirrmacher in eDEN #92 p.79, which referred to “ $2/16^\circ$  or 2 mil, where 1 mil is  $1 / 1,000$  of a radian”.

Yours truly, being duly prodded, recalled that a radian is  $57.296^\circ$  and therefore  $1/1,000$  thereof is  $0.057296^\circ$  and 2 mils  $0.114592^\circ$ , while  $2/16^\circ$  is  $0.125^\circ$ , an error of [I think] 0.010408 – quite happy for any member to correct my maths!

If that is the case, though, it is very unusual for our colleagues in Germany to be inaccurate in a scientific paper. As I say, we will reproduce mathematics in papers exactly, but draw what we consider to be concerns to members' attention.