

C.D.A.R.S.

September 2025

CHESHAM & DISTRICT AMATEUR RADIO SOCIETY MONTHLY NEWSLETTER

The Apollo Projects Unified S Band

We meet the 2nd Wednesday each month at The Golden Eagle Pub in Ashley Green and every 4th Wednesday each month at the Ashley Green Memorial Hall, Ashley Green, HP5 3PP



Feature

**Communications
Development for the
Apollo Missions**

Regulars

***Dates For Your Diary
*Radio Rally Dates
*Contest Results**

Want to write something for the newsletter?
Then you can contact me on
cdarsnews@gmail.com

Can't find that elusive part or have anything for sale?
Why not drop me an email and put it in
'For sale and wanted'.

Learn About.....

What are you interested in? Here are a few useful links:



FISTS CW Club

Promoting Morse Code for 36 years 1987-2023

<https://fists.co.uk>

VK3TBS

Learn About VARAC

<https://vk3tbs.home.blog/2024/03/06/vara-varac/>

Essex Ham

FT-8 Basics

<https://www.essexham.co.uk/ft8-basics-explained>

Essex Ham

What is PSK31? The Basics.

<https://www.essexham.co.uk/psk31-the-basics>

Welcome to LCWO.net

Learn Morse Code (CW) Online!

<https://lcwo.net/>

Electronic Notes

What is RTTY? The Basics.

https://www.electronics-notes.com/articles/ham_radio/digimode/s/what-is-rtty-radio-teletype.php

Meshtastic and MeshCore

Information and Downloads to build your own LoRa Node or Repeater

<https://meshtastic.org/>
<https://meshcore.co.uk/>



Morse Code by Ray Burlingame-Goff (SK - 29th July 2021)

<http://www.g4fon.net/>

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Cover Photo: Apollo 15 Mission. The Unified S Band Antenna can be seen deployed on the Lunar Rover.

Cover photo Attributes By NASA Johnson Space Center Restored by Bammesk - This file was derived from: AS15-88-11866 (21648389932).jpg Original by: Project Apollo Archive at <https://www.flickr.com/photos/projectapolloarchive/21648389932/>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=91388729>

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Chairman	- Dave Keston (G8FMC)	Secretary	- Malcolm Appleby (G3ZNU)	Treasurer	- Matt Whitchurch (M1DTG)
	- Guy Plunkett (M0GUY)		- John Hall (G0ODQ)		- Peter Holliday (2E0PTH)
	- Roger Fellows (2E0TGU)				

All the above are members of the committee and can be contacted on cdars-committee@googlegroups.com

Newsletter Editor - Roger Fellows (2E0TGU) newsletter submissions to: cdarsnews@gmail.com

Welcome

Welcome to this months newsletter. After a short pause in the feature item content we resume this time with an article about communications during the Apollo space program.

At the time of the Apollo 11 moon landing, as a spotty 14 year old, I was absolutely taken in by the project. I remember making Airfix models of the Saturn V rocket, a seperate model of the Command Module and of course the Lunar lander itself. (The Eagle Has Landed!). At school we did a huge collective class project of the whole Apollo 11 mission. All this came up in a conversation recently and it sparked a thought of how did the astronauts communicate with Mission Control and vise versa?



Roger 2E0TGU

Thanks to Wikipedia the feature this month is all about how the comms were developed and what each frequency was used for. This will be a two part series, or possibly three, covering all aspects of equipment, modes and frequencies used.

As always there is the all our regular items with the latest news regarding contests from Dave G8FMC, diary dates , upcoming contests and more.

Until next month.

Roger 2E0TGU.

Chairmans Ramble

With all sorts of dreadful things going on in the world, I was wondering what to write about this month?

One thing I have noted is that in spite of the war, I have been able to work quite a few Ukrainian stations (mainly during HF contests). Given their plight I always make an effort to give those stations some points. It is interesting to note that their operating is usually impeccable. One can't always say that about 80m nets in the Moscow area?!



Dave G8FMC

I have entered a couple of Polish events (SP DX Contest; 2023 1st in England & 2024 2nd in England. Both 40m single band, mainly using my Vertical) & those guys seem some of the nicest & most appreciative folks on the air-waves. I wonder what experiences others have had? With a few (local & notable) exceptions, most operators around the world are fairly decent folks I think? We have however all encountered a few over-enthusiastic types when there is some rare DX on the bands though!

It seems that there is not much interest within the club for the forthcoming SSB FD on the HF bands 6 - 7th Sept? It unfortunately clashes with the 144MHz trophy, where most CDARS members & friends will be operating in SF, or 6F category. As well as putting in a fair bash on 2m, I may have a dabble on HF? There is a fixed station category (single operator only) but there is also the 'QRP Get on the Air' category. This is 5W for a maximum of 6 hrs from batteries or other renewable energy source. With a temporary antenna one can go /P from your own garden, if you want a brief dabble, without having to find a portable site?

I have just tracked down the big (80mm) V bolts that go with the Comet CHA-250BXII HF Vertical of the late Bryan. I may give that a try before listing it on HRD or eBay? There was a fairly favourable review in Practical Wireless about 18 months ago, but additional comments/comparisons may help its sale?

It is the holiday season, so some may be away. Enjoy your breaks. Have you thought about taking any radio equipment with you? My friend John G4KXP who lives in Droitwich, will be in France for the first 2 weeks of September & hopes to have a limited HF station where they are based. We may have a few skeds, which I plan to report on next month.

A final personal item:

I recently went with my daughter Liz & another 2 folks to the ABBA Voyage event in East London. A fantastic production, with unbelievable displays of lights & other effects. I would imagine that there could be a water-cooled super computer driving it all via about 500 – 1,000 outputs? The one slightly disappointing thing was the rather mediocre audio quality. I have the feeling that the 'Tech' guy for the support band (3 x vocalists + 7 musicians) had the volume up a bit too high, just bumping into distortion?

(We are all familiar with over-modulated signals on the airwaves from certain corners of the world!)

73 all, Dave K, G8FMC (Chairman & Contest Coordinator)

Contests/Operating

The UKAC progress for 2025: (under the NRS banner)

We continue to head up the 'Local Clubs' division, with a clear lead over Hereford.
Latest points:

NRC & Friends	=	5196pts (Normalised 1000pts on all bands except SHF)
Hereford	=	3829pts
Spalding	=	2969pts

So still well clear of Hereford at the moment, but they continue to chase us.

80m Autumn Series: (points to CDARS please)

The 'Autumn Series' (which is very similar to the 80m CC's) will start with SSB on Monday 1st September. This will be under the CDARS banner. There are bonus points for foundation & intermediate licensees. Who is able to get on 80m? See: <https://www.rsgbcc.org/hf/rules/2025/rautumn.shtml>

VHF Championship: (under the CDARS banner)

Since last months News Letter the results for the 70MHz Trophy, 144MHz Low Power & 432MHz Low Power have been published. We won the 70MHz Trophy, but Hereford won both Low Power contests, in spite of some quite good scores from us. I was quite pleased with my 10th place out of 40 on 144MHz & 6th place out of 34 on 432MHz.

Hereford 1st place = 6589 points
CDARS & friends 2nd = 5828
Sheffield 3rd = 4303 (There are a total of 73 clubs now listed)

The next big one is the 144MHz Trophy over the weekend of 6-7th September, where we hope to put on a good show. That then just leaves the 23cm & 13cm events on Saturday 4th October, which we may struggle with? Last year Anthony G7LRQ donated his very significant points on these last 2 bands to CDARS. Anthony is now in JO03 square so no longer eligible! Also Roger G3MEH made a significant contribution & no longer has kit for those bands as he has sold the mast & dish, in preparation for the move to Leicester. We thus are likely to be a bit light on entrants? We need to recruit some 'Friends' who have kit for 23cm & 13cm; do we know anyone, suggestions please?

AFS Superleague: (CDARS and friends)

Sunday 21st September is the first of the 'Superleague' series of 8 events covering 160m to 70cm, which runs through to February 2026. This first one is the 70MHz event. We normally do quite well in this series, which has its own unique challenges! I hope for a good turnout? (I am also hoping for less noise than the evening events?)

HF Contests:

I had a go at the 'International Low Power Contest' using my short contest call of M0K in July. Now this is a CW ONLY contest! Most of you know my almost total lack of CW ability, so how come I was so masochistic? (I can recognise 'M0K' my own short contest call & also 'CQ—', but that is about it!)

I had just completed a reasonable bash at the CW leg of the 80m CC's with 43 QSO's in the 90 mins. Since the lead station was only 153 QSO's I thought that was quite good? My "CW Decoder" PC program actually seemed to be decoding 70-80% of what was being sent. (It is often rather worse than that) My placing was 48 out of 56, which I thought was not bad? Given the 'hit & miss' nature of the decoder, my technique is as follows:

*S&P only, as to call CQ & then NOT be able to copy a reply is quickly going to upset the other (proper CW) contestants!.

*With the less than reliable nature of the 'CW Decoder', I will find a station calling "CQ Test", look at the decode for at least 2 x the call-sign to make sure I have it correct. (Often it is a 2 out of 3 deduction)

* Monitor a complete exchange (or 2?) to determine the likely S/N I am going to be given.

*Respond to the next 'CQ' & hope for a reply to ME! (remember as well as the decoder, I can actually copy/recognise 'M0K' at up to about 25wpm!)

*Hit the Function key to send my exchange.

*Copy down in the log his S/N to me. (assuming the Decoder gives me what I am expecting?)

*If his report to me seems wrong, ask for a repeat (oh, it is probably too late for that!)

*Listen for 1 or 2 more QSO's to deduce the correct S/N he must have sent me?

So, all those multiple passes, means it takes me 3 to 5 times longer to complete & log a QSO, than someone with average CW ability. Based on my 43 QSO's to the lead 153 QSO's, that is about 3.5:1 ratio; which I though was quite good given my handicap?

So, flushed with this modest success, I went brave and entered the 'International Low Power Contest'. I entered the UK 10W Fixed category & operated on all 3 bands of 80m, 40m & 20m. Dave G3TBK romped away as the winner with 141 QSO's against my total of 33. Not quite as good as my 80m CC effort! I did however get a few 80m contacts during the fleeting moments that the 80m band was open (just about; it pays to keep checking!) which a number of entrants did not achieve. My overall placing was 15, out of 22. Not too bad for a NON CW operator? I actually quite enjoyed the challenge, even though floundering somewhat! I think I may have got the band tactics about right?

BTW John G4CZB/P managed 2nd place in the UK 5W Portable category, well done John.

I also gave the club call of G3MDG an airing on SSB for the IOTA contest. It is good to keep the call heard on the air. Just a dabble for a few hours, mainly on 40m after midnight on the Saturday (well, technically Sunday morning) using my 40m Vertical. A total of just 25 QSO's with 14 Islands on 40m & later on Sunday 15 QSO's on 20m, with 7 Islands. My 40m Vertical performs very well for darkness DX (low angle radiation) which can be up to 2.5 S points better than a horizontal Dipole. Absolute rubbish for daylight inter-G though, where it can be 3-4 S points down! Horses for courses!

Just having a bit of fun chasing unique Island multipliers. This resulted in 8,232 points in just the 40 contacts! Probably quite a high pts/QSO rating but a pathetic score overall? This is a very popular World Wide contest with 2,221 logs submitted. No results yet. The lead 'Multi-Two' station of EI7M making a claimed 4,576 QSO's over the weekend! That is just over 190 QSO's/hr between the 2 stations. A number of stations achieved over 2,000 QSO's; serious commitment.

A bit out of our league? Until next time.

73, Dave K, G8FMC

The Apollo Projects Unified S-Band.

The Unified S-band (USB) system is a tracking and communication system developed for the Apollo program by NASA and the Jet Propulsion Laboratory (JPL). It operated in the S band portion of the microwave spectrum, unifying voice communications, television, telemetry, command, tracking and ranging into a single system to save size and weight and simplify operations. The USB ground network was managed by the Goddard Space Flight Center (GSFC). Commercial contractors included Collins Radio, Blaw-Knox, Motorola and Energy Systems.

Basis

The previous programs, Mercury and Gemini, had separate radio systems for voice, telemetry, and tracking. Uplink voice and command, and downlink voice and telemetry data were sent via ultra high frequency (UHF) and very high frequency (VHF) systems.[1] The tracking capability was a C band beacon interrogated by a ground-based radar. With the much greater distance of Apollo, passive ranging was not feasible, so a new active ranging system was required. Apollo also planned to use television transmissions, which were not supported by the existing systems. Finally, the use of three different frequencies complicated the spacecraft systems and ground support. The Unified S-band (USB) system was developed to address these concerns.

The USB system did not completely replace all other radio transmitters on Apollo. Apollo still used VHF between astronauts and the Lunar Module (LM) and Lunar Roving Vehicle during extra-vehicular activity; between the lander and the command module, and between the spacecraft and Earth stations in the orbital and recovery phases. As a backup the CM could measure range to the LM over the VHF voice link. The spacecraft radar systems operated on frequencies separate from those of the USB.

Development

The S-Band communications and ranging system was developed by the MIT Lincoln Laboratory in Lexington, Massachusetts, under task A of the Lincoln Laboratory Apollo contract. The design approach was the development of an alternative integrated communication system functionally compatible with the spacecraft design.

The concept was presented by Lincoln Laboratory in an initial report on July 16, 1962 titled Interim Report on Development of an Internal On-Board RF Communications System for the Apollo Spacecraft. In this report, it was shown that many on-board electronic functions could be performed very effectively by a single system that was a suitable adaptation of the transponder developed by Jet Propulsion Laboratory for use with the DSIF tracking stations. This was the origin of the Goal System for Apollo, later called the Integrated (or Integral) RF system, then later known as the Unified Carrier System. The idea behind the unified S-Band communications system was to reduce the number of systems previously used in the Mercury space program, which provided a multiplicity of electromagnetic transmitting and receiving equipment. In early flights, these operated at seven discrete frequencies within five widely separated frequency bands. Largely because of expediency, the following separate units were employed:

- * HF voice transmitter and receiver
- * UHF voice transmitter and receiver
- * Command receiver
- * Telemetry transmitter No. 1
- * Telemetry transmitter No. 2
- * C-band transponder beacon
- * S-band transponder beacon

Ground facilities matching this capsule equipment were included in many of the Mercury network stations.

When the Apollo project was initiated, NASA stipulated that as much as possible of the existing Mercury ground network equipment should be utilized. In addition, the spacecraft was to include a transponder compatible with the Deep Space Instrumentation Facility (DSIF) ground stations established by the Jet Propulsion Laboratory. This transponder would be used for the communications and tracking in cis-lunar space between earth and the moon.

In the preliminary research of the Unified S-Band, North American Aviation, Inc. (the company that developed Apollo's command and service modules) indicated the following four pieces of equipment would be installed in Apollo for ground-to-spacecraft use:

- * DSIF transponder (S-band) (for cis-lunar distances) for transmission of TV, voice, telemetry data, and ranging signals
- * VHF FM transmitter (for near-Earth distances) for transmission of telemetry data
- * VHF AM transceiver (for near-Earth distances) for transmission and reception of voice and guidance of rescue aircraft
- * C-band transponder (for near-Earth distances) for radar tracking

The DSIF transponder had a basic capability to perform the functions of the VHF FM transmitter, the VHF AM transceiver, and the C-band transponder at near-earth distances. Significant features of the transponder and its ground equipment were all-coherent, phase-locked operation and the use of a pseudo-random (noiselike) binary code for unambiguous range measurements at long distances. The choice of optimum modulation methods and waveforms for the upward and downward RF links was a key factor in the adaptation of the unified carrier system to Apollo requirements.

Additional electronic apparatus was to be deployed for rendezvous guidance, for lunar (and Earth) altimetry, and for lunar landing control. The requirements for this additional equipment had not been firmly established when Lincoln Laboratory began its research. From experience with the Mercury space program, it was apparent to Lincoln Laboratory that considerable on-board simplification would result if a single integrated communications and tracking system were used in Apollo instead of the four systems listed above.

Unified S-Band demonstration

Early in 1962, a small group of Lincoln Laboratory staff members was asked to provide a demonstration of the Unified Carrier concept to NASA by December 31, 1962. The demonstration was aimed at providing experimental evidence that the unified carrier concept was feasible. Since manpower was limited, it was decided to concentrate on the space-vehicle-to-Earth link, the critical link in the system. The demonstration was available by December 17, 1962. The demonstration was held on January 17, 1963 for NASA (Manned Space Center and Headquarters) and North American Aviation, Inc.

The demonstration of the unified carrier concept for the space vehicle-to-Earth link was limited to transmitting a ranging code and wideband telemetry signal on a 47.5-mc carrier by hard wire via a noisy and attenuating medium. The simulated ground receiver used a phase-locked loop. The carrier reference generated by the VCO of the carrier phase-locked loop was used to heterodyne the received signal to video, a process of synchronous demodulation. A correlation method was used to process the transmitted and received codes for ranging. The demonstration simulated the Doppler effect and signal-to-noise ratio expected for an Apollo mission. The phase-locked loops in the receiver acquired the transmitted carrier, telemetry subcarrier, and code clock components almost instantaneously for the signal-to-noise ratios predicted to exist at maximum Apollo range and for a radial space-vehicle velocity of 36,000 ft/sec. Range code correlation generally took only a few seconds.

In the beginning, it was suggested that the DSIF transponder could be modified and augmented so as to be used for lunar altimetry and rendezvous ranging. However, as increased emphasis was placed on lunar landing and lunar orbital rendezvous techniques, it became apparent that specialized radar and optical equipment would be preferable for those applications. Accordingly, most of the effort at M.I.T Lincoln Laboratory was directed toward the communication and tracking link between the Apollo spacecraft and earth.

Source: Wikipedia. Part 2 Next Month.

Contest Calendar for September and October 2025

September - HF

Day	Date	Time (UTC)	Contest Name
Mon	01 Sep	1900-2030	Autumn Series SSB
Sat-Sun	06-07 Sep	1300-1300	SSB Field Day
Wed	10 Sep	1900-2030	Autumn Series CW
Mon	15 Sep	1900-2030	RSGB FT4 Contest
Thu	25 Sep	1900-2030	Autumn Series DATA

September - VHF

Day	Date	Time (UTC)	Contest Name
Tue	02 Sep	1800-1855	144MHz FMAC
Tue	02 Sep	1900-2130	144MHz UKAC
Wed	03 Sep	1700-2100	144MHz FT8 AC (4 hours)
Wed	03 Sep	1900-2100	144MHz FT8 AC (2 hours)
Sat-Sun	06-07 Sep	1400-1400	144MHz Trophy Contest
Sun	07 Sep	1100-1500	5th 144MHz Backpackers
Tue	09 Sep	1800-1855	432MHz FMAC
Tue	09 Sep	1900-2130	432MHz UKAC
Wed	10 Sep	1700-2100	432MHz FT8 AC (4 hours)
Wed	10 Sep	1900-2100	432MHz FT8 AC (2 hours)
Thu	11 Sep	1900-2130	50MHz UKAC
Tue	16 Sep	1900-2130	1.3GHz UKAC
Thu	18 Sep	1900-2130	70MHzUKAC
Sun	21 Sep	900-1200	70MHz AFS Contest
Tue	23 Sep	1830-2130	SHF UKAC

October - HF

Day	Date	Time (UTC)	Contest Name
Mon	06 Oct	1900-2030	Autumn Series CW
Wed	15 Oct	1900-2030	Autumn Series DATA
Thu	23 Oct	1900-2030	Autumn Series SSB
Mon	27 Oct	2000-2130	RSGB FT4 Contest

October - VHF

Day	Date	Time (UTC)	Contest Name
Wed	01 Oct	1700-2100	144MHz FT8 AC (4 hours)
Wed	01 Oct	1900-2100	144MHz FT8 AC (2 hours)
Sat	04 Oct	1400-2200	1.2GHz Trophy
Sat	04 Oct	1400-2200	2.3GHz Trophy
Sat-Sun	04-05 Oct	1400-1400	Oct 432MHz-245GHz Contest
Tue	07 Oct	1800-1855	144MHz FMAC
Tue	07 Oct	1900-2130	144MHz UKAC
Wed	08 Oct	1700-2100	432MHz FT8 AC (4 hours)
Wed	08 Oct	1900-2100	432MHz FT8 AC (2 hours)
Thu	09 Oct	1900-2130	50MHz UKAC
Tue	14 Oct	1800-1855	432MHz FMAC
Tue	14 Oct	1900-2130	432MHz UKAC
Thu	16 Oct	1900-2130	70MHz UKAC
Sun	19 Oct	900-1300	50MHz AFS Contest
Tue	21 Oct	1900-2130	1.3GHz UKAC
Tue	28 Oct	1830-2130	SHF UKAC

Dates For Your Diary



CDARS Net and Club Meetings Dates

September

3rd - Net on GB3TU or 144.320 USB if repeater has interference.

10th - Informal Club Meeting at The Golden Eagle, Ashley Green.

17th - Net on GB3TU or 144.320 USB if repeater has interference.

24th - Club Meeting at Ashley Green Memorial Hall, Ashley Green.

Listed below are dates of RSGB, UK and International contests for 2025

All Asian DX Contest, Phone 0000Z, Sep 6 to 2359Z, Sep 7

IARU Region 1 Field Day, SSB 1300Z, Sep 6 to 1259Z, Sep 7

IARU Region 1 145 MHz Contest 1400Z, Sep 6 to 1400Z, Sep 7

WAE DX Contest, SSB 0000Z, Sep 13 to 2359Z, Sep 14

Scandinavian Activity Contest, CW 1200Z, Sep 20 to 1200Z, Sep 21

BARTG Sprint PSK63 Contest 1700Z-2059Z, Sep 21

CQ Worldwide DX Contest, RTTY 0000Z, Sep 27 to 2359Z, Sep 28

Full details and more contests at: <https://www.contestcalendar.com/contestcal.html>

Please double check dates, start/end times etc in good time prior to the event.

Radio Rally Dates.

Full details of the events are available in Radcom & the RSGB website.

September 2025

5th - 6th National Hamfest, Newark Showground, NG24 2NY.

14th - Biggleswade Swapmeet, British Vintage Wireless Society, TheWeatherley Centre, Eagle Farm Road, Biggleswade, SG18 8JH.

14th - Caister Lifeboat Radio Rally, Caister Lifeboat Station, Caister on Sea, NR30 5DJ.

14th & 21st - Radio Society of Harrow, Table Top Surplus Equipment Sale BBSAC Hut, The Lincolnfields Centre, Bushey Hall Drive, Bushey, WD23 2ES.

20th - East Midlands Ham and Electronics Rally, Beckingham Village Hall, Beckingham, DN10 4FX.



(All information courtesy of Radcom & the RSGB website)

For Sale and Wanted

SK sale of the shack contents of the late Bryan M0IHY (Items with Dave G8FMC)

ITEM	ASKING PRICE or O.V.N.O.
1. Power Mag 145 – large magnetic mount + cable (new £62) New & boxed.	£40
2. Comet CHA-250HD/BXII Multi-Band HF Vertical Antenna (new £350) 250W SSB 75W Data. See March 2024 PW review. As new,unused	£220
3. Moonraker MRQ750 2m/70cm Mobile whip (new £35) Unused as new	£25
4. HF Mobile/portable antenna PL259 fitting e.g. large mag-mount? Unused	SOLD
5. Modified Cobweb antenna (Polish) (new £200)	£70
6. Sangean ATS-909X2 all-band portable receiver £225 ish new boxed	£150
7. QRM Eliminator X-phase 1-30MHz - £45 new	£25
8. Kent Straight key	£65
9. CW Keyer TC 701 - £70 new	£45
10. Soldering Station (basic) 60W	Offers
11. IGEN Max regenerative receiver. eBay US has an unbuilt kit at £160.	£50
12. Lead-free solder & cleaner (in bag)	Offers
13. SWR meter Moonraker SWR-300 120-500MHz £35 new	SOLD
14. Austcol Radiation Meter MT525 -£25 online average price new.	£10
15. Signalink USB sound Card 8pm. £120 new	SOLD
16. Metro VNA in case (£270 new)	£175
18. Prepp Comm multi-band morse transceiver. Approx £358 new.	£225
19. MFJ Super Hi-Q Loop Remote Control . Unknown model.	?
20. QRP Kits EFHW Tuner	Offers

Please initially contact Dave G8FMC if interested:- g8fmc547@gmail.com