PRACTICAL WIRELESS

PW

THE RADIO MAGAZINE

8-PAGE WEATHER SPECIAL

AMATEUR RADIO & METEOROLOGY GO HAND-IN-HAND

WEATHER EQUIPMENT SHOWCASE REVIEW

BUILD AN EARTH TUNER

PLUS

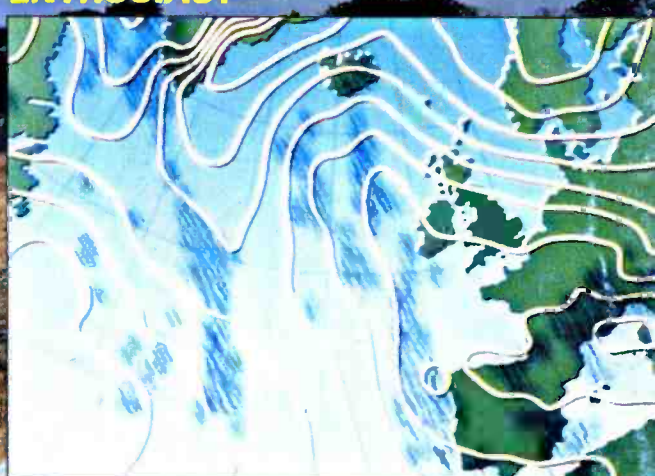
AN 18 AND 24MHz ANTENNA

AND

PW 144MHz CONTEST RESULTS

FROM SATELLITE TO BROADCAST

WEATHERMAN JIM BACON G3YLA EXPLORES METEOROLOGY FOR THE RADIO ENTHUSIAST



OCTOBER 1990

£1.60

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THE NEW
FT-1000 FOR DYNAMIC DX

YAESU

The FT-1000 is a new top of the range all mode h.f. transceiver that is the result of more than 25,000 hours of intensive research by Yaesu's top design engineers. They have adopted a completely new approach to the application of digital and RF technology. The extensive use of surface mounted components has allowed *six* microprocessors and *five* Direct Digital Synthesisers to be integrated with a simple to use operator interface to give a highly reliable full featured transceiver that has been optimised for serious h.f. applications. Please write or call SMC or your local authorised Yaesu dealer for the full specifications of this dynamic new transceiver and discover how you can open up the bands.

YAESU

YAESU

UK Sole Distributor

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Eastleigh, Hants SO5 3BY
Tel: (0703) 255111

Prices and specifications are subject to change without notice

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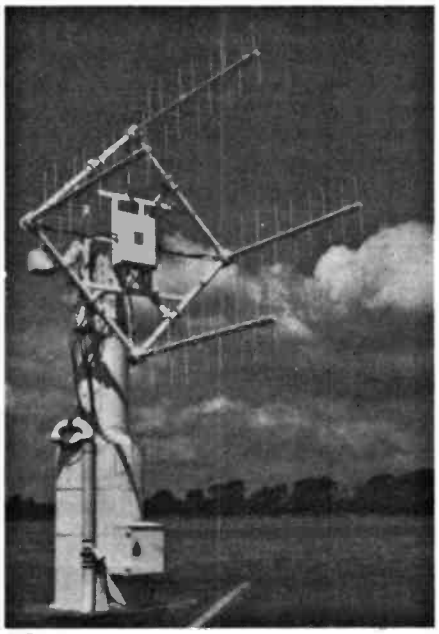

33

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Weather Satellite Antenna Facility courtesy of Royal Aerospace Establishment, Farnborough.

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Regular Features

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ICOM

NEW MULTIBAND IC-970E Base Station

Designed for the serious operator on the 144, 430 and 1200MHz bands, Icom's new IC-970E has up-to-date technology for DX, digital and satellite communications.

The IC-970E is supplied as an all mode dual-bander for 144 and 430MHz bands. Optional units expand its capabilities to 1200MHz or wideband receiving from 50-905MHz.

Communications via satellites has never been easier. The IC-970E automatically tracks uplink and downlink frequencies as the tuning control is rotated also, ten specific memory channels for satellite frequencies.

The dual-band watch allows you to receive both MAIN and SUB band audio simultaneously, multiple scanning systems on the MAIN and SUB bands plus 99 memories, an easy to read central display and Icom's DDS sytem make this one of the most comprehensive multi-band transceivers available.

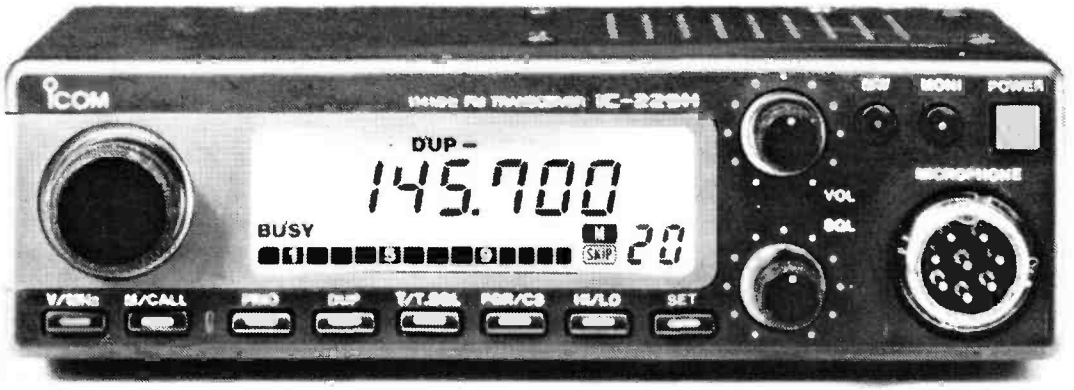
For more detailed information on the IC-970E Base Station or any other Icom radio equipment contact your local authorised dealer or call Icom (UK) Ltd.

Icom (UK) Ltd.

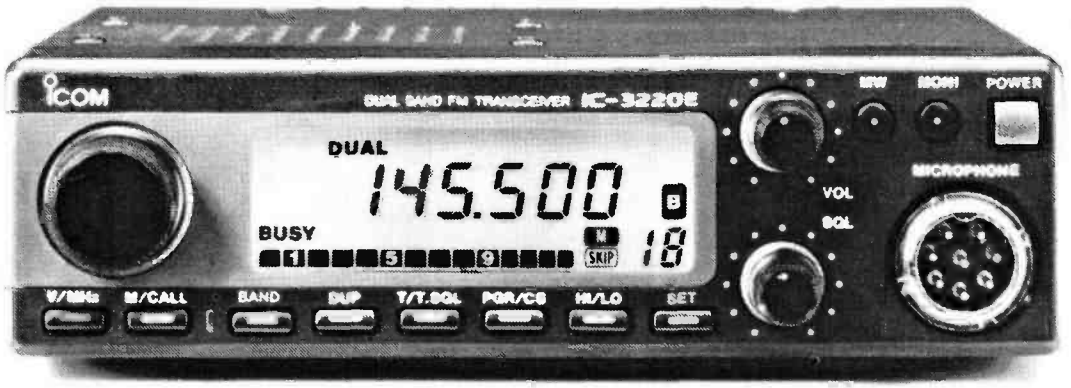
Dept. PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour. As from 1st September our showroom opening times will be Mon–Fri 09.00–13.00 and 14.00–17.30.

Count on us!

NEW MOBILES



IC-229E/449E
2M, FM Mobiles



IC-3220E
Dual-Band
Mobile

Icom have built a range of ultra compact FM mobile transceivers. Similar in style, easy to operate and perfect for driving safety. Advanced features include a variety of tuning steps, memories, scan functions, adjustable R.F. power, optional pager and tone squelch units for selective calling. All these models include the HM-59 hand microphone with up/down and 1750Hz tone call for repeater operation. The unique simple operation enables each function to be operated with one switch. Illuminated switches and controls give complete night time operation.

IC-229E VHF Mobile. This VHF 25 watt transceiver measure just 140(w) x 40(h) x 105(d) mm. No need to worry about installation, its small enough to fit most vehicles. Also available the IC-229H 50 watt version where extra high power is required.

IC-449E UHF Mobile. High sensitivity with GaAs FET's and 35w output power provide optimum performance with this UHF transceiver. 20 Memory channels and a programmable call channel can be used to store most used frequencies.

IC-3220E Dual Band Mobile. Enjoy complete dual-band operation. In addition to cross band duplex operation this transceiver can receive both MAIN and SUB bands simultaneously. One of the smallest dual-band mobile transceivers available, the IC-3220E has a 25 Watt output on both bands. Where higher power is required the IC-3220H offers 45 watts on the 144MHz band and 35 watts on the 430MHz band.

Helplines: Telephone us free of charge on **0800 521145** Mon-Fri 0900-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.
Datapost: Despatch on same day whenever possible.
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YAESU

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HX240 2m to HF TRANSVERTER

Only £249.00 Inc VAT

HX240: 2m to HF Transverter

Frequency Coverage: 80m, 40m, 20m, 15m, 10m

Output power: 30-40W PEP (SSB/CW)
RF Drive: 2.5W/10W Selectable

Rx Preamp Gain: 8-10dB

Power Requirement: DC 13.8V, 7A

Additional features: Carrier operated switching or by remote socket, power output meter, switchable preamp Hi/Lo output selectable, visual indication of antenna missmatch.

ALSO AVAILABLE HX640 for 6m TRANSCEIVERS

A PERFECT MATCH FOR THE FT290R2/FT690R2

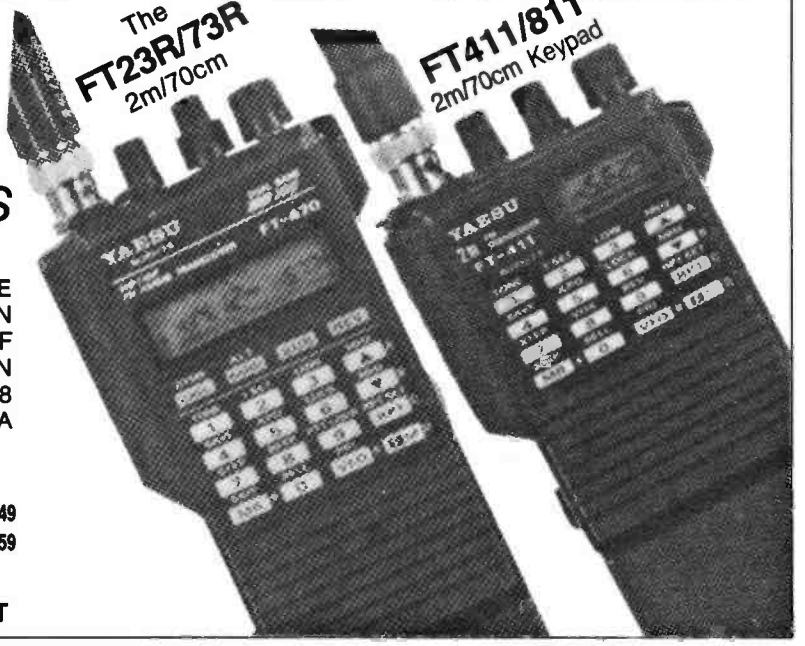
What could Yaesu engineers do to improve on the hugely popular FT x 90R series? The answer was easy, they designed and built the FT x 90R2 series. The FT x 90R2 series of transceivers provide high performance and a 2.5W output, when used with 'C' cells or nicads, ideal for serious portable operations, or when combined with matching linears, and easy to use compact multimode mobile or base station. What more could you ask from a transceiver?

FT290R2 RRP **£429.00 inc**
FT690R2 RRP **£429.00 inc**
FT790R2 RRP **£499.00 inc**

ALL THE ABOVE ARE SUPPLIED WITH FBA6, MH10E8, STRAP AND ANTENNA AS STANDARD.

SUMMER SPECIALS

ON YAESU HANDHELDS



SMC ARE PLEASED TO ANNOUNCE SOME VERY SPECIAL PACKAGE DEALS ON VHF/UHF HANDHELDS. IF YOU BUY ANY OF THE FOLLOWING HANDHELDS WITH AN FNB10 NICAD WE WILL GIVE YOU AN SMC28 WALL CHARGER ABSOLUTELY FREE. A SAVING OF AROUND £14.

FT23R + FNB10 + SMC28 £239 **FT73R + FNB10 + SMC28 £249**
FT411 + FNB10 + SMC28 £249 **FT811 + FNB10 + SMC28 £259**
FT470 + FNB10 + SMC28 £384

ONLY AVAILABLE WHILE STOCKS LAST

***FREE FINANCE ON SELECTED ITEMS**
On many regular priced items SMC offers Free Finance (on invoice balances over £120) 20% down and the balance over 6 months or 50% down and the balance over a year
You pay no more than the cash price!
Details of eligible items available on request
*Subject to status.

CARRIAGE CHARGES
Carriage is charged on all items. Small items, Plugs, Sockets etc by post £1.75. Antennas, Cables and larger items by LYNX from £5.75. Transceivers etc, next day delivery from £8.35. Overnight delivery can be specified at extra cost for other items. Same day despatch whenever possible.

YAESU DISTRIBUTOR WARRANTY
Importer warranty on Yaesu Musen products. Ably staffed and equipped Service Department. Daily contact with the Yaesu, Musen-factory. Tens of thousands of spares and test equipment.

PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SMC South Midlands Communications Ltd.

USED EQUIPMENT

HF TRANSCEIVERS

					Inc. VAT
FTONE	shack	HF 100W Gen. RX	S/S	from	£1095.00
FT980	shack	HF 100W Gen. RX	S/S	from	£1095.00
FT767GX	shack	HF 100W Gen. RX	S/S	from	£1275.00
FT757GX-II	mobile	HF 100W Gen. RX	S/S		£775.00
FT747GX	mobile	HF 100W Gen. 12v DC Gen. RX	S/S		£625.00
HT120	mobile	HF 10W 20mtr 12v DC	S/S		£249.00
OSCAR II	mobile	CB 40CH. 11mtr 12v DC	S/S		£39.00
FL7000		HF 500W L/amplifier	S/S		£1391.00

VHF/UHF TRANSCEIVERS

FT736	shack	VHF/UHF	S/S		£1190.00
FT711RH	mobile	UHF 70cm 45W	S/S		£295.00
FT227R	mobile	VHF2mtr 10W	S/H		£139.00
FT703R	handy	UHF 70cm 2.5W	S/H	from	£139.00
FT73R	handy	UHF 70cm 3/5W (no batt)	S/H	from	£179.00
KDK-FM2030	mobile	VHF 2mtr 25W	S/H		£169.00
IC-1271E	shack	1200MHz 10W FM, SSB, CW	S/H		£775.00
FT727R	handy	VHF/UHF 3.5W dual band	S/S		£319.00
SAGRA-600		VHF Lin/amplifier 600W	S/S		£659.00
HL160V25		VHF Lin/amplifier 160W	S/S		£199.00

RECEIVERS

FRG8800	shack	HF/SW Gen. RX m/mode	S/H	from	£545.00
FRG9600M	scanner	VHF/UHF 60-950MHz RX	S/S	from	£459.00
AR2002	scanner	VHF/UHF 25-1300MHz RX	N/O		£487.00
MX7000	scanner	VHF/UHF 25-1300MHz RX	N/O		£349.00
AIRBAND-RX	handy	VHF/AM 118-136MHz RX	S/S		£99.00
ICF20010	portable	HF/VHF receiver	S/H	from	£219.00

DATA/COMPUTER

FIF232C	Yaesu	RS232/radio interface	S/S		£59.00
TONO-5000E	T/Unit	Amtor, Rtty, Ascii, CW etc	N/O		£659.00
TONO-777	modem	Amtor, Rtty, Ascii, CW	S/H		£149.00
AMT-2	modem	Amtor, Rtty, Ascii, CW	S/H	from	£139.00
MMT4001	T/unit	Rtty, CW c/w keyboard	S/S		£159.00
MULTICOM	modem	Rtty G3LIV data unit	S/S		£39.50
MM1000		Ascii to morse conv.	S/S		£49.00
KP100	keyer	CMOS keyer c/w paddle	S/S		£79.00
RM1	modem	RS232-TTL interface	S/S		£69.00

MISCELLANEOUS/ACCESSORIES

					Inc. VAT
FC757AT	Yaesu	Auto ATU 300W	S/H		£269.00
144/726	module	2mtr plug in (FT726)	S/H		£159.00
FEX144/767	module	2mtr plug in (FT767)	S/H		£139.00
LP50-3-50	Bnos	VHF Lin/amplifier 50W	S/S		£139.00
LPM144-1-100	Bnos	VHF Lin/amplifier 100W	S/S		£199.00
MML432/30L	M/mod.	UHF Lin/amplifier 30W	S/S		£139.00
MMT432/28S	M/mod.	70cm to 10mtr Transvert	S/S		£199.00
MMT28/144	M/mod.	10mtr to 2mtr Transvert	S/H		£85.00
MMA28	M/mod.	10mtr RX pre amp	S/H		£19.00
MMD050	M/mod.	Freq. Pre scaler	S/S		£69.00
MMC156/28	M/mod.	28 to 156MHz (marine)	S/H		£25.00
JD110	meter	SWR/POWER 3.5 to 150MHz	S/H		£10.00
FS711V	meter	SWR/POWER 50 to 150MHz	S/H		£39.00
DC144/28	Datong	2mtr to 10mtr convertor	S/H		£25.00
SRB2	Datong	Auto woodpecker blanker	S/S		£69.00
TP3Q	Tet	HF-Mulitband wire ant.	A/S		£15.00
202	Shure	High imp. fist MIC	S/S		£19.95
YM47	Yaesu	7 pin 600 ohm fist MIC	S/H		£15.00
YM31	Yaesu	6 pin 600 ohm fist MIC	S/H		£9.95
YH77	Yaesu	Headphones 8 ohm	S/S		£15.00
SB2	Yaesu	7 pin min switch box	S/H		£15.00
SB10	Yaesu	8 pin mic. switch box	S/H		£15.00
NC90	Yaesu	45mm enlarger	S/H		£7.00
RSL	Yaesu	HF mobile ant.	A/S	from	£29.00
RSM2	Yaesu	Cutter/cable assm.	N/O		£15.00
BHFRG7	Yaesu	Batt. tray for FRG7 rx	N/O		£5.00
MMB1	Yaesu	Mobile mounting brk.	N/O		£5.00
KR5400	Yaesu	Rotator (control only)	A/S		£85.00
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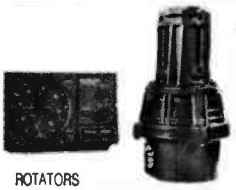
KR400	Yaesu	Rotator (control only)	A/S		£59.00
KR500	Yaesu	Rotator elevation type	S/S		£129.00
CD45	Hygain	Rotator (control only)	A/S		£49.00
AR-40	Hygain	Rotator, medium duty	S/S		£159.00
AR-30	Hygain	Rotator, light duty	S/S		£49.00
SKYKING		Rotator, light duty	N/O		£49.00
K1500		Winch, auto brake	N/O		£59.00
T1200		Winch, standard type	A/S		£19.95
TLNA432u	Mutek	70cm Pre amp	N/O		£29.00
VFAT206	Mutek	6dB Attenuator	N/O		£19.00
310/70		70MHz mobile ant.	A/S		£15.00
HALO/432		70cm mobile Halo	N/O		£11.00
HS1300B		Wideband pre-amp/ant.	N/O		£59.00
VP601		Ascii keyboard	N/O		£39.00
SP4	SMC	RF speech processor	A/S		£19.00
MP-100	Trio	Kenwood mounting brk.	S/H		£20.00

KEY:

S/S	SHOP-SOILED/EX-DEMO	3 MONTH WARRANTY
S/H	SECONDHAND	3 MONTH WARRANTY
N/O	NEW OBSOLESCENT	3 MONTH WARRANTY
A/S	AS SEEN	WITH NO WARRANTY

ROTATORS



Superb engineering standards combined with pin sharp setting accuracy means new technology from Yaesu create Kenpro Hygain.

ROTATORS

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CD45	BELL TYPE METER CONTROLLER	£218.90
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G-1000SDX	BELL TYPE 450 DEG VAR. SPEED	£368.00
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RC5A-3	BELL TYPE VAR. SPEED AND PRESET	£425.00
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GC-038	LOWER MAST CLAMP G-400, 600 etc	£16.95
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MC1	LOWER MAST CLAMP RC5 SERIES	£25.00

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13M20P60	60FT POST MOUNT	£761.30
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13M20FB60	60FT FIXED BASE MOUNT	£596.85
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ALL TOWERS EXCEPT MOBILES ARE AVAILABLE FROM STOCK. 10M10 SERIES SUPPLIED WITH STANDARD WINCHES. 13M20 & 16M20 SERIES ALL SUPPLIED WITH AUTO BRAKE WINCHES. ALL ARE SUPPLIED WITH H2R HEAD UNIT DRILLED TO TAKE GS-065 BEARING. HOLDING DOWN BOLTS FOR BP AND FB TOWERS ARE AVAILABLE AT £28.75 PER SET EXTRA.

ALTERNATIVE WINCHES AND HEAD UNITS ARE AVAILABLE AT EXTRA COST.
DELIVERY IS BY QUOTATION DEPENDENT UPON DISTANCE.

MORSE KEYS

MORSE KEYS

			p.p.
HK702	STRAIGHT KEY	£42.75	£1.75
HK703	STRAIGHT KEY	£49.69	£1.75
HK704	STRAIGHT KEY	£26.35	£1.75
HK705	STRAIGHT KEY	£26.25	£1.75
HK706	STRAIGHT KEY	£28.95	£1.75
HK707	STRAIGHT KEY	£25.49	£1.75
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HK710	STRAIGHT KEY	£41.75	£1.75
HK711	STRAIGHT KEY KNEE MOUNTING	£41.75	£1.75
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HK804	DELUXE BRASS KEY	£95.00	£2.50

MORSE EQUIPMENT

KP100	SQUEEZE KEYER	£109.25	£2.50
DEWSKEYSTD	STAR MASTER KEYER	£54.69	£2.50
DEWSKEY M	STAR MASTERKEY MEMORY	£94.99	£2.75
D70	MORSE TUTOR	£63.40	FOC

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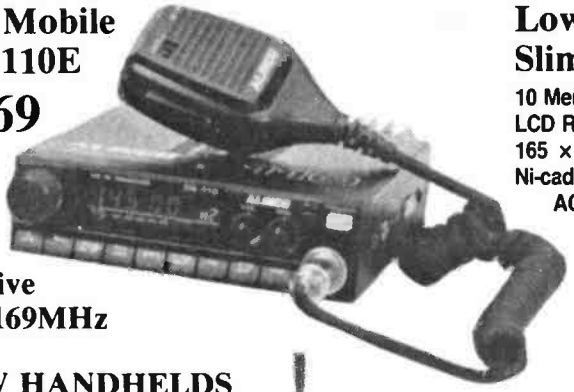

Receive
130-169MHz

NEW HANDHELDS

DJ-160E 2M
This highly attractive 2 metre handy is packed with features that make other rigs look expensive. For the man who wants everything at a sensible price, this is the one! Whether you admire its sleek lines, its DTMF encoader, its multi-function keyboard or its value, you cannot help but be amazed at how much has been packed into such a small space. Send today for brochure.

DJ-460E 70CM
Now you can have a full feature 70cms handheld at a realistic price. It offers more features and better value than any other model. Send for brochure.

£229

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Key-pad
21 memories
DTMF
Extended Rx.
Rotary Tune
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Battery Saver
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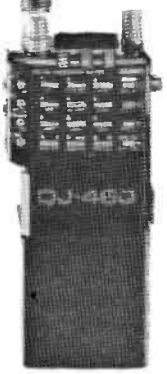

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Keylines

Rob Mannion G3XFD

Our hobby is unique in that it's the only pastime protected by a world-wide treaty. As radio amateurs we value the Geneva Convention governing "the self-training in communications" which gives us the freedom to communicate with like-minded amateurs the world over.

Even in the dark days of the 'Cold War' the many thousands of enthusiasts behind the "Iron Curtain" were able to join amateurs in the west with comparative ease - albeit 'over the air'.

In those days, as now, many organisations and individuals were watching eagerly for the chance to obtain almost any part of the radio frequency spectrum for their own requirements. As time passes, international pressure on our coveted frequencies will grow. It now seems we may have another problem appearing over the horizon with the appearance of the newly-launched Pakistani satellite BADR-1.

Promoting Ideologies

The press release from the Pakistani Government department responsible for the new satellite (launched on July 16) made interesting reading. I found the style of press release - bearing in mind that satellite BADR-1 appears to be very similar to other AMSAT vehicles (and is operating within internationally-allocated amateur frequencies) - very disturbing. The style of the writing seemed to be promoting their particular ideology rather than technology.

The whole document was couched in the terms that I've come to associate with political bodies and the upsurge of Middle-Eastern ideologies that we hear on the TV and radio news virtually every day.

Indeed, in the first paragraph the promotional release firmly states that the successful launch was not only a historic event for the country concerned, but also for their ideology. I had to read it very carefully to find any reference to amateur radio and when I did, it was mentioned last and then only as "the amateur community".

Not Amateur Radio?

It seems to me that the whole Pakistani satellite exercise may not be an amateur radio project at all, but is being undertaken by non-radio amateurs for governmental purposes. When I contacted the Pakistani High Commission in London to obtain further information, none was forthcoming.

A spokesman suggested that I talk to the Military Attache as it appeared to be a military matter. I was not surprised when he had no comment to make to the press!

Radio amateurs around the world should be aware of the possibility of a new threat to the hobby. AMSAT activities could be at risk, if nations that don't have either the expertise or the huge amounts of cash available to develop their own research satellites, adopt this apparently short-cut approach to the starting gate of the space-race.

Silent Key

It's not often that a radio hobby magazine celebrates its 1000th issue. To mark the occasion we had a rather special cake made complete with magazine logo . As *PW* had been established since 1932, the radio and television news journalists who joined our staff celebrations, also wanted to meet our oldest known reader, Leo Worboys G3AFD.

Leo had read *PW* ever since the early days and like the magazine, he too was a pioneer. It was a great pleasure to have Leo join us along with his 'assistant' Elaine G0CDZ who was a great friend and the motive power for Leo's wheelchair.

Despite the fact that Leo was 93 years old and confined to the wheelchair, he was very alert and a great wit.

Although everyone has to go sometime, we were sad when Leo died in late July.

G3AFD was one of those people that you could always count on. Leo was always 'there' when you wanted a signal check or some advice. I was also a frequent visitor to his radio shop - he ran one of the longest established radio retailers in Southampton - to buy my *PW* every month.This was despite the fact that his "Back in 10 Minutes" notice always seemed to be displayed on the door!

In later years I frequently reminded and 'ribbed' Leo about how he made me wait for my ordered *PW* every month - until he'd read it! Whenever I worked Leo on 70MHz (he literally 'sat' on 70.260MHz all day in the 70s) I only had to call "CQ Scrooge" and he'd reply immediately!, I'll certainly miss meeting Leo with Elaine at the rallies in future.

Packet Panorama

From this issue onwards our very popular feature for Packet radio enthusiasts will appear under the title 'Packet Panorama'. G3LDI's approach to the subject - reflecting the international appeal of this very modern facet of the hobby - appeals to many of our readers.

So, keep those letters coming and those mailboxes buzzing to help Roger to give you the best view of Packet every month.

Thorny Problem

The RTTY section in 'Backscatter' has always been a popular section of the magazine. But despite this, Mike Richards G4WNC - who compiles and writes the section - has run up against a thorny problem brought about by the introduction of new data modes.

Mike has found that with the growing popularity of Packet radio, it's increasingly difficult to separate RTTY, Packet and FAX modes. As Packet and FAX are already covered in *PW* Mike has decided to stop writing the monthly RTTY section. In future Mike will be concentrating on RTTY, AMTOR and other special features and reviews. So we can promise some good reading!

Circuits and Ideas

Starting in the November issue of *PW* we'll be starting to publish **YOUR** circuit ideas. We've had many requests to introduce this feature and now's your chance. Send in your idea with a clearly drawn circuit diagram with component values marked and a very brief description of what the circuit does. The idea must be as original as possible and sources must be quoted where relevant.

No instructions - other than important details - will be printed. The idea is to provide 'building blocks' for further experimentation. Each circuit published will win a prize voucher for its author and don't forget - originality, innovation and neatness will help **YOU** to win.

We apologise to readers that 'CB Corner' and part 4 of 'Valve Technology' have been held over this month.

Receiving You...

★★★★★STAR LETTER★★★★★

Dear Sir

Electromagnetic Compatibility. Another of those 'phrases' generating enigmatic initials wished upon us, undemocratically, by the grey eminences in the electrical world. No doubt those same eminences who, among other things, and again undemocratically are endeavouring to twist a non-descript rectangle upon us in place of the diagrammatic standard resistance symbol. A symbol unusually recognised and used for over a century.

What precisely does e.m.c. mean? Rob Mannion G3XFD says "radio interference".

I would, however as a former Post Office Radio Service engineer well versed in the subject,with 27 years of interference tracing and 'killing' behind me, say that it means nothing of the sort!

If anyone, or anybody, Police, Fire, Ambulance, p.m.r. or private persons had complained to me that their respective radio or TV systems were suffering from "electromagnetic compatibility", I would have taken a hard look at the 'mickey' taking capability of the complainant(s)! A jaundiced look, indeed!

So what does e.m.c. really mean? Compatibility we all understand. 'Electromagnetic' by itself is an adjective and needs something added to which it apertains. In this case, since radio interference is involved, we assume r.f.e.m. waves travelling in the medium we used to call the 'ether', because radio interference is just such.

Nobody welcomes r.i. on whatever receiver, therefore in this case so called e.m.c. becomes e.m.i. with apologies and all due respects!. Electromagnetic INCOMPATABILITY!

I suspect, however, that in the case of rx's, the capability to which emc could refer is the complete rejection or lack of response to any signal out of channel. But signals out of channel are by no means interference. Interference is unwanted noise you hear on channel.

If the set responds to any signal out of band together with the wanted signal, again this wouldn't be bona fide interference. Just a bad receiver.

Therefore the only connection between e.m.c. and interference is that radio interference is an electromagnetic state in the transmission medium affecting or marring one wanted signal or an alive band in the radio spectrum, but then so are Droitwich and other electromagnetic states in the transmission medium. An electromechanical relay opens and closes sets of electrical contacts under electromagnetic stress, but it doesn't necessarily cause r.i.!

I would suggest that the compiler hash from 11k.V. overheads is not 'computer hash' but discharges on the system caused by poor insulator glazing, ties, binders, pvc covering etc. and faults which have remained unlocated and therefore uncorrected since the dislocation of the Radio Interference Service of the former GPO and BT/Home Office by an electromagnetically incompatible government!

Alan B Pidgeon G6CBP
Worcester WR2 4JQ

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.
Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

Dear Sir

I was quite pleased to see the letter from G4HFU in August *PW*. He has expressed something that I have felt quite strongly about for some time now. Hopefully, his letter has been widely read by both friends and foes of packet because it goes a long way towards putting packet radio into perspective.

There are still far too many people who fear the 'packet invasion' and perhaps G4HFU's letter will go some way towards calming their fears. There are also a lot of converts to packet who never fully understand the nature of the mode and who somehow feel that they have to 'operate' packet to get the full benefit and then complain bitterly when their fellow users attempt to dissuade them from running high power, DXing nodes and BBS's, etc. (Someone once said that "If it has wheels someone will race it", I'd like to add that if it puts out r.f. someone will DX it!)

I don't believe that the visionaries who gave us packet radio a decade ago ever intended it to be an 'operator's' mode but, instead, a tool to be used in conjunction with our other activities.

The whole concept of a mode where contacts don't have to be conducted in real time is a bit difficult for many of us to fully appreciate until we've been involved with it for some time. I know I had a problem with this at first.

Some operators never get over their disappointment that there are not more 'live' contacts and go back to their former real-time modes. (No, I'm not against 'live packet').

The remainder of us, once we see what all the fuss is about, attempt to make the best of this powerful new tool by keeping a packet station (hopefully, low power) on the air and checking the local BBS once a day for anything new and interesting. Meanwhile, we carry on with our c.w, s.s.b., f.m. or whatever...

To those who go into packet looking for 'live' RTTY-type contacts, you may be disappointed. Live contacts are there and they are fun but very thin on the ground. If that's your expectation from packet, best to opt for RTTY, instead.

For those who fear that packet and computers are taking over, your worst fears are partially realised. There are fully automated contacts taking place on packet all the time, but they'll never replace live conversation. Why not have a look and see what it's all about?

Dave Word
G4YYW/N4DYR
Scarborough

Dear Sir

Amateur Radio - Hobby or career?

Have you looked at what the RSGB propose for a novice course? (If not do so). Things no 'A' Class have had to study or do. My advice, go for the C&G and go all the way or stay on CB (h.f. no exam). My ideas for a workable system are:-

1. v.h.f.Novice exam on proceeding only.
2. h.f. & v.h.f. Novice as above and typing speed exam.
3. A & B as before (no change). 'A' with a typing test.

Novice restricted to part of the band and type approved equipment (no home brew). I use the word 'typing' as I envisage the Novice using a date mode only from the keyboard.

Dave Milne GM1YXM
Edinburgh

Dear Sir

Puzzles and prizes are all very well but **please** could we have some updated DATACARDS showing location of repeaters etc etc?

S. Sier GW6UUF
Mid-Glamorgan
South Wales
CF31 4QJ

Editors Reply: Mr Siers's request is one among a number. We are hoping to beat the economic crisis and up-date the cards as soon as we can! **G3XFD**.

PW has received a letter from Hubert DG9NCX. He's looking for skeds on 144MHz, 430MHz and 1.3GHz. Anyone who can help should write to:

Hubert Metz DG9NCX
Heiurich-
Schatzel-Str17
8716 Effeldorf
West Germany

Competition Corner

SPOT THE DIFFERENCE

Worthington, our cartoonist, has made 12 major changes to the top cartoon. Just circle all 12 changes, in ink please, on the bottom cartoon and post the complete page to SPOT THE DIFFERENCE, Practical Wireless Magazine, Enefco House, The Quay, Poole, Dorset BH15 1PP to arrive not later than Friday 12th October 1990. The first correct entry drawn out of 'the hat' will win a 1 year subscription to *Practical Wireless*. The Editor's decision is final and no correspondence will be entered into.

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Services

Queries
We will always try to help readers having difficulties with a *Practical Wireless* project, but please note the following simple rules:
1: We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2: We cannot deal with technical queries over the telephone.
3: All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
4: Make sure you describe the query adequately.
5: Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of *PW* for the past years are available at £1.65 each including post and packing.
Binders, each holding one volume of *PW*, are available price £4.50 each (£1 P&P for one, £2 for two or more).
Send all orders to the Post Sales Department.

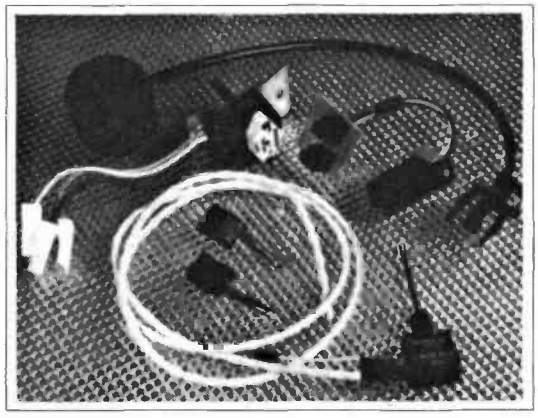
Subscriptions
Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Constructional Projects
Each constructional project is given a rating to guide readers as to its complexity.
Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.
Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.
Advanced: A project likely to appeal to an experienced constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.
Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP KITS, both of who advertise in the magazine.
The printed circuit boards are available, mail order, from the Post Sales Department.

Mail Order
All *PW* services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank), Access, Mastercard or Visa please.

Wireless Line
This is an information service for the radio enthusiast, updated each Friday. Calls cost 44p per minute peak time and 38p per minute off-peak. The number to ring is: (0898) 654632.

Newsdesk '90



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The NanoTECH Trigger fulfills an important need in the daily activities of design, development and service engineers working on digital circuits, especially those that are microprocessor based.

When a set of user-specified conditions is met, the Trigger provides a t.t.l. active-low trigger pulse at its output. The trigger pulse may be used to initiate data acquisition by an oscilloscope, bus or logic analyser, or to trigger a breakpoint or interrupt circuitry in the system under test, or any in-circuit emulator or other equipment attached to it. By routing the pulse to the carry input of another unit, several Triggers may be cascaded to provide a trigger signal when specified conditions are met simultaneously on a number of chips. For example, three Triggers can monitor the occurence of a particular 8-bit data byte at a given 16-bit address.

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The NanoTECH Trigger costs £79.95 plus VAT, post & packing.

Further information from:

Chris Moller
Nanosecond Technology Ltd
344-346 High Street
Cottenham
Cambridge CB4 4TX
Tel: (0954) 51455

German PTT Buys Marconi Transmitters

Marconi Communication Systems Ltd., has been awarded a contract to supply the German PTT (Deutsche Bundespost) with five 10kW high frequency communication amplifiers for ship/shore communications. The contract was awarded through Intronic GmBH in the face of fierce competition from the UK, Europe and USA.

The type H1141 amplifiers will be installed at transmitter sites at Elmshorn (32km north of Hamburg) and Osterloog (32km north of Emden).

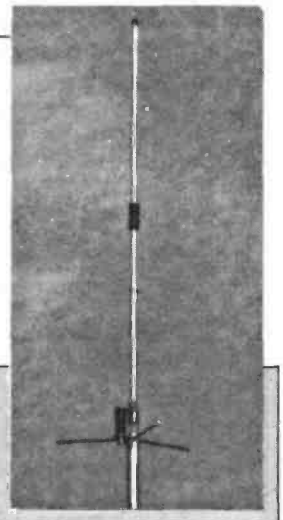
One of the major technical advantages of the system is the use of the H1141 amplifier, which provides a 'fast tuning' facility whereby frequency changes are achieved in less than five seconds. These new amplifiers replaced those previously installed by AEG Telefunken.

Over 450 of these transmitters are in service with PTT authorities and organisations throughout the world, where high reliability and frequency stability are important requirements.

Can Anyone Help?

Can anyone help Mark Parker in finding the following items he had stolen; a Cybernet Delta One (934MHz) rig, 27MHz transceiver, one pair of binoculars and a number of assorted tools. The equipment was taken from the Burma Station Forecourt, Malborough Road, Swindon in Wiltshire. Any information should be sent to Mark c/o us and we will pass it on.

Cushcraft AR-270 Dual Band Ringo



The new AR-270 Dual Band Ringo is the perfect antenna for any dual band 2m/70cm amateur base station transceiver.

The antenna is a durable lightweight design that is all aluminium in construction and utilises stainless steel hardware.

The AR-270 is a compact antenna measuring 3.75' high. It has 3.7dB gain on 2m and 5.5dB on 70cm. You can enjoy full bandwidth on 2m and over 15MHz on 435 through 450MHz to work your desired f.m. repeater.

With its two section vertical element, three short radials weather sealed phasing coil and weighing only 2 pounds, the AR-270 is ready to install anywhere and is ideal for limited place requirements.

The AR-270 is available through amateur dealers world-wide.

Lowe's Takeover

Just 10 years after leaving Lowe Electronics to start his own company, Zycomm Electronics Managing Director, Ian Sneap, this week announced that his company have taken over Matlock based Lowe Electronics Ltd.

Lowe Electronics was formed 26 years ago when the founder J. B. (Bill) Lowe took early retirement from the mineral mining industry and turned his hobby of amateur radio into a business. Lowe has now grown to be the leading amateur radio outlet in the country and has branches in Glasgow, Darlington, Cambridge, London, Bournemouth and Cardiff as well as the head office and engineering facility at Matlock.

Zycomm Electronics Ltd was formed in 1979 when Ian Sneap left Lowe Electronics to form his own company with his co-director Roger Geeson. Over the past 10 years Zycomm has grown and developed in a remarkably similar fashion to Lowe.

New Television Relay for Lewes, East Sussex

A new relay station will shortly bring good television and teletext reception to about 1700 people in Lewes, including the Southover and South Malling areas. It is being built jointly by the BBC and the IBA on the roof of Lewes County Hall, and is expected to open in the next few weeks. Details of the opening date will be given on Ceefax page 698 and Oracle page 697.

The channels to be used at the Lewes are:

Channel 22	BBC1 South East
Channel 25	ITV TVS (South East)
Channel 28	BBC2 South East
Channel 32	Channel 4

To take full advantage of this new service, viewers will need a group A aerial, fitted outdoors and carefully aligned on the new relay.

Viewers to the north and east of the new relay should fit the antenna with the rods vertical while those living to the south should install it with the rods horizontal.

Further information from the BBC or IBA.

Newsdesk '90

The Right Switch For The Job

SASCO is now offering an extended range of electro-mechanical switches to cover virtually any application.

Rocker types include the Arrow Hart Elite mini series which are elegantly styled and available in both illuminated and non-illuminated versions. Suitable for use in areas ranging from office equipment and computers to domestic appliances, the devices feature an inrush capacity of 100A for 4ms. They are rated at 6(4)A, 250V a.c. and are available in all popular circuit versions to fit cutouts of 19.2-19.8mm x 12.9mm.

Subminiature switches include Lima toggle, rocker and paddle devices which are fully washable and have straight or formed p.c.b. terminations. Variants include single and double pole; 2 and 3 position; and maintained and momentary action to simplify selection of the best possible configuration.

For miniature applications, Delta Series are also fully washable to withstand wave/flow-soldering processes and offer a wide selection of circuit functions and actuator styles with both straight and right-angle terminations.

Steve Bacon
SASCO
PO Box 2000
Crawley
Sussex
RH10 2RU
Tel: (0293) 28700

New Philips RF Generators

Two new high resolution r.f. signal generators from Philips Test and Measurement, the 180MHz PM5327 and PM5328, have a new user interface based on a large, multifunction l.c.d. screen that makes operation much simpler then conventional instruments in this class.

PM5327 and PM5328 offer a wide range of modulation facilities including a.m., f.m., a stereo f.m. option and sweep. Modulation may be external as well as internal and all parameters such as modulation frequency, sweep width and frequency deviation are selectable. A number of preset internal modulation frequencies and ten calibrated sweep widths are also included.

Operation of these generators is simplified by the multifunction backlit l.c.d. screen, which provides full, clear information on all signal parameters, selections and settings. Parameter selection is by pushbutton-activated menus covering frequency, output level, modulation mode and modulation parameters.

The PM5327 and PM5328 offer frequency resolution of 10Hz, making them ideal for the testing of narrow-band systems.

Attentuation is set in fine 0.1dB steps, making accurate sensitivity checks easy. The output level range if from -127dBm to +7dBm (PM5327) and -127 to +13dBm (PM5328). The frequency increment mode makes it easy to check circuit response frequency in the r.f. and i.f. bands, while increments are preselectable for precise tuning to critical response frequencies.

Both models have a non-volatile memory for storage of complete front panel set-ups. This memory holds 99 set-ups in the PM5328 and 10 settings in the PM5327. Stored settings can be recalled remotely via the IEEE-488.2 interface, to speed and simplify GPIB programming.

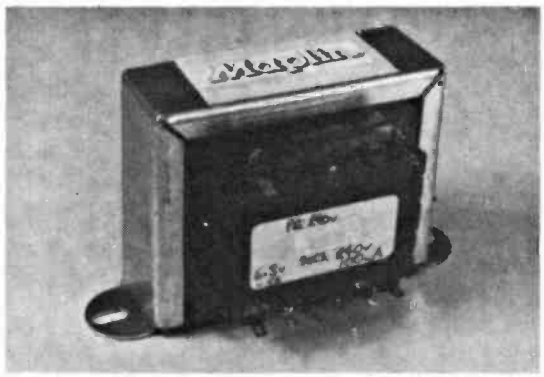
For further information, please contact:

Graham Sibley
Philips Test & Measurement
Colonial Way, Watford
Hertfordshire WD2 4TT
Tel: (0923) 240511

Power Supply Transformer

A new transformer from Maplin Electronics will solve power supply problems for valve equipped projects. The transformer, part reference number XP27E, will be available in the new Maplin catalogue from September. Priced at £8.95, the transformer has a 240V 100mA secondary h.t. winding and 6.3V 1.5A filament winding and has been introduced by Maplins following requests from customers.

Maplin Electronics
PO Box 3, Rayleigh, Essex SS6 8LR



New Products

Personalised mugs and plaques have recently been introduced by Characteristics of Yorkshire. The prices are £3.75 for the personalised mug and £3.25 for the plaque, including postage and packing, or £3 for the mug and £2.75 for the plaque if purchased at the shop in Bridlington.

The plaques are by return, but as the mugs are personalised, they will take two to three weeks for delivery.

Characteristics
44 Hilderthorpe Road
Bridlington
Yorkshire
YO15 3BG
Tel: (0262) 673635

Newsdesk '90

VSO

Richard Mitchell has recently returned from spending two years working as a technical teacher with the UK Charity VSO (Voluntary Service Overseas) in Nigeria, West Africa.

He thought other readers might like to hear about the opportunities VSO offers practically-minded people to live and work overseas.

Every year the charity receives over 50 requests for men and women to help teach the new Introductory Technology course (Introtech) in Nigerian Schools.

Introtech aims to teach basic technology in secondary schools - it is similar to the Craft, Design and Technology course in the UK. Practical projects include the making of toys, jewellery, electrical torches and musical instruments from a range of materials. Through these, students learn about materials, design, technical drawing and measuring and so build up a basic technical knowledge.

Given the broad nature of the subject, VSO is looking for people from a wide range of backgrounds - DIY, carpentry, technical drawing, metalwork, ceramics and vehicle maintenance.

You will need a qualification, ranging from City & Guilds part three to degree and at least two years' work experience. VSO jobs are for a minimum of two years and volunteers are paid at local rates.

VSO volunteers also need quite demanding personal qualities like enthusiasm, adaptability, initiative and a good sense of humour to teach in what is often a very challenging environment. It is a job equally suitable for men and women.

If you would like to know more, please contact Richard Mitchell at:

The Recruitment Unit
VSO
317 Putney Bridge Rd
London
SW15 2PN
Tel: 081-780 2266

Two New Dealers

MET Antennas, the Bromsgrove based manufacturer, are pleased to announce the appointment of two new dealers in the UK. Both dealers carry a stock range and offer full manufacturers back up. They are:

Border Communications Ltd
Units 8a-8c
Drum Industrial Estate
Chester Le Street
Co. Durham
Tel: 091-410 6969

Western Electrical Distributors Ltd
Radfords Field
Maesbury Road
Oswestry
Shropshire
Tel: (0691) 653221

SEND YOUR NEWS ITEMS TO SHARON GEORGE AT OUR EDITORIAL OFFICE.

Screw Contact PCB Connectors

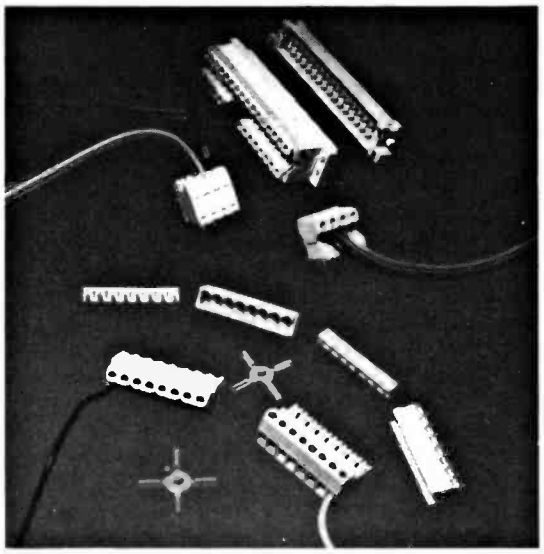
LMI UK announce a new range of low cost 32-way screw contact p.c.b. connectors.

Codenamed 302 series they are ideal for use where space if at a premium, and incorporate what is claimed to be a unique clamping/locking device with screw and wire on the same plane.

Manufactured from Polycarbonate, these products can operate withing a temperature range of -40°C to +125°C and have a current rating of 6A per gold plated contact. They are intermatable with DIN 41612 devices and are fully approved to UL and CSA standards.

For further information, contact:

Paul Haynes, LMI UK, Unit 20, Ptarmigan Place
Attleborough Fields Ind Estate, Nuneaton
Warwickshire CV11 6RX
Tel: (0203) 642429



Benchtop Precision Multimeter

Now available from STC Instrument Services, the remarkable Schlumberger 7151 multimeter incorporates two integral microprocessors which carry out a variety of functions that would normally require a separate computer and test gear to achieve similar results with a standard instrument.

It employs ultra-low-noise circuits designed to operate at 100nV sensitivity on d.c., 1µV on a.c., and down to 1 milliohm using 4-wire resistance measuring. A very high level of linearity over the full dynamic range is provided by its pulse-width A/D converter which, together with a special precision reference, provides a basic accuracy of 0.002%.

Other features include temperature measurement using a platinum resistance sensor; the ability to introduce digital filtering; a pushbutton null facility to zero voltage or current d.c. as well as resistance; the ability to scan, for example, the latest 100 readings to build-up a real time picture of trends; electronic auto-calibration; non-volatile real-time clock control; a history file to collect and retain up to 500 results; and Reset or Resume capabilities after power fail.

Simon Howard, STC Instrument Services
Dewar House
Central Road, Harlow, Essex, CM20 2TA
Tel: (0279) 641641

Regarding Feet - Where Do You Stand?

Perancea stand silent and secure with their new range of Self Adhesive Instrument Case Feet. These feet ensure protection for both equipment and surface. Whilst aiding intended movement, they will not slip or scratch surfaces and provide protection to sensitive instruments by reducing vibration.

Simple and quick to apply (just peel off the backing and press into place) they provide the efficient and cheap answer with prices from $2\frac{1}{2}$p to $8\frac{1}{2}$p each for reasonable quantities. Supplied in either plate finish solid black rubber or light grey closed cell expanded pvc, a comprehensive range of standard sizes from 7.5mm to 25mm diameter are available from stock. The specialised production and tooling methods also offer very competitive pricing on special shapes and sizes. Tooling costs can be as low as £50, providing an economic method for both prototype and production needs. Alternative materials such as fluted rubber, felt, expanded neoprene closed cell sponge, EDPM, expanded natural closed cell sponge and expanded closed cell polyethylene can also be supplied. Comprehensive literature complete with samples is available now.

Perancea, 6-7 Rosebery Mews, Rosebery Road, London N10 2LG. Tel: 081-365 2520

Multilayer Ceramic Capacitors

Kemet C052/C062 series multilayer ceramic capacitors are supplied by Unitel in three different dielectrics - COG and X7R to IECQ requirements and the Z5U for commercial applications.

These radial products are designed for professional use and cover the capacitance range from 10pF to 1µF and voltages of 50, 100 and 200V.

For further details, contact:

Alan Coulling
Unitel Ltd
Unitel House
Fishers Green Road
Stevenage
Herts
SG1 2PT
Tel: (0438) 312393

Newsdesk '90

Practical Wireless 144MHz QRP Contest Results 1990

The leading Scottish station **GM4CAA/P** will be presented with the **Tennamast Trophy** at the Scottish Amateur Radio Convention, to be held at the Cardonald College, Glasgow on 15 September 1990.

A full detailed report on our contest will appear in the next issue.

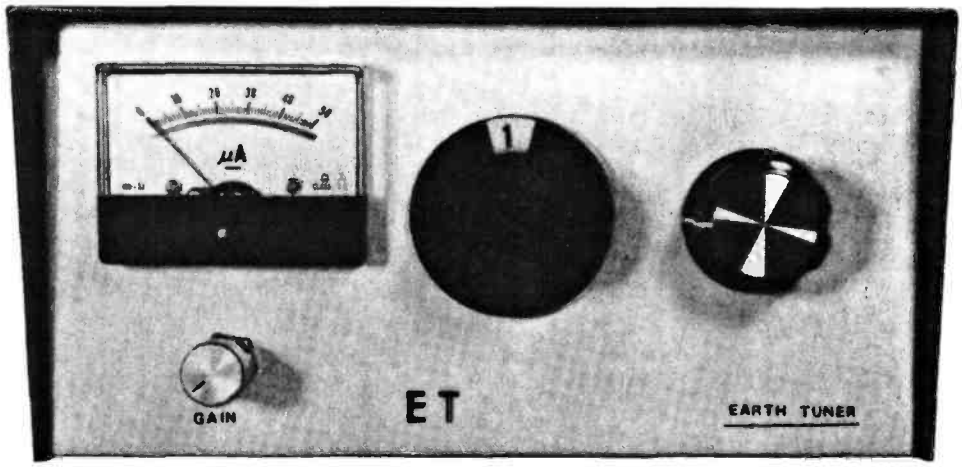
Pos.	Callsign	Points	Pos.	Callsign	Points	Pos.	Callsign	Points
1	**G0MCG/P**	**15040**	40	G6HH/P	2120	79	G4TSW/P	972
2	**GW4VEQ/P**	**13904**	41	G3JXN	2106	80	GW0IIW/P	960
3	GW5RS/P	7337	42	G1JDP/P	2090	81	G1JHZ/P	960
4	G1NUS/P	7221	43	G3WGU/P	2079	82	G4JBR/P	900
5	G1ORC/P	6748	44	GI0EJN/P	2000	83	G0JLF/P	868
6	GW1MOU/P	6578	45	G8OZP/P	1952	84	G6GAU	816
7	G7APD/P	6554	46	GM0GMD/P	1840	85	G1WPD	812
8	**GM4CAA/P**	**6300**	47	G4ARI	1820	86	G7FOX/P	800
9	GW1HGV/P	5373	48	G1OGY	1818	87	GM6FPX/P	750
10	GW4VIX/P	4975	49	G0JKD/P	1782	88	GW0LIS/P	735
11	GW4NVA/P	4876	50	EI6ARB/P	1743	89	G3SVC/P	720
12	G4LDR/P	4872	51	EI2SDR/P	1615	90	PE1EWR	615
13	G7DIP/P	4592	52	GI4SJB/P	1615	91	G1TAI	612
14	G4SRS/P	4524	53	GW0KZE/P	1590	92	G1UKE/P	605
15	G4ILI/P	4370	54	GI7CMC/P	1560	93	G0/SP6GVU/P	600
16	G1STH/P	4163	55	G4ZUN	1520	94	G7CLY	592
17	G1VDF/P	4152	56	G2HR	1365	95	G4CRC/P	580
18	G0HEL/P	3749	57	GW7FKV/P	1365	96	GM0ICF/P	572
19	G0MTV/P	3725	58	G1WYC/P	1350	97	G8ZHF/P	540
20	G6ARC/P	3588	59	G7BPR/P	1349	98	G0MQM	540
21	G1SAS/P	3475	60	G7GCX/P	1316	99	GW0MKQ/P	480
22	G1POS/P	3427	61	G1JGE/P	1312	100	G0JDL	432
23	G8DDY/P	3322	62	G6ESJ/P	1290	101	G1MZD	429
24	GW8ZRE/M	3278	63	G0INF/P	1274	102	G4ZFR	385
25	G8EQD/P	3220	64	GM0HNX/P	1260	103	GM0ARH/P	384
26	G0KYW/P	3168	65	G0FUW/P	1254	104	G8PGM	351
27	G3NJA/P	3168	66	G0EHV	1188	105	G2FKO/P	225
28	G0MTQ/P	3108	67	G3LNR/P	1184	106	G7GEE	208
29	GW6TEO/P	3105	68	G6YZR/P	1183	107	G7FGS/P	175
30	G3OLX	3060	69	G1CSR	1155	108	GW1ARC/P	175
31	GW4ARC/P	3037	70	G2TO/P	1139	109	G7ENY	154
32	GW1YOA/P	2907	71	GM4RIV/M	1134	110	GW7BOY	133
33	G4RSE/P	2898	72	G0JQA/P	1080	111	G8XZW/P	130
34	G1GVA/P	2793	73	EI4HE/P	1026	112	GM1JPJ/P	33
35	G6VAT/P	2751	74	G0ABS/P	1024	113	GM3NHQ/P	25
36	G7GGY/P	2646	75	GW7EVG/P	1008	114	G6WTM	8
37	G1OWP/P	2288	76	G0BYQ/P	1005	115	GM/PE1MHO/P	1
38	G3BPK/P	2275	77	G7EBC/P	994			
39	G0LUR/P	2254	78	PA3FGI	990			

Problem Post

We have heard from the Post Office that they have had some problems delivering our September issue. We would like to appologise to our subscribers on their behalf and we hope that this has not caused too much inconvenience.

Earth Tuner

Construction



A good return earth is the key to efficiency on the lower frequency bands. Godfrey Baillie-Searle GD4EIP has a novel approach for improving matters that can also help reduce the chance of you causing interference.

All amateur stations must have a good earth system in order to prevent leakage to the chassis thereby causing a live chassis. A good earth system also helps in reducing TVI, BCI and RFI.

Although the equipment should be connected to the earth of the mains socket, which of course provides protection in the event of the chassis becoming live due to a power supply fault, such an earth cannot be considered sufficient as a radio-frequency earth.

The conductivity of the ground varies from location to location and from dry to wet weather. Amateur radio operators might think that they have made good radio frequency ground systems when, in actual fact, they have not!

Essential For Efficiency

With some antennas a good low resistance ground is essential for efficient operation, since the antenna is tuned against this 'perfect' ground.

Usually a couple of copper rods or lengths of wire buried in the ground are suitably connected to the transmitter. If, on test, a reasonable signal report is obtained, the installation is considered acceptable. Whereas better results could be achieved if the r.f. ground system was properly tuned.

Considerable Distance

Most amateur radio transmitters are, due to circumstances, located some considerable distance from the ground point. This is a particular problem when the existing domestic earth point is used. The resulting 'random' length of the earth lead as it passes through the house may make the system resonate on one particular frequency but not any other.

How It Works

The circuit consists of an r.f. current indicator and a series tuned *LC* circuit. The *LC* circuit has an inductor made from 12 turns of 2.0mm (14s.w.g.) enamelled copper wire wound on a 37mm diameter former and tapped at every second turn making a total of six taps. I used an American coil former which may not be available here but the method of construction may be of interest for any of you who would like to try a slightly different method of winding a coil in the same fashion.

The relatively large diameter coil can be wound around four Perspex pillars which have slots cut into them. The Perspex rods can be temporarily taped onto a suitable diameter former. Once the wire has been wound and the coil is formed, the slots are filled with clear cement and the former gently slid out from underneath.

Making the tapping points on the coil is straightforward, and can be achieved by placing a pencil or other tool under the wire (as it's being wound) to make it 'proud' of the main body of the coil. At the same time, the main coil windings will be forced inwards to a certain extent.

Building The Earth Tuner

Building the unit should present little difficulty as in is principle a very simple device. The major point to remember is that the tuning capacitor must be insulated from earth. This is not as difficult as it may sound and I achieved it by mounting the capacitor on stand-off pillars.

The stand-off pillars can be made from a plastic rod, suitably drilled at either end, or you can use a large rubber grommet with the fixing bolt for the

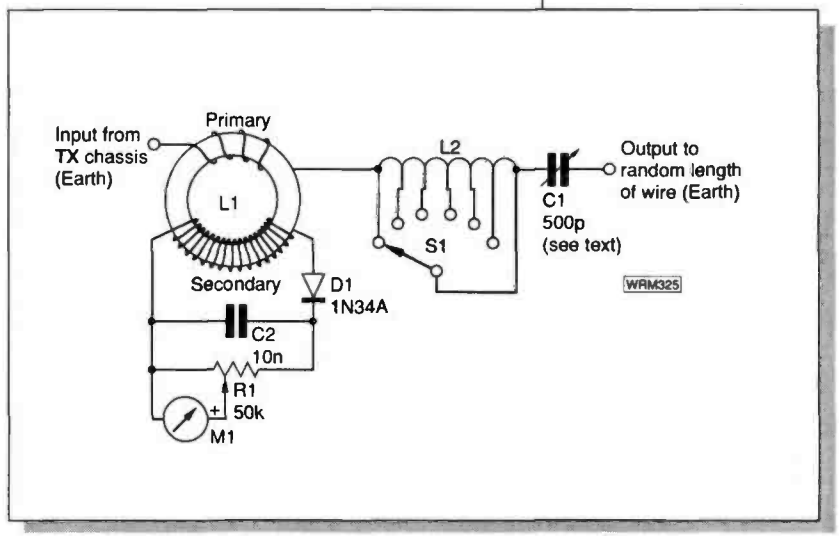


Fig. 1: The diagram of the whole unit. The secondary winding of L1 consists of 10-12 turns of 0.5mm enamelled copper wire, the primary consists of one or two turns using the input 'tail' of the wire used in L2. Care must be taken when winding these turns as the 2mm wire is extremely stiff and damage to the T50-2 core is possible.

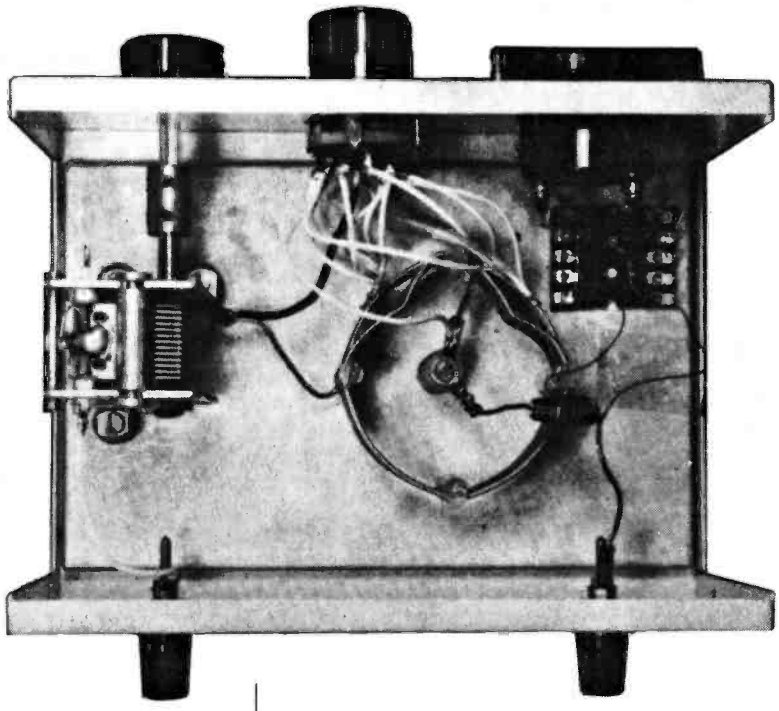


Fig. 2: a view of the inside showing the overall layout of the project. Note the insulation of the body and spindle of capacitor C1, these must be of good quality material

HOW MUCH? £12
HOW EASY? INTERMEDIATE

Shopping List

Resistors
Rotary
50kΩ 1 R1

Capacitors
500pF(var) 1 C1 (original found in an old valved radio set)
10nF 1 C2

Diode
1N34A 1 D1

Miscellaneous
Toroidal core type Type T50-2 (L1 former), 1pole 6 way switch, meter of 50 or 100μA movement, box to contain the project, insulated stand-offs and insulated extension shaft for C1. Enamel covered copper wire of 2.0mm (14s.w.g.) and 0.5mm(24s.w.g.)

capacitor feet passing through two plastic washers. Other insulating materials would also be suitable for the washers (you might find enough of the older laminated resin fabric washers in your junk box if you're lucky).

The tuning control must also to be insulated from the operator! This is achieved by using a standard coupling bush for a variable capacitor or variable resistor shaft. One end of the variable capacitor shaft is fitted into the bush and the other end will accept a suitable length of nylon shaft.

A good source for the shaft is from an otherwise discarded switch or potentiometer. It might be worth your while in asking your local radio and TV repair shop if you can have a suitable specimen from their waste-bin! **PW**

Errors and Updates

Basic Radio Calculations With Pocket Computers, September 1990.

One small problem that seems to have crept into the basic Radio Calculations program by Mike Hadley G4JXX. The lines 110 ('H=1E6/((4*π ....') and line 150 ('O=1E3/(√(Z.....') appear to have caused a little consternation among some of our readers. This is the scientific (or fixed point) method of specifying a number. The actual method of inputting the 'E' character is to use the shifted '+' character. This button is marked with the word 'Exp' above it.

This scientific method of specifying a number is used to for numbers which may have a very wide range. It consists of two parts: the actual figures as a number between 0 and 9.99999 and a power of 10 multipler. The figure 1E3 is 1.000 x 10^3 or 1000 and in similar manner the number $1E^6$ is short for 1000000. (1 x 10^6). As with the decibel (dB) it can make maths very much easier. For example 3200 x 160 looks quite difficult and may be prone to error, but 3.2E3 x 1.6E2 is very much easier. This works out as (3.2 x 1.6) E(3+2) or 5.12E5 (512000).

What A Good Idea!

*In future issues of PW we shall be publishing **YOUR** ideas. As most of the simple projects that come our way are very innovative the best name for the new feature seems to be 'What a Good Idea!'.*

To help readers who would like to submit projects there are a few guidelines to follow and a few notes on how we aim to run the feature. By following the guidelines you will ensure that your idea is published with the minimum of delay.

1. The idea or circuit must be as original or innovative as possible and be addressed to the 'What A Good Idea!' care of PW and reception will be acknowledged. If the idea if not entirely original, any circuit or design it is based on should be referred to in the text. We will not accept any circuit or ideas that involve transmission outside the amateur bands.

2. Wherever possible you should have built, tried or tested the idea or project. Readers should be aware that PW will not necessarily build, test or try any of the circuits or ideas.

*3. Any basic circuit submitted for the 'What A Good Idea!' feature must be **NEATLY** and **clearly drawn in ink** with all values clearly marked alongside each component. No printed circuit board layouts will be supplied. If readers do not know the value of inductance of coils they have wound, the dimensions and instructions on how to wind them will suffice.*

4. Each idea or circuit must be accompanied by the minimum of text to help other constructors. Your full name and address must accompany the idea although we shall not publish it in full.

5. Any queries or suggestions arising from a published idea will be redirected by PW to the author unless the author requests the contrary when the idea is originally submitted.

6. Any query to be redirected to authors must enclose two stamped envelopes. One stamped envelope should have the sender's address and the other should bear the name of the circuit author.

7. All ideas and circuits will be published in strict rotation and we aim to find space in the magazine whenever and wherever possible. Authors will receive a £20 cheque following publication.

8. Finally, you've been asking for this feature - so let's see those ideas coming in. It's up to you!

Radio Diary

***Practical Wireless and Short Wave Magazine in attendance.**

***September 15**: The 1990 Scottish Amateur Radio Convention will be held at Cardonald College, Glasgow. There will be free parking for hundreds of cars, the college dining hall will be open as well as snack bars, there's a licenced bar, three exhibition halls as well as all the usual amateur radio attractions. Doors open at 11am (10.30am for the disabled) with the admission at £1.50. **Tom Hughes. Tel: 041-427 0122**.

***September 16**: The British Amateur Radio Teledata Group annual rally will be held at Sandown Park Exhibition Centre, this time in the larger Surrey Hall. **Peter Nicol G8VXY. Tel: 021-453 2676**.

September 16: The Bristol Radio Rally will be held in Brunel's Great Train Shed, Temple Meads Station, Bristol. All the usual traders will be there, a large Bring & Buy, food and refreshments as well as displays and demonstrations. **D.S. Farr. Tel: (0272) 839855**.

September 22: A QRP Convention beside the Sea will be held in The Garnham Centre, United Reform Church, Back Chapel Lane, Gorleston, Great Yarmouth. Talk-in from 1315 on S22. Prize for the longest traveller and best home-brewed gear, big display of home-brewed QRP gear, light refreshments. Open from 1400-1730 (clocktime). Admission free. **G3OEP, QTHR**.

***September 23**: The Centre of England Amateur Radio Rally will be held at the British Motorcycle Museum, Bickenhill, Nr the NEC. There will be a Bring & Buy, over 60 trade stands all in three large exhibition halls. There are concessionary rates for all who wish to visit the museum and ample free parking. Doors open at 10.30am. Admission £1, concession for RAIBC members and Senior Citizens. Talk-in from GB0COE from 7.30am on S22. **Frank Martin G4UMF. Tel: (0952) 598173**.

September 23: The Peterborough Mobile Rally will be held in the Wirrina Sports Stadium, Peterborough from 10am to 5pm. All the usual traders will be there, Bring & Buy tables may be hired on the day (space permitting). Talk-in is on S22 and SU22 by G3DQW. **Robert Maskill. Tel: (0836) 542630** any evening.

September 30: The 6th North Wakefield RC Rally will be held at Outwood Grange School, Potovens Lane, Outwood, near Wakefield. Admission is 50p at 11am - disabled 10.30am. Fully licensed bar with real ale, good selection of food from cafe, raffle, Bring & Buy, radio, computer and electronic traders and repeater groups. **Richard G4GCX on (0532) 622139**.

***October 7**: The Great Lumley Amateur Radio & Electronics Society will be holding their rally in the Community Centre, near Chester-le-Street, in Great Lumley. Doors open at 11am (10.30am for disabled). **Barry G1JDP. Tel: 091-388 5936.**

October 14: Computercations will be held again this year at Hillhead campsite on the Dartmouth road in Brixham, South Devon. **Bill Trezise. Tel: (0803) 522216**.

October 20: The G-QRP Club Mini Convention will be held in St Aiden's Church Hall, Manchester Road, Rochdale from 10am to 5pm. There will be a large social area, full lecture programme, equipment display, refreshments, Bring & Buy, Component/Kit Stands, Test Bench and lots more. Admission £1. **Rev George Dobbs G3RJV, QTHR**.

***October 20/21**: The 4th North Wales Radio Rally will be held at the Aberconwy Centre in Llandudno. Rally open as at 11am on both days and the entrance fee is £1 with OAPs 50p and children under 14 free. **Mr B Mee. Tel: (0745) 591704**.

***October 26/27**: The Leicester Amateur Radio Show will again be held in the Granby Halls, Leicester.

***November 18**: The Bridgend Annual Amateur Radio Rally will be held in the Leisure Centre, as last year but in 1990 they are taking over the whole of the building! **Don Chennell GW4DUY. Tel: (0656) 863084**.

For the latest news of special event stations, rallies, what's on the bands - ring

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Folded Dipole Antennas for the 18 and 24MHz bands

Steve Nicholls G0JFM finds that a properly designed antenna has the edge on power output, and describes a pair of antennas for the 18 and 24MHz bands.

Like many other amateurs I was delighted with the good news that restrictions had been lifted from the 18 and 24MHz bands. We had been able to use them for low power c.w. facilities before, but could now use them with full legal power on s.s.b. In line with many others my limit is 100W, but it would be fun to find out how 100W would do, on the new bands, compared with the same power on say the 14 and 21MHz bands.

First Attempts

I immediately fired up the rig and using an MFJ Versa Tuner, tuned the dipole (trapped for 3.5 and 7MHz) onto both bands. There seemed little activity on 24MHz but 18MHz was open to the States. The background noise was low and the signals weak - five-by-three, five-by-five at best. So I tried my other antenna, an AQ6-20 minibeam with other results, as this time 24MHz was the better band.

My first contact was with Nick IV3NWV. I received a five-by-five report, but the QSO faded after a few minutes. Several other G stations were getting better reports but this might just have been conditions.

Linear's Turn

I decided to have a go with the linear amplifier and carefully tuned it to 18.140MHz. As I adjusted the rig for maximum output I noticed that lights were coming on in the shack which weren't connected to any supply. Extension loud speakers were howling even though unconnected to any rig. Then the final straw, when using the linear, the frequency read out on my FT-767 was actually changing several hundred kilohertz as I transmitted on s.s.b. I switched off the linear.

Over a period of several hours operating however, I realised that although the tuner would present a excellent v.s.w.r. to the rig, neither of the antennas were as efficient as they might be. I needed dedicated antennas for the bands. I didn't want to spend a great deal of money (who does?), so the 30m of cable to the roof had to give minimum losses - and be inexpensive. What better opportunity to experiment with ribbon feeder and a folded dipole?

Design Ideas

The slotted 300Ω feeder has very low loss at these frequencies and is cheap in price. A further advantage is that the folded dipoles can be made of the same material. The overall length of the folded dipole is the same as an ordinary dipole, i.e. 5% less than one half wavelength. From the frequency to wavelength formula

The wavelength λ is related to the frequency by the formula :

$$\lambda \text{ (measured in metres)} = \frac{300}{\text{frequency (MHz)}}$$

A $\lambda/2$ antenna is usually taken to be 95% of half of this figure. At 18.140MHz this calculation is

$$0.95 \times \frac{300}{2 \times 18.140} \text{m} = 7.856\text{m}$$

and for 24.940MHz

$$0.95 \times \frac{300}{2 \times 24.940} \text{m} = 5.714\text{m}$$

As shown above the dipoles are 7.86m centred on 18.140MHz and 5.72m when centred on 24.940MHz. Could I use a common feeder for the antennas? I have tried in the past and have often experienced problems. In theory the 'unwanted' antenna should present a high impedance to the transmitted signal, allowing almost total radiation from the 'wanted' antenna. This is in theory correct, but would it work in practise?

To Work

The feeder was laid out flat, and under light tension cut to the correct lengths of 7.86 and 5.72m. At each end of each dipole the insulation was stripped back for a distance of 10mm and the resulting wires were twisted and soldered together. To seal the dipole ends they were merely dipped in a tin of gloss paint (choice of colour personal) and allowed to dry. Make a cut in one side of the antenna at the exact centre point, and trim back the insulation to a distance of about 5-7mm each side. See Fig. 1 for more details.

For the dipole connector it would have been possible to have purchased a commercial centre piece, but I preferred to make my own and save a few pennies towards the 'ultimate rig'. I have some 5mm acetate sheet in the shed - used some time ago for double-glazing. It seemed ideal, provided I used two pieces, which had other advantages. It would act

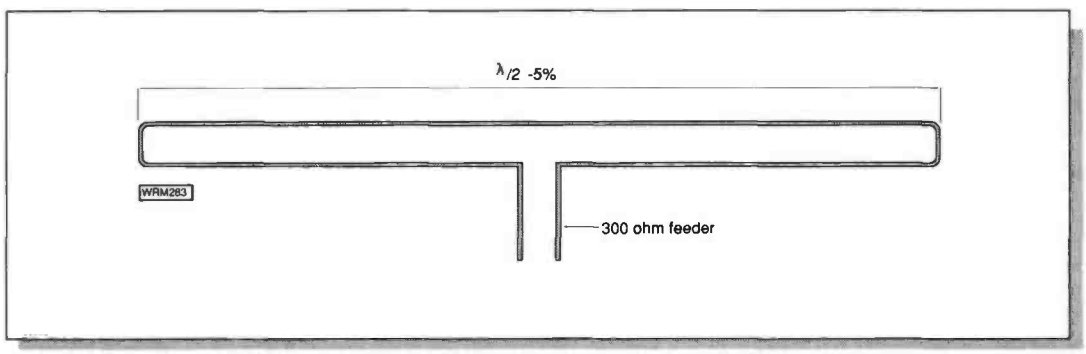

Fig. 1: Each band has its own antenna built to these specifications

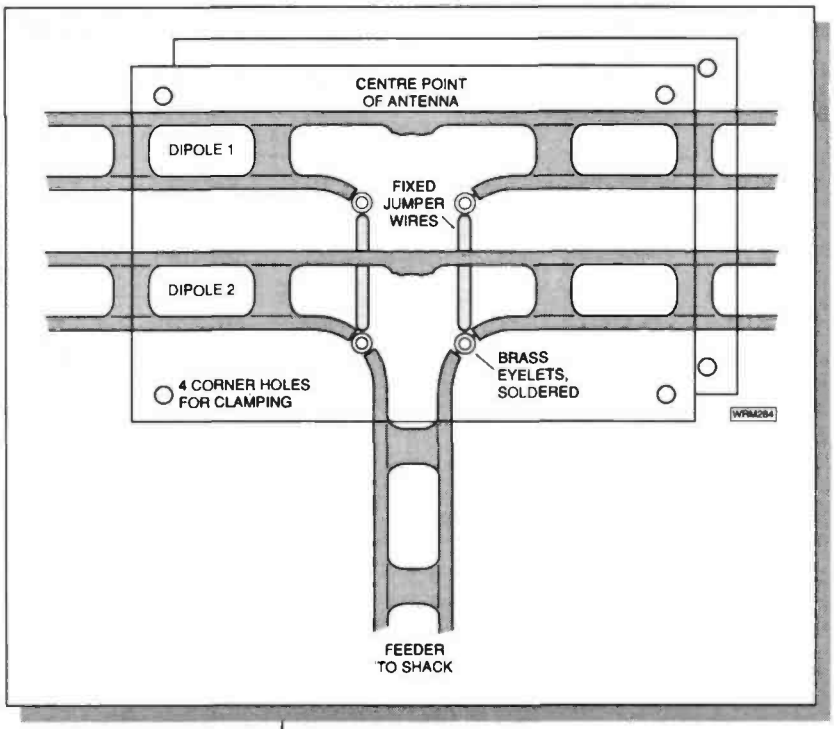

Fig. 2: An enlargement of the centre area of the antenna system, see text for more details

as a clamp to hold the antenna centres together, if the wiring was placed between the two sheets. Also this method would allow some weather proofing of the joints to be carried out. The home QTH has all the atmospheric problems of an exposed seaside location. Two pieces of acetate were cut and clamped together whilst drilling all the various holes (see detail in Fig. 2). The feeders were attached and the plates clamped up together.

Clambering onto the roof allowed both antennas to be stretched out and held horizontally (use heavy weight Nylon mono-filament or other non conductive material), and the feeder dropped nicely down to the shack window.

The 300Ω feeder provides an impedance of, surprise - surprise 300Ω, which matches fairly well to the nominal 300Ω impedance of the folded dipole. This may be correct for the antenna but most modern transceivers will be unhappy about this load value. Either a good a.t.u. and an balun, or at least a balun will be needed to give good matching. I was lucky in that my a.t.u. already has the terminals for a balanced 300Ω feed, but materials to make a 4:1 balun can be purchased for less than £1.00.

Analysis of findings

Using an a.t.u. with a well manufactured 4:1 balun is preferable to using the straight connection to the back of the rig. Should however the a.t.u. not have an option for a 4:1 balun, a cheap home made article can adequately replace it with only a few percent drop in efficiency. The difference in power lost at an s.w.r. of 1.5:1 is very little greater than at 1.1:1.

Within a very short time I found that many DX stations were coming in strongly and clearly. Because of the relative lack of pile-ups there is plenty of time to 'rag-chew', with the rarer stations such as: ZL2APW, since confirmed.

Good DX on the 'new' bands. **PW**

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Would exchange Pocomtos AFR2000 for FC102 a.t.u. Sorry but nothing else will do. If you have one, Tel: L.W. Wood G4ZSB on (0602) 256389

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Have Olympus OM101 35mm SLR camera system. Includes 30-70mm AF lens with manual adapter, some filters and a tripod. All new at Easter but am now housebound. Brian Potts Tel: (0670) 855953

Have Yamaha PSR70 keyboard with p.s.u. foot pedal and stand. A Carlsborough 50W amplifier also available. Radio w.h.y. K Barrett GW4NBY, Tel: (0656) 662867

Have Fuji ST701 SLR camera with wide angle lens, tripod , carrying case and accessories as well as a Mekai TM automatic camera with electronic flash. Would exchange for a communications receiver. S. Phillips Tel: Bourne End 29872

Have D L Bird BBC Fax unit, Psion Organiser II (32k model XP), 4.5inch reflecting telescope with equatorial mount, tripod lenses etc. In excellent condition value £300 new, w.h.y. for h.f. v.h.f./u.h.f. etc. Bill Tel: 091-481344

Have Sharps IQ7000 multi-purpose personal organiser with 32K RAM and much software. Registered with the user club and newsletter due soon. As new boxed. Would exchange for a Grundig or similar digital h.f. receiver with b.f.o. (must be excellent condition). Alex Kevan, 31 Mansfield Place, Newton Stewart, Wigtonshire DG8 6LS

Have Tandberg TD20A-SE 10inch reel-reel tape deck, cost when new over £1200. It has had very little use. Would exchange for a good quality twin deck cassette recorder. Ray Taylor Tel: (0282) 842124

Have Sommerkamp FT-277 1.8-30MHz transceiver complete with mic. and manual. Also Sommerkamp Soka747 transceiver in need of repair. Plus Saisho SW5000 receiver 150kHz to 30MHz coverage. Would exchange the lot for a Yaesu 747 or 757GX or maybe a Yaesu FT102. Letters please to: Tom, 9 Welstye Green, Basildon, Essex SS14 2SR

I would like a manual and both i.f. transformers and other parts for an Eddystone 840C receiver. I am willing to pay all reasonable costs,or what-would-you-like? Howard Tel: (0908) 73114

Have Military radio, a Canadian type 58Mk1, with accessories dated around 1943. Would exchange for a mobile 144 or 430MHz transceiver. Alan Jenkins G7CYD, Tel: (0753) 863735

Have Eddystone IMR54 receiver working and in fair condition. Would exchange for something radio related w.h.y?-Also looking for the manual for a Yaesu FRDX400 receiver, can you help? Keith Heslon, 3 Upavon Court, Pennhill, Swindon, Wilts. SN2 5HD

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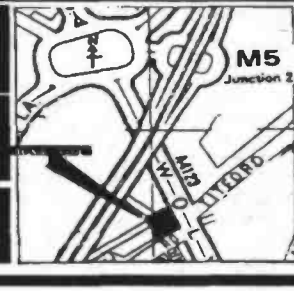

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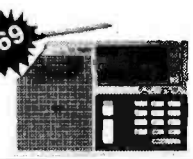
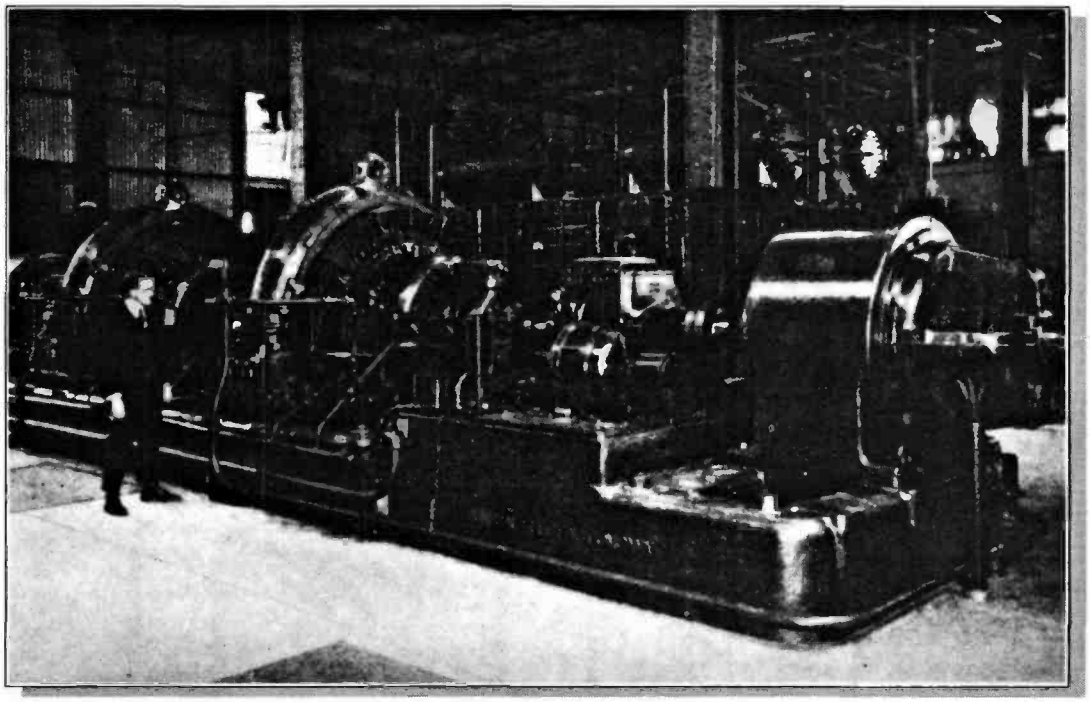


Watts in the Air

Feature

Nowadays most of us take high power radio transmissions for granted but Anthony Hopwood doesn't. He takes an historical look at the megawatts that are launched into the 'ether' every day.



Two coupled 200kW Alexandersson radio frequency alternators at Radio Central (Rocky Point) Station, New York, USA.

It's magical how spinning electromagnets inside a copper and iron cage become 'black holes' for shaft horsepower, and it is quite routine to extract megawatt years of energy from fossil and fissile fuels and then send it down wires to light a distant city.

After a century of electric power, most engineers take it for granted. After all, mains power does follow a circuit where it can be seen at work. But what if you pour electrical power into an antenna wire connected to an invisible ether? That's quite a trick - it's called broadcasting, and absorbs gigawatts of energy across the world. In the UK alone, broadcast radio and TV transmitters radiate over 100 000 horsepower into thin air, all day and every day!

Power Problems

Providing electric power for transmitters has been a problem for over 90 years.

The early wireless pioneers used batteries or portable generators to furnish the modest power needed for isolated cliff top transmitters, or simply hooked shipboard equipment to the ship's electric light supply.

But the key to successful wireless telegraphy was range, and that meant power into the antenna.

As early as 1901, Marconi needed 20kW of electrical power to bridge the Atlantic.

Early wireless telegraphy transmitters used interrupted electric sparks to generate radio waves, which were fed into massive antenna arrays tuned to frequencies between 10 and 100kHz corresponding to wavelengths between 30 and 3 kilometers. These wavelengths are largely immune to day and night effects, and have a world-wide range.

Today, v.l.f.(very low frequency) radio is used for military coded Morse transmissions to nuclear submarines and navigational time signals, because the transmissions can be picked up all over the globe - even underwater.

Large Antennas

Some idea of the size of the antennas used in those early days can be gained by driving past the present installations near Rugby, which can be seen from the M1 motorway or from the main Euston to Birmingham and Scotland railway.

Even before World War I, transmitters were in service with ratings over a megawatt. In practical terms a megawatt transmitter has to feed an antenna with radio frequency current of up to 600 amperes at several thousand volts, switched on and off several times a second to form dots and dashes.

Until the mid 1920s when valves reached the point where they became the preferred method of generating high frequency, high power transmitters used the quenched spark, Poulsen arc or the high frequency alternator.

Historically, the Poulsen arc was to provide the highest powers, with individual sets rated at 2.5MW at 11kHz (nearly 30km wavelength). The Alexandersson alternator peaked at 250kW, and most spark stations were rated at less than 100kW, although there was a Marconi station at Coltano in Italy with a 1MW antenna input.

Providing the power supplies for wireless stations taxed the ingenuity of power plant designers to the limit. The problem was caused by the unique combination of a rapidly cycling heavy electrical load being at odds with supply voltage and frequency stability.

In a few fractions of a second the system had to switch a megawatt load cleanly into the antenna to form a dot or dash, and do so for hour after hour without wandering off tune or blurring dots into dashes. This formidable task is mechanically

An example of a small Alexandersson 100kHz radio frequency alternator.

Close-up detail of complex winding of Alexandersson radio frequency alternator armature.

equivalent to setting a 1500 hp load on and off an engine several times a second while limiting the speed variation to less than 0.1%!

Thunder Factory

No better impression of the awesome power of an early spark telegraphy station can be given than this 1911 description of the start-up of the 25kW Marconi 'thunder factory' at Cape Cod

"At 9.30 the engineer on watch hastens down from the dwelling house to start the great flaming torches which heat the ignition balls of the kerosene engines. Oil engines are used at this plant because of the difficulty and cost of getting coal to the station.

By 9.50am, all is ready - the engines are running and the meters checked to show that the current value is correct.

When the clock points exactly to ten, a red signal light flashes in the engine room, the operator releases the catch on the automatic transmitter, and the crashing noise of the spark is immediately heard from the next room. Here in the transmitting room, great streams of fire a foot long are thrown out by powerful blowers, and the tremendous noise of the spark, although musical, is terrifying.

Very few people have seen this plant in operation, for visitors are strictly prohibited from entering, but the high pitched note of the spark can be heard several miles away on a still night with the wind in the right direction. The spark has even been seen from fifteen miles at sea through the station windows! Viewed from outside, the intense white flash showing through the frosted glass windows and the deafening crash of the spark cause you to think this is the home of the evil one."

Driving Force

Historically, oil engines were used as the driving force for smaller stations because they were easy to set up, and did not need a large fresh water supply - a real problem for many isolated coastal sites.

Bigger stations initially used steam engines, driving generators connected to huge banks of accumulators. As the multi-cylinder diesel engine was developed and perfected, it became the preferred prime-mover. Petrol engines were not popular for wireless telegraphy stations because they used electric ignition, which became very erratic in the powerful electromagnetic fields near the transmitter.

Unusual Locations

The growing commercial importance of wireless telegraphy led to stations being set up in some rather out-of-the-way places, such as Manaos and Porto Velho in 1911, deep in the Amazonian basin.

Both stations were identically equipped with twin Davey Paxman horizontal low speed compound engines (Colchester type), rated at 100 bhp at 120 r.p.m. Drive was by belt from the 2.5 metre flywheels, and although the 70kVA 2kV 50Hz ECC alternators were left-and right-handed on separate beds, there was provision for close coupling the machines to run as one unit.

Boiler water came from a specially constructed 273 000 litre reservoir at Manaos, and the railway company's supply main at Porto Velho. At Manaos, the reservoir was fed by water pumped from an aquifer about nine metres underground, supplemented by rainwater off the the roof - which was often enough to keep up the level during the rainy season without pumping!

Inclined Plane

Getting the equipment on site was no easy matter. The only highway for heavy plant was the river Amazon to Manaos, and a tributary, the Rio Madeira to Port Velho. At Manaos, the station was situated about four kilometres from the town, and approximately one kilometre from, and some 20 metres above the river.

During unloading, the river level varied by over ten metres, so the inclined plane constructed up the bank for heavy items like boilers had to be altered accordingly. That was not the only hazard!

When the water was low, lighters would run aground on the shifting mudbanks, leaving their crews at the mercy of opportunist swarms of mosquitoes and other noxious insects that poured out of the forest to feast on the captives. With nothing to do but endure the discomfort, the crew usually passed the time until they were towed off, by taking pot shots at the numerous alligators basking on the mud, puffing for all they were worth on rank local cheroots in a vain attempt to keep the insects at bay!

Casualties

It was hardly surprising that there were casualties. The most serious incident was the destruction of one of the 25kVA transformers en route to Porto Velho when it slipped from its cradle and crashed on to the quayside!

Some stations within reach of urban mains supplies were big enough to warrant their own power plant. The illustration shows the 1800hp

diesel plant for one of the biggest European stations at St Assise in 1922. Also shown is the turbo generator plant for the GPO's 200kW arc station at Leafield in the same year.

Biggest Headaches

Undoubtedly the biggest power supply headaches were caused by the Alexandersson high frequency alternators. These machines actually generated the radio frequency waves direct. A typical 100kHz machine had 300 poles and ran at 20 000 r.p.m.

With a rotor peripheral velocity of some 300m/sec, they were **VERY** carefully designed and built! Construction was similar to steam turbine practice with forced oil feed to the self aligning plain bearings which were designed to equalise the air gaps as the armature heated up on load.

The air gaps were held to a maximum of 0.015 in to maintain efficiency and the machined slots in rotor and stator had to be parallel - a divergence of 1 in 1000 would cut output by some 20%.

Even when they were running, speed regulation had to be impeccable or the transmitter would go off tune. This was normally done by a Ward-Leonard d.c. drive to the 10:1 helical spur step-up gearbox driving the alternator.

Critical Speed

Speed control was critical for this type of this machine, with variation of no more than 0.1% permitted at the armature (0.01% at the motor) between no load (space) and full load (dot or dash). Even 0.1% variation works out as a clearly audible pitch change of 100Hz at 100kHz transmitter frequency.

The rotational speed on these remarkable machines was governed and held by banks of up to a hundred relays. The relays were synchronised to the transmitting key to weaken the main motor drive field as the antennal load was applied. This technique made the speed rise to compensate for the increased rotor drag as power flowed into the antenna.

But such heroic engineering was short lived and by 1930, the less demanding and more efficient water cooled valve had won the day.

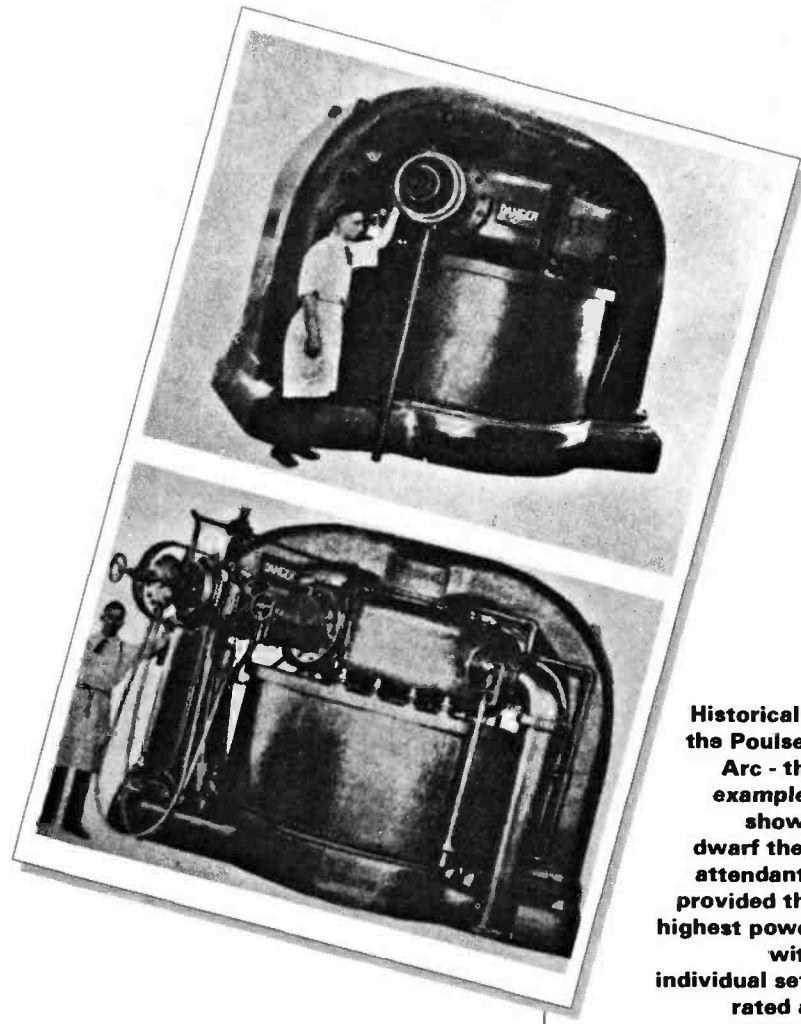
National Grid

Despite the growth of the National Grid, broadcasting and telegraphy stations still installed their own power plants to generate the d.c. for high tension and filament supplies. Experience had shown that the frequent lightning strikes on the antennas often knocked out any incoming a.c. mains,whereas locally generated supplies could be protected from damage, and usually stayed on line.

From the mid 1930s, and throughout the valve age of radio, broadcast transmitter supply practice was typified by the BBC. The Corporation installed standardised power plant made up of one or more 375 r.p.m. 6 cylinder 'solid injection' diesel engines which were close-coupled to 3-phase alternators. This set a pattern that is only now ending as the last rotary plant is replaced by fully protected supplies drawn from the National Grid.

Recycling Energy

As well as recovering some of the waste heat from the engines to keep the station warm and dry, there was a small boiler attached to the diesel exhaust to produce distilled water to top up the cooling circuits supplying the water-cooled power valves.



Historically the Poulsen Arc - the examples shown dwarf their attendant - provided the highest power with individual sets rated at 2.5MW.

Each 50kW valve was water-jacketed, and using distilled water, it was possible to feed coolant to the live jacket at 12500V via a 20 metre rubber hose because pure water is essentially non conducting.

Typical of BBC practice was the original Droitwich transmitter, which entered service in 1934 and was only recently replaced at this important national (and International) station. In this installation the 4 English Electric sets were mounted on a massive concrete slab 13 x 26.5 x 3m weighing about 800 tonnes. The huge slab was isolated from the building by pads of compressed cork to prevent mechanical resonance and vibration problems in the adjacent transmitter hall.

Today, the many thousands of megawatts of energy radiated into the ether are furnished by the National Grid, and it is the turn of the transmitting valve to give way to semiconductors and other more exotic glassware.

But still there remains the magical feat that you can pour enough power into an antenna to light a town, and there is nothing to show for it unless you tune in!

And now that most of the big diesels have been retired, we should not forget that for over 70 years, engines provided the power behind broadcasting. They enabled us to radiate through the ether for over 70 years to help mankind's communication and commerce all around the globe. **PW**

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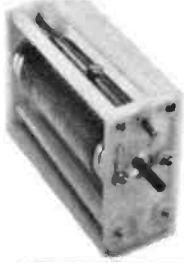

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AMATEUR RADIO & METEOROLOGY GO HAND-IN-HAND

Professional Meteorologist and Anglia ITV 'weatherman' Jim Bacon G3YLA provides an introduction to weather and its effects on radio propagation.

Basic Meteorology

The idea behind this article is to discuss the benefits of weather study to operation on the v.h.f./u.h.f. amateur bands. It will cover the two main weather related propagation events, 'tropo' and Sporadic-E. Each depends on different characteristics of the weather patterns and a basic knowledge of the physics behind these features will greatly improve your chances of working the DX.

On a superficial glance 'weather' seems to consist of two fundamental chart features; the **High** and **Low** pressure areas which can be seen on TV weather maps and on some newspaper weather pages. While it's true that these are only one part of the complex series of factors which go to produce the actual weather we observe, they do establish many of the ground-rules for the day's weather and largely determine the chance of any propagation benefits.

Highs and Inversions

Most of you will be familiar with the idea that areas of high pressure are often times of DX on v.h.f. and u.h.f. This is a direct result of the air motion within a large high, and the effect this has on the refractive index of the air.

Developing highs are characterised by a large scale descent of air within the region of the high, see Fig. 1. This vertical motion (typically 1cm/s downwards) is much more gentle (100 times less) than the horizontal motion of air around the high (the wind, 5-10m/s).

It's important to realise that much of our weather is due to the vertical motion of air rather than horizontal motion. In this case it is downwards but as we will see later, upwards motion is important in areas of low pressure.

Back to the high, and now let consider what happens to the air as it descends in the high. Pressure is greatest at the surface and decreases as you go upwards, therefore air that travels downwards (subsides) is moving into a region of greater pressure.

Increasing Pressure

You are probably aware of one example when pumping up a bicycle tyre; the end of the pump gets hot. This is not due to friction, but is a direct result of increasing the pressure of the air inside the pump. This same principle is at work inside the area of high pressure; as the air descends it warms.

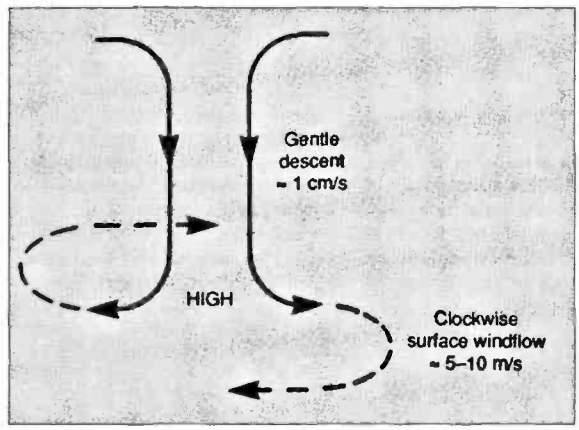


Fig. 1

Meanwhile, near the surface the air has not been warmed by this subsidence and we notice that a temperature **inversion** is established. Let me explain; normally temperature decreases with height as in Fig. 2a, since the air is warmed by contact with the ground. This is not surprising - as you move away from the heat source it gets cooler etc.

Near the surface in the lowest 0.5km (1500ft) region of a large high, you will find air which has not been modified by subsidence. It probably shows the expected temperature decrease with height. Above this will be found air which has subsided in the high and become warmer relative to the surface air below. This subsided air also becomes drier, that is, its relative humidity decreases.

Subsidence Inversion

The contrast between these two air masses forms a temperature inversion, strictly it should be referred to as a **Subsidence Inversion** to identify its cause. The term inversion is stating that the temperature trend (normally a decrease with height) is reversed or 'inverted' and now we see a temperature increase over a small height interval as in Fig. 2b.

The first signs of a useful subsidence inversion often do not appear until it has come below 1.5 km (4500ft) and it may then intensify further as it descends. Many end up around 0.5-1km (1500-3000ft) and some may eventually reach the surface in the middle of large highs.

This whole physical process is taking place over vast areas of the weather chart, highs are among the larger of the weather systems when it comes to horizontal dimensions. This in turn determines the geographical scale of any radio path enhancements produced by highs.

On still, clear nights the ground can lose its heat quite rapidly and this cooling affects the air near the surface to form a **Surface Inversion**; this may be in addition to the subsidence inversion at a greater height, see Fig. 2c.

The surface inversion rarely extends higher than about 0.3km (1000ft) and will be destroyed by daytime heating of the ground the next day. They are essentially late evening, overnight and early morning phenomena.

Very Effective

This horizontal layering of the atmosphere is very effective at limiting vertical motion from the surface. In fact smoke, dust, pollution and cloud will be trapped underneath any inversion often producing an obvious haze layer. Although invisible, water vapour (a gas) is also trapped and becomes noticeable when this moisture condenses to form low cloud or fog, see Fig. 3.

The characteristic movement of highs is a slow drift (about 5m/s or 10kt); they can even become semi-permanent features like the Azores High or Siberian High. Usually, the slower they move the better they are for radio amateurs. Typically they last for 1-2 weeks, but sometimes just for a day or two, serving as separators between successive lows.

The important point to remember about highs and the inversions they produce is that the lower atmosphere becomes horizontally layered over large distances with cool, sometimes

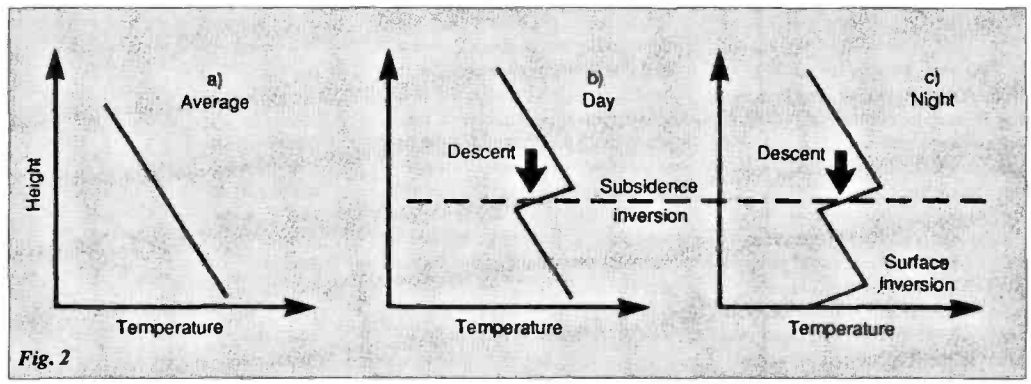


Fig. 2

8-PAGE WEATHER SPECIAL

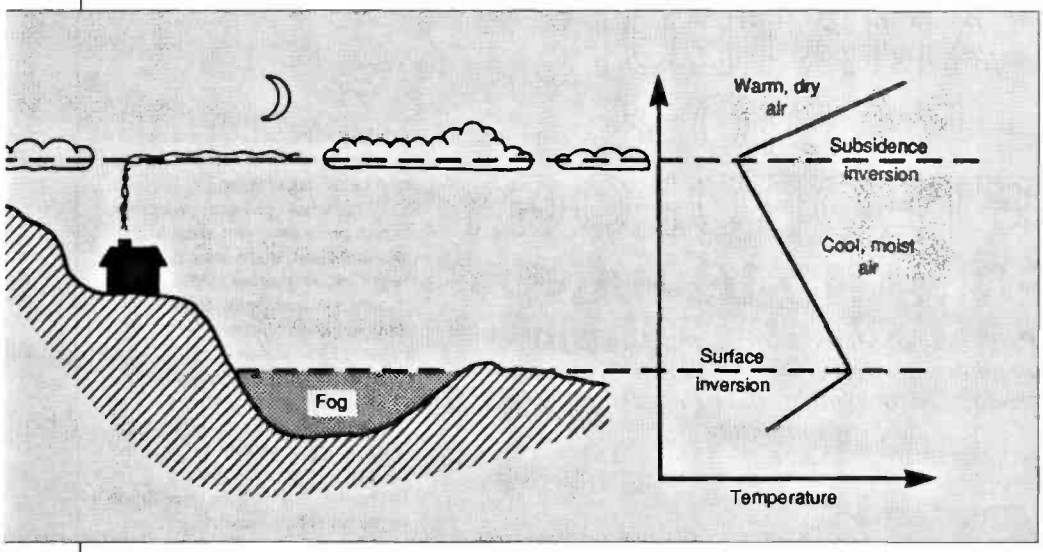


Fig. 3

moist air near the surface, and dry, warm air above the inversion which makes quite an abrupt boundary between these two different air masses.

Lows and Fronts

These are the disturbed parts of the weather chart, it's often lows that bring the strong winds which are the bane of large antenna arrays! If you look at a sequence of Atlantic weather charts you will notice that lows usually move quite fast compared to highs and that their movement is often anything but straight.

The speed of movement can be up to 25m/s (50kt), this will be at their early stages of development, and the speed will drop to as little as 10 m/s (20kt) as they get older and larger. In fact some lows may become quasi-stationary for several days.

As a general rule, small lows which are sometimes called 'wave depressions' because of the shape of the fronts, move quickest. As the low gets larger it will often turn to the left of its original track and slow down, finally occupying much of the Atlantic with a diameter in excess of 1500km.

Weather Fronts

Weather **Fronts** are really the birth place of lows and in general the greater the contrast of temperature across a front, the greater will be the potential for development of lows.

At our latitudes the main front on the charts is usually the Polar Front which separates cold polar air over the northern Atlantic from warm tropical air further south.The 'spikes' and 'bowler hats' on fronts point in the direction of movement of the front, the former represents a cold front and the latter a warm front.

As you will no doubt be aware, a cold front will bring colder air behind it and vice-versa for a warm front, see Fig. 4. The best way to picture the chain of events is to think of the whole Atlantic front as a long 'skipping rope'. The lows behave as if they have been given a flick at one end and the resultant 'ripple' has moved along the rope. In the atmosphere the 'ripples' may also grow in size as they move along.

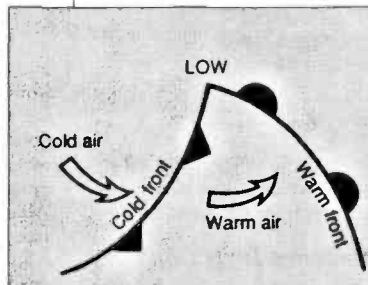


Fig. 4

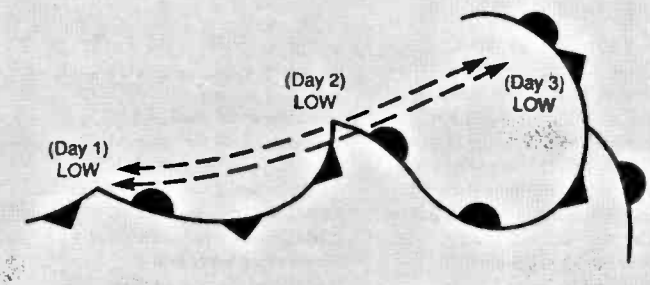


Fig. 5

Typical Sequence

The typical sequence of events is shown in Fig. 5 starting on the left, the Atlantic front has three different lows along its length in order of increasing maturity. The leftmost low is probably a day old, the middle low is about 2 days old and finally the right-hand low may be 3 days old. These are, of course, very much approximations, but serve to give a feeling for the time-scales involved. Often the low will be deepening most rapidly at the middle stage of the sequence and probably be at its most intense in terms of the windspeed in its circulation.

Jet Stream

The remaining feature to mention is the Jet Stream. This is a core of strong winds in the upper atmosphere about 10km (30000ft) above ground and it is directly related to the strength of the weather front associated with it.

The connection between fronts and jet streams is shown in Fig. 6.

As a general rule the jet stream blows parallel to the front; just to the rear of a cold front and ahead of a warm front.

Jet streams are usually strongest in winter, up to 100m/s (200kt), and about half that in summer, 50m/s (100kt). This is reflected in the relative strength of the weather systems in the two seasons.

Often the location of the jet stream is marked by a long smooth edge to frontal cirrus cloud behind a cold front or by fast moving streaks of cirrus cloud ahead of a warm front.

A final point of meteorological interest lies in the pattern of a weather chart at jet stream heights. If you strip away the surface features and look at the high altitude flow at 10km you will notice that the flow is much smoother.

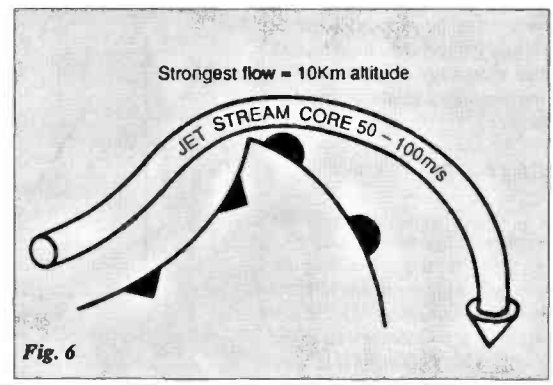


Fig. 6

Troughs and Ridges

There is a series of troughs and ridges which move across the chart like a sine wave on an oscilloscope out of synchronisation. The analogy may be used further; the low amplitude, high frequency sine waves move quicker than the high amplitude, low frequency waves.

Jet streams mark the strongest flow through the pattern which is itself moving bodily across the chart. The axis of a ridge/trough is worth noting, see Fig. 7, as it may play a role in Es development. A typical ridge/trough movement may be as much as 25m/s (50kt), but is usually less, around 10-15m/s (20-30kt). Upper ridges which are growing in amplitude can provide good displays of 'mares tails' cirrus cloud and may be a useful visual clue to Es.

Tropo

You have waded through a lot of meteorology to get to this, but I hope it will be easier to grasp as a result. The development of an inversion is the crucial factor for tropo since this forms the required contrast of temperature and moisture over a relatively small height interval.

The radio refractive index of the air is a function of temperature,

pressure and moisture; the last one being the most important. As a first approximation, it is necessary to only consider the changes of moisture under an inversion to get a feel for the likely changes in the tropo conditions.

The formula used to calculate the refractive index is:

$$N = \frac{77.6 \times P}{T} + \frac{3.733 \times e \times 10^5}{T^2}$$

where P = pressure(mb) , e = vapour pressure(mb), T = deg Kelvin and N is a modified refractive index. The relationship of N to n (the real index) is N= $(n-1)\times10^6$ this has the effect of making the numbers easier to deal with, as a real index of 1.000350 becomes 350.

This modified index, gives figures of the order 350 at ground level, decreasing upwards. A change of 40 units per km height is the 'normal', whereas a decrease of more than 157 units is cause for v.h.f. excitement. This is because it will produce sufficient bending of the signal path to bring the signal back to earth at some greater distance than would usually occur.

As you will appreciate from earlier notes, inversions typically form too low (1.5km or less) to support a 'single skip' h.f. type of path for some of the extreme ranges reported (1500-3000km). To explain this we need to rely upon some sort of ducting mechanism where the signal is trapped in an 'atmospheric waveguide' formed by the inversion. It can then travel for large distances with little loss in strength.

Good Reading

The chapter on propagation in the *VHF/UHF Manual* published by the RSGB covers this subject in greater detail as will the *VHF/UHF PW Handbook* (to be published in the near future), both highly recommended.

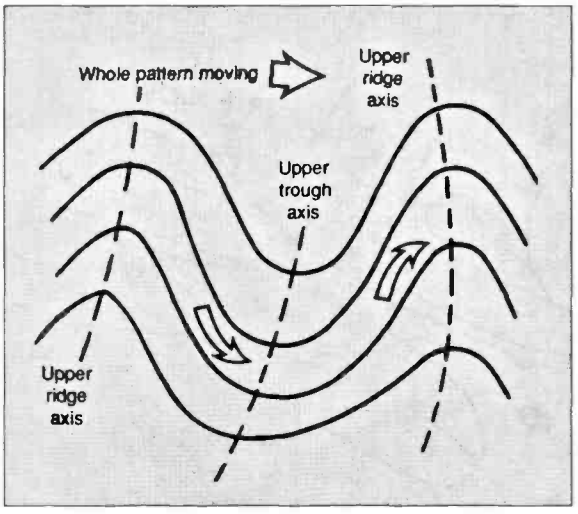


Fig. 7

I aim to finish this section with some tips on how to find out when conditions will be right for DX. First, I will refer you to Fig. 8 which shows some of the locations where tropo can occur. It is a symbolic chart and I don't suppose that all these features will be present at once.

1) Past tropo openings suggest the best distances are achieved around the sides of large slow moving highs.

2) Occasionally a short-lived path may exist parallel to, and just behind, a cold front.

3) Paths across the centre of a high may be shortened by the inversion lowering to ground level.

4) I know it may seem obvious, but don't go above the inversion. Climbing hills may put you above the cloud/haze layer into the sunshine, but you will then be above the inversion!

5) As a large high moves away, the surface flow of air below the inversion is drawn up from the southwest. This brings it across the nearby Atlantic/Biscay and hence picks up moisture. Remember we need moist air below the inversion. (This is the reason why falling pressure after a long spell of high pressure is taken to be good for DX)

6) Conditions often improve in the evening and overnight as the surface inversion develops, providing a shallow entry angle to the main subsidence inversion above where ducting may be possible.

7) Onshore sea breezes which develop around our coast in the summer can bring moist sea air well inland and provide good conditions at the end of a hot sunny day. This is the reason for inland stations suddenly hearing DX as the sea breeze front arrives.

There's no need to feel left out if you live well inland, a strong sea breeze has been known to reach as far as Birmingham in the late evening!

8) Sea paths in summer can provide very long haul contacts, for example G to EA8 or EA1, east coast G to GM/LA, etc.

9) VHF/UHF contests can be won or lost on the behaviour of the weather. A slow moving weather front along the English Channel can cut-off the continental signals from G stations.

10) Tropo works best at higher frequencies, if 144MHz is open, then try 432MHz or 1.3GHz. (This is the reverse of Es).

Sporadic-E

Sporadic-E or Es is largely a summer phenomenon (at least on 144MHz) and although events can take place at other times of the year, they are rare. On lower frequencies the picture is very different; on 28MHz there is evidence of Es on many days throughout the year (usually referred to 'short skip'), while on 50MHz it occurs somewhere on most days in summer and quite a few days in winter.

The cause of Es and a possible link with the weather are both being hotly debated by the scientific community, however some features of Es can be explained by the current literature and I will deal with these next.

The present understanding is that Es is caused by **wind shear** in the lower ionosphere. First, I should explain that wind shear is the term given to a change of wind speed or direction with height or distance. On the edge of jet streams, for example, there is a large amount of wind shear.

It's important to get a basic grasp of where all this is happening since confusion abounds on this point. The height of the various layers of interest is shown in Fig. 9. Es is found at about 100-120km in the E region and this is where the wind shear is located. The original cause of the wind shear is, however, much lower down in the troposphere where the 'weather' is found.

Sporadic-E Trigger

The trigger for Es may well be some weather feature which can be followed on the charts in the same way as highs for tropo. The mechanism by which the weather provides the trigger is interesting.

It's believed to be due to gravity waves, which in effect is just a wave motion in the flow of air above some disturbing obstacle (see Fig. 10). The gravity part of it is simply stating that gravity is the

restoring force for the wave motion. There's nothing unusual in this as it's how waves on the sea work.

The current favourites for possible Es triggers are jet streams, thunderstorms and ridge patterns in the upper atmosphere. Once this wave motion is generated, it can spread upwards to the E Region, even growing in amplitude so that it may be 10-20km pk-pk by 110km.

The next stage is that this gravity wave activity causes the wind shear mentioned earlier. The wind shear manifests itself as a reversal of wind direction with height in the ideal case.

The next bit is a result of the deflection of charged particles when moving through the earth's magnetic field, see Fig. 11. If you move the particles one way at one height and the opposite way at some nearby height, it is possible to gather the charge into a thinner layer.

The opposite combination of wind directions will cause the charges to spread out into a thicker layer. The thin layer produces a greater density of charge; high charge density means higher frequency reflected by the Es patch. This is the physical background to a weather event in the troposphere affecting the appearance of Es.

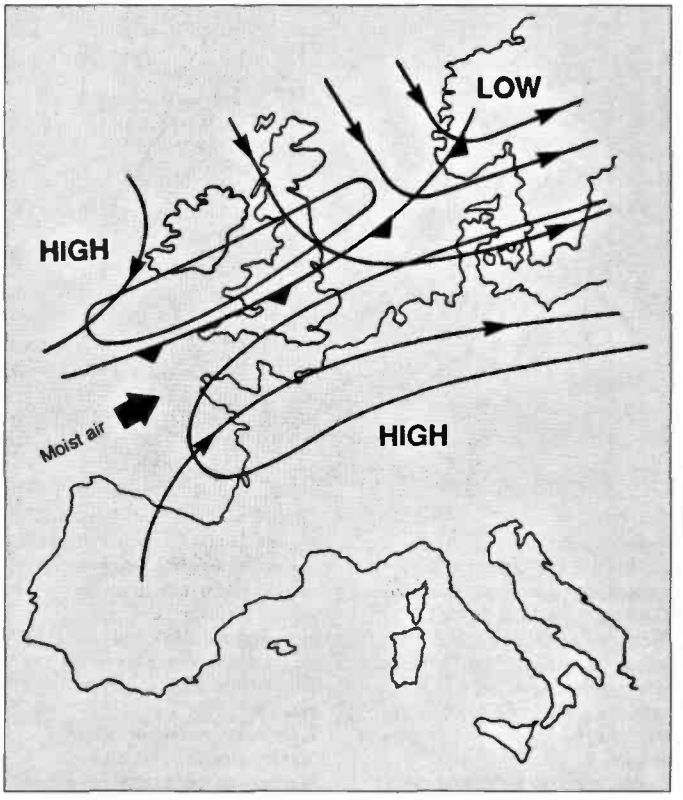


Fig. 8

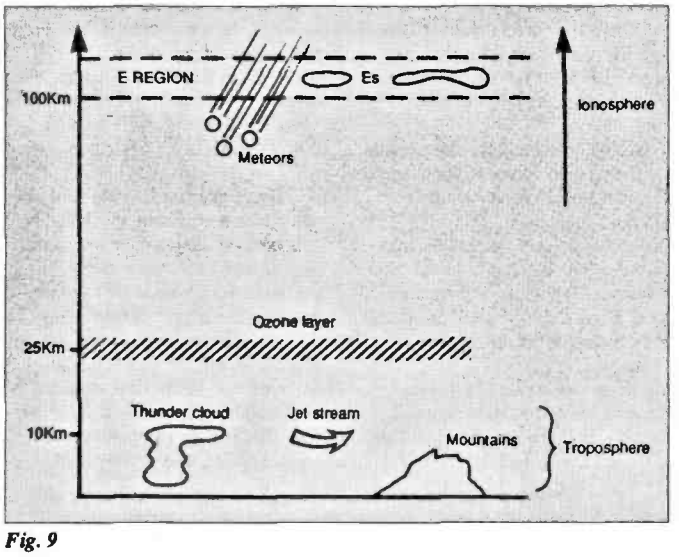


Fig. 9

Other Factors

Two other factors stem from this wind shear effect. One is that changes in the earth's magnetic field may influence whether Es takes place. It has been found that the K index (a measure of the disturbance of the magnetic field) should be 3 or less.

The other factor is the supply of charged particles for deflection. This is most likely to be contributed by meteors burning up in the upper atmosphere.

A further influence on the appearance of Es is the tidal effect on the atmosphere of the sun's heating. This would normally be expected to happen once per day, but the harmonic (twice per day) seems to be more important.

This leads to certain preferred times in the day when Es are most likely to be found. These times are mid morning and again in the late afternoon.

As in the section on tropo, I'll finish with a list of operating tips;
1) Is the K index 3 or less?
2) Are there any weather triggers present (jet streams, thunderstorms or upper air ridge patterns)?
3) Any meteor activity? (check shower dates).
4) Any short skip on 28MHz?- if yes try 50MHz.
5) Any short skip on 50MHz? - if yes try 144MHz.
6) Use 28MHz beacons to select the direction of possible VHF opening.
7) Because of the tidal effects, look for an afternoon opening about 5-6 hours after any morning event.
8) Evening openings are possible 20-21UTC, especially when K index high.

Helping Research

I hope this article will encourage you to use weather information to make DXing less of a 'black art' and more of a skill. I'm sure you will gain from learning about a new subject, and from the DX in the log.

As a final note may I request copies of your Es logs. It is only by a full analysis of past events that we can begin to make some sense of the real mechanisms at work. This is still an area where Amateurs can contribute to scientific research.

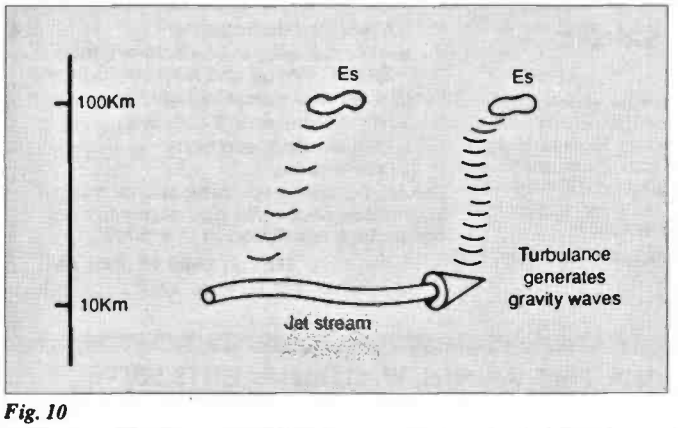


Fig. 10

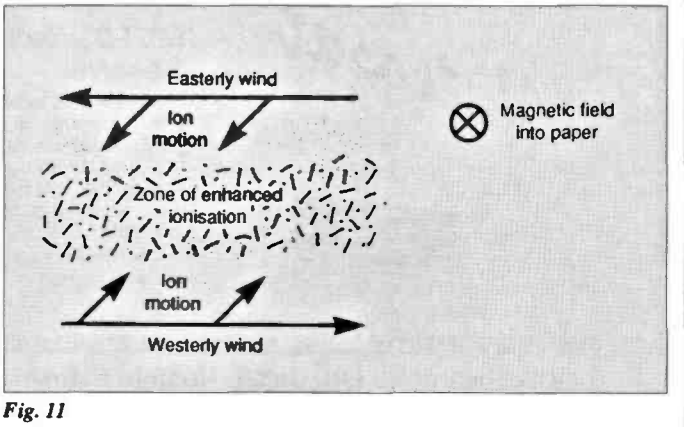


Fig. 11

8-PAGE WEATHER SPECIAL

WEATHER EQUIPMENT SHOWCASE REVIEW

The weather plays an important role in propagation. To help you choose equipment for weather observations, Rob Mannion G3XFD takes a look at what's on offer

Amateur radio and Meteorology really do go hand-in-hand and many radio amateurs already 'dabble'. Although in common with many other enthusiasts I already have a barometer, until recently I had no real idea of the amazing variety of equipment available to help the amateur observer.

To be fair to the high quality of the equipment on offer in *PW* I should use the term 'part time observer' rather than 'amateur' for much of the apparatus mentioned is used professionally by Meteorologists.

Basic Equipment

We've all got to start somewhere! Barometers in cases aren't cheap but the new ***Hobbies 1991 Handbook*** (available from all the High street newsagents at £1) has several bargain-priced aneroid barometer movements for less than £15.

A recording thermometer is also a useful basic tool. I can personally recommend the range of outdoor re-settable recording maximum and minimum instruments made by **Brannan Thermometers**, based at Cleator Moor in Cumbria. There's a good choice for less than £12 and your local hardware or gardening centre should have them in stock.

It's Windy!

Although the **'Windy'** hand-held anemometer is designed for 'instant wherever you are' wind-speed readings, it could prove to be very useful for the radio amateur and weather observer alike. The immediate example that springs into mind is when to lower that telescopic mast!

In use the **'Windy'** displays the wind speed for up to 10 seconds before clearing the display and switching off. Priced at £85 the instrument is available from: **Incastec Associates Ltd**, 75/77 Christchurch Road, Ringwood, Hampshire, BH24 1DH, Tel: (0425) 476211.

Kit Stations

If you want to build yourself a monitoring station you can save time and 'chasing all those bits' and let the kit 'take the strain'. **Maplin Electronics** offer a choice of projects ranging from basic measuring modules and necessary hardware, right up to satellite receiving systems. Full details in their new 1991 catalogue, available at all the major High street newsagents from mid-September.

The well-known kit manufacturer and kit supplier **Cirkit** cater for the weather observer and offer a v.h.f. weather satellite receiver kit, an interface unit and a ROM based software package for the BBC B or Master computers.

Together with their retail shop in Portsmouth, Cirkit operate their mail order service from Park Lane, Broxbourne, Hertfordshire, EN10 7NQ Tel: (0992) 444111.

Complete Weather Stations

Top of the list in the 'If I could afford it' category for G3XFD is a complete weather station set-up. The choice is very wide indeed!

When it comes to choosing a complete station it's definitely a case of 'You pay your money and make your choice' as the range is so wide in price, facilities, features and the choice of 'stand alone' equipment or units designed specifically for use with a computer.

If you prefer the traditional analogue display approach, topped off by an attractive wooden cabinet, **R&D Electronics** of Northdown Road, Cliftonville, Margate, Kent, CT9 3PW, Tel: (0843) 221622, produce the **Weather Station** at £349 and **Weather Station Plus** at £399. Both units have large easy-read dials for read-out of all the facilities. Contact R&D direct for further information and details on new products.

If space is at a premium, you may think that your choice is limited - but you'd be wrong because this is a popular end of the market.

The Digitar TW-3 Weather Station in conjunction with its remote recording head, provides literally everything the amateur

The outlook's good for the budding observer with excellent equipment on offer.

8-PAGE WEATHER SPECIAL

observer needs for £169-95 inc. VAT plus £5 postage.

The hand-sized liquid crystal display unit shows wind speed, direction, chill factor, gust record, minimum and maximum external temperature recording in digital figure form. The unit will also measure rainfall with an optional rain collector and is available, along with other models, from **SKILLTOTAL Ltd**, Atmyres Farm, The Street, Nutbourne, Pulborough, West Sussex, RH20 2HE.

Computer-Based Weather Systems

It seems to me that if you already own a computer and wish to use it in your weather studies - the world is certainly your oyster! The choice, range of facilities and variations in prices are only limited by your pocket and ability to 'take it all in' so to speak!

The various manufactures seem to make add-ons, programs and the necessary modifications and peripherals for nearly all the popular computers with special emphasis - so it seems - on the extensive range of IBM compatible personal computers.

On offer from **ICS Electronics** are several computer-based software and interfacing systems to turn your PC into a sophisticated weather monitor. An ideal way to get the most from your PC! The **PCWPRO** system which provides in-depth analysis and a very comprehensive screen display costs £299.95 inc. VAT plus postage.

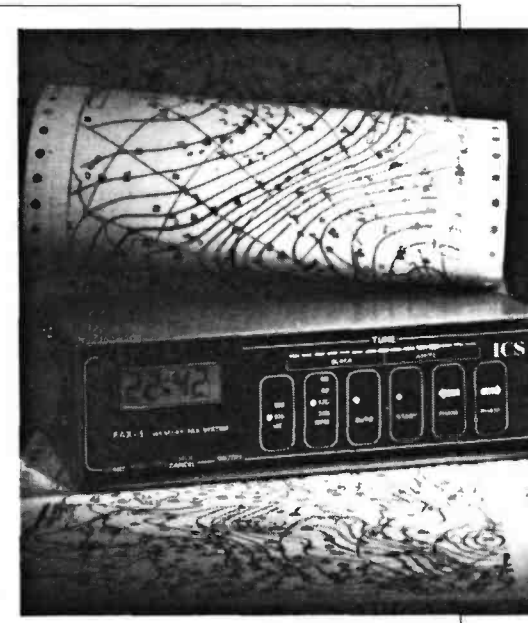
Satellite Receiving Equipment

There's no doubt about it - the fastest growing area in the field of weather monitoring activities for the radio enthusiast must certainly be satellite FAX reception. Many companies - large and small - are active in this field and there's a very wide choice of excellent equipment to suit most pockets and computers.

Prize Winner

The prize winning weather satellite system developed by **Spacetech** for the Archimedes computers is now available for the Atari series. Picture reproduction is very good and although it wasn't the first Atari-based package, Spacetech's system won the 1989/90 BETT Educational Technology Gold Award.

The new software and decoder cost £239-13 and provides powerful new features which are compatible with European, American and Soviet satellites. Further details on the full system and their other products direct from Spacetech at 21 West Wools, Portland, Dorset, DT5 2EA Tel: (0305) 822753.



Technical Software based at Fron, Upper Llandwrog, Caernarfon, LL54 7RF in North Wales Tel; (0286) 881886 have recent added a Weather Satellite decoding module - the APT1 - to their interesting range.of equipment and software. The APT-1 enables reception of all weather satellites on any FAX system and costs £59.

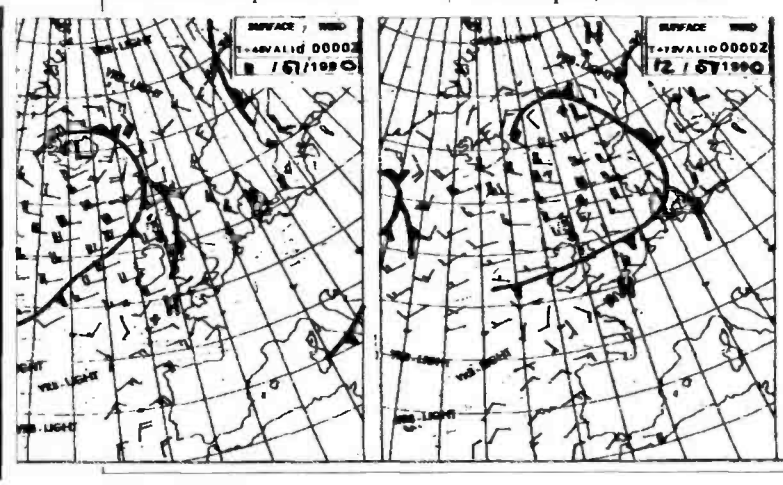
The PC GOES system is a complete weather satellite program and demodulator for the IBM series of computers. Together with their other products, the package is available for £199 inc. VAT plus £2-75 from **Comar Electronics** at 1A Birmingham Road, Cowes, Isle of Wight, PO31 7BH. Tel: (0983) 200308.

The new APT-1 decoding module from Technical Software enables all weather satellites to be received on any FAX system. Contact Technical Software for further information on this unit and their other products at Fron, Upper Llanwrog, Caernarfon, LL54 7RF, Wales. Tel: (0286) 881886.

Along with their other weather observation products already mentioned, **ICS Electronics** at Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex, BN18 0BD Tel: (0903) 731105, have a range of weather FAX receiving systems, add-on and stand alone units available.

Garex Electronics who've long been active in the amateur radio field, ventured into space technology some time ago. They've now launched themselves down to the delightful county of Devon where they can be contacted regarding their Atari weather satellite receiving system. The company also offer a range of satellite receiving 'separates' and you'll find them at Station Yard, South Brent, Devon, TQ10 9AL. Tel: (0364) 72770.

This 'showcase review' can only really hint at the wide selection of excellent equipment and software available. If it only demonstrates to you that a whole new world of exploration with electronics awaits you - it has done the job I intended.



INSTRUMENTS FOR WEATHER OBSERVATION

To obtain the best results in amateur radio meteorology, you need the right equipment. Ron Ham tells us about the basic 'tools for the job' and how to use them.

We must accept the fact that v.h.f and u.h.f. signals have a relatively short range under normal atmospheric conditions. This has already been taken into consideration by the international frequency planners when they allow broadcast transmitters, with a reasonable distance between them, to operate on the same frequency (co-channel working).

Frequency sharing is essential if thousands of transmitters are to provide broadcasting on a limited part of the radio-frequency spectrum. The techniques work well, until some form of atmospheric disturbance increases the range of the co-channel signals making reception chaotic!

The March of Time

Prior to the advent of the Independent Television Authority (now IBA) in the mid-1950s, the only service available in the UK was that provided by the BBC whose 405-line programmes were transmitted on five channels in Band I (41-69MHz).

Unfortunately, during the mid-summer months, the Band I pictures were often affected by outbreaks of Sporadic-E. The ITA were allocated 13 channels in Band III (175-213MHz) and although outside of the influence of Sporadic-E, their transmissions were sometimes upset by natural changes within the troposphere.

Sporadic-E can occur at any time during the year and usually coincides with a spell of fine weather and high atmospheric pressure. However, TV broadcasting in the UK is now only on u.h.f. Bands IV and V away from the effects of Sporadic-E.

Co-Channel Interference

There is no doubt that u.h.f. television is a great success with its sharper 625-line pictures and less susceptibility to man-made interference. But despite this there is still the snag of the occasional co-channel interference due to tropospheric disturbances.

Natural disturbances to radio propagation have interested me since my early days in TV and radio servicing. I soon found that a fascinating DX 'hunting ground' for amateur radio operators occurred at the same time.

The radio amateurs would be busily using 144 and 432MHz while TV DXers would be looking for continental transmissions in Bands III, IV and V.

Scientific literature told me that a close relationship exists between tropospheric openings and the earth's weather. So I began to look for a set of rules by noting the atmospheric pressure and general weather conditions accompanying the abnormal reception.

If you have a household barometer you can join in by taking the pressure readings two or three times per day, and hand-plotting the result on graph-paper.

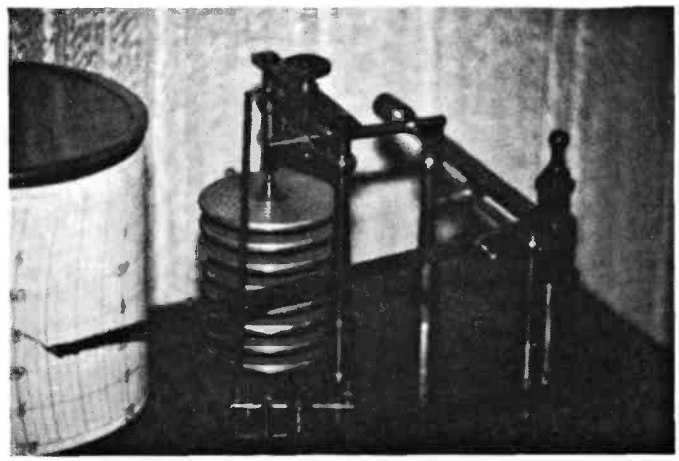


Fig. 1

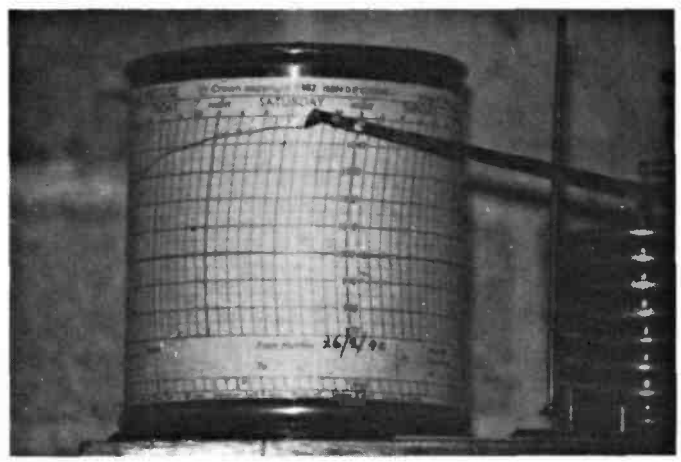


Fig. 2

Tools For The Job

For about eight years prior to 1962, I kept a watchful eye on a standard aneroid barometer, calibrated between 28.0 and 31.0in with an outer dial scribed with the words 'Stormy', 'Rain', 'Change', 'Fair' and 'Very Dry' respectively.

Experience proved that it would be better for my work if I could record the atmospheric pressure continually. So, in January 1962, I installed a Short & Mason barograph.

The Barograph Explained

Briefly speaking, a barograph is a recording barometer. It's basically a large meter movement with a mechanical structure strong enough to carry a pen across a paper chart, instead of just moving a short pointer over a scale.

For example, where the standard household barometer has one aneroid device and a simple mechanical linkage to operate its indicator, a barograph has a 'pile' of aneroid chambers. This mechanism enables the indicating arm to overcome the friction of its pen nib rubbing against the paper chart on the clockwork-powered recording drum, as in Fig. 1.

Long Term Recording

During its 28 years of operation this instrument has shown me, in a practical way, the type of weather to expect as the pressure changes and, what's more, when to expect good DX conditions on the v.h.f and u.h.f. bands.

High Pressure

There would have been real cause for alarm had the atmospheric pressure ever exceeded the scale limits! However, my barograph did almost reach 31.0in at midday on March 3, 1990, Fig. 2 and recorded lows of 28.9in as the hurricane passed over southern-England on 17 October 1987.

The lowest pressure reading I recorded, 28.3in, occurred at 2200 on 25 February 1989, Fig. 3. (lower trace). The latter accompanied a period of very heavy rain and squalls when my rain gauge collected 1.53in of water in three days.

Watch That Barometer!

By comparing the barometer readings with v.h.f. conditions during the past 30 years, I have learnt to expect some form of tropospheric opening when a period of high atmospheric pressure, above about 30.2in, begins to fall.

There have been times when Band II (87.5-106MHz) has opened up shortly before the fall begins thus offering a warning that the weather is about to change and a more extensive opening is imminent.

Let's take for example several warm and clear sunny days accompanied by steady high pressure. Watch out for 'wispy clouds' leading a weather front, the pressure starting to fall, extra stations popping-up in Band II and co-channel interference appearing on television pictures in the u.h.f. Bands.

I witnessed a typical example of this on 12 and 13 July 1990, following a pressure climb from 29.7in on the 5th to 30.5in on the 11th when a really hot sunny spell began. However, at noon on the 12th the barograph began a slow

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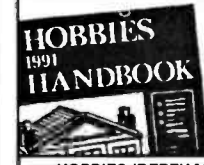

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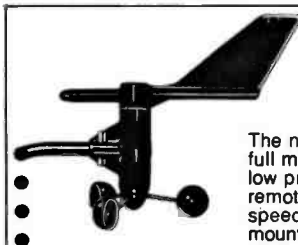

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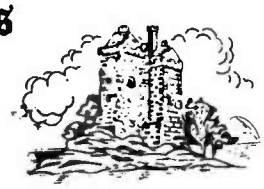

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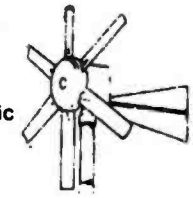

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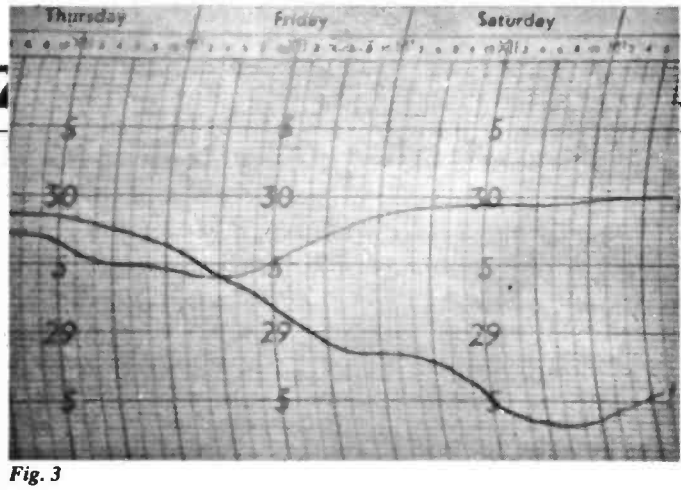

Fig. 3

decline to reach 30.2in at midday on the 14th.

It's not often that I leave home without a portable television receiver in the car and during the afternoon of the 12th, while parked at Chiddingstone in Kent, I saw the first signs of a tropo-opening when French pictures were beginning to show themselves in Band III.

Later that evening, from home, I noted co-channel interference on TV pictures in the u.h.f. band. Early next morning a path to the north-east was wide open and it was very interesting for three hours, until it all faded away around 1030 a.m.

During that time I counted 25 predominantly German broadcast stations in Band II and received a strong steady test card, in colour, from Holland on Ch. E4 (62.25MHz). I also received programmes from four German television stations in Band III.

I checked the same frequencies several times during the day on my journey to and from Polsden Lacey in Surrey. It pays to carry a portable TV for monitoring purposes!

Unfortunately there were no further signs of the disturbance. The peak had obviously occurred early on the 13th in the middle of this pressure fall.

Notable Events

I ran a special project between May 1 and 30 September 1969 to see how the signal strength of the 144MHz beacon in Wales (GB3GW) received at my home in Sussex, was influenced by the changes in atmospheric pressure.

During this five month observation period there was positive evidence that when the high pressure began to fall, the signal from this tiny transmitter increased.

The final result of the experiment occupies six sheets of A4 graph paper, from which I have selected a couple of examples covering the periods June 1 to 15, Fig. 4 and June 25 to July 9, Fig. 5.

The dotted line on each graph represents the atmospheric pressure and the hard trace indicates the variations in strength of the received beacon signal. The 'Y' axis combines the signal strength (0 to 8) and the atmospheric pressure (30.0 to 30.5in).

An experiment such as this must have a consistent signal to be of any value and the beacons are very useful. This is one of the many areas where the RSGB's v.h.f. and u.h.f. beacon service has made a valuable contribution to tropospheric propagation research.

Remarkable Opening

One of the most remarkable tropospheric openings that I have ever witnessed occurred between 18 and 21 January 1974. It's difficult to say when such an event began but, like some others, the event followed a sudden pressure drop.

The barometric pressure fell to 29.6in on the 16th, as severe weather passed over, followed by a sharp rise to 30.4in by 1400 on the 17th. The pressure peaked at 30.5in around noon on the 19th and then slowly declined.

This fall speeded up during the afternoon of the 20th. The first signs of a v.h.f. disturbance came when I heard a few French broadcast stations between 97 and 100MHz during the afternoon and evening of the 18th.

It soon became obvious on the 19th that the disturbance was spreading as more Continental stations were appearing between 93 and 100MHz. The range of European v.h.f. radio signals increased dramatically on the 20th, reaching a peak at midday and lasting until the early hours of the 21st.

Throughout the 20th, I received strong pictures from the Midlands IBA transmitter on Ch. 8, (the IBA were still transmitting ITV on Band III at that time) with only a dipole feeding my television receiver.

During the event a dozen continental broadcast stations were 'dug-in' between 90 and 100MHz, and their strength frequently equalled that of the established BBC stations transmitting in the UK.

By 2300 the signal path to Germany was really open and for a few hours the signals from Nord Deutscher Rundfunk dominated the band. At that time there were approximately 50 transmitters listed for NDR and at 0220 on the 21st, after the BBC stations had closed down, I counted 20 of these between 88 and 100MHz, [then the extent of Band II].

'Quickies'

Over the years I have seen short periods of 'extra' high pressure rise and fall produce an opening from a steady high pressure trace. One of these occurred in March 1977, Fig. 6, when the pressure jumped up from a steady 30.0in at Midnight on the 23rd to Midnight on the 27th.

An approximate 24 hour v.h.f. opening took place between mid-morning on the 25th and noon on the 26th. This is a case of being in the right place at the right time because these short-lived openings are usually very directional and can produce some unexpected DX.

A Typical Event

Another interesting event began between midday on January 10 1978 and noon on the 12th when the atmospheric pressure plunged from 30.1in to 29.3in and back to 30.1in.

During this period gale force winds, rain and snow prevailed. The sharp rise continued and by noon on the 13th the barograph was showing almost 30.5in and remained so until about 1400 on the 14th when it commenced a rapid decline to 29.7in on the 16th.

The graph in Fig. 7, begins at 1200 on the 11th when the pressure began its sharp rise and continues to show the readings at noon on the day and again at Midnight, through to the 15th. An extensive tropospheric opening began around 0800 on the 13th, reached its peak over night on the 14th and 15th and died away later on the 15th.

Setting Up

If you start your own observations, don't forget that a new instrument has to be adjusted for its height above sea level. Barometers usually have an adjustment screw at the rear. A barograph - certainly my favourite instrument - if it's like mine in Fig. 1, has an adjuster, looking like a large terminal, on a plate directly above the aneroid 'pile' and the pen-arm linkage mechanism.

The manufacturer's instructions should clearly indicate these points and once you've set it - you're ready to explore and experiment!

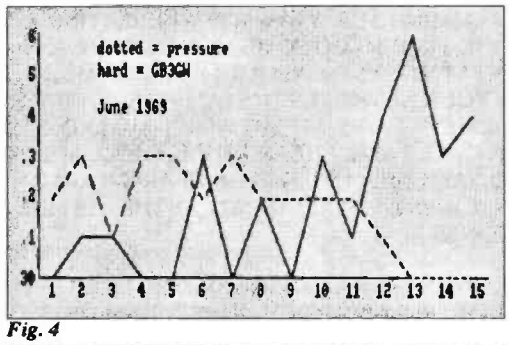

Fig. 4

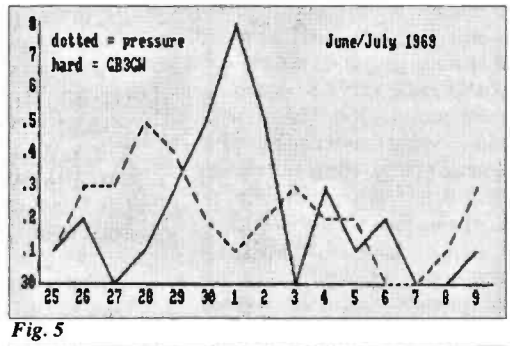

Fig. 5

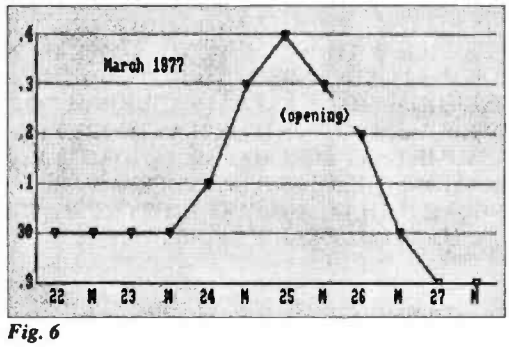

Fig. 6

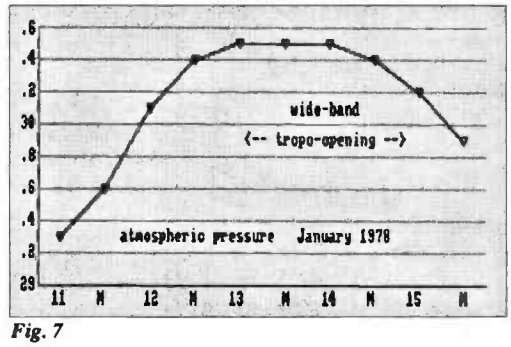

Fig. 7

PACKET P

Roger Cooke's G3LDI column takes on a higher profile as he continues with some extracts from his Bulletin board and how it might affect all packet stations.

As you see, this column now has a new title coincident with the confirmation that it will now be a regular monthly feature. The feedback received has been very encouraging so I shall continue writing the column, hopefully, with your support. So, if you have any news that you wish published, please let me have it, or if you have any interesting photographs, they will be welcome also. I shall try to maintain the 'global' approach to the subject, covering both h.f. and v.h.f. world-wide.

The following is a copy of a letter that was transmitted to the ARRL on the subject of packet intrusion into the RTTY segment. From it you may deduce that the Americans have the same problems that we are beginning to see.

This letter sums up the general opinion of the situation as it exists and shows the confusion that reigns.

The following extract was taken from a personal message to me from Kris TF3KB, who was present at Torremolinos:

The Region 1 Conference in Torremolinos was a memorable event, too big to report in few words. Let me suffice to say, that some people do not view packet radio very favourably, even question if it is amateur radio. Some fear it dangerous to amateur radio, citing ocurrences of bulletins of inappropriate contents. Packet radio on the bandplan above 14.100MHz was one of the questions. After considerable discussion 9 voted for, 18 against (including RSGB) and 7 abstained. The matter was referred to the h.f. working group for further consideration. So we continue to have a bandplan recommendation which nobody follows.

"After the conference I was privileged to make a presentation to the IARU Administrative Council. I made the point that with the projected increase in the number of amateur operators world wide and the decrease in solar activity, the 14 MHz band would become very crowded indeed. This would include packeteers now on 21 and 28 MHz returning to 14MHz. I suggested this should be met on the coming 1992 WARC by amateurs trying to expand the 14MHz band uppwards to ease the pressures all over the band with a bandplan on 14MHz similar to the one on 21MHz today. Further I noted that transmissions of inappropriate contents were not a problem confined to packet radio, citing the recent lunacy around the Bouvet operation. I said I believed that those engaged in international forwarding were doing a good job of screening out inappropriate bulletins.

Greetings from Iceland,
73 de Kristjan TF3KB

The reference to "inappropriate contents" was made at the conference and seemed to infer that most of the h.f. packet consisted of 'junk mail'. Kris is correct when he states that BBS Sysops screen out the junk and added that as far as he had noticed there is less junk on HF than on v.h.f.

Tom OD5NG, has sent me his suggestions for a possible bandplan.

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14.070 - 14.080 AMTOR BBS
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14.115 - 14.125 Packet 'Live'
14.125 - 14.135 Experimental + SSTV, FAX

There is more!! BUT, it will have to wait until next month. Brickbats and Bouquets to G3LDI @ GB7LDI, QTHR, or Tel: (0508) 70278, answering machine available.

Happy packeting de Roger G3LDI.

NOVEMBER 7, 1989

MR. LUCK HURDER - KY1T
DEPUTY MANAGER - FIELD SERVICES ARRL
225 MAIN ST.
NEWINGTON, CT 06111
SUBJECT: GENTLEMEN'S AGREEMENT ???

DEAR LUCK:
THERE IS CONSIDERABLE DISCUSSION AMONG WORLDWIDE RTTY OPERATORS ON ENCROACHMENT OF PACKET OPERATION INTO THE RECOGNIZED HF RTTY BAND SEGMENTS. I HEAR THE PACKET STATIONS BLATTING AWAY ON 14096 AND 21095 (MARK), AND ASSUMED THEY WERE JUST MISGUIDED OR FRUSTRATED PACKETEERS TRYING TO ESCAPE FROM THE HF PACKET BEDLAM ABOVE. THOSE STATIONS DO A FAIR JOB OF JAMMING THE W1AW RTTY BULLETINS AT TIMES.
I FINALLY TOOK TIME TO DO SOME MONITORING, AND FIND TO MY SURPRIZE THAT THOSE PACKET STATIONS ON ABOUT 14096 KHZ (MARK) AND 21095 (MARK) ARE NONE OTHER THAN YOUR AUTHORIZED 'STA' BOYS, OPERATING THEIR LINKED NATIONAL PBBS NETWORK STATIONS. I HEAR W0RLI-2, W5XO, VE3IWJ AND OTHERS ON WHAT THEY WOULD CALL 14098. I HEAR KD5SL, N4QQ, AND N6VV AND OTHERS ON WHAT THEY WOULD CALL 21097 MHZ. I EVEN HEAR N4QQ-1 ON 21099 AT SAME TIME N4QQ IS ON 21097. (THEY IDENTIFY FREQUENCY AS THE LSB FREQUENCY READOUT WITH 1600/1800 HERTZ TONES.)

THESE GUYS ARE IN NO WAY MISGUIDED BUT ARE SUPPOSEDLY OPERATING UNDER CAREFULLY CONTROLLED CONDITIONS UNDER SPECIAL PERMITS COORDINATED BY ARRL. WHAT IS GOING ON HERE ??? I TAKE GREAT EXCEPTION TO THE PRESENCE OF THESE STA BBS BELOW 21100 KHZ AND 14100 MARK-TONE FREQUENCY.
I HAVE NO QUARREL WITH W0RLI, W5XO, KD5SL OR N4QQ. I PARTICIPATED WITH THEM FOR MONTHS IN STA PBBS ACTIVITY, AND THEY ARE ALL FINE GENTLEMEN. OUR EXPERIENCE ON 10 MHZ WAS THAT PAUL RINALDO DICTATED THROUGH VE3GYQ THE SPECIFIC FREQUENCY UPON WHICH AUTHORIZED STA ACTIVITY COULD OCCUR. I CAN ONLY ASSUME THAT ARRL HAS MISGUIDED THE ABOVE OPERATIONS OR THAT THE STA OPERATIONS THERE ARE CLANDESTINE.
I STRONGLY REQUEST THAT YOU TAKE STEPS AS NECESSARY TO RELOCATE ALL STA PBBS ACTIVITY TO AVOID THE RECOGNIZED HF RTTY SUB-BANDS.

THANKS, 73..
CLARK CONSTANT, W9CD

PANORAMA

An addendum and explanation of his thoughts for a bandplan from Tom OD5NG.

I THINK THE ABOVE IS FAIR, AND WHAT SHOULD BE PRESSED FOR AT THE NEXT I.A.R.U. CONFERENCE. SSB OPERATORS WOULD HAVE A BIG OBJECTION BUT WITH THE REMOVAL OF SSB FROM HIGHER UP THE BAND MAY HELP TO GET AGREEMENT. TO ME IT SEEMS LOGICAL THAT ALL DIGITAL MODES SHOULD BE TOGETHER AND 135 KHZ OUT OF 350KHZ IS NOT BEING EXACTLY GREEDY. PACKET IS ALREADY OPERATING AS HIGH AS 14119 (MARK) SO IN REALITY

IT'S ONLY ASKING FOR A SMALL AMOUNT AFTER THE REMOVAL OF SSTV. THE PRESENT AX25 PROTOCOL WILL UNDOUBTABLY CHANGE FOR SOMETHING MORE COMPATIBLE FOR USE ON HF (PARTICULARLY 20M). GROUPS ARE WORKING AT THIS AND HOPEFULLY THEY WILL HAVE GOOD SUCCESS WITH THEIR MISSION.

A picture of Kristjan TF3KB sent to Roger.

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Feature

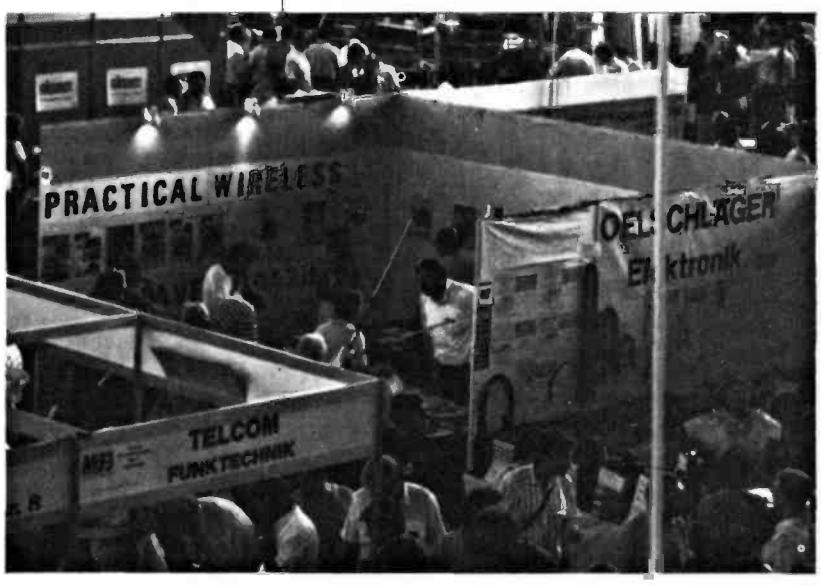
Friedrichshafen 1990 Show Report

The international amateur radio exhibition in the German city of Friedrichshafen, attracts visitors from all over Europe. We sent Rob Mannion G3XFD to sample its delights!

Friedrichshafen is an event I can recommend to anyone - providing that they have boundless energy to sample the many delights for the radio enthusiast. To call the annual event an exhibition is to do the three day show a total injustice. Friedrichshafen is an international gathering of the radio clans. There's no other way of describing it in my opinion.

This year - for the first time - *PW* and *Short Wave Magazine* had a stand at the show. Together with our photographer Rob Mackie and Roger Hall G4TNT, our advertising manager, I travelled via the delightful French motorways (hardly any lorries in sight!) down into Germany.

The drive alone is a delight and it can take you through the heart of the Schwartzwald (Black Forest) if you choose to travel via Strasbourg. Anyone who does opt for the route via Strasbourg and the Black Forest region won't be in any doubt where the Cuckoo clock originated!



G3XFD and G4TNT at work on the *PW* and *SWM* stand.

Family Fair

When we arrived at the show to set the stand up on the Thursday morning I immediately realised that this was no ordinary amateur show. It was abundantly clear that this was a family fair, where everyone brought their caravan, tent or improvised living accommodation with them - complete with children, paddling pools and in some cases-Grandma!

To set the scene I must ask you to try and picture the Leicester show's Granby Halls (with an extra two or three halls of the same size added) with a large area set aside for the caravans and tents. This cosmopolitan, temporary, aluminium, canvas and plastic 'town' was to be their home for five days or so.

Literally every language spoken in Europe could be heard and it was particularly pleasing to see large numbers of East Germans attending for the first time. The East Germans themselves were a friendly bunch and their smoky two-stroke engined Trabant cars attracted many interested onlookers. Interested though I was, I had to refuse the offer of a Trabant in exchange for a five-year subscription to *PW*!

Beautiful Setting

The city of Friedrichshafen lies alongside the breathtakingly beautiful Lake Constance. Bodensee, to give its German name, is an international lake as it's bounded by Germany, Switzerland and Austria. The city is clean and is well used to catering for people attending the Messe, as the exhibition centre is known.

The Messe complex compares favourably in size to the National Exhibition Centre near Birmingham, and new halls are being built as the site gradually expands.

Many of the halls were in use and most of them were air-conditioned. Unfortunately for us the *PW* stand was in Hall J, one of the oldest which wasn't and as the weather was incredibly hot we were pleased to be near one of the many refreshment stalls.

Unusual Facility

Once we had set the stand up, I was able to explore the show before it opened to get a foretaste of what was to be a wonderful experience.

Wandering around the various halls I soon discovered one very unusual facility which could easily be copied here in the UK. The organisers had provided a dormitory facility for younger visitors. The dormitory was in a large hall divided off by screens. It was a very acceptable form of accommodation which was warm and dry with all the basic facilities all provided for a nominal charge. An excellent idea!

The Show Opens

With one or two exceptions the hall, where *PW* was based, was mainly taken up by the larger dealers and organisations. All the well-known names were there and we were able to meet many old friends from the UK and mainland Europe and make many new ones.

When the show opened on Friday June 29 the first torrent of visitors told us that we were going to very busy over the next three days. At times we were trying to cope with questions in six different languages. We quickly discovered that very many people - especially our existing continental readers - were delighted to see a British magazine at the show and in return, delighted us by telling us so.

The British presence was very strong for the 1990 event. Several of the well known UK dealers reported that they were doing good business and making many new contacts. One dealer did so well that he apparently sold out before the end of the show.

Flea Market

To many visitors, including myself, one of the biggest attractions at a show must be the 'Flea Market'. The Friedrichshafen Flea Market was certainly an attraction. By British standards it was big, and had an exciting international atmosphere which wrapped itself around the newcomer.

Valves by the thousand from Czechoslovakia, hand-made radio receivers (in wooden cabinets) from Hungary, vintage equipment from Vienna, tables of antique telephones from Norway, Sweden, Finland and Russia were there in profusion. Truck loads of surplus computers and electronics from Italy, and some unusually modern military surplus equipment (from equally unusual sources) made me wish I had all day to stay.

The Flea Market was in a large hall approached by a covered bridge-like hall (also packed with interesting stands) which passed over the main road from the main exhibition complex. Every visitor to this part of the show had a panoramic view of the market as spread out before them in the hall below.

The remarkable scene was topped off for me by the remarkable sight of a miniature Zeppelin airship, apparently hovering above the mingling crowds below the balcony. The huge scale model hangs there as a reminder of the graceful days of the beautiful airships that were once made in Friedrichshafen. The city has a museum dedicated to these wonderful dinosaurs of the sky, and I fully intend to visit there next year.

National Societies

The exhibition coincided with the 40th anniversary of the German Amateur Radio Society and it was a great pleasure to pass on the congratulations from the *PW* team. As it turned out their celebrations had double value with the news of the re-unification of East and West Germany. I've no doubt that they'll cope with a virtual doubling of membership overnight!

We had many surprises during the event, not the least being the time when an official delegation arrived from the Yugoslavian Amateur Radio Society. The Yugoslavs arrived en masse - and of course they all seemed to speak good English - and promptly made the entire *PW* team honourary members of their society by presenting us with their attractive little lapel badges.

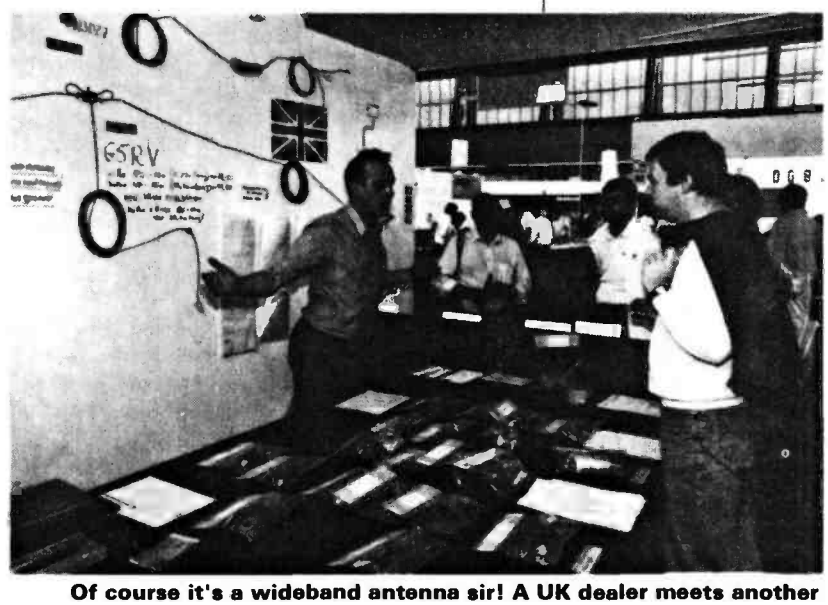
While all this was happening Roger Hall G4TNT, stole a march on the rest of us by being made an honourary member of the East German Amateur Radio Society - complete with a (in the future no doubt) very collectable lapel badge. But crafty Roger knew that he'd never have to pay subs as the society was about to cease as a separate organisation with the imminent re-unification of the two Germanys.

Another busy British stand.

There were many other national societies and I was very pleased to meet many old friends. Frank Hall GM8BZX, President of the RSGB, David Evans G3OUF and Angelica Voss G0CCI were representing the UK Society in no uncertain fashion. In particular, Angelica who has German as her mother-tongue was in great demand, to help us lesser mortals whose expertise using the language left something to be desired!

Products On Show

The Friedrichshafen show has many facets. For some it will be the chance to meet friends. For



Of course it's a wideband antenna sir! A UK dealer meets another customer.

others it will be the chance to see the latest equipment on the many high quality dealer stands and to spend hours looking around the Flea Market.

Another feature of the exhibition were the popular symposiums and specialised meetings. Considering the extremely hot weather - even the many Italian and Spanish visitors complained about the heat - the various planned events proved popular.

As we were there for the three days, I was able to see for myself the direction that amateur radio seems to be taking. Data modes, FAX and SSTV seem to be very popular. As in the UK, there also seemed to be a very large number of computing equipment specialists selling either new or surplus computing gear.

The amazing variety of antenna designs on sale impressed many visitors from the UK - including me! One design - using very long and thin bamboo spreaders - fascinated me and I intend to build one for myself. In essence the antenna was a loop, but made in a way that made it extremely portable.

The home-made wire loop was very popular in earlier years. That they are very successful was proved to me by the late Charles Shilley G3PZO. Charles, from his far from ideal radio location in Southampton, consistently worked the DX using only 50W a.m. - with his antenna only just clearing the ground in his small garden! There's no doubt about it in my mind, we waste our hard earned r.f. in many cases!

Overflowing Stands

The Japanese amateur radio manufactures were there in force and had very high profile stands. Needless to say, their stands were full to overflowing throughout the exhibition. I was able to see much equipment that does not seem to be available here. Incidentally, I was surprised to see that in most cases, their prices did not seem much lower than here in Britain.

On The Lookout

I was on the lookout for equipment that is not available in the UK and I found a variety of single-band transceivers from various countries. The 28MHz rigs on sale from the USA (all made in the Far East though) were particular 'bargain buys'. If I could have legally brought one home with me I could have had a 50W multi-mode transceiver (complete with all accessories) covering the complete band for just £180.

The same source was selling a nicely made transverter to go with the 28MHz rigs. The buyer had a choice (there and then!) to have 50MHz or 144MHz with the modifications to the driving transceiver at no extra cost.

But by far the best buys in the show were the converted CB multi-mode transceivers. I visited one stand in the 'Flea Market' where there were literally hundreds of the rigs piled on top of one another.

Each rig was converted and tested and the German proprietor was taking orders for a very good value transverters for 50 and 144MHz. As soon as he realised I was from Britain he offered to make me a 70MHz transverter to work with any of the multi-modes he was selling. Enterprise and freedom is thriving in mainland Europe!

Solar Energy

I suppose it just had to be an Italian company selling solar panels. Their stand on the communicating bridge between Hall 7 and the 'Flea Market' had the largest selection of solar-energy devices I've ever seen.

The company involved were doing extremely well and the proprietor explained to me - in excellent English - that portable operation is very popular in Italy. He went on to say that many of his countrymen prefer to use the panels to 'float' charge equipment batteries because petrol-electric generators are frowned upon at Italian campsites.

Many of his customers seemed to be German and they were buying the solar panels in quantity, but my new Italian friend knew very well the reason why his products were so popular. He proved it by showing me one of his advertising boards which pictured a beach-side camping site in the south of France. Virtually every German car parked alongside tent or caravan was equipped with a solar panel on the roof to provide power for lighting and refrigeration.

It won't be long before we see very efficient and reasonably priced solar-energy panels here in the UK. At the moment the market is very limited but with the apparent change in our weather pattern who knows what could happen?

I was left in no doubt as to the Italian manufacturer's plans. He's already importing his products into Britain and I've already seen his panels incorporated into a British-made vehicle sun-roof where they supply back-up to the car battery and power a small cooling fan. Let's face it, even on a cloudy day cars get hot inside when the windows are closed and to circulate air in this way is a very simple and excellent innovation. Well done that man!

My Reservations

I've already placed my reservation for next year. A trip to Friedrichshafen makes an unusual holiday and will provide a marvellous opportunity to see amateur radio in a different context. Fair enough, we all appreciate the international aspect of our hobby - but by going to the show next year you'll get the full flavour of the event by complete immersion.

Don't forget that Friedrichshafen provides an excellent base for the family to enjoy while you explore the show. In my opinion it would be difficult to find a better location.

However, before I do go next year I've made up my mind to prepare myself in the best way possible by learning some Italian and French and improving my Dutch, German and Polish. Maybe I'd better learn Romanian and Albanian too? See you there in 1991.

If you would like to know more about next year's show - and how to get there, write to me at *PW*. Rob Mannion G3XFD.

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Back-Scatter

HF Bands

Reports to
Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

As I start this piece, we are in a heat-wave - strange how everyone wishes for such weather and then within hours of it starting starts to complain about the heat! Definitely, there's nowt so queer as fowks!

Bands

As far as the author is concerned, radio activity has been other than operating; but at the times when the rig was used one got a very strong feeling that conditions were somewhat like the curate's egg.

Snakes Alive!

Since my reference to this antenna some months ago, correspondence (well, a couple of letters!) has come in to show us a bit more of the story. Perhaps the main one came from **K6EIL** (Salt Lake City). Wes says Doug DeMaw W1FB referred to it in his article in *QST* for April 1988. In essence, the Snake is a wavelength or longer of coaxial cable laid out on the ground and connected to the receiver's antenna terminals; it is NOT intended as a transmitting aerial. The box which contains a 51Ω resistor to terminate the 50Ω coaxial. Signals are some 20-30dB down, so a pre-amp is in order, but on the other hand, compared with say the Beverage for reception it doesn't need all those supports, being just laid out along the ground. Wes comments 1. that one should experiment with different lengths before deciding it 'doesn't work at this QTH' and 2. That a long length of what is known in USA as '22 gauge speaker wire' is cheaper to buy and seems to work better though in this case the characteristic impedance runs around 190Ω, so it was terminated in 220Ω and fed to the receiver through a 4:1 balun. W1FB reports good results by way of noise reduction, both off the sides and the tail, albeit the directivity goes awry if you lay it over existing underground or radial wires. For UK readers, the nearest equivalent we can think of to the speaker wire would be the flat-twin cable sold for use as mains lead for table lamps and such.

Finally, Wes says he is interested in skeds with QRP ops in this country - the address is Wesley Baden K6EIL, 3914 Parkview Drive, Salt Lake City, Utah 84124.

Wanted!

It is understood that **VK2GSA**, John, is looking for contacts in the Welshpool area; if anyone should happen across him - 14MHz is his favoured band - perhaps they would pass on my address to him and also contact me, by letter or telephone, if possible with John's details so I can set up some local skeds. Thanks!

Obituary

Readers will know of the Ex-G Radio Club, whose members are those who were born in the UK but are now domiciled abroad. Sadly **GM2CWL** wrote to mention the death of the founder and ex-President, Reg Cherrill W3HQO; it is hoped that by next time we will have more details.

Award

From the Northern California DX Club Inc. I have details of the California Award; this is free of charge and is open to those outside the USA, who can produce proof of contact with 200 stations in California, plus confirmed contacts with 20 members of NCDXC since October 1946. The award is free and the QSLs may be checked and certified by officials of recognised radio societies and clubs, or the cards sent to NCDXF for checking. If cards are sent to NCDXF, please include adequate postage for their safe return. Write to NCDXF for a copy of the complete list of all past and present members of the NCDXC and a copy of the Rules, to: Northern California DX Club Inc., PO Box 608 Menlo Park CA 94026, USA.

Top Band

Not much to cover this time. **G3BDQ** (Hastings) notes that on Sunday mornings, GU2FRO on Sark is an S9 signal between around 0830 and 0930Z - it seems he has a 23m vertical, gamma matched, plus an extensive ground system, which may account for the big signal!

In another letter a voice from the past came through - **John Ellerton G3NCN** (Bracknell), who is back on the air, 1.8-28MHz, with QRP c.w. John and I did a lot of nattering on Top Band back in the fifties, but G3NCN had been off the air for years and only recently came back to the hobby.

As for me, pressure has been placed upon us to get back on the band, so after optimising me end-fed arrangement for 3.5MHz, we were persuaded to give Top Band a whirl after modifying the a.t.u. to suit. With 23m up aloft we ended up with five FEWER turns on Top Band than on 3.5MHz! So far, the odd daylight QSO out to 230km-plus suggests we have got it right.

The 3.5MHz band

The effort paid to getting the current lobe in the right place on this band, which provoked the activity just mentioned, certainly paid off; despite reducing the overall length and the antenna's feed impedance considerably, signals came up by a couple of S-points all round and made a marked improvement to Sunday-morning daytime ranges and of course to the ability to hear things at longer ranges after dark as well.

GW0HWK (Wrexham) worked no DX as such, but did have QSOs with GW0LAL, GW3DRV, G4JFH, GM3ULP and GW4UNO.

Mike Davis (Thornton Heath) says he has been in the habit of listening on the band with his home-brew direct-conversion receiver, 32.5m wire and a.t.u. around midnight; this effort yielded, apart from Europeans, K8UR/P, W2RTG, K2RIH, VY2DX, K8UR again, PY4BK, ZP5LRA, ZP5FGS, PY3BD, ZP5LRA working W2HCW, SV0DR, 9Q5BG PY8ZPP, 5Z4BP and 5T5CK. Mike has now passed the RAE - Congratulations! - and is stuck into the Morse. To help with this, he bought a general-coverage receiver, but he makes a telling point when he remarks that on the single-band homebrew box he listens carefully, while the multi-band facilities of the new receiver cause him to hop around, changing frequency and even band but not really listening. Perhaps we have something to learn there!

G0HGA (Stevenage) uses 18.3m and around 20W, which resulted in c.w. to SM7MYM, PA3BTH, F2FP, G3ZY, G3ZWH, G3GCC and GM0KDZ/P.

G0KRT (Welling) is still using the 1.5W from a Lake DTR3 and a straight key from Kent's. GW4TNH was worked, plus about 20 G stations and in the two-way QRP line, were G0DCI, G0HIN, G3YHO, ON4KAR and PA0DXK.

ON7PQ simply notes 'Summer Time!' in the 3.5MHz column of his letter, but does unbend to admit to 3A/K4UEE.

The 7MHz Band

While we were at the business of altering the a.t.u. for Top Band, we thought we may as well make it 'perk' the end-fed wire on 7MHz as well; easy enough to achieve although we did not expect much in the way of DX. First tests have agreeably surprised us!

ON7PQ as always stuck to his c.w. and mentions ZA1R(!?) C56/ON7EH, ZK3EKY, DL8CM/ZS1, TI9CF and JW/DK2OY. One wonders whether this was the 'demonstration' run by the HA chaps to the ZA authorities, or just another pirate.

GW0HWK indicates plenty of G and European stations but nothing more interesting.

Now To G0HGA; Angie mentions GB70SIG, UA3WFH/YL, Y90SOP(QSL via Y25PA), LY2BIZ, lots of G, DL and so on, KO1C and N4MQS.

G3BDQ says he spent a couple of hours at the proposed new Novice power limit, just to see what he could raise; his c.w. at this level raised plenty of replies to CQ calls not in the QRP area and plenty of QSOs with S5 to S7 reports, using the normal wire antennas.

Contests

The CQ WW RTTY runs over the weekend September 29-30, 48 hours midnight to midnight. Classes are single-op, single band; single-op all bands; single-op assisted; multi-operator single transmitter. Send RST and CQ Zone number; USA stations send RST, State, (or VE area) and CQ Zone. Score a point for stations in one's own country, two for same continent and three for contacts outside your own continent. The multiplier is one for each US State and VE area, one for each country per WAE or DXCC list and one for each CQ Zone. Work out the multiplier for each band; then the final score is total QSO points times the sum of the multipliers from each band. Logs, postmarked no later than December 1, to CQ RTTY Contest, Roy Gould KT1N, PO Box DX, Stow, MA 01775, USA. Looking further forward we notice the CQ WW SSB DX Contest over the weekend October 27/28 and over November 24/25 the CQ WW CW DX shindig.

Expeditions

At the time of writing the proposed ZA operation by the HA team hasn't come to fruition and one doubts if it will until things settle down in Albania; one suggests you keep an ear bent to the rig and/or to 'Wireless Line' for an update picture on this one.

American reports seem to suggest that Willis Island activity is now zilch, since VK9TR is now QRT.

Talking of QRTs, 5V7HL went QRT back in 1985, but obviously a pirate has been at work, since DK9KD has been receiving many cards.

The question of which country the recent 70 operation counted for seems still confused; the licence documentation had 'South Yemen' crossed out and replaced by the new title 'Republic of Yemen'; on the other hand PA3CXC says that if the paperwork was issued in Aden, 701AA should count for 70; were it for the new country then the paperwork would have originated from Sana'a as the capital of the new republic. Anyway, the new Republic has not yet applied to ITU for the new callsign block allocation, so for the moment the existing prefixes remain in force. Don Search at the DXCC desk has a knotty one there!

WARC Bands

First **G4ZZG** (Mansfield) who mentions the Siberian Bear DX Group operating as UZ9LWG/UJ8S in Oblast 041(QSL via UW9LA), VE1GE and Europeans.

On to **G3VWC** (Bath) who made it on 18MHz to U0AG, JA6PA, U0AL, N5VV, 4Z4DX, K0KWT, KX9M, W5HNQ, KC5R, UW0SQ, UM8MBA, VE7DGM, TU4DH, N4AR and a gaggle of W1-2-3.

G3NOF (Yeovil) notes little activity during the day on 18MHz, with the band livening up during the evenings. CO2GB, EA9LH, HB0/KB6IVM, JA6GIJ, NY4C, T5RR, TI2SW, TR8CJ, TR8CL, V29A, VP2EEE, VP9MG, WP4BDI, WZ6C/ST4, YL20LSF, ZP8JCY, 3X1AU, 5R8JD, 5T5FA, 8P9FF and 9H3MX. As for 24MHz, very little activity was noted, although Don did make it across to RB5WA/RB9P, ZP5JCY and some Europeans.

10MHz c.w. was investigated by **G2HKU** (Sheppey) who raised N4EJK, SM5AHK/6, W2BA and ZM4HB.

GW0HWK only tried 18MHz, which yielded VK7AAB, 6W1QJ, EA8ZO, WA1I,

Back-Scatter

N4BVQ, W1LCA, W2FJ, K3LGC, VE1ALL, N1EEQ, K1NDF, N1BBE, WB2CBA, KE1Z, VE1BRP, KA1SVU, WB2ERQ, N1SBJ, KC9C, W7FFG, K8RNM, W1XU and KE7TV.

The 14MHz Band

Where, they say, it all happens! G0HGA put 20W to the end-fed wire and raised OH1LA, SM4OTI, UY5D(QSL via UT5DL), UV1AA, UC2OAF, TK0CK/P (via F5DE) and VE1UA.

G0IXR (Ruddington) says he has been a reader of the column for some time and thinks it's about time he put his penn'orth in; Trevor operates mainly in the late evening and mainly on s.s.b. On 14MHz the take included 4U1ITU, EK4AA, HG2P, JW/DL3LAB, KZ2X, LG5LG, N5PSI, UZ9MWJ, VK2AU, VP8CED, WA4PMF and plenty of smaller fry.

Over to the c.w. from **G3VWC**, who notes UA9FDF, K0KES and W6VX.

In the mornings, says G3NOF the long path to VK was often open, including the odd ZL, plus West Coast Ws and South America; s.s.b. contacts were registered with AP2AJ, FR5ZN, HC1CMN, JAs, JW/DL3AB, KI3V/7 (Nevada), OG5SCL, OX3SG, T5RR, TA3G, TU2UI, V85NR, VKs, VU2PMP, YB8HX, YB8RB, YI1BGD, YK1AA, ZK1DD, 4L1NV, 4X6DW, 5N0ETP, 7Q7LA, 9K2YA, 9M2ZZ and 9M8FH.

For **G2HKU** it was, as usual lately, all c.w.; VK2FYM, W7SF, ZS6KT, JA9CAH, 4L1NV, U5WF/UB9P, 4K3/UA3YCA (Kolguyev Is), KH6IJ, VK5GZ, VK5GZ, LY2BFO, 4K3MI Morzhovets Is), P43SF (Aruba) and a single s.s.b. QSO, with ZL4OD just to see it still worked!

For GW0HWK the score included XJ4G (Winnipeg, Ontario) UA9CI on SSTV, UA6JD, A61AB, SU1HN, XE2CQ, TG9GI, J39UL, K2POF, WD9HAW, KA3GTC, K8AHU, WD1V, K2GTS, N1AGV, K0BUR, WA5RNL, W9JOO, N2ETJ, K6UKZ/4, K1CSB, GM4TNW/CT1 and Europeans.

Now to the c.w. from **ON7PQ** (Kortrijk), who offers 4K3ODX, 4K4BAM, ZL0AIC by Amtor, 4K4/UA6WCG, WY7I/VY1, 4K3MI, VP2V/OH2BH, JW/DK2OY XA2DXA, DL8CSM/ZS1 and TI9CF.

For G3BDQ it was all c.w. also, with UV0LM, UA0WX (twice), 4K3/RA3YG and JA9CAH.

The 21 and 28MHz Bands

Space is restricted so we must lump these two together. ON7PQ first; Pat worked FK8KAB/P, 4K4PWB, ZK3EKY, HK0BKX, V6/JJ1TZK, V47NXX, XW8KPL, V73AZ, ZD7KM, C56/ON7EH, KH6/W0RLX, V73AS, FY5FO, F6GCP/BV, 4K3SS, 5V7RC, XX9TDM, 5V7AK, 3D2AG, DL8CM/ZS1 (Penguin Is), A41JV, FP/W5WMU, VP5V and 9M2FB on 14MHz, while on 28 there were ZD8LII, J20CD, 7X4AN, 5V7RC, C56/ON7EH and DL8CM/ZS1 again.

Now to **G3BDQ**. Full power c.w. accounted for UZ0ZWA/UA0X, UA0FHB (Sakhalin), UL8NAO, 4K3/UA3YCA, UZ0LWC, VE7FNP, W7VY, W0RL/KH6, KH6IJ, VP5P (Provo Is), ZD7KM, ZD7DP, FM5WD, G3UUV/J6L, YC9VHS, HK3AHM/1, TK/PA3RBT/P, several JAs; on the novice level power, there were SV9/DL1YBN/P, LZ3IE, UA6LLA, UB4MXO, TA3/DL7AOJ and JH2QBX. All 21MHz.

GW0HWK managed 8J9XPO (Osaka Exhibition), C56/ON7EH (Gambia), ZK3EKY (Tokelau), S79MX (Seychelles), several JAs, VK2SE, KP4LQ, UT4X/RJ5J and about 50 Yanks assorted. Nothing was worked on Ten.

For G2HKU there were 21MHz contacts with HK3RQ, 8P9FT, VU2TTC, CO8LY, UA9FGJ, EA8AB, PT7AA, FY5FO, plus on 28MHz ZD8LII.

At G3NOF, 28MHz yielded S79CYH, S79MX, TU2QW and 5T5FA/M; but on 21MHz Don has an enormous list this time: A61AD, AH3C, AH6HB, AP2DM, BY1PK, BY4RSA, BY5RY, BY5TS, C56/ON7EH, CU2DG, FO0IGS, FO0KW, FR5DX, H44AP, HB9IQB/5B4, HL0/DL9YBY/P, HL1KIB, HR1RMG, HP0POL(S. Shetlands), JAs, JT1BG, JW/DL3LAB, KE5KJ/YV5, KP4CKY, NH6C, P29NCS, PJ/PA3CWQ, RB3MR/JT, T20AA, T30BC, TA2/DL1BIB, TA5C, TR8GL, UF7V/K1ZZI, UF7V/WF2S, V73AX, V73AZ, V85WS, VE8CB, VP2EY, VP8CDS, VQ9RB, VU2PMP, VS6VO, YC4GDZ, YE0Z, YJ0AKY, a questioned ZA3KL, ZK1BY, ZS8MI, ZS9AAA/1 (Penguin Is), 3D2XV (Rotuma), 5B4MF, 5H3TW, 7J1AGW, 8J90XPO, 9Q5PL and a stack of rarer Russian and Yank stations.

Another long list from G0IXR who mentions 4X6RL, 4Z4EC, 5B30JE, 5N9FEA, 7X2VXK, 9K2HA, 9Q5PA, BY5RT, BY4RSA, BZ4CBC, C53GB, CE1LGD, CM2ET, CU2DG, CX7ABT, EA8BSG, FM5DN, HH2CI, HL1EG, HL3EIN, HL4VP, HR1KAS, HZ1AB, J6L/G3UUV, JAs, JT1BG and assortment of Yanks, LU4EZ, PJ2HB, PY2LLF, PZ1AP, TG9CI, TI2OY, TU2UI, TR8/FD1OGL and a goodly assortment of Russian and American calls and Europeans.

G4ZZG mentions c.w. to 8P9FS (QSL to G3DLH) PY4JCP, UA9XFW in Oblast 90 and VP5P on 21MHz; on 28MHz LU6ENY and LU2EPN plus small fry about summed it up.

G0HGA found a couple of short-skip openings on 28MHz; in the first she raised DJ5GG and DF7FG and in the second DF6RI and HA7MY. Angie notes these were on the wire; seems the vertical was more knocked about in the winter storms than she had realised.

Finis

Thats the lot for now; sorry I have had to wield the axe rather fiercely to get into our shortened space...shoot the Editor, please, not me!!

Deadlines for the next three are September 24, October 29 and November 19 to reach me, at the address above.

Come on you 160m fans! Let's hear what you're up to - Editor

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

Solar Data for July 1990

Following the restructuring on the sun in the last week of June when the sun spot count leapt up to 370, the period from July 2-6 saw a decline in both this count and the solar flux levels. The geomagnetic A index was quiet to just unsettled and averaged 10 units for the period. The only flare of any significance occurred on July 4 measuring 670 flux units. This was followed on the next day by a 144MHz Sporadic-E opening to southern Spain. On July 6 there were 5 eruptive regions visible on the suns disc. The quiet side of the sun was looking our way between July 9-15 and therefore the flux levels and spot counts fell. During this period there was only one flare of any note, an M3.1 type lasting 163 minutes on July 13. Co-incidentally, or was it, another 144MHz Sporadic-E opening occurred the very next day, allowing many UK operators to contact stations in Malta, Sardinia, Sicily and Italy. From July 16-22, the sun was very quiet with no flares being noted. The spot count varied from only 73 on July 19 to 207 on July 22. The solar restructuring mentioned last month was still continuing and is the most likely cause for the noted lull in activity. With the active side of the sun becoming visible the solar activity rose again during the period July 23-29. On July 25 a proton flare occurred but it was quite small reaching only 21 particle flux units. Whether this attributed in any way to the excellent African opening on 50MHz later in the day can only be conjecture. However, another proton flare event, on July 27, almost certainly caused the auroral opening on July 28. Solar activity is expected to increase from the levels recorded in the summer to an anticipated peak during September or October 1990. The predicted monthly 10.7cm flux for September is 240 and 230 for October. The prediction of sun spot maximum for cycle 22, using statistical methods continues to be March 1990. Don't be concerned that you have missed the best of the DX on 50MHz as periods of high activity are to be expected during cycle 22's extended maximum. Another certainty is that auroral conditions should be excellent during the equinox period around October 1990 and similarly during March 1991. Polish up your Morse keys now!

The 50MHz Band

Sporadic-E, Aurora and meteor scatter were the mechanisms that provided so much European DX during this summer. The band was also open to Africa, via t.e.p. & Sp-E, on more occasions than you probably thought was the case. Openings to North America were also reported but these were very patchy compared to other years.

Welcome to a new reader of the column, **Ian Porter G1DHV** (WMD). He has just completed building the receive side of a Meon transverter and with a temporary indoor dipole has heard a number of signals on the band. Ian is hopeful that the transmit side will be completed soon and is ready to put up an outdoor HB9CV when everything is operational. Give him a call if you hear him.

John Hilton GM1ZVJ (LTH) runs about 2W into a 3-element Yagi but still made a number of good contacts around Europe. Recent s.s.b. contacts have included DL1UR (JN49), DK5WL (JN49), DL5IO (JN49), DL7AV (JN58) and DL8LAQ (JO43). Some Austrian stations, such as OE5NEL (JN78), OE8HWQ (JN76) and OE9ERC (JN47) have also been worked.

Ivan Jarrett G7CHE (SXW) mentions that he cannot find anyone using the f.m. mode yet. Does anyone claim to regularly use f.m. preferably in the allocated sub-band? Using s.s.b. Ivan made a number of first time contacts with OH0BT, OY6FRA and OZ1BTE.

Jim Smith G1DWQ (DOR) managed to find some choice DX hidden amongst the local European stations. On June 28, between 1755-1812UTC, he heard WA3HNK and at 2005UTC worked W3EP (FN10) on c.w. Another continent, Asia, was added to the list on July 1 when ZC4AD (KM64) was worked on s.s.b. at 53 bothways. New countries contacted have included LX1PD (JN39) on July 9, CU2/

Back-Scatter

144MHz QRB Table
Distances in kilometres

Station	Tropo	Aurora	Meteors	Es
G0CUZ	2943	1758	1996	2943
G0DAZ	2923	1780	2026	2923
G0DKM	2811	1488	—	2203
G0EVT	3080	1640	1808	3080
G0FYD	1315	1624	—	2019
G0ISW	1059	566	—	2057
G0L8K	3060	1755	1876	2350
G1OWQ	1454	1812	—	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	—	2386
G1LS8	1319	733	1732	2723
G1SWH	3035	1429	—	2372
G3FPK	1835	1686	—	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MUT	1163	684	1533	2068
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1404	1774	2025	2172
G4ZTR	935	1535	—	2130
G6DER	1834	997	1957	2068
G6DZH	2924	711	—	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	—	2265
G6LEU	2620	910	—	2430
G8HHI	1742	—	—	2058
G8JDX	2667	1368	—	2663
G8LHT	3070	1780	1868	2510
G8MFJ	1209	1210	1329	2168
G8PYP	1083	1451	—	2318
GD4XTT	3053	—	—	1700
GI1JUS	3067	1614	1507	2216
GI8YDZ	1216	1809	1901	2562
GJ4ICD	1620	1100	2050	2090
GM4CXM	1428	1750	2100	2023
GM4YXI	3160	1881	2048	2513
GW4VVX	2823	1391	1313	1910
GW6VZW	2830	1473	—	2236
ON1CAK	1420	1166	1948	2725
ON1CDQ	1420	1166	1948	2124

G3RFS on July 12 and IT9TVF (JM68) on July 21. Although Jim claimed the latter as a DXCC country, in reality it is not. On several occasions during July, Jim heard stations in southern Africa, but he still cannot find the FR5 or A22 known to be active.

John Heys G3BDQ (SXW) had, by the end of July, pushed his country score up to 58. Recent contacts included ZC4AB at 0859UTC and ZC4AO at 0908UTC on July 1, SV1DH at 1937UTC on July 9, IS0VCY on July 10 and CU2/G3KOX & T77C on July 14. John said it was a thrill to work his old pal Mal Geddes Z23JO, on July 21, having known him for more than 40 years. The opening to Africa, at 1720UTC, extended to Namibia with Kosie V51E also being heard. Later the same evening, EA8/DJ3OS (IL18) was heard operating illegally from the Canary Islands. That one doesn't count I'm afraid. Asia was worked again on July 22, contacting ZC4MK at 1324UTC and for a cross-band QSO, 4X1IF (KM72) at 1342UTC. An opening to Africa on July 25, around 1800UTC, found V51E in beacon mode at 589 and a couple of ZS6 stations at S4 but no QSOs resulted.

Ken Osborne G4IGO (SOM) managed to find some really good DX stations during July. On the 1st, between 1155-1229UTC, he heard the beacon VO1MUN (GN37) on 50.0375MHz peaking 599. It runs 10W output to a vertical antenna. At 1351UTC, WB4JGG (EM75) was worked, fading out at 1409UTC. On July 5, the beacon 9L1US was copied between 1515-1522UTC. More from the Americas was heard on July 6, with KP2A being heard and then worked between 2020-2043UTC on a beam heading of 240 degrees. After that signal had faded, the beacon FY7THF became audible until 2122UTC. Back to Africa, with Z23JO heard between 1841-1856UTC on July 14. Propagation was good the next day with V51E and V51DM being copied between 1753-1828UTC and 1857-1904UTC. At 1816UTC, LU8YYD (FF50) was heard, being worked a little later, before he faded out at 1832UTC. The beacon 9L1US was heard briefly at 1848UTC before propagation swung over to Puerto Rico, with KP4EIT being heard between 2117-2128UTC. More Africans on the 18th, Z23JO copied between 1732-1738UTC and V51E heard between 1822-1839UTC. The best was yet to come. July 21 started well with the beacon FR5SIX being copied between 1622-1644UTC. Then followed a spate of DX callsigns, V51E, A22BW, Z23JO, 9L1US, ZD8VHF and FY7THF. The latter station fading out at 2002UTC. A quite remarkable day!

At my QTH in Herefordshire I noted a number of openings into Africa via t.e.p. with Sp-E extension at the European end. Mal Z23JO (KH52) was heard at 1851UTC, on July 14, peaking 579. On July 18, from 1830UTC, Kosie V51E (JG89) was heard on s.s.b. at 57. These two stations were heard again on July 21, from 1730 through to 1805UTC. The best opening to Africa occurred on July 25. The event started at 1725UTC with 7Q7RM being worked on c.w. 559 bothways. During the next hour, V51E, V51KC, Z23JO, ZR6A, ZS6LN, ZS6RR, and ZS6WB were copied at very good strengths. New countries worked included CU2/G3KOX on July 14, 7Q7RM on July 25 and 1A0KM, the Sovereign Military Order of Malta (JN61) on August 1. This latter station is a valid DXCC country, situated in large gardens in the centre of Rome. It was operated by I0AMU, who was running only 3 watts to a dipole. He promises further activity from this rare DXCC country and from Vatican City, during 1991.

Dave Grey G8YYB (LDN) found a number of interesting or rare stations throughout Europe. Contacts were made with ZB0W on June 21, PA3DWB/TF (IP03) at 1832UTC and ZB0T at 1846UTC on June 22 and IS0AGY & IS0VCY (JM49) on June 24. The Squarebashers on Gozo 9H3LF (JM76) and IT9TVF (JM68) were both worked on June 28. A new locator JP54, was obtained by working LA3EDA/P on July 2. Further contacts during July included I0UMF/IM0 (JN41) and ZC4MK (KM64) on the 4th, CT1/G3SDL (IM57) on the 6th, SV1EN (KM18) and T77C (JN63) on the 7th and IK2OMF/7 (JN82) & EB5EIB (IM99) on July 9. The latter station was an illegal operation of course and cannot be counted for award purposes.

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
GD0ELY	12	-	144	—	156
G4OUT	-	39	99	—	138
G4ASR	34	4	93	—	131
G0FYD	31	—	62	1	94
G0DJA	17	-	10	—	27
GW4VVX	3	-	9	—	12

Number of different stations worked since 1 January 1990

Annual v.h.f./u.h.f. table
January to December 1990

Station	50MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Counties	Countries	Points
G1SWH	42	31	32	6	77	14	38	8	—	—	248
G6HKM	50	31	—	—	62	21	31	10	25	8	238
G0IMG	36	26	37	3	42	8	29	4			185
G4ASR	15	33	45	8	47	27	—	—	—	—	175
G0NFH	40	20	21	3	48	9	11	2	2	2	158
G0FYD	20	24	1	1	75	20	11	4			156
GD4XTT	31	18	—	—	73	17	10	4	—	—	153
G6MXL	5	17	17	3	34	9	17	5	13	4	124
G8PYP	19	23	1	1	42	13	21	6	—	—	126
G0EVT	21	23	—	—	36	14	5	1	—	—	100
GW1MVL	2	2	—	—	43	10	11	2	—	—	70
G7CLY	—	—	—	—	57	9	—	—	—	—	66
GW4HBK	27	7	24	7			26	3			63
G4ZTR	—	—	—	—	36	12	—	—	—	—	48
G4SEU	—	—	42	3	—	—	—	—	—	—	45
GW7EVG	—	—	—	—	23	6	—	—	—	—	34
G7CFK	18	12	—	—	—	—	—	—	—	—	30
GM1ZVJ	1	9	—	—	2	1	—	—	—	—	13

The 70MHz Band

There was an upturn in activity during July caused mainly by v.h.f. field day at the beginning of the month, Sporadic-E throughout the month and the good aurora at the end of the month.

Dave Lewis GW4HBK (GWT) managed to contact ZB0W on June 13 and EA7IC/4, crossband to 28MHz, on June 22, both contacts being via Sp-E. Via the same mode on July 12, Dave worked I4RHP crossband to 50MHz. In the aurora on July 28, contacts were made with GM3UKV/P (IO75) at 1635UTC and with GM4DIJ (IO85) at 1650UTC. GM4AFG was heard but no QSO resulted although Dave did mention that G6XM (DVN) made it.

Collin Redwood G6MXL (DDR) made good use of the contest on July 8 by working several new counties on s.s.b. including Oxfordshire and Lincolnshire.

Two events in July, v.h.f. NFD on July 7-8 and the aurora on July 28, allowed many contacts to be made from my QTH. During the s.s.b. section of NFD I worked EI2WW/P (IO63), GI4DNL/P (LDR), GJ7AOG/P (JER) and GM3FDW/P (DGL). The aurora produced c.w. contacts with GM4CXP (BOS) and GM4DIJ (LTH). Also worked was Martin GM3UKV/P (SCD), on the island of Jura, 58A bothways on s.s.b.

The 144MHz Band

After many months of being in the doldrums the band has come to life. Operators were able to work many new countries and counties thanks to the various propagation modes that prevailed during the month. There was some very good tropo conditions on July 12-15 and July 21-22, Sporadic-E openings on July 5, 14 & 21 and an excellent aurora on July 28. With the sporadic meteor rate reaching a maximum and a number of meteor showers occurring during July, devotees of this mode were also well catered for. A number of major contests, particularly v.h.f. field-day, on July 7-8, also helped tremendously to increase activity.

Gary Nicholas GW7EVG (CWD) has changed his antenna system from a 5-element Yagi mounted in the loft to an out door 8-element array. Recent contacts on s.s.b. have been made with GM1JKJ/P (BDS), GM4CXM (SCD) and GM7FMR (DGL). Conditions were good on July 22, with GM4GUF/P being heard from the Island of Iona.

A number of stations mentioned the Sp-E opening on July 5 which approximately took place between 1625-1700UTC. On the Island of Anglesey, **GW6IWY** running a TR9000 into a 100W amplifier and 17-element Yagi worked EA4CM (IN80), EB5GCT (IM98), EB5HJF (IM98), EA7ALL (IM87), EA7CPW (IM87) and EA7ERP (IM87).

Between 1640-1700UTC, **Byron Fletcher G6HCV** (SFO) contacted EA1CDH (IN71), EA1MO (IN71), EA4CM, EB4CYF (IN80), EA7AJ (IM87), EA7ALL, EA7BNB (IM87), EA7BVO (IM77), EA7CPW, EA7ERP and EA7FTZ (IM88).

John Hoban G0EVT (YSW) managed to work a number of Spanish stations in the recent Sp-E events. In an opening on June 4 between 1800-1815UTC, a contact was made with EB7BQI (IM67), with EA7AH and EA7GAA being heard. The event on July 5 was nearly missed but John managed to catch the last 10 minutes or so, to work EA7ALL and hear EA7BNB before signals faded out.

Ela Martyr G6HKM (ESX) made the grade, on July 5, by working EA7CU (IM86) via Sp-E. Field day produced s.s.b. contacts with EI4ALE/P (Wexford) and EI9GJ/P (Carlow). Sporadic-E on the 14th accounted for IS0HKJ (JM49), IW0AYO (JN61), I0KHY (JN61), IK5OIY (JN52), IC8EGJ (JN70), I8LPR (JN71) and I8WES (JN70). The very good tropo on July 15 produced contacts with HB9RDE (JN37), SM4KYN (JO79), SM6SKY (JO68) and 7 Danish stations in JO46, 47, 56, 57. The period July 19-21 gave more tropo contacts, this time to the east, with OK1AGE (JO70), OK5A (JO70), many West and East German stations. Ela noted that the Polish stations were very weak at her QTH.

Ian McCabe G0FYD (LNH) caught the both Sp-E openings and the aurora. On the 5th he worked EA4APW (IM88), EA4CM, EB5HJF, EA7ALL and EA7CPW. The Sp-E event on July 14 gave QSOs with IK0OKY (JN61), IW0AKA (JN61), IW0BET (JN61), I8LPR and IW8BZN (JN70). Using a TS780 driving a 100W Microwave Modules amplifier into a 15-element Yagi at 10M a.g.l. some good DX was obtained in the aurora on July 28. In the first phase, which ended around 1800UTC, c.w. contacts were made with EI9BG (IO52), LA5JEA (JO18), SP4MPB (KO03) and SP7DCS (JO91). LY2BJB was heard but not worked. The second phase, from 2330-0200UTC, was even better. Stations contacted included ES2XM (KO29), LA7KK (JP50), OK5A,

Back-Scatter

SM5FRH (JO88), SP2JXN (JO94), SP2OFW/P (JO93) and UA2FL (KO04).

By using a variety of propagation modes during July, I was able to work stations situated in 10 locator fields, IM, IN, IO, IP, JN, JO, JP, KN, KO and KP. On July 5, I caught the end of an Sp-E opening to Spain, working EB5HJF at 1705UTC. A similar event, on July 14 between 1935-2010UTC, gave s.s.b. contacts with 9H1GB and 9H5AB, both in JM75, and with 26 Italian stations in call areas 10, 4, 5, 6, 7 and 8. The area covered included JN52, 54, 61, 62, 63, 70, 71, 80 and 81. Following a meteor scatter schedule with IW5BNL (JN53) at 0600UTC on July 22, the band was found to be open to the south-east on tropo. Contacts were made with HG9PX (KN08), SP6SYD/P (JO71) and OK5A before the band faded out. The poorer phase of the aurora on July 28, between 1500-1730UTC, gave c.w. contacts with LA5JEA, LY2BJB (KO15) ex-UP2BJB, SM2CKR (KP03), SK3LH (JP93), SK7JD (JO97), SM7GWU (JO79) and SP4MPB (KO03). Contacts were also made with GI and GM (IP90). Although some of these contacts were over 1800km the best phase of the aurora was during the midnight session but a scheduled m.s. test at 0500UTC put me off from staying up late. The test the next morning, with HG3DXC (JN96) was successfully completed within 30 minutes. On August 1, a Sp-E opening between 1655-1745UTC, gave s.s.b. contacts with EA6PS (JM19), EB3CWZ (JN11), EA3ADW (JN11), EA7CU (IM86) and EB7NK (IM86). Conditions were very good via meteor scatter on August 4, G4YTL/TF (IP03) being worked in 20 minutes with bursts received bothways at over S8.

A trio of operators on the south coast in Dorset made the most of the good conditions during July. G6DWQ, located in Wimborne, noticed the Sp-E opening on July 5 from 1635-1710UTC. He worked two new squares by contacting EB4CYF (IN80) and EA7PZ (IM67). Jim found conditions during field day to be very poor, however tropo conditions had perked up by July 11 allowing contacts to be made with EA2AGZ (IN91) and F6GQE/P (IN92). On July 13, a contact was made with Y23KO (JO62) with SP9EWU (JO90) being heard. The Sp-E opening on July 14, between 1928-2010UTC, gave s.s.b. contacts with I4RHP (JN54), I4XCC (JN63) and IK4MEB (JN64).

Also located in Wimborne, **Steve Damon G8PYP** (DOR), found much to occupy himself with. Tropo, during the period July 10-12, accounted for EA1BCB, FA1LIX/P (JO10), FC1ADT/P (JN15), FC1DPU/P (IN87), FC1HSU/P (JN05) and F6GQE/P (IN92). More tropo between July 21-23 found F6CKZ (JN09), F6HPP/P (JN19), ON5NY (JO10) and OK1AGE/P (JO70). The Sp-E opening on July 14 gave contacts with I4RHP, I4XCC, I6IQU (JN63) and I7QAU (JN80). Another Sp-E event, not mentioned by others was detected on July 21 between 1750-1810UTC, with IS0HKJ and IW9BOQ being heard. An s.s.b. meteor scatter test with IK0BZY (JN61) on July 12 at 0400UTC, was completed in less than 10 minutes. It had been arranged previously on 50MHz and Steve was fortunate to find IK0BZY later the same evening on 50MHz to exchange QSL details.

Rounding off the trio of reports from Dorset is **Ian Galpin G1SMD**. He notes that 144MHz Sp-E openings have been very poor this year but was still pleased to work I4RHP, I4XCC and IK4MEB around 1945UTC on July 14. GW0KZG/MM was worked via tropo whilst in locator IO60, on July 27, to bring Ian's squares total up to 110.

GD4XTT (IOM) unfortunately had to go to work during most of the field day contest but did find time to work EI7M/P (TIP) and EI4ALE/P (CLW). In the Sp-E opening on July 14, contacts were made with I8WES and IW0BCF (JN61) before the band faded. A new all time county was worked on July 14 when GM4CXP (BDS) was contacted. A three-island QSO was made on July 23 when Dave worked GU2FRO (SRK) and GU3EJL (ALD).

G6MXL worked his first ever wet square when he contacted GW0KZG/MM (IO61) on July 26. Another new square was provided by EA2AGZ on July 11. A number of Italian stations were worked in the Sp-E opening on July 14 but nothing new was found.

The Sp-E opening was also heard by **Mike Hearsey G8ATK** (SRY) who managed to work I4RHP, I4XCC, I8LPR, I8WES and IK8JPI.

Ralph Sachs G2CZS (ESX) reporting for the first time to this column enjoyed the event on the 14th as it provided new countries in the shape of IS0HQJ (JM49) and IW0AKA (JN61). It was a good weekend for Ralph as he also worked, on July 15, GM3ZXH/P (JP00), EJ3GE, HB9MY and HB9QQ. The contacts with Switzerland provided yet another new country.

Andy Sillence G4MYS (HPH) was very pleased to work I6JLO (JN62) via Sp-E on July 14 as he was using vertical f.m. at the time. Running a Yaesu FT4700RH into a WX4 colinear antenna, 59+ reports were exchanged. Andy reports that following his QSO, a number of mobile stations in Southampton also heard I6JLO. He wondered if this is a record for the vertical f.m. mode? The answer to this is definitely no. For a number of years, stations located on the south coast of Cornwall have enjoyed regular tropo contacts on f.m. into the Canary Islands (EA8) at distances approaching 3000km.

Manus McClafferty EI7EQ (Co Donegal) resident in locator square IO55 reports that he has now caught the m.s. bug since an expedition to his rare QTH by PA3DZL and PA3FOC. This recent operation utilised both c.w. and s.s.b. with some contacts being made in excess of 2000km. Manus is QRV in s.s.b. and hopes to have a c.w. system active very soon. I recently heard EI7EQ on the European v.h.f. net arranging schedules for the Perseids shower so by the time you read this he should be an experienced operator.

The 430MHz Band

Two operators **John Acton G0NFH** (AVN) and G6MXL have written bemoaning the lack of activity on this band. Outside of contests there is very little to be heard unless there is super-tropo or a large scale aurora. You've all heard the saying "Use it - or lose it". Don't say you haven't been warned!

GW4HBK found field day to be quite useful for picking up new squares. From his QTH in the valleys of south Wales he made contacts with G4CLA/P (JO03) and G4GCM/P (IO94). Also heard was PE0MAR/P who was not quite strong enough to work. During the aurora on July 28, Dave heard GM4DIJ (LTH) on c.w. at 51A.

Ian Wright GW1MVL (CWD) made a number of s.s.b. contacts during n.f.d. including G0BWV/P (SFD), G0JSR/P (HPH), G6FRS/P (HPH), GW6ZME/P (PWS), G8OHM/P (HWR) and G8ZTT/P (CHS).

Yet another operator, G8PYP, made use of n.f.d. to work counties not normally heard. In total 20 s.s.b. contacts were made with stations in 13 counties. During the French QRP contest on July 21, contact was made with F6HPP/P (JN19). Stan OK1AGE/P (JO70) was worked at 0838UTC on July 23.

The good tropo between July 12-14 gave G6HKM contacts with DD1BR (JO32), DG4BR (JO33), DG8BAX (JO43), DL3YEE (JO42), GD8EXI (IOM), ON1AZH (JO20) and OZ/DK2UO/P (JO45). The following weekend, July 21, gave further QSOs with DL1BBW (JO43), DL2NO (JO43) and OK1AGE/P (JO70).

GD4XTT has repaired the fault on his 21-element Yagi but still has problems with his amplifier so he is restricted to 1W of s.s.b. at the moment. Recent contacts have included GD2HDZ & GD8EXI (IOM), GI4EIZ (ATM), GW8ELR (DFD), G3BW (CBA), G8XVJ (CHS) and G0JPF (NHM).

Andy Symonds G8DQX (CHS) is now active on both 430 and 1296MHz and is looking for skeds for either band. He runs 50W to an 18-element Yagi and 2W to a 55-element Yagi respectively. His QTH, in north Cheshire, has a reasonable take-off from east through to south-east and is passable in other directions. Contact Andy, QTHR, or via packet radio at GB7CRG.

The Microwave Bands

G6MXL is now active on both 1.3 and 2.3GHz. During the field day contest on July 7-8, Collin worked on 1296MHz, new counties in the form of Guernsey, Oxfordshire and Lincolnshire. On July 21, F6HPP/P (JN19) was worked for a new square. The contest also helped with the 2320MHz scores. Running 1W into 35m of Pope H100 cable and a single Tonna Yagi, contacts on s.s.b. were made with G0FCT/P (DOR), G3NNG (OFE), G3ULT/P (HPH), G3YGF/P (DOR), G4HGU/P (DVN) and G8VOI/P (IOW). Subsequent contacts on the band include hearing G3AUS (DVN) on July 19 and QSOs with GU8IRF (GUR) on July 21 and G8OPR (HPH) on July 24.

Another operator to make use of n.f.d. was G6HKM. In total, Ela worked 36 stations in 9 counties on 1296MHz. There were good tropo conditions on July 14, contacts being made with OZ/DK2UO/P (JO45), G8AAP and G8SSL, both in Nottinghamshire. Good tropo prevailed on the following weekend, QSOs being made with G1KDF (LNH), FC1LJA/P (JO10) and PA0MSH (JO32). Ela made her first ever

QTH Locator Squares Table

Station	50	70	144	430	1296	Total
GJ4ICD	407	—	263	119	59	848
G3IMV	228	—	430	125	51	834
G3JXN	204	22	187	134	88	635
G6HKM	235	—	219	109	46	609
G1KDF	258	—	183	104	37	582
EI5FK	314	—	187	58	—	559
G0DAZ	146	—	221	137	39	543
G6HCV	309	—	233	—	—	542
G3UVR	—	50	257	140	83	530
G4KUX	—	—	372	120	—	492
G4RGK	—	—	284	124	50	458
G3XDY	—	—	206	148	91	445
G1SWH	185	26	156	59	—	426
G4DEZ	55	—	249	49	49	402
G0LBK	—	—	260	89	46	395
G6DER	—	22	183	110	78	393
ON1CAK	48	—	280	53	11	392
G8LHT	79	19	185	93	14	390
G1EZF	—	—	263	93	—	388
G4XEN	—	—	274	111	—	385
G1DWQ	239	—	144	—	—	383
G4MUT	82	22	153	93	31	381
ON1CDQ	43	—	255	56	7	361
G1LSB	44	—	172	143	—	359
G0EVT	88	—	209	57	—	354
G4ASR	268	38	—	41	3	350
G4RRA	—	—	255	80	—	335
G3COJ	—	—	186	103	44	333
G8PNN	7	24	129	99	64	323
G4SSD	—	—	229	93	—	322
G4FRE	—	—	102	146	72	320
G4TIF	—	—	200	110	—	310
G8PYP	166	2	108	32	—	308
G4DHF	—	—	307	—	—	307
G1EGC	—	—	198	80	23	302
G8HHI	—	—	148	110	38	296
G4ZTR	78	28	104	50	30	290
G6MGL	—	—	141	89	59	289
G4NBS	—	—	119	105	63	287
DL8FBD	—	—	280	—	—	280
G8ATK	—	—	143	91	45	279
GM0HBK	111	1	142	15	—	269
GW6VZW	118	—	143	6	—	267
G4PCS	—	—	258	3	—	261
G1GEY	—	—	168	77	11	256
G3NAQ	—	—	175	80	—	255
G0FYO	100	—	151	1	—	251
G6STI	—	—	152	69	24	245
G6DZH	—	—	156	87	—	243
G3FPK	—	—	241	—	—	241
G6MXL	52	22	97	48	20	239
G4IGO	—	—	238	—	—	238
G0EHV	—	—	160	75	—	235
GW4FRX	—	—	231	—	—	231
GM4CXP	—	—	198	31	—	229
G1SMD	115	—	106	—	—	221
G4DOL	—	—	216	—	—	216
G4MEJ	—	—	213	—	—	213
G8LFB	—	—	209	—	—	209
G8MKD	—	—	150	49	—	199
GJ6TMM	—	—	151	48	—	199
G4YCD	—	—	197	—	—	197
G1TCH	94	—	95	6	—	195
GI1JUS	—	—	192	—	—	192
G8XIR	—	—	123	—	62	185
G0NFH	54	26	73	16	8	177
G7ENF	59	—	89	24	—	172
G7ANV	—	—	153	—	—	153
G4FVK	—	—	79	49	22	150
G4AGQ	—	—	104	42	1	147
G8XTJ	29	—	116	—	—	145
G6MEN	41	2	63	26	4	136
GW4VVX	10	—	117	—	—	127
G1WPF	—	—	97	29	—	126
G0FEH	—	—	101	24	—	125
G0ISW	45	—	59	17	—	121
GW1MVL	—	—	109	7	—	116
G1IMM	—	—	98	17	—	115
G7CFK	109	—	—	—	—	109
G1CEI	11	—	77	18	—	106
GI4OWA	—	—	103	—	—	103
GM0GDL	—	—	81	22	—	103
G7CLY	—	—	100	2	—	102
G1SWH	—	—	148	53	—	101
G4WHZ	—	—	76	—	7	83
G0GTF	76	—	—	—	—	76
G0HEE	—	—	73	—	—	73
GU4HUY	—	—	73	—	—	73
G1NVB	—	—	73	—	—	73
G0HDZ	—	—	64	—	—	64
GM1ZVJ	6	—	48	—	—	54
GM0JDL	—	—	47	—	—	47
G2OHV	—	—	33	7	2	42
G7AHQ	—	—	34	—	—	34
GW7EVG	—	—	16	—	—	16

No satellite or repeater QSOs
Starting date January 1 1975

Back-Scatter

contact with Czechoslovakia when she worked OK5A (JO70) on July 22. Collin G6MXL (DOR) was worked the same day.

Peter Blakeborough G3PYB (YSW) has been making improvements to his 24GHz antenna system. Previously he used a 600mm dish with a penny feed. A measured 6dB increase in gain has been made by using a 450mm offset fed dish with the 24GHz module mounted at the focus to eliminate waveguide losses. A new receive preamplifier is located very close to the mixer diode. This feeds the i.f. system which has a 50KHz bandwidth and by necessity requires an a.f.c. system to keep signals locked in. The overall receive performance is 2-3dB better than before. Recent contacts on 24GHz have included G3PHO/P & G8AGN/P, both at 86km and G3NKL/P & G4UQI/P, both at 72km. Conditions for 24GHz work were quite poor when these contacts were made so it is expected that these distances can be improved fairly easily.

VHF News

Paul Feldhahn G7CFK, presently in Kualar Lumpur, reports that he is making contact with the Malaysian Amateur Radio Transmitting Society and the Radio Amateur Licensing authority to ascertain if permission can be obtained for 50MHz operation. Paul also mentions that he took his morse test two days before going out to Malaysia and that his XYL telephoned him, in mid-July, to say that he was successful. Congratulations to Paul and let's hope he can get permission for 50MHz although I do recall that UK operators received Band I TV from Malaya prior to the Australian openings last October. This would indicate that obtaining permission may prove difficult.

Tony Collett G4NBS (CBE) hasn't been very active during the past 18 months, having been diverted from DXing by running a 430MHz Packet Radio node from his QTH. Fortunately his situation was recoverable and he is again active on 70, 144, 430 and 1296MHz.

GM0GDL reports that he has moved to a new QTH in Tayside which has a very much better take off than the old location. He expects to get something up fairly quickly but it will not be until next year that the full array will be ready.

If you managed to work the v.h.f. operation from 4U1ITU on August 4-5 you may wish to know that it was operated by IK2CSR and IK2NCJ.

Geir LA5JEA (JN18) is now active on 144MHz from an oil platform in the North Sea. He is running 25W into a 5-element Quad. Look for him during periods of tropo and aurora.

In similar circumstances, **GM3ZXH/P** (JP00) can also be found on 144MHz. He is mainly active at weekends, running 50W into a 9-element Yagi.

Beacon and Repeater News

A new 50MHz beacon, **FX4SIX** (JN06CQ) became active during July. It is operating on 50.047MHz, running 10W into a 5-element Yagi beaming 050 degrees. During September, the power will be increased to 50W and the antenna will become omni-directional. Reports of hearing the beacon can be sent to FC1GHV.

An Italian beacon, **I1U** (JN34TW) can now be heard on 50.099MHz. It is uncertain if it will remain on this frequency as it is operating outside of the recognised IARU beacon sub-band.

Terry Cooper G4XOP of the Mid Cornwall Beacon and Repeater Group has passed on details of re-installation of the beacons following storm damage earlier in the year. The building now has been re-roofed and the GB3CTC beacons on 70.030, 144.915, 432.970 and 1296.860MHz are again operational. The 70MHz beacon is however working on low power. Problems still exist with the 50MHz beacon which is causing interference but the group hope to have this resolved soon. This beacon has been allocated a frequency of 50.042MHz.

The Oxford u.h.f. repeater **GB3OX** has been closed down and the equipment is having a complete overhaul. The site is also being changed. Further details about the Ridgeway Repeater Group can be obtained from G4XUT.

Help Wanted

Dave Law G0LBK has been running high speed c.w. meteor scatter for some time with an IC-202 transceiver. He is changing the system to an FT-707 and transverter and doubts whether this system will key very fast. Dave has heard of some operators using audio keying via the microphone socket and wonders if anyone knows of a suitable circuit for m.s. applications. On a similar tack, Dave is also looking for a program to enable his PC to be used as a high speed keyer. Any offers?

QRZ Contest!

The entire month of September has been scheduled as a 1296MHz activity contest by the RSGB. Other microwave events include a 430MHz-24GHz contest on October 6-7, with the final 10GHz cumulative contest coinciding on October 7, and the start of a series of 1.3-2.3GHz cumulatives on October 9.

The 70MHz Trophy contest has been scheduled for September 16. It will take place between 0900-1600UTC.

The c.w. enthusiast is well catered for, with 144MHz cumulative contests arranged for September 21 and October 5 and a 50MHz c.w. event on September 30. The German c.w. contest, AGCW-DL, will be held on September 22, between 1900-2300UTC. I can send you a copy of the rules, on receipt of a stamped addressed envelope, or via packet radio if requested, at GB7TCM.

The Scandinavian activity contests will be run on the following dates. Microwave activity on October 1, 144MHz on October 2 and 430MHz activity on October 4.

Deadlines

Please send your letters to reach me no later than the end of September. The target dates for the following two issues are October 29 and November 30. I can also receive messages via packet radio at my mailbox GB7TCM.

Back-Scatter

RTTY

Mike Richards G4WNC

Those of you who read the editorial comment will already be aware that this is the last of the RTTY columns. The decision to stop has not been taken lightly and has been based largely on the lack of feedback from readers. It is very difficult to maintain a regular column on a narrow subject without some contribution from the readers. Another factor, of course, is the declining interest in RTTY and the increase in Packet activity. Whilst I fully support the current progress with the Packet network, the RTTY decline is sad. My concern is that if the simple modes such as RTTY are not supported, the basic skill levels of amateurs will decline. These simple modes are a great way to understand the basic problems associated with data communications over radio - many of which are invisible to the Packet operator. That's quite enough of my opinions, so let's look at the future.

You will have no doubt noticed that, in recent months, I have concentrated on equipment reviews. The reason for this is that, in the past, been difficult to find room for these reviews in the main part of the magazine. Although I haven't received much feedback on this, it does appear to be a popular feature. In fact, it is part of my new brief to continue to review data comms equipment, so this aspect will continue.

I also have a commission to produce some new initiatives that you should see appearing over the next few months. As to the detail, I'm afraid you will have to watch the Editor's comment for the launch.

So back to this month, I thought it would be interesting to cover a slightly different area of data communications, but one that I know has much amateur interest. This is simply using your existing decoding equipment to listen to other services on the h.f. bands.

So what can you receive and what equipment is required?

There are many data services transmitted on h.f., but one of the most interesting is the Press Agencies. Although most of the major western agencies now use satellite links for their networks, there is still plenty to hear. Some of the easiest to receive, in the UK, are from the Middle East and, of course, these are so often topical. The most common format for these transmissions is a speed of 50 baud and a shift of 425Hz. The main languages used are French and English, so you can almost always find a Middle East country sending English news. The secret is knowing the transmission times, as all the Press stations operate to a fixed schedule. The place to find these schedules is the *Guide to Utility Stations* by Joerg Klingenfuss - this is available from the *PW* Book Service. The section to make particular note of is the Chronological Guide to Press Transmissions.

Just to get you started, here are a few stations you might like to try:

These stations use 50 baud and 425Hz shift. The format used is frequency, callsign and English transmission times.

10.543MHz, Y2V54, ADN Berlin, every hour on the hour.

8.030MHz, IRF50, ANSA Rome, on the hour most hours from 0700UTC to 2100UTC.

12.085MHz, RCB55, TASS Moscow, on the hour most hours from 0700UTC to 2100UTC.

7.959MHz, 9BC23, IRNA Tehran, 1000UTC then on the hour from 1500UTC to 2100UTC.

15.935MHz, SUA291, MENA Cairo, 1200UTC, 1700UTC, 2000UTC.

Another interesting mode that can also be very useful to the amateur is FAX. On h.f. the majority of FAX stations transmit a variety of weather charts. Besides giving interesting general weather information, the charts can be used very effectively for predicting propagation enhancements on the v.h.f. bands. The range of information sent is really amazing and ranges from

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Back-Scatter

basic surface predictions, much like the TV weather reports, through to details such as upper air wind directions and pressures. If you are interested in DX, it's possible, with standard amateur FAX equipment, to receive good quality charts from the Far East. These often include Chinese manuscript and Typhoon warnings!

The most common format used for these charts is a drum speed of 120 r.p.m. which is the same as that normally used by amateurs. The IOC. is either 288 (the amateur standard) or more commonly 576. One very useful feature of most commercial FAX transmissions is that they are designed for automatic reception and so include standard start, stop and synchronisation sequences. This enables amateurs with suitable equipment to take advantage of this automatic mode. I'm sure many of you will have seen the impressive full disk Meteosat photographs. Well most people seem to think that the only way to receive these images is with specialist satellite equipment - not true! These images are in fact re-broadcast on l.f. by Offenbach Meteo on 134.7kHz. Although the images can be received on the simplest of systems, the best results are to be achieved with equipment that can receive the image with a fine grey scale.

For those who would like to try their hand at satellite image reception, the following list of frequencies and times should help:

134.2kHz, Offenbach Meteo, 0103UTC, 0144UTC, 0315UTC, 0643UTC, 0852UTC, 1225UTC, 1244UTC, 1300UTC, 1539UTC, 1843UTC, 2143UTC,

12.730MHz, USCG San Francisco, 0326UTC, 0339UTC, 1503UTC, 1515UTC, 1741UTC, 2030UTC, 2041UTC.

16.410MHz, USN Norfolk, 0200UTC, 0515UTC, 0545UTC, 0745UTC, 1115UTC, 1400UTC, 1715UTC, 1745UTC, 1945UTC, 2315UTC.

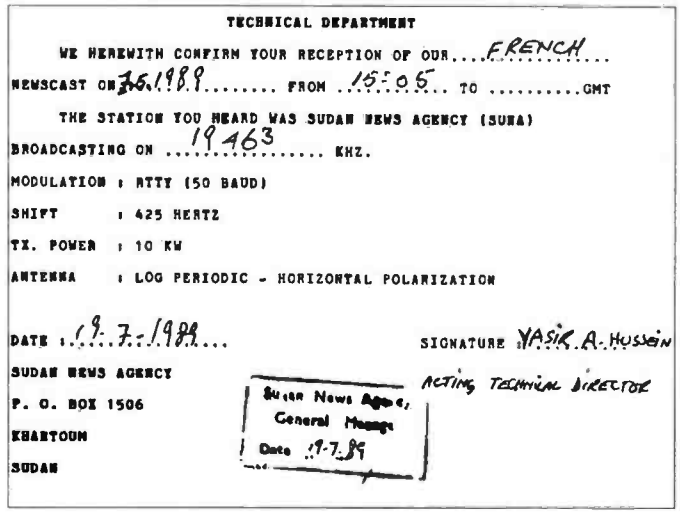
For the reception of straight forward charts, the following stations are worth monitoring:

13.597MHz, Rome Meteo, IMB 56.
4.782MHz, Bracknell Meteo, GFE21.
10.536MHz, CFH Halifax Canada.
13.882MHz, Hamburg Meteo, DDK6.
8.454MHz, Athens Meteo, SVG4.

Finally on the FAX front, press pictures from Buenos Aires can be received on the following frequencies, providing your equipment can receive 60 r.p.m. 288 IOC. images.

17.672MHz, LQZ 67
10.720MHz, LRB 72
13.753MHz, LRB 75
10.679MHz, LRN 2
18.433MHz, LRO 83
18.093MHz, LRO 84
21.770MHz, LRO 89

For more details of FAX stations, the *Klingenfuss Guide to Facsimile Stations* is very good.



TECHNICAL DEPARTMENT

WE HEREWITH CONFIRM YOUR RECEPTION OF OUR....FRENCH....
NEWSCAST ON 26.7.1989..... FROM ..15:05.. TO .....GMT
THE STATION YOU HEARD WAS SUDAN NEWS AGENCY (SUNA)
BROADCASTING ON ..... 19463 KHZ.
MODULATION : RTTY (50 BAUD)
SHIFT : 425 HERTZ
TX. POWER : 10 KW
ANTENNA : LOG PERIODIC - HORIZONTAL POLARIZATION

DATE : 19.7.1989... SIGNATURE YASIR A. HUSSEIN
SUDAN NEWS AGENCY — ACTING TECHNICAL DIRECTOR
P. O. BOX 1506
KHARTOUM
SUDAN

Sudan News Agency, General Manager, Date 19-7-89

Fig. 1: Some utility stations will even QSL if you send a good report as this card from the Sudan News Agency illustrates

Interference Help

I think most operators who use computers with radio will at some time have suffered interference either with the radio affecting the computer or vice versa. One of the most useful aids to solving these problems is the ferrite bead or ring. The only snag being when you want to use a bead or ring on a lead with a moulded plug. The simplest solution is to use a split ferrite bead that can be fitted on the lead without detaching the plug. One supplier of these beads was TMP Electronics run by GW3TMP. The latest news is that he has now sold TMP and started a new company called Ferromagnetics. Besides selling a useful range of split ferrite beads, he also carries a range of iron powder and ferrite toroids. These are of particular interest to the home constructor as they have many applications in r.f. design. For more information the Ferromagnetics address is: PO Box 577, Mold, Clwyd, North Wales CH7 1AH.

Readers Letters

I have a heartening story for this month. Regular readers may remember that I recently made a plea on behalf of a Bulgarian amateur for details of RTTY and c.w. software for the Dragon 32 computer. Milen LZ2MP recently wrote to tell me that he had received a parcel containing RTTY and c.w. programs on tape, complete with user manuals and the *Radioteletype Press Broadcast Handbook*. The surprising point about the parcel was that it was sent anonomously! So if the sender is reading this, Milen has asked me to pass on his thanks for a very generous gesture.

BARTG Sandown Park Rally

A last minute reminder of this popular rally that takes place on Sunday September 9 at the Sandown Park racecourse near Esher. I will be on the *PW/SWM* stand, so please come and have a chat.

Finale

Well, that's about all from me, but before I go, I would like to thank all the readers and suppliers that have supported the column over the past couple of years. I will still be contributing the 'Decode' column in *Short Wave Magazine* - join me there.

Back-Scatter

Amateur Satellites

Reports to
Pat Gowen G3IOR
17 Heath Crescent
Hellesdon, Norwich, Norfolk NR6 6DX

Microsat Status Report

Harold Price NK6K, has provided via the AMSAT News Service a complete run down on the ongoing MICROSAT Bulletin Board System (BBS) software development effort. Working in close collaboration with Harold is **Jeff Ward K8KA**, at the University of Surrey (UoS) on the UO-14 BBS Software. The following is a brief synopsis of the current progress.

It was earlier decided to use UO-14 as a test bed for all of the MICROSAT BBS development work, and Harold points out that there are several advantages to this. Firstly, all software developed for UO-14 is completely portable to the MICROSATs due to the programmers call for high-level Application Programming Interfaces (API). The APIs hide the differences between the different computer architecture of the MICROSATs and UO-14. They perform the 'nitty-gritty' tasks that are peculiar to the hardware of a particular computer system. For example, one of the most common tasks performed by all computer systems is Input/Output (I/O) operations. Thus, to the programmer it makes little difference if the BBS Software he or she is writing is for the MICROSATs or for the Packet Communication Experiment (PCE) on UO-14, as long as he uses the APIs.

Another advantage for using UO-14 as a test bed is the 9600 baud uplink/downlink that it uses. Harold says that he can load in new software in two passes of the satellite as compared to eight passes for the MICROSATs, as the MICROSATs use the much slower but more common 1200 baud rate. Furthermore, UO-14 has a completely separate computer system for the PCE operations. The UO-14 On-board Computer (OBC) which controls the satellite is unaffected by what happens with the secondary PCE computer. So if the the BBS software crashes, UO-14 will continue to operate normally. If the BBS software causes a crash of the OBC on a MICROSAT, a great deal needs to be reloaded. Although an OBC crash doesn't put a MICROSAT at great risk, it is inconvenient to the users. Except for DOVE, most software reloads of a MICROSAT OBC are not very difficult to accomplish.

Now to go through the list of MICROSATs to give the present status for each one.

AO-16

AO-16 is in good shape. RAM memory tests are now virtually complete in preparation for uploading the BBS software, which was targeted to be installed and operational by August. Until then digipeating operation will be possible. A-O-16 PACSAT is on 437.025MHz, in the same orbit as all the other MICROSATS, but appearing some 25 minutes ahead of UOSAT-OSCAR-14.

DO-17

DOVE flies again! Until mid July, DOVE

Back-Scatter

DO-17 was still transmitting on 'S'-Band only, but was getting top priority ranking for the recovery effort. Full re-emergence was delayed due to an unexplained anomaly in the S-Band transmitter, and **Bob McGwire N4HY**, had to rely exclusively on this S-Band transmitter because the 145MHz transmitter blocks the 144MHz receiver on DOVE. This anomaly required him to use his considerable programming skills in writing special Digital Signal Processing (DSP) software to work around this problem.

Bob was connected through a phone patch to the Boulder Colorado QTH of **Bill McCaa K0RZ**, in order to take advantage of Bill's high quality S-band station in an intense effort to bring DOVE back to life on two meters, because Bob's own s.h.f. station was some 5dB short of the S/N ratio needed for reliable reception. Thus, whilst Bill K0RZ provided his downlink station, Bob used his own 145MHz station to uplink the software to DOVE. In what amounts to an all-time packet radio first, he listened by ear for the 'ACK' acknowledge packets to decide if he needed to re-send each 128 byte packet. N4HY was using his own special bootloader to upload 50000 bytes of software instead of the resident ROM based MICROSAT Bootloader (MBL). (This new DOVE bootloader will only send an 'ACK' when it receives a good packet stream, but will never send 'NACK's). If N4HY therefore did not hear an 'ACK' for a particular uplinked packet, he assumed that the packet was not received by DOVE, and he manually sent it again. This 'auditory' packet software loading technique worked well. Although many might view this as a futile effort, N4HY has chided himself for not thinking of this technique several months ago. As he himself puts it: "What a hack ...but no reason it shouldn't work!" It did, and the primary ingredient to making it happen was the outstanding S-band station of K0RZ.

On Saturday July 7, after the success of all of the above patient work, DOVE again crashed, so evidenced by MBL transmissions from the S-Band beacon. Analysis was immediately undertaken to determine whether the crash was due to a problem in one of the tricky software upload sessions or, less likely, another hardware problem. On Sunday July 8 at 0230UTC N4HY was able to successfully command DOVE back on 145.825MH and, for a short time, the familiar ASCII telemetry was heard again. However, by the time DOVE reappeared over North America at around 0500UTC, it was evident that its on-board computer (OBC) had crashed yet again! During the short time in which DOVE was sending its telemetry, K0RZ copied several minutes which N4HY subsequently studied to evaluate the health of the spacecraft. From these first few frames of telemetry, N4HY declared that DOVE's batteries were in excellent condition with the bus voltage showing 10.9V. Also, the RAM memory appeared to be in good condition. Overall, DOVE has survived its four month hiatus very well.

In spite of the initial setback in returning DOVE to regular service, N4HY and K0RZ persisted in loading software into DOVE using the 'auditory' method, i.e., using the ear to tell when a packet stream has been successfully received and then manually sending the next packet group. N4HY stated that he thought one of the probable causes of the OBC crash was due to his thinking he heard an Acknowledge packet when in fact there was no 'ACK' during the software loading process.

After a four month sojourn in a computer coma, DOVE OSCAR-17 finally returned to active service on July 22 at 0241UTC when N4HY commanded to keep its 145MHz transmitter on. As it passed over the horizon at his QTH, he knew immediately that the tedious and time consuming 'auditory' software loading process had been successful and that this time the on-board computer would not crash. Later, ZS6HKV heard DOVE's 145MHz beacon on 145.825MHz at 0650 and again at 0826UTC over South Africa. ZS6AKV and stations in Zimbabwe heard DOVE correctly sending ASCII telemetry for 2.5 minutes and then stop for half a minute, and then repeat this cycle again and again.

At the time of writing this story, DOVE's r.f. output power is about 250mW and will stay at that level until the battery bus voltage reaches 11V. Once the batteries have charged up the battery charging algorithm in the OBC will take over and automatically increase the r.f. output to 1.5W, and this will happen soon now that DOVE battery charging is back under software control. Whilst at first it may be difficult for those with a simple station, i.e., non-tracking antennas, to hear DOVE's 250mW, those blessed with beam antennas and low-noise preamps will not have any trouble receiving the ASCII telemetry. After careful analysis, N4HY has concluded that the problem which made the software reload of DOVE so difficult was caused by an anomaly in the 'AART', the Addressable Aysnchronous Receiver Transmitter board. The AART provides a bus which connects all the various modules of a MICROSAT to the On Board Computer and allows them to be controlled individually by the OBC. For reasons not yet clear to N4HY, the AART was not responding to the S-band transmitter, telling it that the OBC had correctly received an Acknowledge packet when software was being loaded using the 2m uplink command receiver. Therefore , when N4HY was listening for 'Acks' on his S-band down converter while uplinking, software was being loaded properly but the S-band was not sending the Acks as it was supposed to. The OBC was commanding that the Acks be sent, but the S-band transmitter wasn't "hearing" the command coming out of the OBC. N4HY says he now has an understanding of the problem and he and NK6K will be able to tailor their software to work around this problem. Bob says "it is not a dangerous problem, and the DOVE module is accepting commands".

DOVE is now back with us, and by the time that you read these words should be fully powered up, programmed and functional with its f.m. DIGITALKER to boot.

The many DOVE enthusiasts owe an enormous debt of gratitude to dedicated amateurs such as K0RZ, N4HY and NK6K for the time, ingenuity and sheer effort that they have put in to solve a problem that would have proved very difficult on a test bench in the MICROSAT Lab, and even more difficult to work with DOVE several hundred miles in space.

WO-18

Webersat-Oscar-18 is in good shape, and the third version of the imaging software has been uploaded. The Weber State University (WSU) engineers have added more 'tuning knobs' to the picture taking software in order to improve the contrast of the earth images. Additional information has been added to the image header giving the solar array currents and horizon sensor values when the picture was snapped. These added items will provide more information about where the lens was pointed at when the picture was taken. The impact detector, which was originally designed to indicate when WO-18 was hit by micro-meteorites, is being used to verify that the c.c.d. camera iris shutter has clicked. When the shutter is snapped, the impact detector instantaneously sees the vibration that the shutter operations cause in the spacecraft structure.

Each day several images have been downloaded, and those who have 'WeberWare 1.0' programs can turn the binary data into pictures on NTSC CRT screens. Finally, the 1.2GHz Fast Scan TV receiver was tested and the horizontal sync was detected. A full image is expected to require more gain and/or much more accurate antenna pointing.

OSCAR-18 WEBERSAT is in like orbit to UoSAT-OSCAR-15, but is heard some fifty minutes ahead on a downlink of 437.100MHz with its 1200 b.p.s. b.p.s.k. sending down the binary encoded pictures.

LU 019

LU-SAT Oscar-19 is working well. The r.f. power output is thought to have been varying because of the simultaneous operation of the c.w. beacon. Once the RAM memory checking software has been finished and checked out on AO-16, the same RAM memory check will be performed on LO-19. Eventually the AMSAT-LU Group will take over all the software development for LO-19 after the BBS version is installed. At the present time all general housekeeping and monitoring tasks are performed by the AMSAT-LU team. OSCAR-19 LU-SAT is on 437.150MHz 1200 b.p.s. b.p.s.k., in common orbit but arriving some one hour ahead of the functioning new UoSAT OSCAR-14.

UOSAT

Whilst faithful UoSAT-OSCAR-11 has been active with Whole Orbit Data sent down from channels 10, 11, 19 and 29, and the 'Digitalker' is regularly activated, a new version of the PCE Housekeeping Integration Task (HIT) has been uploaded to the UoSAT-OSCAR-14 spacecraft. In addition to providing telemetry and file broadcast, this version also incorporates digipeating. The digipeat callsign is UOSAT3 (SSID 0). All binary data (e.g. telemetry & broadcast packets) will now be sent from UOSAT3 to allow filtering with the LCALLS command). The Cosmic Particle Experiment (CPE) on UO-14 has been monitoring the Low Earth Orbit radiation environment since late April. On Monday May 21, at just before Midnight, the CPE picked up enhanced activity at high latitudes, in which the particle count rate grew by two orders magnitude, peaking after about 8 hours, so indicating that a solar flare had occurred. There was then a slow decay until about 2200 hours on Thursday 24th, when there was a very sudden increase in auroral region activity - again by about two orders of magnitude. This activity decreased rather more slowly, with further enhancement occurring on the evening of the May 26 and the morning of the 28th. Since then, the activity has decreased further, reaching its 'normal' level by June 1. Data from this experiment are collected and analysed at UoSAT Mission Control before being passed on to RAE Farnborough. Those readers who follow propagational phenomena and solar data may wish to keep an eye on this parameter to aid forecasting and prediction.

UOSAT-3 is sending long explanatory files on 435.070MHz 9600 b.p.s. f.s.k. describing its operating protocol, and will be the first of the new style Pacsats to be fully operational. It is in polar orbit passing UK roughly every 100 minutes between 0900UTC and 0100UTC.

U-o-15

UoSAT-15 is still as before, i.e. very dead, and no new information has come in on the status of this satellite. It rather begins to look like a total loss, and that the earlier enthusiasm expressed for recovery was more than a little over-optimistic.

AMSAT-OSCAR-13 Schedule

The new Transponder Schedule for AO-13 put into effect on July 3 is expected to continue into mid-October this year. The present transponder schedule for AO-13 is as follows:

Mode-B:	MA 003 to MA 165
Mode-JL:	MA 165 to MA 190
Mode-LS:	MA 190 to MA 195

(Mode S Beacon only)

Mode-S:	MA 195 to MA 200
Mode-BS:	MA 200 to MA 205
Mode-B:	MA 205 to MA 240
Off:	MA 240 to MA 003
Omni Ant on:	MA 240 to MA 060

Cross mode B and S QSOs are possible from MA 200 to 205. The current attitude estimate is BLON 207 and BLAT +1.

A-O 10

AMSAT-OSCAR-10 appears to be receiving sufficient solar energy to support

Back-Scatter

Mode-B transponder operations, therefore, the transponder is available for general use whenever AO-10 is in view at your location. Please DO NOT use the transponder if the signals are frequency modulating. The August estimate of AO-10's attitude was LON 24 deg LAT -9 deg.

Much activity has been heard on AO-10 centring around a popular calling frequency of 145.910MHz.

Pakistan/Sino 'Amateur' Satellite Launch

BADR-1, the 50kg first Pakistani 'amateur' satellite was successfully launched by a 'Long March 2-E' booster from the Xichang launch site in China at 0940 Chinese Summer Time on July 16 1990 according to SUPARCO, the Space and Upper Atmosphere Research Commission of Pakistan. BADR, an Arabic word meaning 'Dawn' and Urdu for 'New Moon' is a clone of the UoSAT-2 OSCAR-11 satellite, understood to have been created by two students from Pakistan earlier studying at the spacecraft laboratory at the University of Surrey. (They obviously learned their subject well!) The payload was placed into an elliptical rather low 198km perigee 982km apogee 28° inclination orbit Earth orbit, and is unlikely to last more than a few months before re-entry to atmosphere. The first Keplerian element set follows:-

Satellite:	BADR-1
Cat. number:	20685
Epoch Year:	90
Epoch Day:	198.08455059
Element set:	7
Inclination:	28.4931 deg
RA of node:	297.7287 deg
Eccentricity:	0.0562305
Arg of perigee:	138.0890 deg
Mean anomaly:	226.3844 deg
Mean motion:	14.90429605 rev/day
Decay rate:	1.9729e-03 rev/day^2
Epoch rev/Orbit:	16

Amateurs around the world have been hearing the BADR-1 145.825MHz transmissions, some thinking it was UoSAT-2 signal somehow mysteriously propagating from sub-horizon, whilst many thought it to be the new RM-1 RUDAK! It was heard up in northern Europe usually on two or three orbits coming between 2200 and 0330UTC in July, but may well be absent when you read these words. The signal compares in strength, format, sound and polarisation to UoSAT-11, and data modulation and/or modulation tones have been heard on the f.m. carrier but any data has yet to be interpreted by any AMSAT source. The transmitter can be also switched to 144.028MHz (!).

Reported by JA2PKI, BADR-1 1200 b.p.s. f.m. a.f.s.k. 8-bit Hex mode telemetry was heard at 2155UTC on July 18 by JR3FRF, who sends the following sample stating "It seems it means nothing".

80C080C0 808080C0 808080C0 8080C080
C08080C0 8080C0C0 C08080C0 C0C08080
C08080C0 8080C080 C08080C0 8080C080
80C0C0C0 80C0C080 C0C080C0 80C080C0
E080C0C0 C0C0C0C0 8080C080 80C0C0C0
80C0C080 C0C080C0 C080C080 C080C0C0

Bob McGwier N4HY, describes the new satellite as being "pretty loud" on the pass over him at 0545UTC on the July 21, when it was still sending the apparently random assortment of 80s C0s and 00s). Bob noted that "it was tumbling and has some deep fades and changes polarisation at a good rate. I expect the thing to re-enter fairly quickly".

Courtney Duncan N5BF, wrote "Signals are good. r.h.c.p. is favoured giving a stronger signal, with l.h.c.p. weakest with the satellite tumbling at a few r.p.m. Modulation is a constant tone, probably 2200Hz. No data whatsoever, whilst signal levels appear to be UoSAT class, i.e. one watt or so).

Reliable sources say that this is more a Pakistan government satellite rather than amateur, and it is thus rather surprising that our exclusive amateur space service band has been chosen, and in particular the very vulnerable 144.028MHz alternative frequency, upon which a digitised speech f.m. of a lady's voice giving numbers has been heard.

The uplink of BADR-1 consists of two command receivers operating simultaneously in the u.h.f. range, possibly in the range 432-438MHz. On-board experiments are in-house monitoring of sub-systems through telemetry, and the telecommand of the satellite. Two primary ground stations with facilities for tracking, telemetry and telecommand are already in operation at Karachi and Lahore.

The mission objectives of the BADR-1 project are stated by SUPARCO as: (i) to test the performance of indigenously developed satellite sub-systems in the space environment (ii) to perform experiments in real-time voice data communications between two user ground stations, (iii) to demonstrate store-and-forward type message communication, and (iv) to educate the country's academic, scientific and amateur community in the tracking and use of low Earth orbiting satellites. Planned experiments include the monitoring of the performance of satellite sub-systems, voice communication experiment between Karachi and Lahore via satellite, and store-and-forward type of digital communication experiment.

Further Studies Examine AO-13 Decay

Continuing analysis of AO-13's orbital decay situation, more work has been recently done by an orbital dynamics expert to characterise the nature of this problem more fully. Using a very large and detailed mathematical model of the earth's gravitational field and the perturbations to AO-13's orbit due to the sun and moon, the results show a mostly linear decay, but with a few perturbations in the perigee altitude until 1992. At that point the perigee altitude will start to trend upwards until early 1994 when it will reach a peak. Then it turns around and the mathematical model subsequently predicts that the perigee altitude will plunge to 200km by mid 1996. By late 1996 the maths model shows that AO-13's perigee will reach 100km and eventual re-entry into the earth's atmosphere.

The following statement has been received from **Dr Karl Meinzer DJ4ZC**, President of AMSAT-DL:

"Recently some information has been circulated stipulating the decay of the AO-13 orbit between 1992 and 1997. "Elliptic orbits with high inclination (like AO-13) are potentially unstable due to lunar-solar

Satellite	NOAA 9	NOAA 10	NOAA 11	METEOR 2/16	AO-18	AO-19
Int. Design	84-123A	86-073A	88-089A	87-068A	90-005F	90-005G
Object No.	15427	16969	19531	18312	20441	20442
Element Set	600	447	300	436	94	93
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	183.49384590	183.38641876	183.33527313	163.84350850	176.97428079	176.96688537
Inclination	99.1681	98.5974	98.9823	82.5504	98.7032	98.7032
RAAN	183.6778	210.9907	131.6607	293.7260	253.1910	253.1992
Eccentricity	0.0014744	0.0012582	0.0011228	0.0011310	0.0013374	0.0013755
Arg of Perigee	330.1865	223.1463	239.0064	270.3251	127.5597	127.1591
Mean Anomaly	29.8464	136.8731	120.9992	89.6614	232.6799	233.0849
Mean Motion	14.12606907	14.23850599	14.11639309	13.83651108	14.28891909	14.28960538
Decay Rate	0.00000257	0.00000322	0.00000632	0.00000219	0.00000253	0.00000328
Orbit Number	28614	19677	9110	14238	2212	2212
Nodal Period	101.995534	101.205892	102.065721	104.131187	100.834763	100.829926
P-drag	1.314E-06	1.609E-06	3.239E-06	1.192E-06	1.250E-06	1.621E-06
Increment	25.496067	25.301890	25.515106	26.161565	25.207670	25.206453
I-Drag	3.307E-07	4.048E-07	6.149E-07	2.979E-07	3.146E-07	4.078E-07
Beacon-ORG	137.620=APT 1707.0=HRPT	137.500=APT 1698.0=HRPT	137.620=APT 1707.0=HRPT	137.850=APT	437.0751/ 437.102MHz	437.15355/ 437.1258/ 437.125MHz
Ref. EQX	07 Jul 1990	05 Jul 1990	05 Jul 1990	12 Jun 1990	05 Jul 1990	05 Jul 1990
Orbit	28678	19715	9148	14238	2341	2342
HHMM.MM	0038.83UTC	0122.27UTC	0041.29UTC	2014.82UTC	0010.62UTC	0140.17UTC
Degrees W	106.12	89.75	158.72	270.82	23.19	45.58

Satellite	METEOR 2/17	METEOR3/02	METEOR 2/18	METEOR 3/03	FO-20	UO-15
Int. Design	88-005A	88-064A	89-018A	89-086A	90-013C	90-005C
Object No.	18820	19336	19851	20305	20480	20438
Element Set	308	517	252	159	89	98
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	183.01336308	183.68947808	184.07333203	164.03372894	181.28756712	181.08904202
Inclination	82.5436	82.5392	82.5207	82.5534	99.0372	98.7008
RAAN	338.8720	266.4541	215.7967	206.8168	225.3021	257.1434
Eccentricity	0.0015480	0.0015888	0.0013633	0.0014711	0.0541322	0.0011075
Arg of Perigee	285.5831	275.8492	327.4139	293.5623	19.0386	113.1419
Mean Anomaly	74.3808	64.0765	32.6182	66.3962	343.0149	247.0945
Mean Motion	13.84349406	13.16899574	13.83986282	13.15860486	12.83137855	14.28385889
Decay Rate	0.00000070	0.00000391	0.00000106	0.00000012	-0.00000155	0.00000151
Orbit Number	12223	9299	6776	3303	1842	2270
Nodal Period	104.078691	109.405477	104.105945	109.491630	112.2748	100.870461
P-Drag	3.804E-07	2.488E-06	5.765E-07	7.592E-08		7.470E-07
Increment	26.148496	27.480158	26.155484	27.501647	26.0823	25.216671
I-Drag	9.507E-06	6.171E-07	1.441E-07	1898E-08		1.879E-07
Beacon-ORG	137.300?=APT	137.300=APT	137.300=APT	137.300MHz	435.796/ 435.910MHz	435.120MHz
Ref EQX	5 Jul 1990	8 Jul 1990	06 Jul 1990	8 Jul 1990	03 Jul 1990	05 Jul 1990
Orbit	12265	9343	6817	3343	1878	2341
HHMM.MM	0110.54UTC	0046.68UTC	0053.93UTC	0148.24UTC	0147.18UTC	0130.02UTC
Degrees W	324.15	31.33	83.80	106.17	80.05	43.19

Satellite	OSCAR 10	OSCAR 11	RS10/11	OSCAR 13	AO-16	AO-17
Int. Design	83-058B	84-021B	87-054A	88-051B	90-005D	90-005E
Object No.	14129	14781	18129	19218	20439	20440
Element Set	530	753	242	134	89	92
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	177.47365882	179.89452450	183.91845192	174.93372292	176.98995664	178.98575390
Inclination	26.0107	97.9469	82.9272	56.9983	98.7039	98.7042
RAAN	197.5005	231.8719	316.9027	149.0018	253.1757	253.1818
Eccentricity	0.5961085	0.0011941	0.0013306	0.8978008	0.0012780	0.0012828
Arg of Perigee	154.3991	207.5607	76.9918	229.8967	126.8009	126.4283
Mean Anomaly	254.3150	152.4938	283.2787	44.7257	233.4351	233.8075
Mean Motion	2.05881318	14.65453589	13.72096336	2.09704095	14.28748643	14.28794920
Decay Rate	-0.00000041	0.00000934	-0.00000068	-0.00000147	0.00000338	0.00000431
Orbit Number	5292	33765	15160	1551	2212	2212
Nodal Period	698.984	96.322184	105.007971	686.805	100.844868	100.841600
P-Drag	-	4.279E-06	0	-	1.671E-08	2.130E-06
Increment	175.302	24.561656	26.377861	172.192	25.210207	25.209382
I-Drag	-	1.076E-06	0	-	4.204E-07	5.360E-07
Beacon-ORG	145.810/.987 MHz	145.826/ 435.025/ 2401.5MHz	29.357/.408, 145.857/.903 29.407/.453, 145.907/.953	145.812/ 435.651/ 2400.664MHz	437.02625/ 437.05130/ 2401.143MHz	145.82516/ 145.82438/ 2401.2205 MHz
Ref EQX	07 Jul 1990	08 Jul 1990	06 Jul 1990	03 Jul 1990	05 Jul 1990	05 Jul 1990
Orbit	5314	33872	15203	1571	2341	2341
HHMM.MM	0335.91UTC	0000.54UTC	0117.91UTC	1118.77UTC	0034.49UTC	0028.01UTC
Degrees W	142.96	44.91	348.66	302.95	29.19	27.56

Satellite	SALYUT 7	MIR	OKEAN 2	SPOT 2	MDS-1B	UO-14
Int. Design	82-033A	86-017A	90-018A	90-005A	90-013A	90-005B
Object No.	13138	16609	20510	20436	20478	20437
Element Set	359	771	36	259		173
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	183.89439158	183.89213145	85.25406192	183.68020540	53.75691501	182.88383264
Inclination	51.6003	51.8127	82.5304	98.7338	99.0783	98.6966
RAAN	224.6111	251.5145	174.0686	257.9780	124.4428	258.9496
Eccentricity	0.0001635	0.0010974	0.0020031	0.0001118	0.0001392	0.0012561
Arg of Perigee	9.8922	101.2360	178.8390	67.7178	105.8840	112.2042
Mean Anomaly	350.2132	258.9979	181.2867	292.4096	254.2514	248.0419
Mean Motion	15.65215552	15.82331915	14.72805655	14.20015693	13.94896401	14.28648317
Decay Rate	0.00032411	0.00020188	0.00006022	0.00000502	-0.00001487	0.00000383
Orbit Number	46731	25055	386	2294	218	2296
Nodal Period	91.938135	92.108050	97.8324913	101.484530	103.289741	100.851953
P-Drag	1.215E-04	7.614E-05	2.718E-05	2.527E-06	0	1.894E-06
Increment	23.371712	23.413423	24.587741	25.365882	25.822410	25.212048
I-Drag	2.990E-05	1.873E-05	6.790E-06	8.359E-07	0	4.764E-07
Beacon-ORG	19.953/142.417/ 925.240MHz	143.625=voice 186.130=data+ ranging 247.5=KVANT	137.400=VIS+ 2xradar		136.112MHz	435.070MHz
Ref EQX	08 Jul 1990	06 Jul 1990	29 Mar 1990	06 Jul 1990		08 Jul 1990
Orbit	46811	25104	427	2342		2341
HHMM.MM	0002.20UTC	0037.78UTC	0056.94UTC	0129.78UTC		0051.05UTC
Degrees W	87.55	57.50	28.90	44.91		33.44

Keplerian Tables

perturbations. This has been known for a long time, and, in fact, some Molniya satellites have prematurely decayed from this mechanism. AMSAT was aware of this problem and had a study performed by a NASA expert in the late nineteen seventies for the Phase-III programme. The conclusion of the study was that the perigee height can oscillate with an amplitude of ±1000km. As a consequence the minimum perigee height for the Phase-III satellites was chosen to be 1500km. On AO-13, 2500km was chosen for additional margin against decay".

The problem of orbit stability was addressed by **Victor Kudielka OE1VKW** (AMSAT-DL Journal 2, 90, pp. 5-7). OE1VKW discovered that the perturbations can have a longer 'time-constant' and thus result in much larger effects than previously believed. In particular he predicted a possible decay of AO-13 for early 1997. At this time we do not understand the discrepancy between the old study and OE1VKW's results. Since OE1VKW's results so far are in good agreement with the actual orbit of AO-13, there is little doubt that his computations are basically correct. The conclusion is inevitable that the old study was either too coarse, or that the change of the lunar orbit (18.6 years nutation period, 8.6 years period of perigee rotation) has invalidated the original study.

The publication of OE1VKW's work triggered a flurry of activity in the USA. In particular Bob McGwier N4HY, used a NORAD tracking program and found that a decay may happen as early as 1992. Bob states that he used the program as a black box without having user instructions. Unfortunately, the orbit situation is such that some very slight parameter changes have a dramatic influence on the lifetime. Also, numerical integration programs have many potential pitfalls. Bob writes "At this time, we can only conclude that the perigee height of AO-13 is coming down and this could lead to the loss of AO-13 during the nineties. It is unclear in what direction the orbit will be influenced by the onset of air drag and atmosphere expansion in the continuing high solar flux. It could either make the orbit more stable or accelerate the decay. Also it will be worthwhile to investigate if we have any means to prolong the life of AO-13 by exploiting the on-board systems. With the orbit of AO-13, we apparently were very lucky and very unlucky at the same time. We were lucky in that we used to our propulsion excess to increase the perigee height over the original figure just to 'buy margin' without a strong reason. But we were all agreed that it would have been easy to either wait after the first motor-burn for a sufficient RAAN change before the final burn thus eliminating the problem or to increase the perigee height even further. Certainly we will not be so blue-eyed with Phase-III-D. However, before all AO-13 users start to mourn the loss of this most popular OSCAR, keep in mind the old computer programming axiom, 'GIGO' (Garbage In, Garbage Out). At the present time this very large computer program used to generate these results is like a 'black box.' The analysts' answers are only as good as the assumptions that were used in building this computer program and the initial data available to work with. All AO-13 users are requested to keep this in mind when contemplating the impending re-entry of AO-13."

AMSAT-DL will make every effort to keep AO-13 in operation as long as possible. It is to be hoped that they can keep AO-13 until Phase-III-D is launched to give continuity of operation.

Back-Scatter

Propagation

Reports to
Ron Ham
Faraday
Greyfriars, Storrington, West Sussex RH20 4HE

Solar

In June, **Ron Livesey** (Edinburgh), using his 2.5in refractor telescope and a 4in projection screen observed 4 active areas on the sun's disc on days 16 and 25, 5 on days 19 and 22, 6 on the 15th and 17th, 9 on the 28th and 10 on the 30th. In Sevenoaks, **Cmdr Henry Hatfield**, operating his spectrohelioscope, identified 2 sunspot groups, 16 filaments, 8 quiescent prominences, many spicules and a plage almost flaring at 1135 on May 26, 2gps, 12fs and 12qps, through cloud, at 1430 on June 10, 1gp, 19fs, 9qps and a very dark long thin filament at 1025 on the 17th and 2gps, 11fs, 11qps, a few active plages and a short life small flare between 1115 and 1418 on the 29th and although Henry's observation was spoilt due to cloud on July 3 he did find 6 groups one of which was very wide. In addition he located 4gps, 13fs and 8qps at 1115 on the 6th, 3gps, 16fs, 12qps and many spicules at 1355 on the 8th, 1g, 22fs, 12qps, many spicules and a loop prominence at 0942 on the 11th, 1g, 22fs, 7qps and many spicules at 1137 on the 12th, 23fs, 13qps and a small 'hot spot' on the north-west limb at 1045 on the 13th, 14fs, 10qps and a few spicules at 1117 on the 14th, 1gp, 20fs, 11qps and many spicules at 1002 on the 18th, 1gp, 22fs, 10qps and many spicules at 0930 on the 19th, 2gps, 13fs, 12qps and a large filamentary q.p. on the east limb at 1130 on the 20th, 2gps, 19fs, 9qps and yesterdays large q.p. still on east-limb, at 1115 on the 21st and, despite trying to see through a heat haze, 2gps, 15fs and 15qps on the 23rd.

"The mean solar flux for June 1990 was 169 s.f.u.," wrote **Neil Clarke G0CAS** (Ferrybridge) who kindly sent his computer print-out, Fig. 1, showing a peak of 219 units on the 12th and a steep rise to 216 units toward the end of the month. The latter rise is not surprising after seeing the number of sunspots observed and drawn by **Patrick Moore**, with special apparatus, at his observatory in Selsey early on July 2 and 3, Figs. 2 and 3. In Bristol, **Ted Waring** counted 20 sunspots on the 8th and 44 on the 25th.

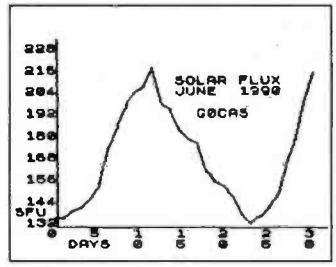


Fig .1

Henry also recorded radio noise from the sun at 136MHz on June 10 and 29, a few individual bursts on the 11th and 29th and July 20 and noise storms on July 5 and 6. **Ern Warwick** (Plymouth) heard variations in the background noise of his 28MHz receiver on June 27 and 29 and July 3, 5, 10, 11, 13 and 24.

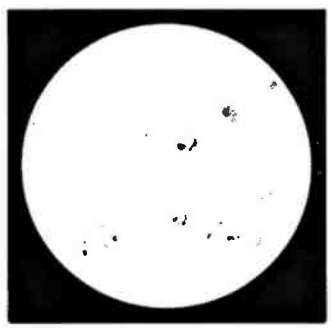


Fig. 2


Fig. 3

Auroral

Ron Livesey, the auroral coordinator for the British Astronomical Association, received reports of "red patches, multiple red and white rays, active red rays up to 90°, glow rays, pulsating rays and patches" from observers in Denmark and Nova Scotia for the overnight period of June 12/13. This was not reported from the UK due to summer twilight and cloud but the magnetic and radio records show that it would have been seen here on a clear winters night. Ron received reports of auroral reflected radio signals (tone-A) on the 50 and 144MHz bands during the early evening of the 12th from **Garry Hawkins** (Bristol), **Tony Hopwood** (Worcester) and **Doug Smillie** (Wishaw)

Magnetic

"June 1990 was mostly unsettled with the occasional quiet day," wrote Neil Clarke and pointed out the storm period from the 12th to the 14th which is clearly seen on the Ap index graph, Fig. 4, which he kindly prepared on his computer. The variety of magnetometers used by Garry Hawkins, Tony Hopwood, Ron Livesey, **David Pettitt** (Carlisle) and Doug Smillie also recorded strong magnetic-storms on the 12th 13th and 14th and Doug and Garry added "stormy" for the 7th, 9th and 10th.

Sporadic-E

"A real belter of an opening," said **Terence Burke** (Bradford) about the Sporadic-E disturbance on June 19, when he identified television pictures in Band I (48-68MHz) from Czechoslovakia, Finland, Hungary, Italy, Switzerland, the USSR and Yugoslavia. **Bob Brooks** (Great Sutton) saw a wide variety of programmes and test-cards from stations in Czechoslovakia, Denmark, Finland, West-Germany, Hungary, Iceland, Italy, Norway, Portugal, Spain, Switzerland, the USSR and Yugoslavia via Sporadic-E on days 20, 21, 22, 23, 26, 27,

Back-Scatter

28, 29, 30, July 1, 2 and 3.

In Basingstoke **John Woodcock** received pictures from Italy, Iceland, Spain and Sweden on the 18th, 19th, 20th and 22nd respectively and mixed-up and unidentifiable pictures on the 20th and July 5. I watched fluctuating pictures of the news from the USSR on Chs. R1 (49.75MHz), R2 (59.25MHz) and R3 (77.25MHz), between 1800 and 1900 on July 9 and 11 and almost saw the start of the opening around 1700 on the 13th while parked at Polsden Lacey, a National Trust property in Surrey. I noted that Band I was clear several times on the journey and again, before tea at 1615. However, a further check around 1720 revealed a mixture of pictures on Chs. E2 (48.25MHz) and R1. I also counted 40 very strong signals from East-European f.m. broadcasters between 66 and 73MHz around at 1810 on the 11th and 35 at 1940 on the 13th. Among the exceptional haul of Band I television stations identified by **Simon Hemer** (New Radnor) during the mid-June/July disturbances were pictures from Albania to Scandinavia, Jordan, Nigeria, Morocco and parts of the USSR.

Strong pictures on the three 'E' channels in Band I and several broadcast stations were found in Band II, from Spain, between 1900 and 2100 on July 25 and during an extensive opening around 1900 on August 1. I found a variety of pictures all fighting for predominance on most channels in Band I, at least 60 east-European broadcasters between 66 and 73MHz, pictures and sound on Ch. R3 and heard sync-pulses and the sound for Chs. R4 (85.25MHz) and R5 (93.25MHz) in Band II.

Some of the disturbances extended their influence down to 27MHz where Ern Warwick heard CB operators from Holland and Scotland on June 26, 28 and 30 and, on the 29th, he worked stations in Braintree, Goole, Ipswich and the north-west coast of Holland. Ern heard CB signals from Scotland again on July 2 and reports that around 1900 on the 5th, "Seems everybody from all over the UK can hear everyone else." He copied CB stations from Germany and north-west Ireland during the late afternoon of the 9th, northern-Italy at 1740 on the 14th and Holland and Scotland on the 18th. Ern uses a Barracuda transceiver and a 1.5m rod antenna for his normal CB activity and a Plessey receiver for tuning through that part of the spectrum.

Propagation Beacons

First, my thanks are due to Mark **Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Henry Hatfield, **John Levesley G0HJL** (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Ted Waring and Ern Warwick for their detailed 28MHz beacon logs from which I compiled the monthly chart of beacons they heard, Fig. 6. Ern Warwick also copied signals almost daily from IK6BAK (24.915MHz), PY2AMI (24.931 and 18.100MHz), OH2B, ZS6DN/B, 4U1UN/B and 4X6TU/B (14.100MHz) and DK0WCY (10.144MHz). On less frequent occasions during the period he heard JA2IGY, KH6O/B and LU4AA on 14.100MHz.

Tropospheric

The slightly rounded atmospheric pressure readings for the period June 26 to July 25, Fig. 6, were taken at noon and midnight each day from the barograph (see the weather supplement in this issue) installed at my home in Sussex.

While the pressure was hovering around 30.2in (1022mb) at 1830 on July 9, I heard French stations at good strength around 95, 98 and 100MHz. As the high pressure declined on July 12, I received negative pictures from France, in Band III, on my Plustron TVR5D with its own rod antenna, while parked at Chiddingstone, Kent. At 1600 and later that evening from home I noted cochannel interference on some stations in the u.h.f. bands. The troposphere really opened next morning when between 0730 and 1030 I counted 25 predominantly German stations in Band II and received strong pictures in colour, from four German stations in Band III. Between 2132 on the 11th and 0210 on the 12th **Marc Henry** (Evesham) heard about 27 broadcast stations in Band II on his Roberts R25 portable ranging, over a triangle, from Holland to Guernsey and inland to Bedfordshire.

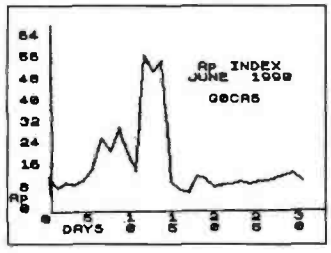


Fig. 4

934MHz

"Things opened up quite a bit on 29 June," wrote **Mick Miller UK-569** (Leigh-On-Sea) having worked stations in Cambridge (EMT), Diss (EM-99) and Ely (FB-02). "All good contacts for me as my station is normally dead, north from my QTH," said Mick who is also active in the world of amateur radio with the callsign G7EGX. During the late evening and early hours of July 13/14, Hampton Court DX Group member, **Terry Wyatt UK-845** (Walton-on-Thames), was delighted to renew contacts with FB-02 in Cambridgeshire at 125km, NL-1 (Lincolnshire) at 200km and TJ-355 (Leicestershire) at 155km and to work for the first time EMT-48 (Cambs), GB-933 (Bucks), HT-19 (Warwicks) JP-92 (Staffs), NG-35 (Northants) and UK-1210 and UK1478/M in Sussex all between 56 to 190km.

R.S. Petrie G7GDY (Yeovil) also operates a DELTA ONE, with a NEVADA PA7E collinear on 934MHz from his location 70m a.s.l. and on July 25, he contacted a station in Brixham at 90km. While the pressure was high in July, John Levesley UK-627, heard GY-186 and/or JY-604 in Guernsey and Jersey respectively, at about 160km on days 1, 8, 15, 16, 17 and 25 and worked GY-186 on days 2, 14 and GY-186 and MARN-9/MM on the 21st.

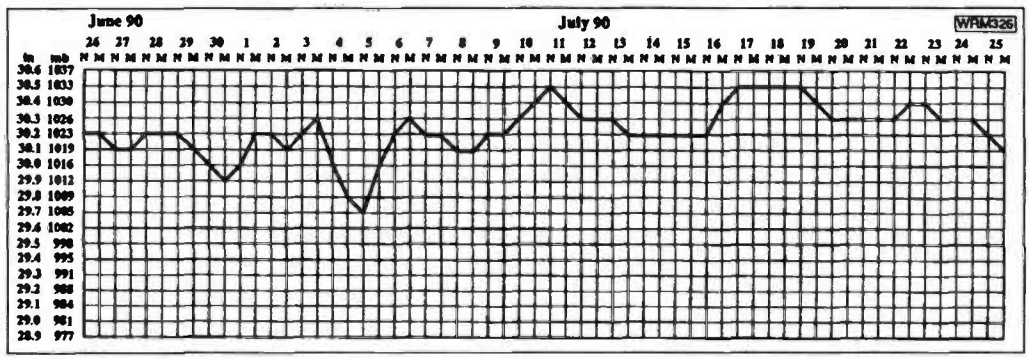


Fig. 5

Beacon	June 26	27	28	29	30	July 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
DF0AAB	X		X	X	X	X	X	X	X	X	X	X	X	X																
DF0THD			X		X												X		X	X	X		X	X						
DL0IGI	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X		X	X	X	X	X		X	X
EA3JA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
HG5GEW			X	X	X	X	X		X	X				X	X	X	X	X	X		X	X	X		X			X	
IY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LA5TEN	X			X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X		X	X			X			
LU1UG				X	X				X			X																		
OK0EG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X		X			
OH2TEN	X			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X						
PI7BQC																							X							
PI7ETE	X				X																									
PT8AA		X					X																							
PY2AMI	X	X		X	X	X			X	X	X	X	X	X	X	X	X		X	X	X	X		X			X			X
PY2GOB														X																
SK5TEN	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X						X
VK2RSY															X		X													
VK5WI		X													X															
VK6RWA		X		X	X										X					X		X	X		X				
WA4DJS	X				X			X								X								X					
W3VD					X																									
YO2CHP														X																
ZD8HF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
ZS1LA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
ZS5VHF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
ZS6PW	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Z21ANB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4N3ZHK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
5B4CY	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5Z4ERR	X	X			X								X															X		

Fig. 6

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ARP35	1.50	ECC82	0.95	EF89	1.80	EY86/87	0.75	PL508	2.00	UF41	1.85
ATP4	0.90	ECC83	1.50	EF91	1.60	EY88	0.65	PL509	5.35	UF80	1.80
B12H	6.90	ECC84	0.60	EF92	2.15	EZ80	0.80	PL519	5.85	UF85	1.45
CY31	2.40	ECC85	0.75	EF95	1.40	EZ81	0.80	PL802	6.80	UL84	1.50
DAF70	1.75	ECC88	1.25	EF96	0.65	GM4	11.05	PY80	0.90	UM80*	2.30
DAF96	1.35	ECC189	1.20	EF183	0.75	GN4	6.30	PY81	0.75	UM84	1.30
DET22	32.80	ECC804	0.65	EF184	0.75	GY501	1.50	PY81/800	0.85	UY82	1.10
DF92	0.95	ECF80	1.25	EF812	0.75	GZ32	2.90	PY82	0.75	UY85	0.85
DF96	1.15	ECF82	1.80	EFL200	1.85	GZ33	4.20	PY88	0.80	VR105/30	2.75
DH76	1.15	ECF802	1.80	EH90	0.85	GZ34	2.80	PY500A	2.10	VR150/30	2.75
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DY802	0.70	ECH42	1.65	EL34*	9.50	MX120/01	29.50	QQV03/20A	27.50	Z759	17.90
E92CC	1.95	ECH81	1.25	EL82	0.70	N78	9.90	QQV06/40A	28.50	Z800U	3.45
E180CC	9.80	ECH84	0.90	EL84	1.35	O82	1.70	QQV06/40A*	46.00	Z801U	3.75
E1148	0.75	ECL80	0.75	EL86	1.45	PCL82	0.95	QV03/12	7.40	Z803U	21.15
EA76	1.80	ECL82	0.95	EL90	1.75	PCL84	0.85	QY4/900	101.80	Z900T	9.50
EB34	1.15	ECL85	0.95	EL91	6.50	PCL86	0.80	SP61	3.20	1A3	1.90
EB91	0.60	ECL86	1.20	EL95	1.80	PCL805/85	0.95	TT21	47.50	1L4	0.95
EBC33	2.20	ECLL800	17.25	EL504	2.30	PD500/510	5.80	TT22	45.00	1R5	1.20
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Broadcast Round-up

Reports to
Peter Shore

One never knows what will happen next in the world as was proved at the beginning of August when Kuwait was invaded by Iraqi forces. Short wave radio broadcasts from Radio Kuwait's Main Arabic service stayed on the air after the occupation of Kuwait City, broadcasting music and brief announcements urging countrymen not to listen to the "false propaganda" being transmitted by Iraqi radio and television. Indeed, ITN news bulletins used actuality recording of Radio Kuwait in Arabic provided by the BBC Monitoring service at Caversham near Reading. On the day of the invasion, 2 August, the English service was unheard - it seems that the Iraqi forces made straight for the Radio and TV building with the aim of taking both off the air, or at least putting their own people in to broadcast to Kuwaitis. However, the Arabic programmes continued to be transmitted from a studio at the Kabd short wave transmitter site, south-west of Kuwait City. At the time of writing, neither the Arabic nor the English short wave services have been traced on their usual frequencies, although I have included all known pre-invasion frequencies later in this column. In response to the crisis, Arabic broadcasts from the BBC have been increased, and in addition the Burmese and Thai services have gained frequencies beamed to the Middle East for the benefit of the thousands of migrant workers in Gulf countries. Special services programmes from BFBS have also been arranged, and are transmitted over BBC World Service facilities - frequencies are given later.

HCJB in Quito has been making news with the introduction of tests using s.s.b. signals instead of the usual d.s.b. preferred by international broadcasters. Some readers may recall that Swiss Radio International tested s.s.b. transmissions some years ago, and it seems that the Swiss PTT, which operates the transmitting stations of the Swiss station has sold these old senders to the Ecuador broadcaster. Test transmissions are presently directed to Europe and South Pacific target areas, but there are plans to transmit on s.s.b. further afield. Earlier this year this column brought you news of Radio Scandinavia, a Swedish language service beamed to the Scandinavian countries from Poland. This commercial venture has folded for the time being, but the operator hopes to be back on the air by the year end, this time using the long wave frequency of 225kHz which Polish Radio's domestic service uses.

Financial difficulties in Belgium may mean the closure of the French language overseas service, RTBF's Radio 4 International. The Flemish speaking community operates BRT with services in English to listeners around the world and this appears not be threatened by the budgetary restraints facing its French counterpart. The separation of the Flemish and French communities in Belgium appears to be becoming more permanent in many areas of life - indeed under the country's "federalisation" process, radio and TV services were amongst the first to be separated.

Both BRT and RTBF are funded by licence fees, and RTBF feels that it receives only sufficient income to run either the domestic or the international service henceforth. The French service may consider co-operation with Radio France International in order to keep it on the air. In West Germany, staff at Deutsche Welle are rubbing their hands together with uncontrolled happiness at the thought of the demise of Radio Berlin International following unification at the end of this year. RBI operates 10 transmitters in the East, whilst DW has 32 around the world including 18 in West Germany. Staff at RBI have employment guarantIEd only until the end of December, and I suspect that it is unlikely that many would be able to secure positions with either DW or Deutschlandfunk. Radio Moscow has reorganised its Scandinavian coverage, with broadcasts in Finnish, Danish, Swedish and Norwegian all reduced. Finnish is now broadcast for 90 minutes each day, with the other three languages having just one hour long transmission between 1700 and 2000 UTC

In the United States, Voice of America's parent organisation, the US Information Agency, has announced that from October VoA, Radio and TV Marti and the Worldnet international television service are to be merged into a single governmental broadcasting unit. Richard Carlson who currently heads VoA will be in charge of this new organisation. This will do nothing to staunch the flow of critics who say that VoA is seen as a propaganda tool of the US government, and that its independence is waning by the day.

European Stations

Programmes from BFBS to the Task Force in the Gulf over the transmitters of BBC World Service can be heard :

0200-0230 on 7.125, 9.64 & 13.745MHz

0930-1000 on 15.205, 17.695 & 21.735MHz

1330-1400 on 15.195, 17.695 & 21.735MHz

Following the unprecedented opening up of the Eastern parts of Europe, news from Czechoslovakia that Radio Free Europe will broadcast in Czech and Slovak from transmitters located in Czechoslovakia itself. Agreement has been reached for RFE programmes to be transmitted between 0300 and 0540, and again from 1300 until 2210 on the medium wave frequency of 1.287MHz.

The Irish station, Atlantic 252, which is run by a company owned jointly by RTE and Radio Luxembourg, has extended its broadcasting hours on the long wave channel of 252kHz.

This frequency is also allocated to Radiodiffusion-Television Algerienne with a power of 750kW at night. Until the beginning of August, Atlantic 252 closed down at 1800, but now runs through until 0100, although power at night is reduced to 100kW, with the main target area the North and Midlands regions of England. Reports have come from the continent of reasonable reception despite interference from Algiers. Radio Netherlands English Service has made some changes to its output and frequencies, although the main European cast is still on 9.715 and 5.955 at 1130. At 1430 frequencies from the Flevo site in the Netherlands are 5.955, 13.77 and 17.605. The 1830 slot comes entirely from overseas relays and thus reception is limited in this country, but the frequencies in use are 21.685 and 17.605 (both from Bonaire) and 15.56 and 6.02 (from Madagascar). AT 2030 the West Africa transmission uses 15.56, 13.70 and 9.86 all direct from Holland. In the *Media Network* slot on Thursdays, some of the topics which will be covered in the next few weeks include on September 6 the jingle and promo industry in Europe and North America, whilst on September 13 the programme will be news based with reports from the WRTH offices in Amsterdam. There is an update on the NAB programmers conference in Boston on 20 September, whilst Asian news will feature in the programme of September 28 If you are new to international radio listening, make a note in your diary because on October 4 a new autumn season of *Media Network* will start off with a programme specifically for newcomers to the hobby.

African and Middle Eastern Station

I mentioned at the beginning of this column the tense situation in the Gulf, and here are some frequencies of the main protagonists in the Middle East to enable you to keep track of developments. Radio Baghdad in Iraq:

English is heard at 1900-2200 on 13.66 & 9.69MHz.

Arabic uses many frequencies during the day - try 12.025, 15.17 & 17.72MHz from 0700 until 1300; 9.605 & 15.40MHz from 1500 until 2300.

Radio Kuwait English was scheduled at 0500-0800 on 15.345MHz and at 1800-2100 on 11.665MHz. Arabic programmes scheduled for 15.505, 15.495 & 11.99MHz from 0600 until 2300.

Saudi Arabia English at 1600 until 2100 on 9.72, 9.705MHz.

Radio Damascus, Syria English at 2105 until 2205 on 15.095 & 9.95MHz.

United Arab Emirates, Dubai English at 1030, 1330 on 21.605, 17.865, 15.435 & 11.995MHz 1630 on 17.865, 15.435, 11.955 & 11.73MHz.

Radio Jordan English from 0500 until 1400 on 13.655MHz and from 1400 on 9.56MHz until close at 2200.

Elsewhere in the African region, the continuing conflict in Liberia which resulted in the evacuation of American citizens at the CIA listening posts outside the capital Monrovia has also affected broadcasting from that country. The religious station ELWA continues to be heard sporadically on 4.76MHz at various times of the day.

Asia and Pacific

All India Radio's General Overseas Service has made some changes to its frequencies for European broadcasts.

1845-1945 on 11.935, 11.86, 11.62, 9.91, 9.665 & 7.412MHz.

2045-2230 on 15.265, 11.715, 11.62, 9.91, 9.665 & 7.412MHz.

Hindi language transmissions to Europe are heard:

1945-2045 on 11.62, 9.91, 9.665 & 7.412MHz.

The Voice of Indonesia is traced for its European transmissions which start with Spanish at 1730 running through to English at 2000-2100 on 11.785 and 11.753, but also announces 9.675 and 7.125, neither of which are heard in the UK. Is anyone in a position to confirm these frequencies, or has anybody traced Djakarta on different channels?

Radio New Zealand International's current schedule from its recently installed 100kW transmitter in the North Island :

0000-0400 on 17.675MHz (daily).

0400-0715 on 17.675MHz (Monday-Friday).

0400-0645 on 17.675MHz (Saturday and Sunday).

0645-0800 on 17.675MHz (Sunday).

0645-1100 on 9.855MHz (Saturday).

0715-0830 on 9.0855MHz (Monday-Friday).

1750-1845 on 15.485MHz (Monday-Friday).

1845-1935 on 15.485MHz (daily).

1935-2205 on 15.485MHz (Sunday-Friday).

2205-2400 on 17.675MHz (Sunday-Friday).

There is an English language DX programme on the first and third Monday of the month at 0430 called *Mailbox*. Some programmes may be in regional languages such as Maori, Fijian and so forth between 1750 and 2030.

Sri Lanka has launched a 'World Service' English language programme noted at 1830 on 15.12MHz, with an additional channel announced of 9.72, although this has not been traced to date. Close down appears to be at 2000.

North, Central and South American Stations

Radio Havana Cuba transmits to Europe in English during the evening :

1900-2100 on 11.80MHz

2000-2100 on 17.86MHz

2200-2300 on 11.93MHz

During the morning period, Europeans can tune in to Spanish and Portuguese at 0630 and 0730 respectively on 15.23MHz. As mentioned at the head of this column, HCJB in Quito has been testing s.s.b. transmissions to Europe. Tests have been erratic so far but the frequencies to try are 25.95, 21.47, 17.79 and 15.155MHz. The power of the transmitters is 30kW and HCJB is using 20% carrier.

Meanwhile the *DX Partyline* programme has some interesting features during September, including DXing Peru on September 1st, a review of the

Back-Scatter

Panasonic RF-B40 receiver on September 8, and on September 15 the programme will be investigating the computer programs available for the Kenwood R-5000 receiver.

HCJB is offering an award entitled 'The World by 2000 Confirmed Stations Award' in cooperation with FEBC, TWR, KGEI, TWR and a number of other religious broadcasters. The award will be issued to listeners who have verifications from at least one World by 2000 station in each of the five geographical areas of Europe, the Americas, Africa, Asia and the Pacific. The verifications must include at least one from FEBC, TWR and HCJB.

In other words, TWR verifications from each of the five areas are unacceptable - FEBC and HCJB must also be represented. Photocopies of the verifications, with details of confirmations clearly shown, should be sent, together with one IRC for return postage, to DX Partyline, HCJB, Box 691, Quito, Ecuador. A special endorsement is available if entrants submit verifications from all ten stations.

Have you heard anything that Peter has not written about? If so, why not write and tell him all about it.

Back-Scatter

ATV

Reports to
Andy Emmerson G8PTH
71 Falcutt Way
Northampton NN28PH

Standstill on GB3ZZ

Britain's most dynamic amateur TV repeater has come to a stop - or at least a freeze frame. No, they haven't run out of funds or enthusiasm .... instead they have added a new gimmick to their repertoire of bells and whistles which make GB3ZZ the most advanced 'box' in Britain.

What the team has done is to add a user-controlled video recorder to the repeater. This incorporates a frame store which allows users to see what their pictures looked like before they dropped carrier (not everyone has 'look-through' or the ability to monitor the repeater while transmitting, and the freeze frame may be the only way that they can tell how their signals were going through the repeater). The video recorder is used exactly like any normal domestic v.c.r. but telephone-style DTMF ('touch-tone') tones are used to 'push' the buttons for PLAY, STOP, RECORD and so on. Users should remember to stop and rewind the tape after use, just like any other tape recorder, if only as a courtesy to other users.

All the new codes for controlling the v.c.r. and frame store are on page 29 of the repeater's INFOTEXT teletext pages (hit star 29 hash). If you leave a frozen image on the screen when you drop out, it will remain there until another user presses star 79 hash; this is to provide an easy method of leaving a general message for all users on the screen (typically latest news about a social event). All licence identification will occur as usual by Morse and the super-imposing system. The software has also been enhanced to allow networking to other repeaters and the links will be added after some experimentation with 10GHz equipment and some discussion with other TV repeater groups. This last feature would really bring ATV to life - at the touch of a few audio tones you could patch yourself through from Bristol to London or Brighton or Glasgow!

I'm pleased to advise that my mention in *PW* of the group's excellent newsletter *P5* drew them some extra members; they also had a very favourable mention in a feature article on amateur television in the May issue of *Camcorder User*. This is exactly the kind of exposure our hobby needs.

To Substitute Or Not To Substitute

If you're the constructional type or a person who restores old or non-working equipment you've probably come upon obsolete devices. By that I mean components which are no longer listed in the main catalogues, things like valves and early transistors and i.c.s. If you're lucky you will have an equivalents boom which lists a more modern device which is still easy to find. In this case you have no problem - obtain and fit the substitute. Good substitution books can be expensive but the little Babani ones are cheap and adequate for most purposes. Tandy stores will sell you their own cross reference book, and this is quite useful. Tandy has turned substitution into an art form ... they stock only a limited range of transistors but they have listed hundreds upon hundreds of other devices which their own range can substitute. Their book is so comprehensive it even lists some manufacturers' private 'in-house' transistor numbers.

Now you know the substitute, all you have to do is order it. But if there is no substitute you'll have to search for the real thing. If you know where to look you can often be lucky, so here is my list of 'good guy' firms, most of which have helped me in the past. Most valves and other components are not hard to find: we recommend Billington Valves (0403-210729), Kenzen (021-446 4346), Wilson Valves (04575-6114) and PM Components (0474-560521). For hard-to-find transistors I have heard of The Semiconductor Archives (081-691 7908) and Vectis Components Ltd. (0705-669885). Would you like to recommend other firms? If you think a firm gives good service please tell us all!

News From The Trade

Camtech have released another module intended for f.m. television systems; this time it's a video i.f. board intended for do-it-yourself receiver projects. The board itself, which is available either as a kit or fully assembled and tested, takes in a 40MHz signal from your receiver/downconverter and provides demodulated video and audio (6MHz inter-carrier sound). In fact there is also an on-board audio amplifier so you need add only a loudspeaker to hear as well as see what you are receiving.

Although this is a fairly complex project (180 components) it has been designed to require straightforward test gear and methods: comprehensive instructions are provided. The VAT-exclusive prices are £79.95 for the kit and £99.95 for the assembled model. Postage and packing cost £2 extra. The spec. sheet and price list are free though and you can have these by sending a stamped addressed envelope to Camtech Electronics, 21 Goldings Close, Haverhill, Suffolk CB9 0EQ.

Repeater News

I made a fleeting reference to GB3TN recently - the TN stands for Television Norfolk. It has already scored some DX contacts, from Sheffield for instance, and they can't wait for a bit of tropo enhancement across the North Sea. When not in use as a repeater the box transmits information pages in teletext format. More details from **Mark G4WVU** who lives locally to the repeater in Fakenham (I have details beyond these, which came from an anonymous informant!). TN also gets across the water to the south; it pops up regularly on the north Kent coast where it is seen by **G6GHP** and **G8GHH** in Westgate. It has also been spotted by G8SUY in Faversham.

And up in Yorkshire **GB3ET** on Emley Moor has been going from strength to strength. The team there had for a long while been concerned that the receiver was not as sensitive as it should be: the co-ax was now chief suspect. Well, they were right ... it was found to have five joints and water dripped out! A nice piece of LDF-450 is the replacement and what a difference this has made. One user who previously needed 4W to get in can now access the repeater with just 10mW! More good news ... the repeater has been seen on Germany. Yes, on 21st July Barry G6LIC was going through the repeater and was spotted by **Axel DF1XB** in JO53EF square, 40km south of Hamburg.

Much further south, work is in hand on the planned TV repeater for East Kent. It started in August with a meeting in Whitstable attended by eight ATVers and supported in spirit by others unable to come; this resulted in a vote to proceed. Site tests are now proceeding with a view to establishing a repeater at Dunkirk, Beltinge, Detling or Kent University. Anyone who wants to participate will be most welcome: the contact is **Andy G8SUY** who can be reached on Faversham (0795) 531541. Andy himself is now active on 24cm ATV with a p.a. as well.

Publicity Helps!

At the beginning of this article the Severnside Group remarked how important the printed word is in gaining attention and new members. Another club who think along these lines is ON5VL-T in Liege, Belgium. They have printed a smart information leaflet in order to gain a bit of publicity, and a copy dropped through my letter box recently.

The club has established a permanent station at Trooz, 276 metres a.s.l. and broadcasts go out from the studios there every Saturday starting at 1500. Transmissions, with intercarrier sound (5.5MHz of course), are made on channel 17 (the designation often used on the Continent for 70cm). The actual vision carrier is on 434.25, sound on 439.75MHz. Downconverters (to channel E4) are also sold by the club for viewers whose TVs don't already tune channel 17 (though most modern ones do). A special QSL card is also issued for new viewers' first reception reports.

All very simple stuff you may say ... but name me one British club which has set up a proper ATV studio - or goes out of its way in this fashion to promote 'looking-in' by non-amateurs! The leaflet goes on to say that visitors are most welcome every Saturday at the address given and invites them to join in this fascinating and rewarding hobby. What an excellent idea and a nice note to end on. I look forward to hearing from you what YOUR club is doing to promote our hobby in the wide world outside!

PW BOOK REVIEW

Practical Guide to Packet Operation in the UK by Mike Mansfield G6AWD.
Author-Publisher Mike Mansfield, Warrington, Cheshire.
69 Pages, £6.00
Available from PW Book Service , 75p post and packing

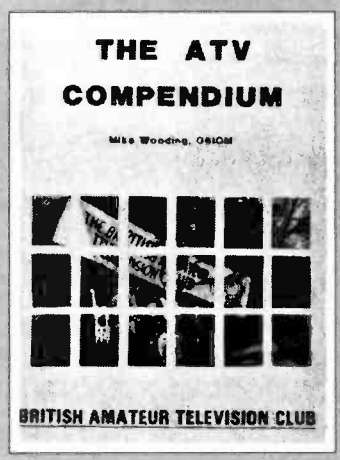
Packet radio seems to be a growth area in amateur radio in the UK, as is backed up the interest shown in 'Packet Panorama' in *PW*. Mike Mansfield's budget-priced handbook on the subject should prove useful to anyone taking up packet radio operation.

The newcomer is taken through a clearly written introduction with plenty of well-presented diagrams and graphics. His step-by-step approach guides the newcomer up to the stage where the whole sequence of commands are explained.

For a novice to packet, the book will serve to unravel many of its mysteries. The book will prove useful as a constant reference source - especially for the specialist jargon!

This book is designed for everyday bench use and uses the loose-leaf spirally bound technique. Doubtless packet fans as well as those who don't know much about this new mode will find it very useful.

The ATV Compendium
Mike Wooding G6IQM
British Amateur Television Club
ISBN 0-9513779-1-4
103 pages £3.00.
From PW Book Service,
75p post and packing



This book is a must for the amateur television enthusiast and those wanting to 'have a go'.

Packed with interesting articles - with the emphasis on home construction - this handbook will serve as an ideal introduction to the fascinating world of amateur television transmission and reception.

1990 Radio Amateur Callbook - International Listings
Edited by Marilyn Hertel and Donna Evans.
Radio Amateur Callbook Inc. Library of Congress Catalogue Card Number 65-31161. 1591 pages £19-50. From PW Book Service, 75p post and packing.
1990 Radio Amateur Callbook - North American Listings.
Edited by Marilyn Hertel and Donna Evans.
Radio Amateur Callbook Inc. Library of Congress Catalogue Card Number 65-30177. 1454 pages, £18-50. From PW Book Service, 75p post and packing.

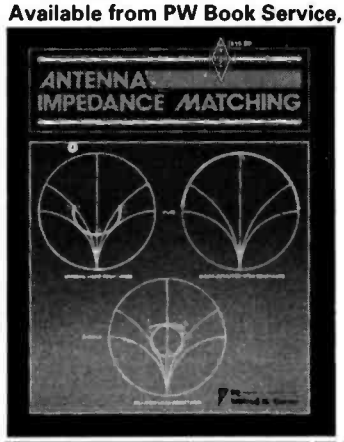
These annual publications have become a veritable institution. If you're a DX-hunting, h.f. bands operator, then these are the books for you!

For the s.w.l. or licensed amateur who wants to QSL direct, an up-to-date listing is essential reading. A copy is also useful to have in the shack to enable you to identify a particular station and get a good idea of what propagation conditions are like.

Useful items often come in pairs and these two books are a prime example. Even if you don't buy these books every year, when you do, buy them as a matched pair.

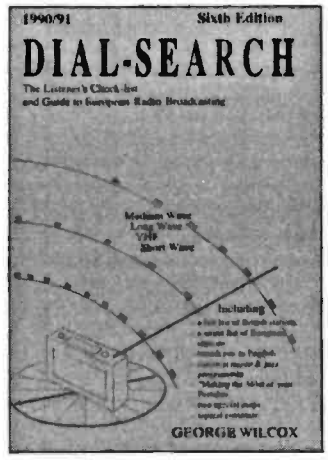
Both volumes are large and some of the entries are fascinating to read. If you're one of those people that enjoys reading maps and gazetteers you'll find hours of interest just finding where the exotic places are before **trying** to work them!

Antenna Impedance Matching
Wilfred N. Caron
ARRL ISBN 0-87259-220-0
192 pages, £11-95
Available from PW Book Service, 75 post and packing



If you are a really keen antenna constructor and designer this book could help you along the way. Packed with theoretical, practical and worked examples, the author leads the reader through many differing matching situations. There's an interesting section dealing with the old favourite 'the matching stub' and the Smith Chart is used in many of the worked examples. This book is an ideal reference work for the dedicated designer.

1990/91 Dial Search, Sixth Edition
George Wilcox
Author-Published ISBN 0-9508575-4-8
54 pages, £3-95 From PW Book Service, 75p post and packing.

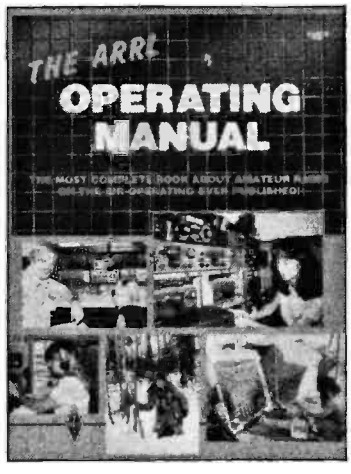


This handy little listeners' reference and data book has quickly established itself as being an essential guide to European broadcasting. The friendly, 'no frills' approach provides a great deal of information in a small package.

The detailed map sections - complete with the comprehensive 'how to use them' section - are by far the most useful section in an already very useful little publication. Recommended for radio amateur and listener alike.

The ARRL Operating Manual
Edited by Robert J. Halprin K1XA
684 pages, £12-95
Available from the PW Book Service, 75p post and packing

Although this book is undoubtedly aimed at the radio amateur and short wave listener in the USA and Canada, it will prove useful anywhere in the world.



The comprehensive book is a follow-on from where the *ARRL Amateur Radio Handbook* leaves off. Sections such as short wave listening, the amateur radio spectrum, basic operating, contests, operating wards, f.m. and repeaters, packet radio, and satellite techniques, clearly show that this book is in reality a handbook on amateur radio itself.

An excellent book, it is unusual in that it makes a good read. There aren't many books of this category that can claim that distinction. Well worth having on your bookshelf.

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