



DECEMBER 1986

# Q S X P E

THIS NEWSLETTER IS PUBLISHED BY THE  
PORT ELIZABETH BRANCH OF THE SOUTH  
AFRICAN RADIO LEAGUE.

P.O. BOX 10402  
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## PORT ELIZABETH BRANCH

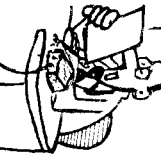
MEMBERS ARE REMINDED THAT THERE IS NO BRANCH MEETING DURING THE MONTH OF DECEMBER. THE NEXT BRANCH MEETING WILL BE HELD ON THE THIRD FRIDAY OF JANUARY, 1987.

### COMMITTEE



CHAIRMAN: BRIAN WELLER ZS2AB 303498  
 VICE CHAIRMAN: LIONEL COOMBE-DAVIS ZS2DD 321770  
 SECRETARY: MARGE WELLER ZS2DB 303498  
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 G.D.B.: OWEN WHEELER ZS2HZ 381310  
 LIBRARIAN: BEAVAN GWILT ZS2RL 306958  
 COLIN ASHMELL ZS2AD 312471

### BULLETIN ROSTER



	40 METRES	2 METRES	80 METRES
21 DEC	ZS2157	BOTTOM UP	ZS2AB
28 DEC	ZS2HZ	MIDDLE DOWN	ZS2RL
4 JAN	ZS2RL	MIDDLE UP	ZS2AB
11 JAN	ZS2AB	TOP DOWN	ZS2HM
18 JAN	ZS2DD	BOTTOM UP	ZS2RL

### SUNDAY BULLETINS

HF 40M - 7098KHZ (LOWER SIDEBAND)  
 80M - 5640KHZ (LOWER SIDEBAND)  
 VHF 145,700 AND 145,75MHZ

BRANCH FREQUENCIES  
 F.E. REPEATER 145,05/65  
 GRAHAMSTOWN 145,15/75  
 LADY'S SLIPPER 145,10/70  
 COCK-SCOMB 145,00/60  
 RTTY MAILBOX 145,35  
 VHF BEACON 144,910MHZ

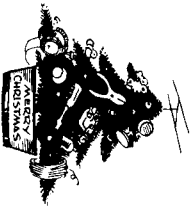


WE LIKE BEING YOUR BRANCH

in Gesënde Kerstees

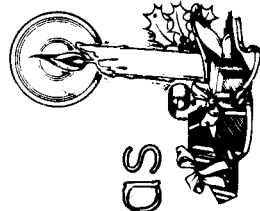
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Voorspoedige Nawe Jaar.





# Chairman's Christmas Message



AT THIS TIME LAST YEAR I WROTE OF THE UNCERTAINTY PREVAILING AMONG SOME OF OUR MEMBERS WHO WERE ASSOCIATED WITH THE MOTOR TRADE, AND EXPRESSED THE WISH THAT THEY, AND ALL OF YOU, WOULD FIND STRENGTH IN THE MESSAGE OF CHRISTMAS AND ENJOY A PEACEFUL 1986. WELL 1986 HAS ALL BUT GONE, AND SO HAVE A COUPLE OF OUR FRIENDS WHO MOVED TO PASTURES NEW. WE ARE ESPECIALLY PRIVILEGED IN THAT, BY WAY OF OUR HOBBY WE ARE ABLE TO MAINTAIN CLOSER CONTACT THAN ANYONE ELSE, WITH THOSE WHO MOVE TO ANY PART OF THE WORLD.

OUR HOBBY, UNLIKE SO MANY OTHERS, SEEMS TO HAVE BEEN ABLE TO RISE ABOVE THE INTERNATIONAL HOO-HAH AT PRESENT AFFECTING ALMOST EVERYTHING CONNECTED WITH SOUTH AFRICA, AND THIS SAYS SOMETHING ABOUT THE CALIBRE OF PERSON WHO ENTERS THE AMATEUR RADIO RANKS. LET US ALL, OVER THIS FESTIVE SEASON, SPREAD THE MESSAGE OF CHRISTMAS TO EVERY STATION WE WORK AND ENGENDER GOODWILL AND FRIENDSHIP. OURS IS TRULY THE ONLY HOBBY WHICH MAKES THIS POSSIBLE WITH GREAT EASE.

TO ALL OF YOU, MEMBERS AND YOUR FAMILIES, COUNCILLORS AND FAMILIES, OUR ADVERTISERS AND READERS IN THE BRANCHES, I EXTEND MY SINCEREST WISHES FOR A HAPPY AND BLESSED CHRISTMAS AND A PEACEFUL AND PROSPEROUS 1987.



## MOTION SUBMITTED BY P. E. BRANCH 1987 A.G.M.

THAT: THE SUBSCRIPTION PAYABLE BY A NEW MEMBER OR BY AN EX-MEMBER WHO WAS NOT A MEMBER DURING THE PREVIOUS YEAR, WHO APPLIES TO JOIN THE LEAGUE AFTER THE FIRST DAY OF SEPTEMBER OF ANY YEAR, BE SET AT ONE-TWELFTH OF THE PREVAILING ANNUAL SUBSCRIPTION PER MONTH FOR THE BALANCE OF THE CURRENT FINANCIAL YEAR. THE PREVAILING ENTRANCE FEE TO BE PAID IN FULL BY ANY SUCH APPLICANT.

### MOTIVATION

1. THE BRANCH FEELS THAT IT IS UNFAIR TO EXPECT A NEW APPLICANT WISHING TO JOIN SAY, IN DECEMBER, TO HAVE TO PAY THE FULL SUBS FOR THE YEAR, LIKEWISE AN APPLICANT JOINING IN MAY OR JUNE MAY BE DETERRED BY THE REQUIREMENT THAT HE PAY HALF-SUBS AT THAT TIME AND THE FULL RENEWAL ONLY A MONTH OR TWO LATER.
2. IT HAS HAPPENED IN THE PAST THAT A PROSPECTIVE MEMBER MAKING ENQUIRIES ABOUT THE LEAGUE LATE IN THE CALENDAR YEAR, HAS DECIDED TO WAIT UNTIL AFTER THE BEGINNING OF JANUARY TO JOIN, AND HAS THEN NOT DONE SO. THIS COULD CERTAINLY BE AVOIDED BY THE SYSTEM PROPOSED ABOVE.
3. ANY PROSPECTIVE MEMBER WHO DEFERS HIS APPLICATION TO JOIN UNTIL AFTER 1ST JANUARY IS LOST TO THE BRANCH AS FAR AS VOTING STRENGTH AT THE FOLLOWING A.G.M. IS CONCERNED.
4. WE ARE AWARE THAT COUNCIL HAS FROM TIME TO TIME "EXTENDED" THE MEMBERSHIP YEAR WITH OFFERS OF FULL MEMBERSHIP FOR THE COMING YEAR FOR THOSE JOINING BEFORE 1ST JULY. HOWEVER WE FEEL THAT SOME DEFINITE FINANCIAL CONCESSION WOULD PROVE VERY ATTRACTIVE TO PROSPECTIVE MEMBERS.



THIS AND THAT



CHRISTMAS GREETINGS: THE EDITOR AND STAFF WOULD LIKE TO EXTEND BEST WISHES TO COUNCIL AND THEIR FAMILIES, TO THE PRINTERS AND FAMILY, TO THE ADVERTISERS AND FAMILIES, TO ALL LEAGUE MEMBERS AND ESPECIALLY TO ALL BRANCH MEMBERS AND THEIR FAMILIES FOR A HAPPY AND BLESSED CHRISTMAS AND A PROSPEROUS AND HEALTHY NEW YEAR.

WELCOME: TO JOHNNY RIVERS, ZS2DQ WHO HAS JOINED THE BRANCH. MAY YOU ENJOY A LONG AND HAPPY ASSOCIATION WITH US.

: TO MIKE ZS2MJ AND JUNE ZS2JJ WHO HAVE MOVED TO FORT ELIZABETH FROM FORT BEAUFORT. WE HOPE YOU HAVE SETTLED IN WELL AND THAT WE'LL SEE YOU AT MEETINGS AND OTHER SOCIAL GET-TOGETHERS.

FAREWELL: WE ARE REALLY SORRY TO HAVE TO SAY GOODBYE TO DICK ZS2DH AND XYL LYNN WHO WILL BE MOVING UP TO DIVISION 6 ON TRANSFER AT THE END OF THIS YEAR. DICK HAS BEEN AN ENTHUSIASTIC MEMBER OF THE BRANCH AND A COMMITTEE MEMBER FOR TOO SHORT A TIME. WE WISH YOU AND THE FAMILY EVERY HAPPINESS AND SUCCESS IN YOUR NEW HOME.

CONGRATULATIONS: TO NEVILLE ZS2NR A SOCIAL MEMBER OF THE BRANCH. NEVILLE WAS PLACED AS THE DIV. 2 STATION WITH THE HIGHEST POINTS IN THE SINGLE-OPERATOR HOME-STATION SECTION OF THE RECENT V.H.F. CONTEST. WELL DONE, NEVILLE.

FIELD DAY: MANY THANKS TO ALL THOSE WHO PARTICIPATED IN ANY WAY WITH THE MOST SUCCESSFUL FIELD DAY HELD LAST MONTH. THERE ARE TOO MANY NAMES TO MENTION, BUT THANKS ARE DUE TO QUEN ZS2HZ WHO DID MOST OF THE ORGANISING. CONDITIONS ON THE BANDS WERE VERY GOOD, AND CONTACTS WERE MADE ON 160, 80, 40, 20, 15 AND 10 METRES AND THE POINTS TOTALACHIEVED WAS OVER 24 000. ONCE AGAIN WE HAD A VERY GOOD SITE OVERLOOKING THE LAKE FARM AND SEVERAL MEMBERS STAYED AND OPERATED THROUGH THE NIGHT. THANKS TO THOSE WHO LENT EQUIPMENT, ANTENNAS AND CARAVAN AND TO THE TWO OWNERS OF THE PROPERTIES WHERE THE STATION WAS SET UP.

LICENCES: DON'T FORGET THAT YOUR AMATEUR LICENCE IS DUE TO BE PAID BY THE END OF DECEMBER, SO MAKE SURE YOU BUDGET FOR IT AND AS SOON AS YOUR LICENCE RENEWAL FORM ARRIVES FROM THE G.P.O., GET THERE POST-HASTE - EXCUSE THE PUN!

FOR SALE:NATIONAL H.R.O. RX CLEAN AND WORKING. R30

VIKING RANGER MARK II TX WITH 6 METRES. IDEAL FOR THE NEW MAN. R100.

HUSLER 4 BTV VERTICAL ANTENNA. R75.

5MR METER. R15.

38 METRES RG 213 U EXTRA LOW LOSS 50 OHM COAX. R35 LOT.

ALL THE ABOVE GUARANTEED IN GOOD CONDITION. CONTACT DUBBLEY ZS2ZAW, 10 CROMWELL STREET, GRAHAMSTOWN, 6140.

10-TEC MODEL 405 BROADBAND SOLID STATE HF

LINEAR AMP. 80 - 10 METRES, 12V D.C. OPERATION, VOX OR PTT SWITCHING.

BUILT-IN POWER/SWR METRES, 1 WATT DRIVE, 50 WATT OUTPUT, WITH MANUAL AND

CIRCUITS. CONTACT BRIAN ZS2AB, PHONE 3035498.

RECIPE FOR LIFE TAKE A GOOD SOUND VESSEL, WIPE OUT ALL TRACE OF CLEANSER AND LEAVE A LITTLE WHILE IN GOD'S SUN TO DRAIN. TAKE THE MAIN INGREDIENTS - HEALTH, BEAUTY OF THE SOUL, MIX TOGETHER LOVE AND COURAGE, BINDING GRADUALLY THE WHOLE. SEASON THEN WITH TACTFULNESS, ADD A PINCH OF FUN. SIMMER UNTIL FINISHED AND LIFE WILL BE WELL DONE.

## SEARCHWATER



MARITIME RECONNAISSANCE RADAR OF THE FUTURE.

CERTAIN REQUIREMENTS HAVE BEEN LAID DOWN FOR IDEAL EQUIPMENT FOR PEACETIME AS WELL AS WARTIME SURVEILLANCE. THESE DEMANDING CRITERIA ARE ACHIEVED BY THE SEARCHWATER RADAR SYSTEM. THEY ARE ACHIEVED BECAUSE SEARCHWATER WAS DESIGNED TO THOSE STANDARDS. MOST SYSTEMS FOR ONE REASON OR ANOTHER TURN OUT TO BE MODIFICATIONS OF AN EQUIPMENT WHICH HAD ANOTHER ORIGINAL PURPOSE. SEARCHWATER WAS DELIBERATELY DEVELOPED AGAINST SPECIFIC TASKS. IN THIS ALONE IT IS UNIQUE. THE SYSTEM HAS ALSO BEEN BROUGHT TO OPERATIONAL CONDITION IN A SHORT TIME AND AT LOW COST. BEARING IN MIND THAT DEMONSTRATED SUCCESS SETS IT APART FROM ALL OTHER SYSTEMS. IN SHORT IT LEADS THE WORLD BUT DOES ITS JOB WITHOUT BALLYHOO AND 'SHOUTING FROM THE ROOF TOPS'. HOWEVER, THIS BRIEF ARTICLE IS AN OPPORTUNITY TO BRING TO THE NOTICE OF AS MANY AS POSSIBLE THAT CONTRARY TO THE DISPARAGEMENTS WHICH FOREVER APPEAR IN THE MEDIA, BRITISH ENDEAVOUR STILL LEADS THE WORLD. FOR OBVIOUS REASONS OF SECURITY IT IS NOT POSSIBLE TO PROVIDE AN EXTENSIVE TECHNICAL REVIEW OF THE SYSTEM.

BECAUSE ALL THE DESIGN REQUIREMENTS HAVE BEEN MET AND BECAUSE AFTER EXHAUSTIVE TESTS THE FIRST USERS HAVE DISCOVERED EVEN MORE EXTENSIVE CAPABILITIES IN PRACTICAL USE. SEARCHWATER HAS GONE INTO SERVICE WITH THE ROYAL AIR FORCE IN NIMROD MARK 2.

REQUIREMENTS.

THE MAIN REQUIREMENTS FOR SUCH A SYSTEM ARE AS LISTED BELOW;

1. DETECTION AND CLASSIFICATION OF SURFACE CRAFT IN ALL WEATHER CONDITIONS AT RANGES IN EXCESS OF THE RADIUS OF THE EFFECTIVENESS OF HOSTILE MISSILES.
2. TO PROVIDE A MEASURE OF OVERLAP IN CAPABILITY AGAINST OTHER THREATS, DETECTION RANGES ON SUBMARINE PERISCOPE AND 'SNORT' TARGETS SHOULD BE AS GREAT AS POSSIBLE IN SEA CONDITIONS UP TO THE MAXIMUM IN WHICH SUBMARINES MIGHT OPERATE.
3. THE RADAR SHOULD HAVE THE CAPABILITY TO DETECT AIRCRAFT AT LONG RANGES ALTHOUGH THE CHARACTERISTICS OF SUCH TARGETS ARE VERY DIFFERENT FROM SHIPPING.
4. CLASSIFICATION PERFORMANCE SHOULD BE AS COMPREHENSIVE AS POSSIBLE IN ORDER THAT IN A WARTIME SITUATION THERE COULD BE NO DOUBT AS TO WHETHER THE TARGET IS HOSTILE AND THAT IT IS A PARTICULAR TYPE OF VESSEL BEFORE MAKING AN ATTACK.
5. THE RADAR MUST BE ABLE TO OPERATE IN THE PRESENCE OF SEVERE COUNTER MEASURES.
6. IT MUST BE POSSIBLE TO UPDATE METHODS OF DECEPTION; THIS MEANS ACTIVE AND PASSIVE DECEPTION MEASURE.

THESE PARAMETERS BRING OUT THE COMPLEMENTARY MEASURES WHICH ARE DESIRABLE, SUCH AS THE ABILITY TO DISCRIMINATE BETWEEN REAL AND FALSE TARGETS. THIS HAS TO BE TRUE WHETHER THE DECEPTION IS BY WAY OF DISGUISSING ONE CRAFT TO LOOK LIKE ANOTHER, BY THE ADDITION OF REFLECTING DEVICES OR BY ELECTRONIC SYNTHESIS OF FALSE TARGETS.

IN MARITIME PATROLS THERE ARE LONG MISSION TIMES AND THEREFORE OPERATOR FATIGUE MUST BE TAKEN INTO ACCOUNT. IT FOLLOWS THAT THE PARAMETERS OUTLINED FOR THIS EQUIPMENT MUST LEAD TO A CONSIDERABLE INCREASE IN OPERATOR LOAD TIME. THEREFORE A MAXIMUM OF AUTOMATIC OPERATION IS REQUIRED IF SUCH A SYSTEM IS TO SUCCEED.

SEARCHWATER PROVIDES, FOR ALL CATEGORIES OF TARGET FROM PERISCOPES TO LARGE SURFACE VESSELS, A VERY HIGH PROBABILITY OF DETECTION COMBINED WITH A VERY LOW FALSE ALARM RATE IN HIGH SEA STATES OUT TO VERY LONG RANGES. THE MERE INCREASING OF SENSITIVITY OR THE REDUCTION OF BACKGROUND NOISE LEVEL WILL NOT IMPROVE THE TARGET DETECTION EFFICIENCY, ESPECIALLY IF THE SEA IS VERY ROUGH AND 'CLUTTER' RETURN EXCEEDS THE RECEIVER NOISE

LEVEL. THERE ARE A VARIETY OF TECHNIQUES WHICH CAN BE USED TO ATTEMPT IMPROVEMENTS IN THIS AREA.

IN THIS EQUIPMENT THE DOMAINS OF SPACE, TIME, FREQUENCY AND AMPLITUDE ARE ALL EXPLOITED: FOR EXAMPLE THE DIMENSIONS OF A PATCH OF SEA ILLUMINATED AT ANY MOMENT ARE KEPT SMALL IN AZIMUTH BY USING A NARROW BEAM WIDTH AND IN RANGE BY PROCESSING A NARROW PULSE GENERATED BY USING COMPRESSION TECHNIQUES. FREQUENCY AGILITY IS EMPLOYED AND THE TOTAL NUMBER OF RETURNS DURING THE TIME THE AERIAL BEAM TAKES TO PASS A GIVEN POINT IS INTEGRATED. INTEGRATION OF INFORMATION FOR THE WHOLE AREA OVER SEVERAL AERIAL SCANS RESULTS IN AN IMPROVEMENT IN TARGET DISCRIMINATION BECAUSE THE CLUTTER CHARACTERISTICS CHANGE WITH TIME. IN SEARCHWATER THIS METHOD OF IMPROVEMENT IS ACHIEVED BY USING A DIGITAL SCAN CONVERTOR FOR STORAGE OF INFORMATION FROM SCAN TO SCAN.

IMMEDIATELY AFTER THE DETECTION OF THE RETURN SIGNAL A THRESHOLD IS CONTINUOUSLY ADJUSTED USING A CONTROL SIGNAL DERIVED FROM THE INSTANTANEOUS CLUTTER LEVEL SO THAT, AS NEAR AS POSSIBLE, A CONSTANT FALSE ALARM RATE IS PRESENTED TO THE OPERATOR. THE COMBINATION OF ALL THESE TECHNIQUES ENSURES THAT THE DISPLAY IS VIRTUALLY FREE OF CLUTTER AND ANY NEW RADAR CONTACT IS IMMEDIATELY EVIDENT.

BY USING AN INTEGRAL REAL TIME DIGITAL COMPUTER MANY TARGETS CAN BE TRACKED AUTOMATICALLY AT ONE TIME. VARIOUS FORMS OF HIGH RESOLUTION DISPLAY ARE AVAILABLE FOR THE DETERMINATION OF THE CLASSIFICATION OF DATA ON TARGETS BEING TRACKED. INTEGRATED IFF (IDENTIFICATION, FRIEND OR FOE) FACILITIES PROVIDE ANOTHER USEFUL INPUT. INFORMATION ON THE TARGETS CAN BE DISPLAYED READILY IN ALPHA-NUMERIC FORM ON A SINGLE RADAR DISPLAY. AFTER A SHORT PERIOD OF TRACKING THE FILE ON EACH TARGET IS SO DETAILED THAT THE VESSELS CAN BE CLASSIFIED WITH GREAT CONFIDENCE WITHOUT THE NEED FOR VISUAL CONFIRMATION.

THE DISPLAY IS IN TELEVISION RASTER FORMAT ON A BLACK AND WHITE TUBE SO THAT BRIGHT FLICKER-FREE INFORMATION IS SHOWN TO THE OPERATOR. RADAR CONTROLS, MAINLY PUSH BUTTONS, ARE ARRANGED CONVENIENTLY AROUND THE DISPLAY AND THE OPERATING ROUTINES ARE SIMPLE SEQUENCES OF PUSH BUTTON AND ROLL BALL MOVEMENTS.

NO MEASUREMENTS ARE TAKEN DIRECTLY FROM THE SCREEN. THE BUILT-IN COMPUTER TAKES CARE OF MANY OF THE TASKS AUTOMATICALLY, CONSEQUENTLY THE OPERATOR CAN MAINTAIN A HIGH LEVEL OF EFFICIENCY FOR SEVERAL HOURS AT A TIME. THIS IS IN CONTRAST TO THE MORE USUAL LONG PERSISTENCE RADAR DISPLAYS WHERE OPERATOR PERFORMANCE IS SEVERELY AFFECTED AFTER ABOUT 30 MINUTES. THERE IS ALSO ANOTHER RELIEF FOR THE OPERATOR IN SEARCHWATER IN THAT THERE ARE BUILT-IN TEST EQUIPMENTS WHICH ENABLE AUTOMATIC DETECTION OF FAULTS AND THEIR DIAGNOSIS DURING OPERATION FLYING. THE MODULAR CONSTRUCTION AND THE USE OF SOFTWARE CONTROL ALLOWS EASY INCORPORATION OF PERFORMANCE IMPROVEMENTS AND CHANGES AS MAY BECOME NECESSARY.

WHY AIRBORNE SURVEILLANCE USING LONG RANGE AIRCRAFT EQUIPPED WITH A WIDE RANGE OF SENSORS IS ACCEPTED BY THE N.A.T.O. COUNTRIES AS THE MOST EFFECTIVE MEANS OF OBTAINING UP TO DATE INFORMATION TO ENABLE VITAL SEA LANES TO BE PROTECTED. THREATS TO NAVAL SURFACE FORCES ARISE FROM THREE SOURCES; SUBMARINES, AIRCRAFT AND SURFACE VESSELS.

OPINION IS DIVIDED AS TO WHICH OF THESE THREATS IS THE MOST DANGEROUS. WHATEVER THE OPINIONS THE FACT REMAINS THAT ALL THE AREAS OF THREAT MUST BE TAKEN INTO ACCOUNT IF THE PHILOSOPHY OF 'SEA CONTROL' IS TO BE MAINTAINED. THE MATTER PRESENTS PROBLEMS BECAUSE THE CHARACTERISTICS OF EACH TARGET ARE DIFFERENT FOR EACH THREAT. THIS OF COURSE MEANS THAT EACH IS LIKELY TO NEED A DIFFERENT APPROACH. THE ORIGINAL INTENTION WAS THAT SEARCHWATER WOULD FILL THE REQUIREMENT FOR USE IN MARITIME AIRBORNE PATROL. THE RESULT OF THIS WORK HAS PROVIDED THE MOST EFFECTIVE SENSOR SYSTEM WHICH IS LIKELY TO EMERGE IN THE NEXT DECADE.

DEALING WITH THE MARITIME SITUATION, IT IS CLEAR THAT THE MAJOR THREAT WOULD COME FROM FRIGATES, DESTROYERS AND CRUISERS. SUCH CRAFT ARE ALREADY FITTED WITH SURFACE TO AIR MISSILES WITH RANGES OF ENGAGEMENT WHICH PRECLUDE CLOSE EXAMINATION AND POSITIVE IDENTIFICATION OF THE NATURE OF THE THREAT. SINCE DEVELOPMENT OF MISSILES CONTINUES TOWARD GREATER RANGE AND LEVELS OF OPERATION, IT BECOMES MORE IMPORTANT THAN EVER TO PRODUCE A SYSTEM PROVIDING POSITIVE IDENTIFICATION QUICKLY. THE SAME SYSTEM IS DESIRABLE IN PEACETIME TO REDUCE THE FLYING TIME IN IDENTIFYING VESSELS BY VISUAL METHODS. WHERE THERE IS A CONCENTRATION OF VESSELS IT IS EXTREMELY IMPORTANT TO BE ABLE TO RECOGNISE INDIVIDUAL UNITS FROM A PLACE REMOTE FROM THE THREAT OF MISSILES. THE SAME CRITERIA RULE IF THERE ARE MANY VESSELS STRUNG OUT, FOR THEN THE NEAREST APPROACH MUST BE OUTSIDE THE MISSILE RANGE OF THE NEAREST VESSEL.

AT SUCH RANGES OPTICAL, INFRA-RED AND ELECTRO-OPTICAL SYSTEMS WOULD BE INADEQUATE. SUCH A SITUATION WOULD ARISE IN POOR VISIBILITY WITH LOW GRAZING ANGLES OR BECAUSE OF THE INHERENT RESOLUTION OF SUCH SYSTEM WOULD BE INCAPABLE OF MAKING POSITIVE IDENTIFICATION.

THE IFF SYSTEMS ARE NOT EFFECTIVE IN SITUATIONS OF CAUTION BECAUSE THEY CAN ONLY INDICATE THAT THE SHIP IS NOT AN ALLY. IF IT IS NOT IDENTIFIED AS AN ALLY THERE IS NO WAY OF DISCOVERING WHETHER IT IS A NEUTRAL VESSEL, A CIVIL VESSEL OF A HOSTILE SHIP. THE INTERROGATION OF ELECTRONIC EMISSIONS IS EQUALLY DIFFICULT. EXPERIENCE HAS SHOWN THAT THE ONLY POSITIVE SYSTEM IS ONE BASED ON RADAR. TO THIS END SEARCHWATER HAS TRANSCENDED ALL OTHERS.

ABILITY  
THE COLLABORATION OF E.M.I.E. AND R.S.R.E. HAS BEEN DIRECTED OVER A PERIOD OF YEARS TO THE IDENTIFICATION AND PRACTICAL EVALUATION OF THOSE TECHNIQUES MOST APPROPRIATE FOR THE LONG RANGE AIRBORNE SURVEILLANCE AND CLASSIFICATION OF MARINE TARGETS; DETECTION OF SMALL TARGETS SUCH AS THE SNORT OF A SUBMARINE, ITS PERISCOPE OR SMALL FAST PATROL BOATS AT LONG RANGE IN HIGH SEAS.

THE CURRENT STATE OF THE ART IS EXEMPLIFIED BY THE SEARCHWATER WHICH IS HIGHLY FLEXIBLE, BASED ON FREQUENCY AGILE TECHNIQUES USING COMPRESSION, PITCH AND ROLL STABILISED SCANNING ANTENNAS WITH CONTROLLABLE TILT AND AUTOMATIC SECTOR SCAN.

A NIMROD MARK 2 EQUIPPED WITH SEARCHWATER AND FLYING AT 20 000 FEET CAN DETECT A SUBMARINE SNORT IN ROUGH SEAS AT A RANGE OF 200 NAUTICAL MILES. SINCE NIMRODS ARE BASED ON ASCENSION ISLAND THIS COULD BE ONE REASON WHY ARGENTINA DID NOT RISK ITS SUBMARINES OR SURFACE FLEET IN THE SOUTH ATLANTIC.

BY FRANK W. HYDE. PRACTICAL ELECTRONICS SEPTEMBER 1982.



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CAPACITORS FOR COUPLING, DE-  
COUPLING AND FILTERING  
A BRIEF RESUME OF THEIR APPLICATION BY DR. CJD CATTO.  
(WITH ACKNOWLEDGEMENTS TO RADIO AND ELECTRONICS WORLD - JAN 1984.)

A GLANCE AT AN AUDIO CIRCUIT WILL REVEAL HOW MUCH SPACE IS TAKEN UP BY CAPACITORS, THE MAJORITY OF WHICH ARE FOR INTERSTAGE COUPLING, I.E. FOR TRANSFERRING THE AC SIGNAL. WHILST BLOCKING THE DC COMPONENT. IN PARTICULAR, THOSE CAPACITORS FOR OPERATION AT LOW FREQUENCIES CAN BE REALLY QUITE LARGE, AND IN THE AWKWARD CASE WHERE THE POLARISING VOLTAGE MAY REVERSE, IT IS NECESSARY TO USE A 'REVERSIBLE' ELECTROLYTIC. THIS IS, IN EFFECT, TWO CAPACITORS 'BACK-TO-BACK', AS ILLUSTRATED IN FIGURE 1 - A SOMEWHAT CLUMSY COMPONENT. THE ALTERNATIVE IN GENERAL IS TO KEEP THE IMPEDANCES HIGHER (E.G. BY USING FET'S), THEREBY PERMITTING SMALLER VALUES OF C. HOWEVER, IN THE CASE OF A POWER AMPLIFIER, HAVING A LARGE COUPLING CAPACITOR TO THE LOUDSPEAKER CAN BE AVOIDED IF A DOUBLE (BRIDGE-CONNECTED) OUTPUT STAGE IS EMPLOYED.

ANOTHER ANSWER IS TO APPLY SOME 'LATERAL THINKING' AND FIND WAYS OF REDUCING THE NUMBER OF STAGES. ONE OF THE MANY DISADVANTAGES OF TRANSISTORS OVER VALVES IS THAT COMPLEMENTARY DEVICES ARE AVAILABLE, THUS AVOIDING THE NEED FOR SO MUCH LEVEL SHIFTING. IN ADDITION, IT IS OFTEN POSSIBLE TO APPLY DC FEEDBACK OVER SEVERAL STAGES AND SO REDUCE THE NUMBER OF CAPACITORS.

RAIL DE-COUPLING

MOST POWER SUPPLIES ARE SITUATED SOME DISTANCE FROM THE LOAD AND, ASSUMING THE LATTER TO BE AN ARRAY OF IC'S OR OTHER ACTIVE DEVICES TAKING VARYING CURRENTS, IT IS NECESSARY TO 'DE-COUPLE THE RAILS'. THE OBJECT OF THIS IS TO REDUCE THE LOCAL VOLTAGE VARIATION  $V$  TO A MINIMUM (E.G. 100 MILLIVOLTS PEAK-TO-PEAK ON A 5V RAIL), BUT PARADOXICALLY THIS IS RARELY ACHIEVED BY EMPLOYING THE LARGEST AVAILABLE CAPACITOR. A SATISFACTORY ARRANGEMENT IS SHOWN IN FIGURE 2A, WHERE A 33nF CERAMIC CAPACITOR IS EMPLOYED IN A CONFIGURATION THAT HAS MINIMAL TRACK LENGTH. IN CONTRAST, THE LAYOUT SHOWN IN FIGURE 2B IS INEFFECTIVE AT HIGH FREQUENCIES.

AN EVEN BETTER COMPONENT TO USE THAN THE CONVENTIONAL CERAMIC CAPACITOR IS THE FLAT DEVICE RECENTLY INTRODUCED BY ROGERS CORPORATION WHICH CAN SIT DIRECTLY UNDER THE IC (SEE FIGURE 3). THE SERIES INDUCTANCE IS CONSIDERABLY REDUCED THIS WAY. THERE IS, OF COURSE, MUCH CLAIM AND COUNTER-CLAIM BY MANUFACTURERS OF CERAMIC AND PLASTIC FILM CAPACITORS. THE METALLISED-FILM VARIETY IS INHERENTLY SELF-HEALING, AS THE FILM AT A PIN-HOLE SHORT SHOULD MELT BACK AND CLEAR THE FAULT. HOWEVER, IT HAS BEEN CLAIMED THAT THIS MANIFESTS ITSELF AS BURSTS OF CURRENT, A TYPE OF NOISE OF WHICH ITS CERAMIC RIVAL IS BELIEVED TO BE INNOCENT.

RECTIFIER FILTERING

WHEN VALVES, WITH THEIR RELATIVELY HIGH VOLTAGES AND LOW CURRENTS, WERE IN GENERAL USE, THE TWO-SECTION CAPACITOR WAS FREQUENTLY EMPLOYED IN RECTIFIER-FILTER CIRCUITS SUCH AS THAT SHOWN IN FIGURE 4. THEN CAME TRANSISTORS AND LOW-VOLTAGE, HIGH-CURRENT POWER SUPPLIES WITH HIGH-CAPACITANCE ELECTROLYTICS, SOMETIMES TOGETHER WITH BIG IRON-CORED INDUCTORS. THE LATTER WERE SOON ABANDONED WHEN SERIES-PASS TRANSISTOR REGULATORS BECAME POPULAR.

THERE ARE MANY ADVANTAGES TO THE MORE RECENT SWITCHED-MODE REGULATORS, AND THEIR POPULARITY HAS BROUGHT HIGH-VOLTAGE ELECTROLYTICS BACK INTO FAVOUR, PARTICULARLY AS THESE ALLOW THE MAINS TO BE RECTIFIED DIRECT. THERE IS, IN ANY CASE, SOME ADVANTAGE TO BE GAINED IN STORING ENERGY AT A HIGHER VOLTAGE: FOR A GIVEN PHYSICAL SIZE OF CAPACITOR, CV IS FIXED BUT THE ENERGY STORED IS PROPORTIONAL TO CV(SQUARED).



HOWEVER, THE HIGH FREQUENCY PERFORMANCE IS NOW AN IMPORTANT CONSIDERATION IN PARTICULAR, THE EQUIVALENT SERIES IMPEDANCE SHOULD BE KEPT LOW, E.G. BY MULTIPLE-TAB CONSTRUCTION WHICH CAN TAKE THE POINT OF  $Z_{min}$  (SEE FIGURE 5) BEYOND 10 KHZ. REDUCING THE EQUIVALENT SERIES IMPEDANCE IS ANYWAY AN IMPORTANT GOAL, AND IT CAN BE ACHIEVED BY USING SUCH DEVICES AS THE MULLARD TYPE 106, FOR WHICH  $Z_{min}$  IS BELOW 10 MILLIOHMS (AT 10,000uP, 25V). AMONG THE SMALLER CAPACITORS, ALUMINIUM ELECTROLYTICS WITH 'SOLID ELECTROLYTE' ARE EFFECTIVE: THEY MAY BE SOMEWHAT LARGER THAN 'SOLID TANTALUM', BUT THE RIPPLE RATING IS MUCH HIGHER. FOR EXAMPLE, AT 150uF AND 6V, THE VOLUME RATIO IS 3:1 BUT THE RIPPLE RATIO IS ABOUT 10:1.

#### CASE HISTORIES

TO CONCLUDE - SOME PRACTICAL EXAMPLES THAT DEMONSTRATE THE ADVANTAGE TO BE GAINED THROUGH TAKING CARE OVER WHICH CAPACITOR TO USE:

\*A VALVE OSCILLATOR BEGAN TO PRODUCE A SMELL LIKE A DEAD RAT. THIS WAS TRACED TO AN OIL-IMPREGNATED PAPER AND FOIL CAPACITOR, WHICH HAD BECOME LOSSY AND WAS OVER-HEATING. IT WAS REPLACED BY A 'MIXED DIELECTRIC' (IMPREGNATED PAPER AND POLYESTER) TYPE -- AT A FRACTION OF THE SIZE AND COST -- AND THE CIRCUIT THEN CONTINUED TO WORK HAPPILY. A WORD OF CAUTION IN RESPECT OF THIS EXAMPLE, THOUGH: IN APPLICATIONS WHERE THE PULSE RATING IS MORE SEVERE (E.G. AROUND 1kV/uSEC) IT IS PREFERABLE TO USE THE MORE MODERN POLYPROPYLENE TYPE, AND EVEN THESE MUST BE DE-RATED ABOVE 10 KHZ.

\*IN ANOTHER CASE, A PAIR OF 47uF TANTALUM CAPACITORS ACTING AS THE FILTER OF A HIGH FREQUENCY RECTIFIER CONTINUALLY FAILED CATASTROPHICALLY AFTER LESS THAN 100 HOURS. IT BECAME EVIDENT THAT THEY COULD NOT HANDLE THE RIPPLE CURRENT: ALTHOUGH V WAS ONLY A FEW HUNDRED MILLIVOLTS, THE PRODUCT C V/ t WORKED OUT AT ONE AMP PER CAPACITOR. A MORE PRACTICAL EXPEDIENT WAS TO REPLACE THEM WITH A 100uH CHOKE FOLLOWED BY A GROUP OF FIVE 4u7 FILM/FOIL CAPACITORS. ALTHOUGH PHYSICALLY LARGER, THIS ARRANGEMENT HAS PROVED ITS WORTH BY SURVIVING THOUSANDS OF HOURS OF OPERATION. ALL THIS, TO MY MIND, GOES TO SHOW THAT, DESPITE THE INVASION OF DIGITAL CIRCUITS AND COMPLEX IC'S, CAPACITORS ARE STILL AN IMPORTANT SECTOR OF ELECTRONICS, ESPECIALLY WHEN IT COMES TO REDUCING V.

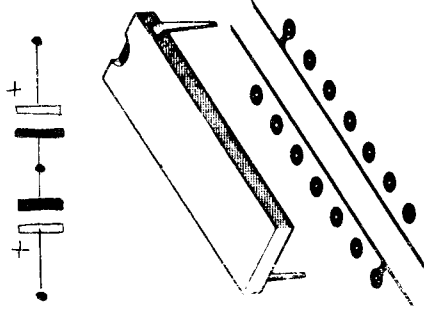


FIG.1 BACK-TO-BACK ARRANGEMENT OF CAPACITORS THAT COULD BE REQUIRED FOR INTERSTAGE COUPLING WHERE THE POLARISING VOLTAGE MAY REVERSE.

Fig 3 A foil capacitor of 47uF can successfully hold 1000V for multiple cycles before failure.

Fig 4 A type 206 electrolytic circuit

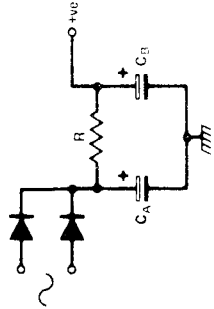
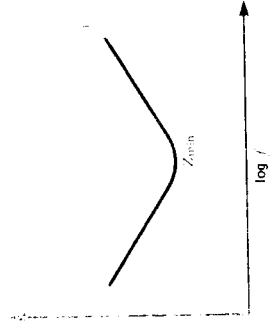
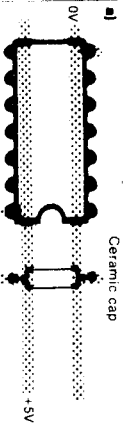
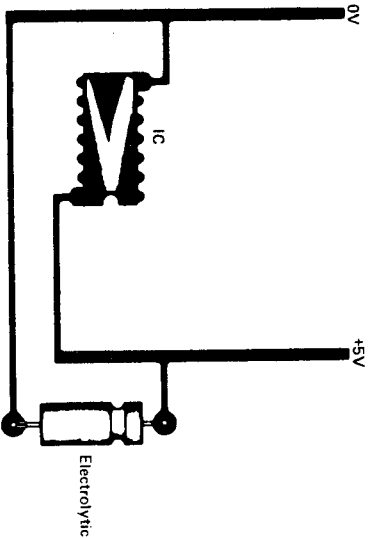


Fig 5 Typical dependence of impedance on frequency for a high-voltage electrolytic





**Fig 2 a)** Use of a ceramic capacitor for tail decoupling in a minimal "hard" logic configuration by Alter-Div. (low Q) which is useful for all high frequencies.



At Christmas, the miracle of the manger lives anew. May this holy time bring abundant blessings to you.

## COLUMBUS DIDN'T KNOW WHERE HE WAS

JUST AS YOU THOUGHT THERE WERE ENOUGH THINGS TO WORRY ABOUT, A COMPUTER HAS SHATTERED THE PREVIOUSLY IRONCLAD NOTION THAT COLUMBUS FIRST LANDED IN AMERICA ON WARLING, NOW BETTER KNOWN AS SAN SALVADOR.

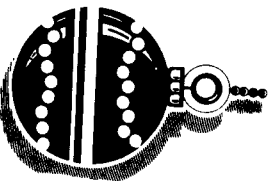
BUT NATIONAL GEOGRAPHIC MAGAZINE, USING STATE-OF-THE-ART CONTROL DATA COMPUTERS AND SOME SPECIALLY DEVELOPED SOFTWARE, HAS CONCLUDED THAT THE ACTUAL ISLAND IS A CURRENTLY UNINHABITED PATCH OF LAND KNOWN AS SAMANA CAY.

LIKE OTHER HISTORIANS, NATIONAL GEOGRAPHIC ENTERED DATA FROM COLUMBUS'S DAILY SHIPLOG INTO THE COMPUTER TO DETERMINE THE SHIP'S POSITION ALONG THE WAY. BUT, FOR THE FIRST TIME, THE NATIONAL GEOGRAPHIC PROJECT ALSO INCLUDED THE EFFECTS OF CURRENT.

ALTHOUGH THE CURRENT HAS ONLY A MINISCULE EFFECT ON THE DAILY PROGRESS OF THE VESSEL, OVER THE COURSE OF COLUMBUS LONG VOYAGE, IT ADDED UP TO ABOUT 65 MILES WORTH OF DEVIATION.

THE COMPUTER POINTED AT SAMANA CAY AND RESEARCH SUBSEQUENTLY FOUND THE ISLAND TO MATCH COLUMBUS' DESCRIPTIONS.

AS FINAL PROOF, THE NATIONAL GEOGRAPHIC TEAM ALSO DISCOVERED NUMEROUS INDIAN ARTIFACTS ON THE ISLAND, SHOWING THAT, AT THE TIME COLUMBUS LANDED HERE, IT WAS INDEED INHABITED.



## I WAS THE NIGHT BEFORE CHRISTMAS

IT WAS THE NIGHT BEFORE CHRISTMAS AND ALL THROUGH THE HOUSE  
NOT A CREATURE WAS STIRRING, NOT EVEN A MOUSE.

I'D JUST GONE TO SLEEP WHEN A NOISE REACHED MY EAR  
I SAT UP IN BED AND LISTENED IN FEAR.

IT SEEMED TO COME FROM THE SHACK IN THE REAR  
SO I CLIMBED OUT OF BED AND CREEPT QUIETLY THERE.

I CRACKED OPEN THE DOOR FEELING QUITE BOLD  
AND THE THING THAT I SAW WAS A SIGHT TO BEHOLD.

THE ROOM WAS WELL LIGHTED I'LL NEVER FORGET  
AND SANTA WAS SITTING IN FRONT OF THE SET.

HE HAD ON THE EARPHONES AND MIKE IN HIS HAND  
AND WAS FRANTICALLY TUNING ALL OVER THE BAND.

HIS VOICE WAS PITCHED HIGH, HE WAS QUITE IN A STEW  
"CQ!" HE KEPT SHOUTING, "CONFOUND IT, CQ!"

AT LAST HE GAVE UP THEN SAID WITH A SIGH  
"I'LL BET THIS OLD RIG EVEN GIVES T.V.I.!"

IT'S SO OBSOLETE, NOBODY CAN HEAR ME  
AND A GOOD SPELL OF HAMMING WOULD REALLY HAVE CHEERED ME.

BUT THIS THING'S SO OLD IT CREAKS WHEN I TUNE.  
IF IT ISN'T REPLACED IT WILL FALL APART SOON.

AND THEN AS I WATCHED HE PUT THE MIKE BACK  
AND QUICKLY HE STARTED TO RIFLE HIS SACK!

THERE WERE PRESENTS AND CANDY ALL OVER THE FLOOR  
TILL HE GOT TO THE BOTTOM; THE SACK HELD NO MORE.

THEN WIPING HIS BROW HE SAT BACK IN THE CHAIR  
AND SADLY EXCLAIMED, "NOT A SINGLE SET HERE!"

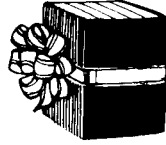
"IF ONLY I'D KNOWN I COULD HAVE PREPARED,  
BUT THEY'RE MUCH TOO EXPENSIVE TO CARRY A SPARE!"

HE LOOKED FOR A MOMENT AS THOUGH HE WOULD CRY  
THEN ALL OF A SUDDEN HE LAUGHED AND YELLED "HI!"

"I HAVEN'T A RIG BUT I KNOW WHAT I'LL DO  
I'LL LEAVE HIM A NOTE AND MY I.O.U."

THEN HE REPACKED HIS BAG AND WENT OUT TO HIS SLEIGH  
AND IN A FEW MOMENTS WAS WELL ON HIS WAY.

BUT I HEARD HIM EXCLAIM AS HE DROVE OUT OF SIGHT  
"73'S, MERRY CHRISTMAS, 88'S AND GOODNIGHT".



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