

WHO IS KELLY?

- 1942 Commissioned Ensign, USNR, Engineering Volunteer (EV-S), Pittsburgh, PA. Prior employment--engineer for Westinghouse, Generator Division.
- 1943 Indoctrination at University of Arizona; training at Underwater Harbor Defense School, San Pedro; duty at Panama Sea Frontier--Maintenance Officer for magnetic loops and sonobuoys.
- Realization for the first time the agony and the frustration of cable laying and repair of both sea and shore equipment.
- Obtained a liberal education in cable laying when the cable ship ALL AMERICA repaired a communication cable for ALL AMERICA cables. In the process, it picked up one of the magnetic loop cables. A report was made by Captain Hack to the Navy, and Ensign Kelly was assigned duty on the cable ship to represent the Navy incidental to the cable repair. Mr. Petch, the Cable Officer, introduced me to the BIBLE--"Submarine Cable Laying and Repairing," by H. D. Wilkinson, published in Wimbledon, June 1896.
- This was later to be reprinted as NAVSHIPS 93085.
- 1944 Incidental to the maintenance of the magnetic loops and sonobuoys, Navy decided to install a Wallace & Tiernan HERALD (water works machinery--a cable controlled echo-ranging device) off Cristobal Harbor and terminate it at the HECF, Fort Sherman, Canal Zone.
- The equipment and many reels of cable arrived at NSD, Coco Solo, and I was called by the Supply Officer to tell him what it was and where it was to be used.
- Checking with the RMO (Radio Material Officer), I found out CNO Bureau of Ships (BuShips) had not made up their minds whether it would go in or not. The recommendation was to hold until advised.
- Back to the Supply Officer. Ensign Kelly requested a heated warehouse for the sea and shore terminals with open storage for the cable. I was promptly told by the Supply Officer that I had a rock in my head. "This is Panama. It is hot enough. It goes in a regular warehouse--period."
- Four months later, a message from CNO ordered the HERALD installed. Back to the Supply Officer. Requested custody of the equipment to install. Upon opening the crates, found the equipment to be alive with fungus and corrosion. Spent an additional two months rebuilding the gear.
- The HERALD was installed, and we used an Army Mineplanter and a Navy Icebreaker. (Why an Icebreaker in Panama?) Found out that if I ever had to lay cable again, this was not the combination. I had been spoiled by the duty on the cable ship ALL AMERICA.
- Immediately upon completing the installation, I made a detailed report to the BuShips of the condition of the equipment and what had to be done to make it operational.
- I should never have written that report, or better still, should not have sent it to the BuShips.
- Orders were cut, and soon I was in Clearfield, Utah, NSD, as the Tropicalization Officer.
- 1945 After duty at NSD, Clearfield, and the wind-down of the war, I returned to East Pittsburgh and generators and large motors.
- 1 Mar 51 BuPers to Lt. Kelly, subject: Active Duty Service. They had caught up with me.
- 14 May 51 Reported for duty, BuShips. Assigned Code 949, Advance Base Functional Components.

Dec 51 Discussion of my career with RADM Homer Wallin, Chief of BuShips:

Nature of the discussion - Unhappy over the lack of work.

Admiral's solution - "What do you know of JEZEBEL?"

Lt. Kelly - "What's that?"

Admiral Wallin - "Welcome, you are Project Officer."

All bridges were burnt after that session!!

Travel of LCDR Kelly in 1953

5- January	BTL Murray Hill - R&D Contract NObsr 57093
11-14 January	Seattle Washington - C/S Albert J. Myer - Sunfelt Equipment Co.
19 January	BTL Murray Hill - Conference on cable ship and machinery
22-23 January	BTL Murray Hill - R&D Contract NObsr 57093 System Study NObsr 6312
29-30 January	CINCLANTFLT - NORVA - briefing of BTL people on System Study
18 February	Eastern Sea Frontier New York City - System Study briefings.
3-4 March	Naval Radio Station Cape May N.J. - Shore Site Selection
12 March	COMSERVLANT NORVA - Ship scheduling for Hydro Survey Group ONE
16-27 March	Preliminary site selection - San Salvador-Grand Turks Ramey AFB P.R. San Juan P. R. Patrick AFB Cocoa Beach Fla.
8 April	BTL Murray Hill - Discussion of sites.
14 April	Beth Steel Shipyard Key Highway Baltimore - C/S. Neptune
30 April	USS Maury at NORVA - conference on surveys
6 May	BTL Murray Hill - Conference WECO/BTL on production CAESAR
21-29 May	Site selection - Sable Island- Cape Sable N.S. Halifax, Shelburne NS.
8 June	USS Maury, USS Prevail, USS Shelldrake - at NORVA. - Ships scheduling.
21-24 June	BTL Murray Hill - R&D effort, USS Maury at Brooklyn NSY survey, USS Neptune at NORVA - briefing of officers on the project.
8-10 July	WECO Winston Salem N.C. Production conference
19-30 July	Caribbean - Rendezvous with USS Maury - visited Patrick AFB Grand Turks BWI, COM-10ND San Juan and Navy Base GTMO, Cuba.
11 August	BTL Murray Hill - Reschedule of Hydro Survey Group ONE
24 August	BTL Murray Hill - Discussion of Cable Laying Techniques.
1-3 September	USS Neptune at Boston - Review of acoustic data.
11 September	BTL Murray Hill - Host to Candians - general briefing of program
15 September	WECO Winston Salem Production Conference on NObsr 57605 and 57606
2 October	BTL Whippany N.J. (Navy work moved to be with other military NIKE) preparation for Fifth Interim Report of NObsr 57093.
26-8 October	Simplex Wire and Cable Newington N. H. inspection of new machinery BTL Whippany for the 5th Interim report on NObsr 57093
11-17 October	Ramey AFB- P. R and San Juan P.R. (10th ND) final selection on Ramey.
20 October	WECO Winston Salem - Production conference
27-28 October	Naval Radio Station Cape May N.J. - CB Construction SOSUS station
19 November	WECO Winston Salem Production Conference
16 December	WECO Winston Salem Production Conference.

get up

CAESAR DID NOT JUST HAPPEN! CAESAR HAD ROOTS!

- 1915 JOSEPHUS DANIELS, SECNAV WHOSE CLAIM TO UNDYING FAME IS THE ELIMINATION OF DEMON RUM FROM THE NAVY, ESTABLISHED A NAVAL CONSULTANT BOARD CHAIRED BY THOMAS A. EDISON.

THAT SAME YEAR, ONE OF THE RECOMMENDATIONS WAS TO ESTABLISH A NAVAL RESEARCH LABORATORY. THIS WAS NOT TO HAPPEN UNTIL 1923.

- 1917 TWO YEARS LATER, THE "BOARD" ACCEPTED A RECOMMENDATION FROM MR. FAY OF SUBSIG (NOW RAYTHEON) TO ESTABLISH STATION TO CONDUCT EXPERIMENTS ON SUBMARINE DETECTION, USING UNDERWATER SOUND. STATION ESTABLISHED AT NAHANT, MASS.

RA DM GRIFFIN, CHIEF BUREAU OF STEAM ENGINEERING (LATER BUSHIPS) INVITED GENERAL ELECTRIC AND WESTERN ELECTRIC TO WORK WITH SUBSIG AT NEW LABORATORY. WECO SENT HENRY THYER - GE SENT OWEN YOUNG.

WESTERN ELECTRIC REALLY GOT INTO THIS BUSINESS ON THE GROUND FLOOR.

- 1917 U.S. DECLARES WAR ON GERMANY 6 April.

SUBMARINE DETECTION COMMITTEE OF NRC WAS ESTABLISHED WITH DR. MILIKAN OF THE UNIVERSITY OF CHICAGO AS CHAIRMAN. ONE OF THE MEMBERS OF HIS COMMITTEE WAS MR. W.H. NICHOLS OF WESTERN ELECTRIC.

NEW LONDON GROUP, HEADED BY PROF. A.A. MICHELSON, UNIV. OF CHICAGO AND NOTED FOR NOBEL PRIZE IN 1907. HIS GROUP CONSISTED OF

PROF. MERRITT OF CORNELL
PROF. BUMSTEAD OF YALE

PROF. MASON UNIV OF WISCONSIN
PROF. HARVEY HAYES OF SWATHMORE

LABORATORY ESTABLISHED IN ABANDONED MACHINE SHOP ADJACENT TO FORT TRUMBULL, NEW LONDON. SIX ENLISTED MEN PLUS MR. FARNSWORTH FROM WESTINGHOUSE, EAST PITTSBURGH MANNED THE SHOP. END OF YEAR THERE WERE 200 PEOPLE EMPLOYED.

RESULTS

- (1) PASSIVE SONIC SET - SC TUBE, ORIGINAL "T FORMATION" + STETHOSCOPE
- (2) PASSIVE SONIC SET - K-TUBE WITH MULTIPLE OPENINGS (ARRAY GAIN)
- (3) PASSIVE SONIC SET - MV-TUBE - MICROPHONES (12) + COMPENSATOR
- (4) PASSIVE CABLE CONNECTED HYDROPHONES - INSTALLED CHESAPEAKE BAY AND LONG ISLAND SOUND - DEVELOPED BY NICHOLS AND COLPITTS - WECO
- (5) MAGNETIC LOOPS - OBTOMED CABLES + GALVANOMETER - COLPITTS - WECO

OBSERVATION - KEY WORDS? PASSIVE LISTENING - HYDROPHONES - CABLES WECO - WAS THIS THE BEGINNING OF CAESAR?

SONIC TRAINING SCHOOL ESTABLISHED AT NEW LONDON - TRAINED 1500 ENLISTED FROM SEPTEMBER 1917 TO NOVEMBER 1918.

- 1918 SCHOOL ESTABLISHED FOR OFFICERS IN JULY, 1918 - CALLED THE HYDROPHONE SCHOOL - REASON - TOO MANY SMART ENLISTED MEN IN THE FLEET.

ASDIC (ALLIED SUBMARINE DIVISION INVESTIGATION COMMITTEE) ESTABLISHED IN SEPTEMBER IN ENGLAND - THIS WAS TO BECOME A NEW WORD TO MEAN ALL SONIC DEVICES.

- 1918 NOVEMBER ARMISTICE DAY - WW-I ENDS.

- 1918 END OF WAR RESULTED IN BIG LET DOWN. EXCEPTION WAS PROF. HAYES WHO HELD ONTO ABOUT TWENTY DEDICATED SCIENTISTS AND EVENTUALLY FOUND SHELTER FOR THEM AT THE NAVAL EXPERIMENTAL LABORATORY, ANNAPOLIS. CAPTAIN T.L. TOMPKINS OF THE CONTROL FORCES, U.S. FLEET, WAS HIS ANGEL IN UNIFORM. IT ALWAYS PAYS TO HAVE THIS KIND OF HELP.
- 1920 GROUND BROKE FOR NAVAL RESEARCH LABORATORY, BELEVUE D.C. SECRETARY DANIELS DID THE HONORS. THOMAS EDISON, CHAIRMAN OF THE "BOARD" WAS SO UPSET THAT THE LABORATORY WAS NOT LOCATED AT SANDY HOOK THAT HE REFUSED TO COME TO THE PARTY.
- 1923 NAVAL RESEARCH LABORATORY ESTABLISHED. DR. HAYES AND HIS GROUP COMES "HOME."
- 1925 BELL TELEPHONE LABORATORIES ESTABLISHED.
- 1929 JK PASSIVE LISTENING DEVICE DEVELOPED BY HAYES GROUP - USED ROCHELLE SALT CRYSTALS INSTEAD OF QUARTZ. WASHINGTON NAVY YARD MANUFACTURED 60 SETS BY 1933.
- 1931 QB ECHO RANGING DEVELOPED BY HAYES GROUP. BOTTOM MOUNTED SO IT COULD OPERATE WITH SUBMARINE SURFACED.
- 1933 WASHINGTON NAVY YARD MANUFACTURES 20 SETS QB. GOODYEAR INTRODUCED RUBBER SPHERE TO REDUCE FLOW NOISES. SUBSIG GIVEN CONTRACT FOR 20 SETS QB. GOODYEAR GIVEN CONTRACT FOR 30 RUBBER SPHERES. BUSHIPS WAS CONTRACT AGENT.
- 1934 SUBSIG DEVELOPS MAGNETOSTRICTION FOR FATHOMETER. JP PASSIVE LISTENING DEVICE DEVELOPED USING MAGNETOSTRICTION.
- 1937 NRL INSTALLS QB ON M/V ATLANTIS (WHOI) C.O'D ISELIN WAS C.O. OF ATLANTIS CRUISE FROM CHESAPEAKE BAY TO GTMO REVEALED ERRATIC BEHAVIOR OF QB. TEMPERATURE PROFILE OF WATER COLUMN OBTAINED WITH SOUNDING LINE RIGGED WITH CLOSELY SPACED MERCURIAL THERMOMETERS. RESULT - TEMPERATURE DECREASED WITH INCREASE IN DEPTH - SPEED OF SOUND DECREASED WITH TEMPERATURE DECREASE AND THIS ACCOUNTED FOR THE REFRACTION OF SOUND BEAM. THIS WAS THE BEGINNING OF PRACTICAL OCEANOGRAPHY TO NAVAL WARFARE.
- 1938 WHOI TESTS THE FIRST EXPERIMENTAL BATHYTHERMOGRAPH (BT)
- 1939 ENGLAND AND FRANCE AT WAR WITH GERMANY - WW-II BEGINS (SEPTEMBER)
ASDIC REESTABLISHED IN ENGLAND.
- 1940 US/UK AGREEMENT - DESTROYERS FOR BASES. ALL DD EQUIPPED WITH ECHO RANGING SONIC SETS PLUS USN BLUEJACKETS TO OPERATE.
KEY WEST SOUND SCHOOL ESTABLISHED IN DECEMBER.
- 1941 US NAVY ESCORTS CONVOYS OF LEND-LEASE SHIPMENTS. GERMANY TORPEDO USS KEARNEY AND USS RUBEN JAMES.
U.S. DECLARES WAR ON AXIS AFTER PEARL HARBOR 7 DECEMBER.
INTENSE EFFORT DURING THE WAR MAINTENANCE OF SUPPLY LINES TO EUROPE AND THE INTERDICTION OF THE GERMAN SUBMARINES. MEASURES, COUNTERMEASURES AND THEN COUNTER-COUNTER-MEASURES.

OPERATIONS

1939

ORDER OF BATTLE

30 - 250 TON COASTAL U-BOATS
20 - 500 TON OCEAN TYPE U-BOATS
10 - 750 TON OCEAN TYPE U-BOATS

1939

GERMANS ATTACKED ALLIES SHIPPING
BUT ONLY IN DAYLIGHT HOURS

1940

U-BOATS BEGIN TO ATTACK AT NIGHT

1941

U-BOATS DEVELOP WOLF-PACK TACTICS

GERMAN INNOVATIONS

1940

GERMANS BEGIN TO ACCELERATE
U-BOAT BUILDING PROGRAM

1941

GERMANS BUILD MORE U-BOATS

ALLIES ASW MEASURES

1939

ORDER OF BATTLE

165 DD WITH ASDIC
35 PATROL CRAFT WITH ASDIC
20 TRAWLERS WITH ASDIC

1939

ASDIC IMPROVED TO GIVE EQUAL
SIGNAL TO OPERATOR FOR BOTH
LONG AND SHORT RANGES.

1940

50 DESTROYERS TRANSFERRED FROM
UNITED STATES TO UNITED KINGDOM
BATHYTHERMOGRAPH DEVELOPED BY WHOI

1941

HF/DF INSTALLED AT SHORE SITES
BT DEVELOPED BY WHOI FOR SUBMARINE
NDRC ESTABLISHES DIVISION VI UNDER
DR. TATE - LABORATORY ESTABLISHED
AT SAN DIEGO UNDER UCDWR
AT NEW LONDON UNDER CUDWR
AT CAMBRIDGE UNDER HARVARD USL
HEDGEHOG FORWARD THROWING MORTAR
DEVELOPED AND DEPLOYED
RADAR - 1 METER WAVE LENGTH
DEPLOYED ON SHIPS
U.S. DECLARES WAR ON AXIS
UK AIRCRAFT CAPTURE U-BOAT U-570
SUBMARINE GAVE MUCH INTELLIGENCE
BRITISH REPAIRED AND RECOMMIS-
SIONED HER HMS-GRAPH.

OPERATIONS

1942

U-BOATS OPERATE EAST COAST
UNITED STATES AND CARIBBEAN

COW OPERATIONS -
RESUPPLY SUBMARINES COULD
MET U-BOATS AT-SEA AND
REFUEL, REARM AND RESUPPLY

1943

LARGE WOLF-PACK OPERATIONS
IN THE NORTH ATLANTIC.
BY LARGE 20 U-BOATS WOULD
ATTACK A CONVOY

GERMAN INNOVATIONS

1942

SSBT SUBMARINE BUBBLE TARGET CALLED
"PILLENWERFER" DEPLOYED ON U-BOATS
PILL DROPPED IN SALT WATER CAUSED
GAS BUBBLE THAT "FOOLED" SONAR

GSR - GERMAL SEARCH RECEIVER
DEPLOYED ON U-BOATS. THIS WAS
LIKE OUR RADAR "FUZZBUSTER" TODAY
WAS TUNED TO 1-METER RADAR.

INNOVATIONS ATTRIBUTED TO RELEASE
OF GERMAN SCIENTIST FROM ARMY DUTY

1943

HF COMMUNICATIONS PERFECTED
FOR MULTI U-BOAT OPERATION
INCIDENTAL TO WOLF-PACKS

INTELLIGENCE FROM U-570
CAPTURE INDICATED THERE WAS
U/W TELEGRAPH SYSTEM TO
COMMUNICATE WITH OTHER U-BOATS

INTELLIGENCE FROM U-570
SONAR ON U-BOATS WAS COMPLETELY
PASSIVE - HAD AN ARRAY OF 24
3" MICROPHONES ON EACH BOW.
TEST BY BRITISH ASDIC OPERATORS
GOT TEN (10) MILE RANGE.

ALLIES ASW MEASURES

1942

TED HUNT "INVENTED" THE EUPHORIOUS
COMBINATION SONAR WHICH HE MEANT
SONIC AZIMUTH AND RANGE
U.S. NAVY IN PROMULGATING THE TERM
EX POST FACTO JUST CHANGED THE
TRANSLATION TO SOUNDING, NAVIGATION
AND RANGING.

BRITISH DEPLOY AND ADMIRALTY NET
DEFENSE ON MERCHANT SHIPS. NET
INTERCENT TORPEDOES EVEN WHILE
UNDER WAY.

HF/DF INSTALLED ON ASW SHIPS.

AIR DEPLOYABLE SONOBUOY DEVELOPED
AND DEPLOYED.

Q-ATTACHMENT MADE TO SONAR/ASDIC
TRANSDUCERS SO IT COULD DIRECT A
BEAM DOWNWARD AT DEEP TARGETS.

1943

10CM RADAR INSTALLED ON ASW SHIPS
ACOUSTIC TORPEDO DEPLOYED AIR
LAUNCH DESIGNATED M-24 AERIAL MINE

FLEET ADMIRAL KING ESTABLISHES
TENTH FLEET WITH HIMSELF AS
COMMANDER LOCATED AT WASHINGTON
NAVY YARD. MISSION TO RECEIVE
ALL INFO ON ASW AND BRAINSTORM
FOR SOLUTIONS.

DEVELOPMENT STARTED ON X-BAND
RADAR 3 CM.

BDI BEARING DEVIATION INDICATOR
INTRODUCED INTO THE SONAR TO
AID OPERATOR TO STAY ON TARGET.

SQUID A MORE SOPHISTICATED HEDGEHOG
TYPE OF MORTAR HAD DEPTH DETERMINA-
TION CRANKED INTO BY THE ASDIC.

OPERATIONS

1943

1944

SCHNORCKEN INTRODUCED INTO U-BOAT FLEET. U-BOATS COULD NOW BE "TOTALLY SUBMERGED."

COUNTER TO HF/DF WAS THE SUPPRESSION OF RADIO TRAFFIC BASIC IF YOU DON'T MAKE SIGNALS, THEY CAN'T HOME ON YOU.

1945

U-BOATS WITH SCHNORCKEL RETRENCH AND STAND BY FOR ATTRITION OF SUPPLY LINES FROM ENGLAND TO EUROPE

FINAL GASP - TRYING AND FAILING TO CUT SUPPLY DURING BATTLE OF BUDGE

GERMAN INNOVATIONS

1943

1944

ZIG-ZAG TORPEDO DEVELOPED TO MAKE EVASION MORE DIFFICULT

ELECTRICAL DRIVEN 25 KNOT TORPEDO WITH ACOUSTIC HOMING DEVICE DEPLOYED.

NAXOS RADAR RECEIVER INSTALLED TURNED TO 8-12 CM RADAR.

RUBBER COATING TRIED TO ACT AS ANTI-RADAR MEASURE

TYPE XXVII 39' MIDGET U-BOAT DEPLOYED. A TWO MAN OPERATION.

1945

KURIER DEVELOPED TO USE A TAPE RECORDER IN COMMUNICATION LOOP. RECORD AT LOW SPEED SEND AT HIGH SPEED LESS EXPOSURE TO HF/DF.

TUNIS DEVELOPED AS TWO RADAR RECEIVERS IN ONE SET "MUCKE" TUNED TO 3 CM BAND "CUBA IA" TUNED TO 10 CM BAND.

ALLIED ASW MEASURES

1943

MK-8 DEPTH CHARGE DEVELOPED AND DEPLOYED HAD MAGNETIC PROXIMITY FUZE.

MK-9 DEPTH CHARGE DEVELOPED AND DEPLOYED - HEAVIED UP TO INCREASE SPEED OF SINKING.

FOXER GEAR DEVELOPED TO BE TOWED BY A SHIP AND PRODUCE NOISE THAT WOULD ATTACK ACOUSTIC TORPEDO.

1944

MDC MAINTAIN DEPTH CONTACT DEVELOPED AND BACKFITTED ON ASDIC/SONAR.

USS GUADACANAL - A CVE CAPTURES U-BOAT U-505 AND TOWS IT BACK TO BERMUDA. A GOLD MINE OF INTELLIGENCE.

X-BAND 3 CM RADAR BACKFITTED INTO ASW SHIPS.

1945

VE DAY 7 May 1945
THE 72 MONTH BATTLE ENDED IN VICTORY BUT WHAT A COST - 4,773 MERCHANT SHIPS (21,141,000 GROSS TONS) SUNK BY ENEMY ACTION, 966 AXIS SUBMARINES WERE SUNK AND 221 PLUS SCORES OF MIDGETS WERE CAPTURED AT THE END OF THE WAR.

A short review of the history of procurement with emphasis on electronic equipment is in order to appreciate the atmosphere in which CALSAR was initiated.

- 1861 Civil War (really going deep this time)--Revised Statute 3709 governed the USN contract procedures. It insisted on advertisement of a proposal, competitive bidding, and award of contract to the lowest bidder who met the specification.
- Every year, the Navy would request relief from such a restricted procedure, and every year, the Congress added more boiler plate to the rules governing procurement.
- 1911 Relief was incorporated in the Appropriation Bill in that progress payments were allowed, but under no circumstances were any advances permitted.
- 1917-18--WWI "Cost-plus-percentage" types of contracts were permitted during the war to compensate for spiraling prices. Contractors were just unable to estimate cost, and this was the only way to give relief to the suppliers.
- This method was immediately stopped with the Armistice, and the old rules were again reinstated. Arguments against the "cost-plus" way of doing business was that there was always the danger of uncontrolled overruns.
- 1939 The Navy Appropriation Bill of 1939 had the usual restriction, even to dictating that electronics be manufactured in Government Navy Yards and Arsenals even when they had none of the special equipment to manufacture a vacuum tube. This was the reason that Washington Navy Yard was the manufacturing arm of NRL. The 1939 bill did have an out in that the Secretary of the Navy (SECNAV) was permitted to waive these restrictions when required in the interest of National Defense.
- January 1940 The SECNAV removed ALL administrative restrictions which had accumulated over several decades.
- 1940 Congress passed Public Law 671 which eliminated all peace-time restrictions. This act permitted SECNAV to authorize, when necessary, procurement through negotiation and permitted "cost-plus-fee" contracts.
- PL 671 allowed:
- (1) Negotiating by Material Bureau plus BUSANDA for contract.
 - (2) Entering into Facility contracts by Material Bureau.
 - (3) Okaying the use of "Letter of Intent" at the start of manufacture with assurance that supplier would be paid even if contract were never developed.
- 7 December 1941 WW II declared.
- 8 December 1941 First War Powers Act was passed by Congress and signed into law the same day.
- 28 December 1941 SECNAV allowed Material Bureau to contract direct if less than \$200,000. SECNAV approval needed for contracts from \$200,000 to \$500,000. War Production Board approval needed for contracts in excess of \$500,000.
- January 1942 SECNAV set up Office of Procurement and Material (NAVMAT) with authority to act for the War Production Board for Navy procurement.
- June 1942 Practically all contracts were by negotiation.
- July 1942 NAVMAT registered TILT--too much confusion in the Material Bureaus--put the contracts back with the business experts--BUSANDA.
- December 1942 SECNAV decided:
- Material Bureaus contract for technical material.
- BUSANDA contract for all nontechnical material; NAVMAT would referee and ensure that all was legal.

- 1945 VE DAY MAY - GERMANY SURRENDERS
VJ DAY AUGUST - WW-II ENDS,

POST WAR LET DOWN SETS IN AGAIN,
HARVARD UNDERWATER SOUND LAB DISESTABLISHED, SONAR - (IT CAN BE USED NOW FOR TED HUNT "INVENTED" THIS COMBINATION TO MEAN SONIC AZIMUTH AND RANGE, U.S. NAVY IN PROMULGATING THE TERM EX POST FACTO JUST CHANGED THE TRANSLATION TO SOUNDING, NAVIGATION AND RANGING) - WAS SENT TO NEW LONDON WITH HAROLD NASH - USNUSL AND THE ORDINACE WAS SENT TO PENN. STATE WITH ERIC WALKER.

- 1946 CNO DECLASSIFIES SOFAR- PICKED UP THE PRESS AND TRUE MAGAZINE PUBLISH STORY ON HOW TO EXPLOIT DEEP SOUND CHANNEL TO EFFECT LONG RANGE SUBMARINE DETECTION, IT HAD ALL THE GERMS OF CAESAR,

DR. GLEN CAMP OF OEG PAPER - DESCRIBES EXISTANCE OF LOW FREQUENCY DISTINCT LINE SPECTRA SUBMARINE NOISE. SUGGEST USE OF VISUAL SPEECH ANALYZER ALREADY DEVELOPED BY BTL AND "FINGERPRINT" THE SUBMARINE SIGNATURE. DR. CAMP PUSHED TO TWO YEAR ONE MAN CAMPAIGN TO GET SOMETHING STARTED ON THIS LINE, NOBODY LISTENED TO HIM. HE WAS JUST FOUR YEARS AHEAD OF HIS TIME, THE CLIMATE WAS JUST NOT RIGHT,

THE COMMITTEE ON UNDERSEAS WARFARE (CUSW) IS ESTABLISHED UNDER NATIONAL ACADEMY OF SCIENCE, ONR SPONSERED, PROF. TED HUNT WAS ONE OF THE ORGANIZERS,

WARTIME TECHNICAL DEVELOPMENTS PUBLISHED BY COMMADORE SCHADE OF NRL, WEALTH OF INFORMATION ON STATE OF GERMAN SUBMARINES AT THE END OF THE WAR, A MOST HELPFUL DOCUMENT WHEN MISSION IS CATCHING SUBMARINES,

- 1948 CUSW MEETS AT USNUSL TO DISCUSS FAVORITE SUBJECT - UNDERSEA WARFARE, NOT MUCH DOING - NOT MUCH ACCOMPLISHED SINCE END OF WAR. PROF. HUNT ONE OF THE CHIEF MOURNERS,

ERA WAS KNOWN AS "ELECTRONIC HOLIDAY", FROM PERSONAL EXPERIENCE AT NSD CLEARFIELD UTAH, WITH THE WAR WINDING DOWN, NOT CARLOADS BUT TRAINLOADS OF ELECTRONIC EQUIPMENT WAS DELIVERED AND STORED, CAPT. SKILLMAN, C.O. OF NSD CLEARFIELD REMARKED IT PROBABLY WOULD BE BETTER TO SCRAP IT AND IF NEED BE START ALL OVER AGAIN, EVERY TIME ANYONE WANTED TO DO SOMETHING STOCK ANSWER WAS USE WHAT WE HAVE,

- 1949 CNO ESTABLISHES SUBDEVGROUPONE AT SAN DIEGO - SUBDEVGROUPTWO AT NEW LONDON TO FURTHER DEVELOPMENT ON SUBMARINES.

NEL REPORTS RANGES OF 10 TO 15 MILES ON SUBMARINES FROM PT. SUR AND PT. ARENA SOFAR STATIONS - RANGES INCREASED TO HUNDREDS OF MILES BY MID YEAR,

SOFAR STATION ESTABLISHED AT BERMUDA - DR. MAURICE EWING MADE IT HAPPEN, STATION OPERATIONAL OCTOBER 1949,

CUSW MAKE APPEAL TO ESTABLISH DEEP WATER TEST STATION AT BERMUDA, NAVY NOT INTERESTED,

CUSW SUGGEST NAVY ESTABLISH A "RESEARCH FLEET" SIMILAR TO ADM KINGS MOST SUCCESSFUL "TENTH FLEET", NAVY FLAG OFFICERS NOT INTERESTED. ONLY FRIENDLY BLUE SUITER WAS VADM STRUBLE,

1950 PROJECT MARVEL REPORTS ITS FINDINGS - 1-2 SEPTEMBER

"REPORT ON SECURITY OF OVERSEAS TRANSPORT"

UNDER SECRETARY OF THE NAVY (LATER TO BE SECNAV) DAN KIMBALL WAS THE SENIOR MEMBER PRESENT. IMPETUS WAS GIVEN NUCLEAR PROPULSION OF NAVAL VESSELS

MARRIAGE OF MISSILES WITH SUBMARINES - POLARIS

FASTER, MODERN TRANSPORT - MARINER CLASS

MORE IMPORTANT TO THIS DISCUSSION, THE REPORT SPelt OUT THE POSSIBILITY OF USING LOW FREQUENCY SOUND WITH REAL TIME SPECTRUM ANALYSIS AS THE COMBINATION WITH THE MOST PROMISE FOR ASW,

THESE WERE SPelt OUT IN APPENDIX D AS FOLLOWS:

- (1) POSSIBILITY OF CYLINDRICAL SPREADING FOR L/F SOUND
- (2) NARROW BAND ANALYSIS OF NOISE SPECTRUM IN REAL TIME
- (3) USE OF LOW FREQUENCY NOISE FOR UNDERWATER COMMUNICATION
- (4) POSSIBILITY OF NAVIGATION BY UNDERWATER LORAN SCHEME
- (5) POSSIBLE NOISE REDUCTION BY FEEDING NOISE BACK IN PHASE OPPOSITION,

GENERAL COMMENT WAS THAT LOW FREQUENCY DETECTION WAS THE ANSWER TO THE SCHNORCKEL SUBMARINE AND THIS RATED WITH THE ADVENT OF THE MAGNETRON TO RADAR IN 1939,

1950 SUB DEVGROUPTWO WITH ASSISTANCE FROM ALVIN VINE OF WHOI REANALYZED THE TORO AND HALFBEAK TAPES AND THIS TIME WITH A REED FREQUENCY ANALYZER WITH AN ANALYZING BAND WIDTH OF ONE (1) HERTZ.. LOW FREQUENCY ENERGY WAS MOST STABLE AND DEDUCTION THAT THE ANALYZING BAND WIDTH COULD BE REDUCED TO ENHANCE SIGNAL TO NOISE, THIS WAS CAUSE FOR GREAT CAUTION FROM A SECURITY POINT OF VIEW,

1950 DR. KELLY BTL VISITED ADMIRAL SHERMAN IN OCTOBER AND OFFERED THE SERVICES OF BTL IN THE FIELD OF LOW FREQUENCY UNDERWATER SOUND.

ADMIRAL SHERMAN ANSWERED THIS VISIT WITH A LETTER TO DR. KELLY DATED 10 OCTOBER ". . . , I HAVE DIRECTED RADM. T.A. SOLBERG, USN, CHIEF OF NAVAL RESEARCH TO PROCEED WITH ARRANGEMENTS WITH BELL TELEPHONE LABORATORIES TO INSTITUTE A PROGRAM OF RESEARCH AND DEVELOPMENT IN THE FIELD OF LOW FREQUENCY SONAR".

BTL HAD ALREADY STARTED WORKING ON ADAPTING DR. POTTER'S VISIBLE SPEECH ANALYZER TO THE TASK. REPORT WAS THAT THIS WORK STARTED ON 6 OCTOBER AT MURRAY HILL LABORATORY,

BTL HAD MADE A FAST BREAK FROM THE STARTING GATE,

WECO, THE BUSINESS ARM FOR BTL, ARMED WITH A PROPOSAL STARTED NEGOTIATIONS WITH ONR ON 29 OCTOBER.

LETTER OF INTENT TYPE CONTRACT NOnr-210(00) SIGNED 30 NOVEMBER BETWEEN ONR AND WECO FOR THIS R&D EFFORT. INITIAL FUNDING WAS \$1.0M AND WAS FUNDED 50/50 BY ONR AND BUSHIPS,

1950 BTL INITIATED STEPS TO SET UP SEASIDE LABORATORY AT SANDY HOOK N.J.

BTL INITIATED STEPS TO UTILIZE SOFAR LABORATORY AT BERMUDA,

1950 FIRST REPORT ON CONTRACT NOnr-210(00) WAS GIVEN BY BTL TO NAVY IN DECEMBER. REPORT OUTLINED PARAMETERS OF LOW FREQUENCY ANALYZER LOFAR = LOW FREQUENCY ANALYZING AND RECORDING TERM FIRST USED.

- 1951 HARTWELL COMMITTEE MET AT COLUMBIA UNIVERSITY IN MARCH. DR. RABI CHAIRED THE MEETING. COLUMBIA UNIVERSITY AGAIN PROPOSED A "RESEARCH FLEET" TYPE OF LABORATORY THAT WOULD BE SIMILAR TO "TENTH FLEET" EFFORT IN ASW USED BY ADMIRAL KING SO EFFECTIVELY. PROPOSAL WAS THAT THE LABORATORY WOULD BE A HAVEN FOR THE SCIENTIST PURSUING THE ASW PROBLEM AND WOULD COST ABOUT 10 MILLION A YEAR.
- BTL MADE A PRESENTATION WHICH INCLUDED A WORKING MODEL OF THE POTTER VISUAL SPEECH ANALYZER - ANALYZING SOUND IN 1-1/2 HERTZ BANDS IN REAL TIME. SCHEMES WERE DESCRIBED FOR HYDROPHONES, CABLES, AND DELAY NETWORKS TO PRESENT MULTIPLE BEARINGS SIMULTANEOUSLY FOR WIDE AZIMUTH COVERAGE.
- CONSENSUS WAS THAT BTL HAD A LEG UP ON THE PROBLEM AND THERE WAS NO NEED FOR THE "RESEARCH FLEET" TYPE OF LABORATORY. THE COLUMBIA UNIVERSITY PROPOSAL HAD IN EFFECT BE LEFT AT THE POST.
- COMPROMISE WAS REACHED. PROJECT JEZEBEL WAS ASSIGNED TO BTL PROJECT MICHAEL WAS ASSIGNED TO COLUMBIA UNIVERSITY TO BE IN THE ROLE OF SCIENTIFIC COMMUNITY SUPPORT OF PROJECT JEZEBEL.
- COLUMBIA UNIVERSITY LABORATORY CAME TO BE KNOWN AS HUDSON LABS.
- 1951 SPRING EFFORT SET UP PROGRAM TO COLLECT INFORMATION ON FOREIGN SUBMARINES. MAJOR EFFORT WAS WITH ARL TEDDINGTON WHO INSTALLED MAGNETORECORDERS AT BOTH LOCK GOIL SCOTLAND AND PORTSMOUTH ENGLAND. BY SUMMER, GOOD RECORDINGS WERE MADE ON THE FOLLOWING:
- HMS ACHERON
 - HMS ANDREW
 - XE-7 A SNEAK CRAFT
 - HMS TUDOR
 - HMS TALLY-HO
 - HMS TACITURN
 - FRENCH SUBMARINE L'AFRICAIN
 - EX-GERMAN TYPE XXI
 - DUTCH HNMS-021
- 1951 FIRST "BRASSBOARD" MODEL OF LOFAR DEVICE MADE BY BTL WITH AN ANALYZING BANDWIDTH OF 3/4 HERZ AND A WINDOW OF 10-150 HERZ DELIVERED IN MAY.

1951 JULY NEGOTIATION WITH BRITISH TO ACQUIRE SEASHORE SITE AT ELEUTHERA BWI. - TEST HYDROPHONES (6) WERE PLANTED OFF ELEUTHERA - 3 IN 40', 2 IN 960' AND 1 IN 4000' TEMPORARY TERMINAL AT AIR FORCE MISSILE TRACKING STATION.

1951 FALL LABORATORY COMPLETED AT ELEUTHERA

1951 OCTOBER NRC (NATIONAL RESEARCH COUNCIL) DECLARES LOFAR A "BREAK-THROUGH". STRONG SUGGESTION FOR FURTHER DEVELOPMENT. NEGOTIATIONS STARTED BETWEEN WECO AND BUSHIPS.

1951 NOVEMBER BUSHIPS SIGNED LETTER CONTRACT NObsr-57043 WITH WECO WITH FOLLOWING TASKS

1. STUDY PROPERTIES OF NOISE AND SOUND TRANSMISSION
2. CONDUCT FUNDAMENTAL DEVELOPMENT AIMED SPECIFICALLY AT:
 - (a) FIXED LOW FREQUENCY DETECTION, LOCATION, CLASSIFICATION AND IDENTIFICATION SYSTEM
 - (b) LOW FREQUENCY DETECTION AND DISPLAY EQUIPMENT FOR SMALL CRAFT EMPLOYED AS PICKETS
 - (c) LOW FREQUENCY DETECTION AND DISPLAY EQUIPMENT ON SUBMARINES
 - (d) LOW FREQUENCY SONOBUOYS WITH DISPLAY EQUIPMENT ON NAVAL VESSELS AND AIRCRAFT.
 - (e) LOW FREQUENCY EQUIPMENT AND MOBILE SOUND RANGES THAT WOULD MEASURE THE NOISES RADIATED FROM SHIPS AND SUBMARINES.

THIS CONTRACT WHICH COVERED EVERY ASPECT OF LOFAR APPLICATION PROMISED ONLY A REPORT. THIS WAS LT. KELLY'S FINDING WHEN HE BECAME PROJECT OFFICER AND DISCUSSED THE DETAILS WITH MR. F.J. WINTER IN JANUARY, 1952.

LT. KELLY REALLY DIDN'T BELIEVE THAT ALL HE WAS GETTING WAS A REPORT BUT WENT ALONG WITH THE GAG. AS IT TURNED OUT, THERE WAS CONSIDERABLE HARDWARE AND MODELS PRODUCED AND DELIVERED TO THE NAVY.

THE CONTRACT WAS CONVERTED TO COST PLUS FIXED FEE AFTER THE FIRST YEAR AND WAS RENEWED ANNUALLY UNTIL 1961.

- 1952 FIRST DEEP ARRAY FOR LOFAR INSTALLED OFF ELEUTHERA, BWI IN JANUARY HMTS ALERT PLANTED THE CABLE AND LAID THE CABLE TO THE BEACH. 2.5nm ARRAY IN 200 FATHOMS OF WATER IS 1000 LONG - 40 HYDROPHONES SPACED 25' TUNES TO 100 HERTZ. STILL GIVING USEFUL INFORMATION.
- CHARTER FOR SHIP COST \$56,400 FOR FIFTY DAYS (PORTAL TO PORTAL) BRITISH WANTED ONLY A HANDSHAKE WHEN NEGOTIATIONS WERE HELD IN BPO LONDON. BTL PEOPLE INSISTED ON A "PIECE OF PAPER". THAT IS ALL THEY GOT - A SINGLE SHEET OF PAPER.
- 1952 FIRST FORMAL REPORT TO ONR ON NONr-210(00). SAND' HOOK TRACKED SCHNORCKELING SUBMARINES AT RANGES OF OVER 400 MILES. THE VERNIER TYPE LOFAR WAS INTRODUCED - BY MEANS OF A BAND SHIFTER MODULATOR, THE SPECTRUM COULD BE ANALYZED IN FINER DETAIL i.e., A 25 CYCLE "SLICE" OF THE SPECTRUM COULD BE ANALYZED TO 1/8 OF CYCLE FINISS.
- 1952 FLAG OFFICERS VISITED ELEUTHERA. TWO NAVY PLANES, ONE FROM WASHINGTON WITH RADM AKERS OF OP31 AND PARTY AND ONE FROM NORVA WITH RADM ENTWHISTLE COMOPDEVFOR AND PARTY ARRIVED ELUETHERA 29 APRIL.
- LCDR MALCOLM WOOD, LATER TO WORK IN BU SHIPS CODE 849 WAS THE OFFICER IN CHARGE OF THE NAVAL FACILITY.
- THE ADMIRALS LOOKED AT THE LOFARGRAMS WHICH WAS PRINTING THE SIGNATURE OF A SUBMARINE OFFSHORE. SUBMARINE COULD BE SEEN AT TIME FROM THE STATION. INSTRUCTIONS WERE GIVEN TO THE SUBMARINE TO CHANGE SPEED, COURSE AND DEPTHS AND CHANGES WERE OBSERVED ON THE LOFARGRAMS. FINAL INSTRUCTION WERE TO HAVE THE SUBMARINE OPEN RANGE AND MAKE A BOX MANEUVER EVERY TWENTY FIVE MILES TO GIVE CHECK POINTS ON THE LOFARGRAM. THE ADMIRALS NEVER WAITED - THEY HAD SEEN LOFAR AND WERE CONVINCED. AS FAR AS THEY WERE CONCERN THAT SUBMARINE IS STILL OPENING RANGE. THEY HEADED BACK TO WASHINGTON AND NORVA RESPECTIVELY TO MAKE CAESAR HAPPEN.
- CAPTAIN J.S. MCCAIN (LATER TO MAKE FOUR STARS) WAS OP316 PROJECT OFFICER. DR. BILL MARTIN (V.P. FROM BTL) AND LCDR KELLY WERE OCCUPANTS OF THE JUMP SEATS ON THIS EXCURSION.
- 1952 CNO SER. 00388P31 DATED 3 JUNE, 1952 DIRECTED THE BUREAU OF SHIPS TO PROCURE SIX (6) LOFAR STATIONS. LCDR KELLY CARRIED THE MAIL AND BELIEVE IT NOT, THE LETTER WAS ONLY ONE PAGE.
- THE BRAKES WERE OFF THE MERRY GO ROUND. PROJECT CAESAR WAS ON ITS WAY.

- 1952 CNO SER. 00078P31 DATED 6 JUNE, 1952 SUGGESTED FOLLOWING SITES
 "CAPE" SABLE ISLAND (NOVA SCOTIA)
 CAPE HATTERAS
 BERMUDA - TWO ARRAYS, ONE NORTH, ONE SOUTH
 ELEUTHER BWI
 CULEBRA, PUERTO RICO
- 1952 CINCPACFLT SER. 00514 DATED 9 JUNE 1952 TO CNO IS A "ME TOO" - WANTED TO BE KEPT ADVISED OF PROGRESS AND SUBMITTED A PLAN TO WIRE UP THE PACIFIC.
- 1952 CNO SER. 00339P31 DATED 25 JUNE, 1952 TO COMOPDEVFOR SET UP PRIORITY A TO EVALUATE THE LOFAR SYSTEM NOW CALLED SOUND SURVEILLANCE SYSTEM OR SOSUS.
- 1952 BUSHIPS ENTERED INTO THREE MAJOR CONTRACTS TOTAL MONEY \$15M ON THE LAST DAY OF THE FISCAL YEAR 30 JUNE, 1952.
 NOBSR 57605 - EQUIPMENT
 NOBSR 57606 - INSTALL EQUIPMENT
 NOBS 3230 - FACILITY TO MAKE SUBMARINE CABLE
 ALL THREE WERE WITH WESTERN ELECTRIC.
 CODE 849 WAS ESTABLISHED AS PROJECT OFFICE FOR CAESAR.
- 1952 TRAVEL - SURVEY OF SITES - SHIPS TO LAY CABLE - CABLE PLANT RENDEVOUS WITH SURVEY SHIPS
 CABLE SHIP BULLARD WAS IN THE JAMES RIVER RESERVE FLEET. SHE WAS A SISTER SHIP OF THE C/S ALBERT J. MYER THAT HAD BEEN ACTIVATED FROM THIS SAME RESERVE JUST A TWO YEARS BEFORE AND WAS ON CABLE GUARD DUTY AT SEATTLE FOR THE ALASKIAN COMMUNICATION CABLE SYSTEM.
 CDR. HILLER, SHIPS DESIGN DESK AND LCDR KELLY VISITED THE BULLARD 15-16 AUGUST, 1952. REPORT MADE TO CHIEF OF BUSHIPS ON RETURN RECOMMENDING SHE BE REACTIVATED FOR CAESAR. IN REPORT NOTED THAT C/S ALBERT J. Myer UPON REACTIVATION REQUIRED ALMOST COMPLETE RE-RIVETING AS FIVE YEAR (1945-50) HAD CORRODED ALL RIVETS.
 IN GREAT WISDOM, ADM MANSAEU, OF BUSHIPS ADVISED CDR. HILLER AND KELLY HAVE NO FEAR, DID NOT THINK THE BULLARD WOULD HAVE ANY RIVET PROBLEM.
 UPON DRYDOCKING FOUND IT NEEDED ONLY TWENTY RIVETS. THE ADMIRAL WAS SO WISE, THE C/S MYER HAD ACTED AS THE SACRIFICIAL ANODE FOR THE BLOCK OF SHIPS.
- 1952 CABLE FACILITIES - SIMPLEX, MAKER OF ELEUTHERA CABLE (DELIVERED TO C/S ALERT VIA GONDOLA CARS TO FT. LAUDERDALE) WAS THE ONLY ONE INTEREST IN THIS NEW NAVY BUSINESS. DECISION MADE TO EXPAND SIMPLEX AT NEWINGTON N.H. WITH SIMPLEX PUTTING UP THE BRICKS AND MORTAR AND THE NAVY BUYING THE MACHINERY (FACILITIES). THE CARRY OVER OF THE WAR TIME RULES ABOUT FACILITIES WORKED WELL FOR CAESAR.
- 1952 CNO SER. 00408P31 ESTABLISHED TARGET DATES FOR NAVFACS. FIRST DUE OCTOBER 1954 AND RATE OF INSTALLATION ONE PER MONTH. RAMEY P.R. CAME ON THE AIR NOVEMBER 1954.

- 1952 CNO SER. 000109P31 DATED 9 AUGUST, REQUESTED OP04 (LOGISTICS) TO TAKE NECESSARY ACTION TO ACQUIRE BASE RIGHTS.
- 1952 HYDROGRAPHIC OFFICE SER. 007017 DATED 11 SEPTEMBER SET UP HYDRO SURVEY SCHEDULE FOR CAESAR. HSG-1 ASSIGNED TASK USS MAURY, SHELLDRAKE AND PREVAIL. GROUP PREVIOUSLY DEPLOYED IN PERSIAN GULF. HASSEL IN CNO AS TO WHAT WAS MORE IMPORTANT - ASW OR OIL - ?
- 1952 TWO LOFAR MACHINES SENT TO ENGLAND - ONE LOCK GOIL, THE OTHER UDE PORTLAND TO ANALYZE SIGNATURES ON THE SPOT.
- 1952 CNO SER. 0092P42 DATED 25 SEPTEMBER INCREASED NUMBER OF STATIONS FROM SIX (6) TO NINE (9).
- 1952 CNO PLANNING MEETING ON CAESAR. BUAER REPRESENTATIVES MOST UPSET NO LOFAR FOR THE AIRPLANE. BUAER WANTED ITS OWN R&D CONTRACT WITH BTL. THIS DID NOT HAPPEN UNTIL FOLLOWING YEAR AUGUST 1953 WITH CONTRACT NOas-53-910.
- 1952 CNO SER. 000126P31 DATED 26 SEPTEMBER GAVE LOCATIONS OF THE NINE STATIONS:
- SABLE ISLAND ("CAPE" HAD BEEN DROPPED)
 - NANTUCKET
 - CAPE MAY
 - CAPE HATTERAS
 - BERMUDA - SOUTH
 - BERMUDA - NORTH
 - SAN SALVADOR BWI
 - TURKS ISLAND BWI
 - RAMEY AFB P.R.
- 1952 BUSHIPS SER. 002976 DATED 15 OCTOBER OUTLINED REQUIREMENTS FOR A CABLE SHIP TO CARRY OUT CAESAR. SUGGESTED C/S H.G. BULLARD NOW IN JAMES RIVER.
- 1952 CNO SER. 00610P31 DATED 27 OCTOBER SET UP SECURITY RULES FOR LOFAR PROGRAM.
- 1952 CNO SER. 000159P31 DATED 20 NOVEMBER RESPONDED TO (INCPACFLT 9 JUNE "GAVE THE DOG A BONE" - SUGGESTED LOFAR STATION IN PACIFIC WOULD ONLY BE ON A "NOT TO INTERFER BASIS", SUGGEST PILOT SYSTEM IN THE ATLANTIC (WHICH IS CLOSER TO WASHINGTON) BE GIVEN PRIORITY. PACIFIC EXPANSION WAS NOT TO COME UNTIL 18 MONTHS LATER WITH SER. 00748P41 DATED 28 MAY 1954 WHICH ADDED TEN STATIONS TO ORIGINAL NINE.
- 1952 MARTINE ADMINISTRATION RELEASES C/S BULLARD TO NAVY, RECHRISTENED USS NEPTUNE (ARC-2).
- 1953 CONTRACT LET TO WESTERN GEAR FOR MACHINERY FOR USS NEPTUNE. CABLE DRUMS TO BE 15 FEET DIAMETER; BOW SHEAVES TO 12 FEET DIAMETER; CABLE DRUMS TO ELECTRIC DRIVE WITH EACH MOTOR BEING SUPPLIED BY ITS OWN TURBO-GENERATOR SET.
- 1953 USS NEPTUNE JOINS HSG-1 AND TAKES ON THE ROLE OF ACOUSTIC SURVEY SHIP. PREVIOUS ARRANGEMENT WITH THE USS PREVAIL MOST UNSATISFACTORY AS SHIPS WAS TOO SMALL AND THERE WAS NO CALBE HANDLING MACHINERY ON BOARD. USS NEPTUNE WORKED OUT VERY WELL.
- 1953 CAESAR GETS BRICK BAT URGENCY RATING TO KEEP ON SCHEDULE.

- 1953 HSG-1 FINISHES FOUR SITES - RAMEY, GRAND TURKS, SAN SALVADOR AND SHELLBURNE N.S. CABLE SPECIFICATIONS FINALIZED AND ORDERS PLACED ON SIMPLEX.
- 1954 CNO SER 0002P31 DATED 8 JANUARY RECOMMENDS 3 MORE STATIONS BE ESTABLISHED AT BARBUDA BWI, BARBADOS AND CAPE RACENFLT.
- 1954 USS NEPTUNE ENTERED YARD AT SEATTLE TO HAVE NEW MACHINERY INSTALLED.
- 1954 CABLE FACILITY AT SIMPLEX BEGINS TO PRODUCE CAESAR CABLE. FIRST RUN WAS FIVE MILE PRACTICE CABLE PLUS STUB - SHIPPED BY RAIL TO SEATTLE TO TEST MACHINERY BEING INSTALLED ON USS NEPTUNE.
- 1954 LOFAR MAKES NATIONAL SECURITY COUNCIL "HIT PARADE" NSC PAPER 5408 DATED 17 FEBRUARY 1954. PRESIDENT EISENHOWER APPROVES NSC 5408 ON 24 FEBRUARY, 1954.
- 1954 ARRAY AND CABLE INSTALLED AT RAMEY.
- 1954 CNO SER 00748 P41 DATED 28 MAY 1954 - TEN ADDITIONAL STATIONS AUTHORIZED FOR PHASE II OF CAESAR. 3 IN THE ATLANTIC, 6 ON PACIFIC WEST COAST AND 1 FOR HAWAII.
- 1954 ARRAY AND CABLE INSTALLED AT SAN SALVADOR 13-25 JUNE
- 1954 ARRAY AND CABLE INSTALLED AT GRAND TURKS (TROUBLE WITH "CRACK" IN SEA MOUNT). HAD TO REDO 12-28 JULY
- 1954 ARRANGEMENTS MADE TO CHARTER C&GS SHIP PIONEER TO DO PROJECTOR MAPPING TO VERIFY PERFORMANCE OF STATIONS. IT WAS THIS SHIP THAT TOWED THE MANETOMETER AS AN AFTERTHOUGHT TO THE CAESAR PROJECTOR MAPPING THAT GAVE THE CLUE TO THE TECTONIC PLATE.
- 1954 FIRST NAVFAC - RAMEY AFT P.R. COMMISSIONED. 18 SEPTEMBER 1954.
- 1954 WEST COAST COMMANDS BRIEFED AT SAN FRANCISCO - SOME ONE SET IT UP AS TOP SECRET AND LCDR KELLY HAD TO GET ADMIRAL LEGGETT TO INTERCEDE TO GET INTO THE MEETING. LCDR KELLY WAS THE BRIEFING OFFICER.
- THE FIRST ONE WAS THE HARDEST. THE FACT SHEETS GAVE AN OVERVIEW OF WHAT HAPPENED ON MY WATCH.

CAESAR'S MONEY

<u>FISCAL YEAR</u>	<u>R&D</u> (000)	<u>PRODUCTION</u> (000)	<u>MILCON</u> (000)
1952	\$1,780	\$8,950	\$ 0
1953	2,450	27,550	0
1954	1,900	5,330	2,440
1955	1,450	36,090	5,420
1956	2,750	31,480	8,330
1957	2,470	24,240	10,320
1958	3,170	26,710	400
1959	6,020	25,890	350
1960	6,600	31,900	300
1961	6,000	1,280	2,000
1962	4,020	9,920	1,900
1963	5,040	16,110	1,100
1964	7,510	59,940	3,640
1965	7,950	30,700	3,890
1966	9,320	27,940	0
1967	13,300	26,200	0
1968	12,200	48,400	4,700
1969	14,780	67,300	0
1970	22,260	68,500	7,110
1971	18,765	43,900	4,980
1972	<u>25,516</u>	<u>67,800</u>	<u>1,100</u>
Total	\$175,251	\$686,130	\$57,980 \$919,361

CAESAR IS NOT A "MULTI-BILLION" PROGRAM. IN FACT KELLY AFTER 21 YEARS OF REALLY TRYING DID NOT MAKE THE FIRST BILLION.

RESEARCH REPORTS

AGENCY
CONTRACT
TYPE
INITIATED

ONR
NONR-210
RESEARCH
NOVEMBER 1950

BUSHIPS
NOBSR 57093
DEVELOPMENT
NOVEMBER 1951

BUSHIPS
NOBSR 63125
SYSTEM STUDY
AUGUST 1952

BUAER
NOAS-53-910
DEVELOPMENT
AUGUST 1953

#1 - 4/8/52

#2 - 9/3/52

#3 - 1/22/53

#4 - 5/12/53

#5 - 10/7/53

#6 - 2/16/54

#7 - 9/22/54

#8 - 3/23/55

#9 - 10/18/55

#10 - 6/7/56

#11 - 1/30/57

#12 - 7/25/57

#13 - 5/13/58

#14 - 4/14/59

#15 - 3/16/60

#1 = 6/16/53

#2 - 1/21/54

#3 - 7/21/54

#4 - 3/22/55

#5 - 12/14/55

#6 - 10/5/56

#7 - 7/11/57

#8 - 6/17/58

#9 - 3/17/60

#A - 4/28/54

#B - 9/22/54

#C - 3/24/55

#D - 9/21/55

#E - 5/17/56

#F - 12/11/56

Final 1/31/57

#G - 9/5/57

#H - 3/27/58

#I - 10/22/58

#J - 6/24/59

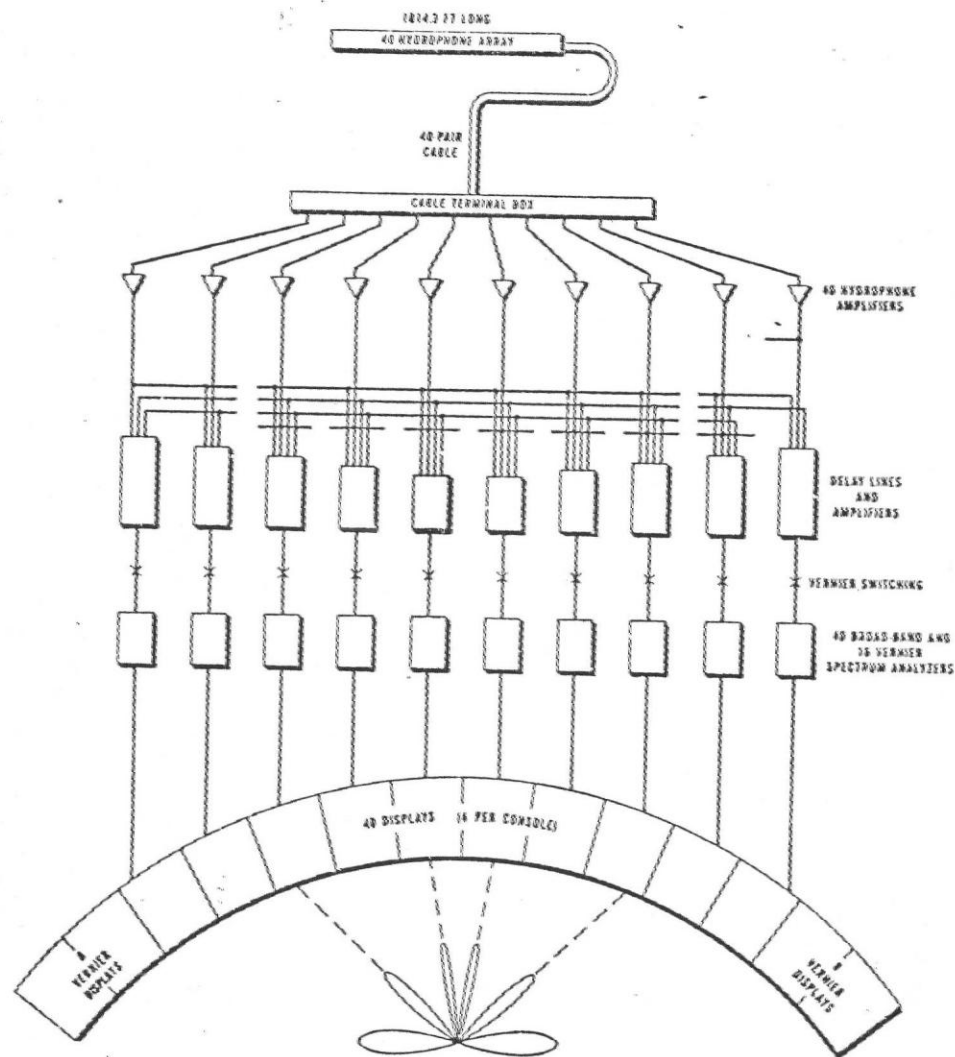
#K - 12/10/59

Final 2/15/59

Final 3/31/59

- NOTES (1) ONR CONTRACT NONR-210 HAD QUARTERLY REPORTS.
(2) BUAER HAD A NEW CONTRACT NOAS- 57-366 FOR REPORTS G THROUGH K.
(3) THERE WAS AN ASW CONFERENCE 16 JULY 1959 TO EXPLAIN WHY BTL HAD FOUR DIFFERENT CONTRACTS WITH THREE DIFFERENT NAVY OFFICES FOR "RESEARCH." NAVY WAS SATISFIED THAT EACH OF THE TASKS, EVEN THOUGH RELATED, WERE UNIQUE ENOUGH TO WARRANT SEPARATE CONTRACTS.

SOUND SEARCH STATION FUNCTIONAL DIAGRAM



Fact Sheet -SOSUS as of September 1968

2 Operational Control Centers	Norfolk OCEANSYSLANT	Pearl Harbor OCEANSYSPAC
21 Naval Facilities	13 - Atlantic	8 Pacific
34 arrays	24 - Atlantic	10 Pacific
10,050 nm of submarine cable	6082 - Atlantic	3968 Pacific
304 Naval Officers		
2376 Enlisted Men		
\$510.1 Million Invested in Equipment		
36.5 Million Invested in Military Contruction		
\$546.6 Million Total Investment		
\$ 14.6 Million Annual Military Pay		
\$ 7.4 Million Annual Operation and Maintainence		
\$ 14.0 Million Annual R&D		

<u>Fact Sheet SOSUS as of September 1968</u>					
Fiscal Year	Phase	Arrays	Funds Approved	Funds Pending	Funds Total
52-55	C-I	9	\$60.1M		\$60.1M
55-58	C-II	12	\$128.0M		\$128.0M
58-63	C-III	5	\$ 78.8M		\$ 78.8 M
63-69	C-IV	11	\$210.3M		
70	C-IV	2		\$ 22.0M	\$232.3M
68-69	SDC	8	\$ 69.4M		
70	SDC			\$ 64.9M	
71-73	SDC	—	—	<u>\$ 57.7M</u>	<u>\$192.0M</u>
Totals		47	\$546.6M	\$144.6M	\$691.2M

Fact Sheet SOSUS as of September 1968

Phase	Arrays	Cost	\$/Array	Cable n.m.	Cable/Array	Phones	\$/Channel mile
C-I	9	\$60.1M	\$6.6M	520	47.8	360	\$3452
C-II	12	128.0M	10.6M	1221	76.3	640	3473
C-III	5	78.0M	15.7M	1900	380.0	200	1033
C-IV	13	232.0M	17.8M	9190	706.9	536	616
SDC	<u>8</u>	<u>192.0M</u>	<u>24.0M</u>	<u>5800</u>	<u>725.0</u>	<u>344</u>	<u>769</u>
Totals	47	\$690.0M		18,631n.m.		2080	
Average			\$ 14.7M/array		396n.m./array		\$913/channel mile

Fact Sheet on Naval Facilities (NVFACS)

PHASE-I

Year	Code	Location	Cablen.m.	Repeaters	Shore Equip	Remarks
1954	Charlie	Ramey P.R.	19		FQQ-1A-1	
1954	Baker	San Salvador	24		FQQ-1A-3	Secured 4/30/78
1954	Item	Grand Turks	43		FQQ-1A-2	Secured 1/31/78
1954	Fox	Shelburne	106		FQQ-1A-4	
1955	DOg	Bermuda	34		FQQ-1A-5	
1955	Easy	Bermuda	39		FQQ-1A-6	
1955	How	Nantucket	116		FQQ-1A-7	Secured 6/30/76
1955	George	Cape May	108		FQQ-1A-8	Shifted to Lewes 5/
1955	Able	Hatteras	36		FQQ-1A-9	

PHASE-II

1955	Jig	Antigua	83		FQQ-1A-10	2- sea cables, 1-FQ
1956	Sugar	Hatteras	115		FQQ-1A-11	
1956	Love	Barbados	88		FQQ-1A-12	Secured 1979
1956	Mike	Eleuthera	119		FQQ-1A-13	
1957	Uncle	San Nicolas	130		FQQ-2A-1	2-sea cables, 1-FQ
1957	X-Ray	Pt. Sur	75		FQQ-2A-2	2 sea cables, 1-FQ
1957	Tare	Centerville	79		FQQ-2A-3	2 sea cables, 1-FQ
1958	Zebra	Coos Bay Ore.	45		FQQ-2A-4	
1958	William	Pac. Beach	56		FQQ-2A-5	
1958	Yoke	Pac. Beach	172		FQQ-2A-6	Phantom powered am
1958	King	Argentina	189		FQQ-2A-7	Phantom powered am
1959	Victor	Shelburne	261		FQQ-1A-14	Curved array p/p/ amp.

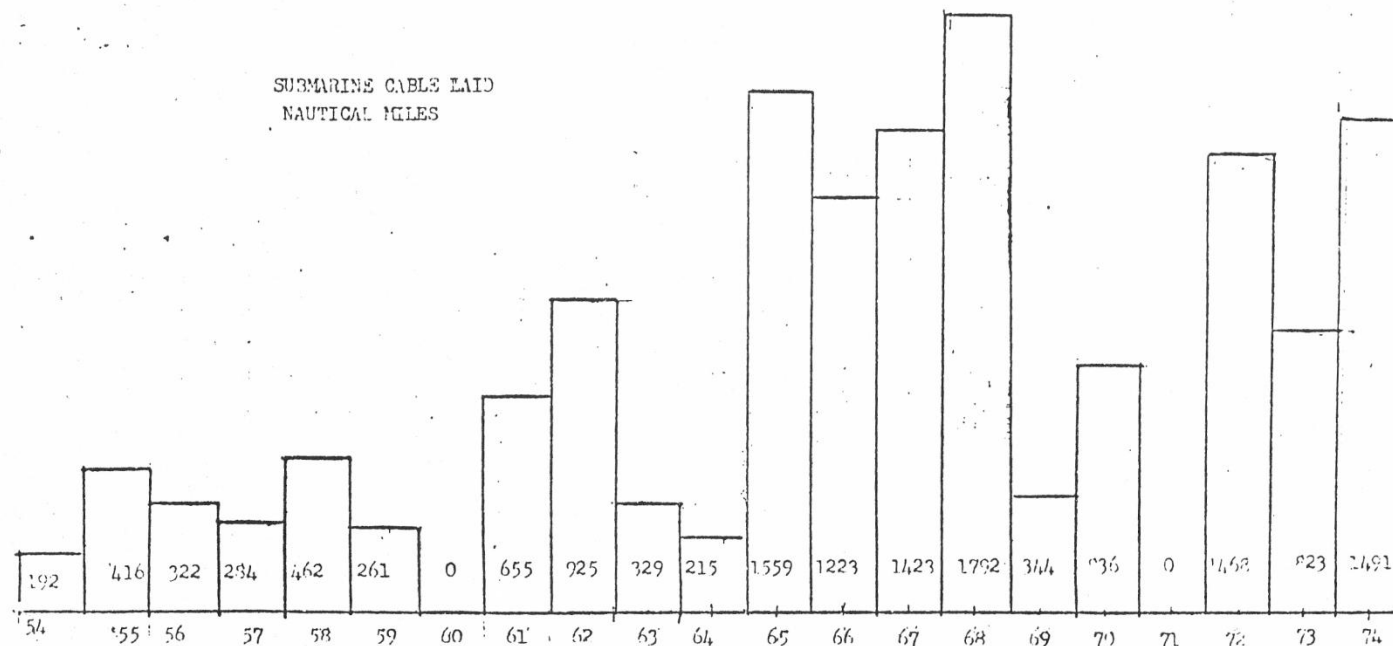
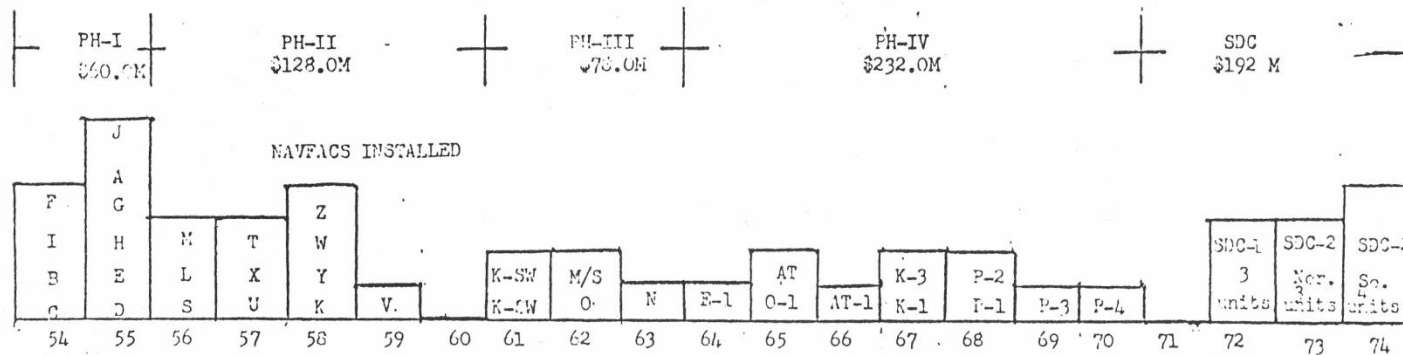
PHASE III

1961	King SW-1	Argentia	298		FQQ(XN)-1	Mixture of 4,8,12,16,21
1961	King SW-2	Argentia	357.2		FQQ(XN)-2	cable mileage=equivslen
1962	M/S	Eleuthera	330.2	8	FQQ-9V (X)	SW system secured July
1963	NAN	Argentia	329.	8	FQQ-9V-2	First experimental SB c
1964	Easy-1	Bermuda	215	5	FQQ-9V-3	Elbow 2x20 configuration

Phase IV

1962	Oboe	Adak	595	15	FQQ-9V-1	Pushed ahead because of Cul
1965	Oboe-1	Adak	745	19	FQQ-9V-4	
1965	AT	Keflavik	814	21	FQQ-9V-5	
1966	AT-1	Keflavik	1223	32	FQQ-9A-1	Power Supply at Hofn.
1967	King-1	Argentia	892	23	FQQ-9V-6	
1967	King-3	Argentia	531	14	FQQ-9A-2	
1968	P-1	Guam	915	24	FQQ-9A-3	
1968	P-2	Midway	877	23	FQQ-9A-4	
1969	P-3	Midway	344	9	FQQ-9A-5	
1970	P-4	Barber Pt.	836	22	FQQ-9A-6	
1970	SDC-1	Centerville	1468	75	FQQ-11V-1	

CAESAR



MAGIC THAT MADE CAESAR HAPPEN

- (1) BUPERS GAVE KELLY REPEAT TRAVEL ORDERS WITHIN AND WITHOUT CONTINENTAL UNITED STATES.
- (2) KELLY WAS GIVEN AUTHORITY TO SIGN CORRESPONDENCE TO FORCES AFLOAT. THIS WAS USUALLY RESERVED FOR FLAG OFFICERS IN BUSHIPS.
- (3) THERE WAS NO RESTRICTION ON THE TELEPHONE. A RARE PRIVILEGE.
- (4) AIRPLANES WERE A TIME COMPRESSOR AND I COULD SLEEP ANYTIME AND ANY PLACE - NO JET LAG.
- (5) EASE OF CONTRACTING AS PRACTICED DURING THE WAR WAS STILL ALLOWED.
- (6) THE NAVY WANTED TO MAKE IT HAPPEN.
- (7) TRANSITION FROM R&D TO PRODUCTION WAS EASY WITH WECO/BTL TEAM. IF THERE WAS A PROBLEM, THE POOR BTL MAN WAS JUST TRANSFERRED TO THE WECO PLANT, SOME NEVER GOT BACK TO MURRAY HILL OR WHIPPANY.
- (8) THE BTL TEAM WERE THE SAME GROUP THAT DEVELOPED THE MARK 24 AERIAL ACOUSTIC MINE IN THE RECORD TIME FROM 24 DECEMBER 1941 (ASSIGNED TASK) TO PRODUCTION FROM A WECO PLANT BY JULY 1943. PEOPLE LIKE STEINBERG, WEIBUSCH, ROMANOFF, MARTIN AND ILGENFRITZ.
- (9) PEOPLE LIKE DR. HAYES WHO KEPT THE SONAR ALIVE BETWEEN WW-I AND WW-II AND PROF. TED HUNT WHO DID SUCH HEROIC WORK DURING AND AFTER WW-II ARE THE REASON FOR WHAT SUCCESS WE HAVE TODAY.