24 JUNE 1974

THE CLASSIFICATION OF THIS BRIEFING IS ~~TS/E/TK~~ TOP SECRET

I- INTRODUCTION:

A- IT IS ALWAYS A PLEASURE TO ASSOCIATE WITH FRIENDS AND ESPECIALLY NOW DAYS WHEN THEY ARE ALL SO YOUNG AND SO VERY CAPABLY. I AM CONTINUOUSLY AMASED AT THE OUTSTANDING WORK WHAT THIS TEAM IS DOING. AS I RECOUNTED HISTORY IN PREPARATION FOR THIS TALK I COULDN'T HELP FEELING THAT I WAS BORN 15 YEARS TOO SOON BECAUSE OF THE JUICY JOBS ALL OVER THE PLACE TODAY AND I'M STUCK WITH A JOB SO FAR FROM THE BENCH WHERE THE TRULY EXCITING EVENTS ARE TAKING PLACE AT NRL TODAY.

B- FOR THOSE OF YOU WHO WERE PRESENT AT THE LABORATORY SATURDAY YOU MAY HEAR AGAIN SOME OF THE THINGS WHICH I RELATED DURING YOUR VISIT BUT TRY TO BE PATIENT WITH ME AS I TRY TO UNFOLD SOME OF THE HISTORY AND A PROGNOSIS OF THE FUTURE AND HOW WE ARE GOING TO GET THERE.

II- HISTORY - - - - -

A- MY CAREER AT NRL STARTED IN DEC 1943 AS AN ~~APPRENTICE~~ SEAMAN 1ST GOING TO THE RADIO MATERIAL SCHOOL. THIS WAS FOLLOWED BY A SPECIAL PROJECTS (COUNTERMEASURES) SHCOOL AND A TOUR IN THE PACIFIC AS THE ELECTRONIC TECHNICAN ON AN "UNDERWAY" TRAINING TEAM FOR ECM. THERE I SERVED ON SOME 65 SHIPS OVER A PERIOD FROM FEB 45 THROUGH OCT 45, I THEN ENTERED GW UNIVERSITY HERE IN DC AND GRADUATED AFTER 3 YEARS OF DAY AND NIGHT SCHOOL. ENTERVIEWED ALL OVER DC AND FINALLY WENT TO NRL WHERE THEY RECOGNIZED THE VALUE OF MY FLEET EXPERIENCE TO THEIR COUNTERMEASURES PROGRAMS. THE FIRST JOB THAT I HAD WAS TO EVALUATE THE GERMAN ATHOS SYSTEM AND TO TAKE OUR TECHNOLOGY AND ADAPT IT FOR USE IN OUR FLEET AND THIS EFFORT TOOK ME FOR THE MOST PART UP THROUGH THE NEXT 8 YEARS...THE ATHOS SYSTEM WAS A SMALL CRYSTAL VIDEO TYPE RECEIVING SYSTEM THAT WAS HAND HELD BY THE LOOKOUTS ABOARD THE GERMAN SUBS AS THEY WERE ON THE SURFACE AND BY VIRTUE OF OUR USE OF RADAR THEY COULD HEAR US LONG BEFORE OUR RADAR COULD SEE THEM AND THIS GAVE THEM A DISTINCT ADVANTAGE SINCE THEY COULD SUBMERGE BEFORE OUR AIRCRAFT OR SHIPS COULD CLOSE RANGE SUFFICIENTLY TO DETECT THEM (IF THEY HAD REMAINED ON THE SURFACE). THERE FOLLOWED FROM THIS INITIAL EVALUATION OF CAPTURED WAR MATERIALS FROM GERMANY (several) ~~MANY OF THE~~ EFFORTS THAT WE SEE IN USE IN OUR NAVY TODAY....HF/DF USES THE GONIOMETER WHICH WAS GERMAN AND IT IS PERHAPS THE MOST WIDELY KNOWN TO YOU BUT THERE WERE OTHERS TOO. THE CRYSTAM VIDEO RECEIVING TECHNIQUE WITH ITS SIMILICITY, SMALL SIZE AND WIDE OPEN CHARACTERISTICS OF FREQUENCY AND INTERCEPT AZIMUTH CAME INTO WIDE USE FOR THE DF SYSTEMS ABOARD OUR SHIPS, SUBS AND AIRCRAFT THROUGH THE DEVELOPEMENTS OF MYSELF AND OTHERS IN THE LATE 1940S AND EARLY 1950S. IT WAS THE 8A PERISCOPE SYSTEM WHICH I WAS DESIGNING IN 1958 THAT LED TO THE CONCEPT OF POPPY. IN RESPONSE TO THE REQUEST BY CNO (ARLEIGH BURKE) TO ALL HANDS TO "CONSIDER HOW THEY COULD USE SPACE IN THEIR DESIGN IDEAS FOR THE NAVY, I PROPOSED THAT THE "PERISCOPE" COULD BE RAISED TO AN ORBITAL ALTITUDE LIKE 200 TO 500 MILES AND THAT RADAR SIGNALS COULD BE TRANSPONDED DOWN TO COOPERATIVE GROUND STATIONS. THIS CONCEPT WAS SOLD BY THE LABORATORY FROM MIDDLE 1958 UP THROUGH NAVY, DOD, ARPA UNTIL WE HAD PRESIDENTIAL APPROVAL IN AUGUST 1959...OF COURSE HE ALSO KILLED THE TATTLETALE PROJECT WHEN IT WAS LEAKED TO THE NEW YORK TIMES IN LATE 1959 AND THEN HE CALLED IN TO HIS OFFICE THE DIR. ONI AND THEY WORKED OUT A SYSTEM OF SECURITY OATHS THAT WAS TO BE HANDLED SO TIGHTLY THAT AT THE TIME OF LAUNCH OF OUR FIRST SATELLITE THERE WERE LESS THAN 200 PER[illegible] IN THE ENTIRE WORLD THAT HAD THE FULL STORY on The Program.

(1)

~~TOP SECRET~~ Handle via BYEMAN Control Systems Jointly

(2) THE OBJECTIVES FOR THIS EARLY VERSION OF POPPY ARE SUPRISINGLY SIMILAR TO THE ONES YOU ARE OPERATING UNDER TODAY...SIGNAL ENVIRONMENT, UNKNOWNS AND KNOWN MILITARY [redacted] TERS AND TO AID IN DEVELOPMENT OF PROCESSING TECHNIQUES

TOP SECRET [redacted]

(3) THE SATELLITE SHOWN IN THIS VIEWGRAPH IS DRAWN IN AUGUST 1958 AS THE EARLY BEST GUESS AT WHAT OUR SPACECRAFT WOULD LOOK LIKE. THE NEXT VUE GRAPH SHOWS
(4) A PICTURE OF OUR FIRST BIRD AND YOU CAN READILY SEE THE SIMILARITY. THE MAIN DIFFERENCE FROM THE OUTSIDE VIEW IS THE INCREASED SIZE OF THE SOLAR CELLS.

(5) THIS VU GRAPH USES THE ACCRONYM NTPC AND IT IS THE EARLY FORERUNNER OF THE GROUP THAT IS NOW AT NSA UNDER KEN GALLAGHER...IN FACT KEN PROBABLY WAS IN THE GROUP SINCE THESE DAYS IN 1959. IT PROVIDES THE SYSTEM OVERVIEW WHICH REMAINS VALID EVEN TO THIS DAY.

(6) THIS VU GRAPH SHOWS THE DISPOSITION OF THE DEDICATED COLLECTION SITES FOR THE EARLY PROGRAM. THE NAVY WAS THE HOST AT [redacted] SITES, WITH THE AF AT [redacted] THE ARMY AT [redacted] SITE. SO THE PROGRAM FROM THE FIRST DAYS WAS A DOD PROGRAM AND OVER THE YEARS THE SITES WERE SHIFTED SOMEWHAT AND HAS BECOME NAVY [redacted] THE TRACE OVER THE USSR IS FOR A SUBMARINE FIRED LAUNCH CAPABILITY WHICH WAS BEING PROPOSED IN LIEU OF CANAVERAL AFTER WE HAD A MISSLE IMPACT INTO CUBA....VANDENBERG WAS THE BETTER CHOICE THOUGH.

(7) THIS VU GRAPH SHOWS THE ELECTRONIC SHELTER HUTS WHICH WERE PIONEERED BY THE LABORATORY IN ORDER TO PROVIDE THE SITE WITH A SYSTEM THAT COULD BE LOCATED WITH MINIMUM IMPACT. SOME OF YOU MAY RECALL THAT THE HUTS WERE NOT ALL THAT MINIMUM-IMPACT TO THE TEAM THAT HAD TO OPERATE AND MAINTAIN THEM, BUT THERE WAS ALMOST NO MILCON (BRICK AND MORTOR) TYPE SUPPORT. THE NAME OF THE GAME AT THIS POINT IN TIME WAS TO MAKE THE BEST POSSIBLE RECORDING AND FORWARD IT IN THE COURIER RUN TO NSA FOR PROCESSING. THERE were ~~WAS~~ CERTAIN OCCASIONS THAT THE SITE COULD BE ABLE TO SCAN THESE TAPES AND MAKE MESSAGE DISCLOSURES OF THEIR CONTENT SO THAT NSA COULD BE BETTER ABLE TO PROCESS THE PRIORITY DATA FIRST....EVEN IN THE EARLY 60S THERE WAS A RECOGNITION OF PRIORITY DIFFERENCES BETWEEN THE BASIC STRATEGIC INFORMATION THAT WOULD EXPAND THE TOTAL FUND OF KNOWLEDGE ON ROUTINE EMITTERS AS DISTINCT FROM THE DISCLOSURE OF NEW OR UNUSUAL OR UNKNOWN EMITTERS....THE RECOGNITION OF THESE UNKS WAS HIGH PRIORITY AND THEY RECEIVED WIDE DISTRIBUTION. SO THE PROGRAM ATTAINED THE RECOGNITION OF ITS EARLY DETECTION/GENERAL SEARCH CAPABILITY.

(8) THIS VU GRAPH SHOWS THE RESULTS OF THE FIRST MISSION ATTAINED ON 22 TASKED REVS THAT WERE APPROVED FOR USE BY THE PRESIDENT. THIS WAS NOT THE FINAL REPORT ON THE ANALYSIS BUT MERELY AN INTERIM ONE...YOU CAN SEE THAT LOCATIONS WERE NOT OUR BIG OUTPUT BUT THEY RECEIVED MUCH INTEREST AND ENCOURAGEMENT.

(9) THE QUANTITY OF RADAR INTERCEPTS MADE IN FIVE AND ONE HALF MONTHS IN LATE 1952 AND THREE AND ONE HALF MONTHS IN EARLY 1953 ARE GIVEN HERE. IF YOU CAN COMPARE THIS WITH WHAT YOU SEE IN ONE 15 MINUTE PASS TODAY IN YOUR SITE YOU CAN SEE HOW VERY FAR WE HAVE COME IN 22 YEARS.

THE FIRST LAUNCH OCURRED IN JUNE 1960 AND WAS FOLLOWED ALMOST A YEAR LATER BY OUR SECOND LAUNCH....THERE WAS A FAILURE IN NOVEMBER 60, JAN 62 AND APRIL 1962 WITH SOME LOUSEY ORBITS THAT WERE NOT CALLED FAILURES. BY DECEMBER 1962 WE WERE PLACING [redacted] AND WERE OBLIGED TO EXPAND OUR SITE COMPLEXES ACCORDINGLY. THUS WE BEGAN TO OCCUPY THE OLD WOODEN GRD-6 DF BUILDINGS AT THE NSG SITES. AND BEGAN TO MOVE INDOORS AT OTHER PLACES AND USE REMOTE CONTROLLED ANTENNAS BY 1965. WE RECOGNIZED THE VALUE OF THE [redacted] DATA AND COORERATED IN A COLLECTION SYSTEM IMPROVEMENT EFFORT IN 1966 SO THAT WITH THE FLIGHT OF MISSION 7105 WE WERE EQUIPPED WITH AN A-TO-D DATA CONVERTER AND A COMPUTER AT [redacted] TO PROVIDE QA ON THIS CONVERSION PROCESS. THE LARGE REVIEW IN LATE 66 CAUSED THE ENTIRE OVERHEAD COMMUNITY TO ASSESS THEIR PROGRAMS AGAINST THE ABM DETECTION AND ANALYSIS TOP PRIORITY JOBS.

TOP SECRET [redacted]

Handle via BYEMAN Talent Keyhole Control Systems jointly

DECEMBER 19[illegible] FROM PMR.

(10) 7101 = FIRST NRO MISSION FOR US FROM VANDENBERG ABOARD THOR AGENA.
FIRST [redacted] FLIGHT
THEY D[redacted]TED THAT [redacted] COULD BE USED.
FIRST [redacted]ED LAUNCH= NO COVER EXPERIMENT USED.
FIRST [redacted] INTERCEPT AROUND MOSCOW
HIGHLY ELLIPTICAL ORBIT GAVE COMMUNITY CHANCE TO LOOK FOR POPPY AT WIDE RANGE OF ALTITUDES AND IT WAS HEARD ONLY BELOW 250 MI.
FIRST [redacted] DETECTION

AGENA BURNED UNTIL IT RAN OUT OF FUEL 125x 1500 N.MI.

---

(11) 7102 = FIRST THREE BIRD LAUNCH.... JUNE 1963
LOWEST FREQUENCY WE HAVE EVER TRIED TO INTERCEPT 88 MHz
UPPER FREQUENCY OF USE RAISED TO 4100 MHz
AGENA STOPPED BURNING CORRECTLY BUT REFUSED TO RESTART
OPERATIONAL LIFE LESS THAN 45 DAYS.

---

(12) 7103 = JANUARY 1964 PMR ON THOR AGENA.
FIRST GGS
UPPER FREQUENCY OF USE ELEVATED TO 5150 MHz.

I COULD GO ON BIRD BY BIRD AND MISSION BY MISSION BUT THESE HIGHLIGHTS HAVE BEEN ATTAINED BY THE PERSERVERANCE AND DEDICATED HARD WORK OF THE NSG TEAM IN THE FIELD AND THE SUPPORT BY OUR FRIENDS AT NSA. LETS LOOK FOR THE POINTS OF TECHNOLOGICAL INFLECTION WHERE THE PROGRAM UNDERWENT A SIGNIFICANT CHANGE IN CAPABILITY......

DEC 1966 WITH THE HARRY DAVIS COMMITTEE REVIEW OF THE ABM PROBLEM. HERE WE GOT OUR FIRST A-TO-D DATA CONVERSION SYSTEM AND COMPUTER TO PROVIDE THE QA...THE GOALS WERE TO WEIGH EACH PULSE FROM 7105 AND DETERMINE IF IT CAME FROM ANY OF THE HALF DOZEN ABM SITES...THIS WAS REAL TIME GEOGRAPHIC LOCATION SORTING AND IT WAS DONE BUT VERY DIFFICULT AND SUBJECT TO ERROR. THE COMPUTER AND THE DIGITIZING OF OUR DATA WAS THE MOST MOST MAJOR CHANGE TO THE PROGRAM SINCE ITS INCEPTION...IT ALLOWED THE IMPROVEMENT OF OUR TIMING RESOLUTION BY A FACTOR OF OVER 100 AND THUS WE COULD GET ACCEPTABLE LOCATIONS ON MUCH BRIEFER SAMPLES OF DATA.

THE NEXT POINT OF INFLECTION WAS THE DEVELOPMENT OF THE SOLID STATE RECEIVERS BY MARK VAN DE WALLE WHICH USHERED IN TO THE SITE THE RS-1 RECEIVERS AND THEIR MUCH IMPROVED PHASE LINEARITY AND CONSEQUENT [redacted]

THE ADAPTIVE THRESHOLDER, WHICH ELIMINATED THE AMPLITUDE-VARIATION SOURCES OF TIME ERROR...DONE BY JIM O'CONNOR AND MARK AND LEE.

(13) THE NAVY WAS STIRRING EVEN IN 1966 WITH THE NORWEGIAN SEA EXERCISE. THIS VU GRAPH SHOWS THE DATA WHICH WAS EXTRACTED OUT OF 7104 DATA. NOTE: THE GUGE THIS WAS MENTIONED FRIDAY AND I THOUGHT AFTERWORDS THAT THERE WERE PROBABLY NOT MANY HERE WHO KNEW WHAT I WAS TALKING ABOUT.... WELL 2 YEARS AFTER THIS (SEPT 68) THE NSA REQUESTED [redacted] TO LOCATE SOME GUGE EMITTERS IN SEARCH OF THE SA-4 OR SA5 OR SA-6???? AND WHEN THEY SHOWED UP AS THE FIRST OFFICIAL X-BAND LOCATIONS FROM THE PROGRAM AND THEN WERE IN [redacted] TO SAY THAT THEIR CREDITABILITY WAS IS QUESTION IS AN UNDER-STATEMENT. ONLY AFTER THE VQ SQUADRON ALSO CONFIRMED THAT THE GUGE WAS IN [redacted] WOULD THE WORLD BELIEVE THAT IT JUST MIGHT NOT BE RUSSIAN AFTER ALL. WELL THE BRITS ARE GOOD FRIENDS AND THEY CONFIRMED THAT THEIR [redacted] HAD A SYSTEM CALLED [redacted] THAT HAD THE SAME CHARACTERISTICS [redacted] GUGE...IN FACT THEIR EMITTER WAS THE ONLY VALID ONE. HERE WAS A RARE CHANCE TO KEEP THE COMMUNITY HONEST AND ELIMINATE AN ERROR OF OVER FOUR YEARS. POPPY COULD HAVE BEEN USED IN THIS WAY TO EXAMINE THE FUND OF KNOWLEDGE OF THE VARIOUS EMITTER FAMILIES ACROSS THE USSR......

TOP SECRET

Handle via BYEMAN/Talent Keyhole

(14) BY 1968 THE PROGRAM WAS BEING EVALUATED FOR ITS "TIPOFF" ABILITY AND THERE WE CAN S[redacted]AT MESSAGES WERE ENROUTE TO NSA SMAC CENTER WITHIN [redacted] AFTER INTERCEPT OF TOP PRIORITY SIGNALS.

CNO (ADM MOORER) IN APRIL 1968 GAVE THE PROGRAM A MANDATE TO LOCATE SHIPS AT SEA AND KEEP HIM INFORMED ON OUR PROGRESS...WITHIN DAYS THE FIRST THREE LOCATIONS WERE ON HIS DESK AND THUS THE CURTAIN WAS RAISED ON THE STAGE FOR OCEAN SURVEILLANCE BY SATELLITE... THIS EFFORT WAS ACCOMPLISHED ONLY BY THE VERY FINEST TEAMWORK WHICH HAS BEEN IN EXISTENCE BETWEEN NRL, NSG AND HRB-SINGER. LT RON POTTS LEE HAMMARSTROM, DICK WALES ARE CHIEF AMONG THE LIST OF KEY PLAYERS BUT THE SITES [redacted] HAD [redacted] OUTSTANDING CONTRIBUTORS AS WELL, many other

THE ARRANGEMENT OF THE SITES HAD SHIFTED TOWARD THE FULL NSG SPONSORSHIP BY 1969 WHEN THE AIRFORCE CLOSED UP SHOP IN [redacted] FOR POPPY. THIS WAS A BUDGETARY EVENT SINCE THE COMPUTER IN [redacted] WAS ATTAINED ONLY BY CLOSING UP ONE SITE....IT WAS MORE THAN A FAIR TRADE THOUGH SINCE THE COMPUTER ENTERING INTO THE PACIFIC HAS PAVED THE WAY FOR ALL SITES TO HAVE COMPUTERS.

ACCURACY WAS BEING IMPROVED BY IMPROVED CALIBRATION OF SYSTEMATIC ERRORS AND REDUCTION IN THE VARIATIONS OF THESE ERRORS, BUT AT THE SAME TIME [redacted] THE ACCURACY SUFFFERED ACCORDINGLY....THESE TWO ASPECTS COUNTERBALANCED EACH OTHER SO THAT THE PROGRAM ACCURACY REMAINED PRACTICALLY THE SAME IN THE FACE OF BETTER AND BETTER HARDWARE AND SOFTWARE. THE ELEMENT WHICH INCREASED DRAMATICALLY WAS THE QUANTITY OF SIGNALS WHICH COULD BE GEOPOSITIONED IN A SINGLE PASS ACROSS THE STATIONS. THUS THE THREE KEY ELEMENTS OF SYSTEM PERFORMANCE ...ACCURACY TIMELINESS PRODUCTIVITY WERE ALL GAINING BUT MOST OF ALL THE TIMELINESS WAS IMPROVING REMARKABLY.

(15) BY APRIL 71 THE MEMORANDUM OF AGREEMENT WAS SIGNED BETWEEN CNO/NRO/NSA WHICH CLEARLY STATED THAT THE EXISTING RESOURCES WOULD BE USED TOWARD THE ACHIEVEMENT OF OCEAN SURVEILLANCE.

(16) STARTING IN APRIL 71 THERE WAS A 9 MONTH FUNDED STUDY BY THE VARIOUS TECHNOLOGIES REPRESENTING THE ELINT OVERHEAD COMMUNITY....POPPY TECHNOLOGY WAS OPTIMIZED FOR OCEAN SURVEILLANCE DURING THIS STUDY AND THE PROGRAM THAT WAS PROPOSED BY THE LABORATORY WAS [redacted] AND THIS WAS DELIVERED TO THE COMUNITY IN NOVEMBER JUST PRIOR TO THE LAUNCH OF MISSION 7107 IN DECEMBER 16 1971. IN THE MONTHS THAT FOLLOWED THE TRAIL BECOMES SOMEWHAT OBSCURE BUT IN ANY CASE THE LABORATORY HAS AS A RESULT OF POPPY AND THE [redacted] PROPOSAL BEEN ALLOWED TO PARTICIPATE [redacted] ...THIS IS THE FIRST TIME I'VE MENTIONED THIS NAME I THINK.

(17) THE 9 MONTH STUDY WAS COMPETITIVE WITH THESE OTHER PARTICIPANTS.

Handle via BYEMAN ~~Talent-Keyhole~~ Control Systems Jointly

~~TOP SECRET~~ [redacted]