

PRESENTATION AT NAVAL WAR COLLEGE

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"The Navy's Role in Space"

GENTLEMEN, I AM VERY APPRECIATIVE FOR THIS OPPORTUNITY TO SPEAK TO

YOU ABOUT THE NAVY'S ASTRONAUTICS PROGRAM. I WILL TELL YOU ABOUT SOME OF
OUR CURRENT EFFORTS AND RELATE THESE TO OPERATIONAL CAPABILITIES AND I HOPE
PLANT A SMALL SEED FOR THOUGHT WITH YOU.

SLIDE #1

THESE THREE BENCHMARKS ARE A GUIDE IN OUR PROGRAM -----(PAUSE)-----.
WE TAKE THEM VERY SERIOUSLY AND I WISH TO DWELL HERE A MOMENT. I THINK THERE
HAS DEVELOPED A SORT OF "SPACE CADET" IMAGE OF WANTING TO BLAST OFF INTO
SPACE FOR THE SAKE OF BEING IN SPACE. IF I COULD LEAVE ONLY ONE THOUGHT
WITH YOU TO CHARACTERIZE OUR ASTRONAUTICS EFFORTS, IT WOULD BE THIS: "TO US
SPACE IS NOT A MISSION." WE HEAR SPACE SPOKEN OF AS THE HIGH GROUND OF THE
NEXT WAR BUT WE SAY THAT THE NAVY HAS NO REQUIREMENTS FOR SPACE OR ASTRO-
NAUTICS AS SUCH. WE DO HAVE REQUIREMENTS FOR SUCH SUPPORT FUNCTIONS AS
NAVIGATION, OCEAN SURVEILLANCE AND COMMUNICATIONS TO ASSIST US IN MEETING
OUR HARD-NOSED EARTH-BOUND MISSIONS. OUR INTEREST IS IN APPLYING THE

TECHNOLOGY TO DO TRADITIONAL NAVY MISSIONS MORE CHEAPLY OR BETTER.

SLIDE #2

WHEREAS OUR EXPLORATORY PROGRAM SPANS ALL OF THESE AREAS, I WILL DWELL ON THE FIRST FIVE BECAUSE OF THEIR IMPACT ON NAVAL OPERATIONS AT THE PRESENT OR IN THE FORESEEABLE FUTURE.

SLIDE #3

THE FIRST OF THESE AREAS IS NAVIGATION, HERE IS THE NAVY'S SATELLITE NAVIGATION SYSTEM. IT CONSISTS OF SATELLITES IN 600 MILE POLAR ORBITS, FOUR TRACKING STATIONS IN HAWAII, CALIFORNIA, MINNESOTA AND MAINE. A COMPUTER CENTER AT PT. MUGU, TWO INJECTION STATIONS AT MUGU AND MINNEAPOLIS, AND SHIPBOARD EQUIPMENTS.

THE TRACKING STATIONS TRACK THE SATELLITES AND RELAY THE INFORMATION TO THE COMPUTER CENTER WHERE THE ORBITS ARE PREDICTED AND THE INFORMATION IS INJECTED INTO THE SATELLITE MEMORY BY THE TWO INJECTION STATIONS. EACH SATELLITE CONTINUOUSLY TRANSMITS A CW SIGNAL, THE TIME AND ITS POSITION WHICH ARE RECEIVED BY A SHIPBOARD RECEIVER. BY ANALYSIS OF THE DOPPLER OF THE CW SIGNAL THE SHIP DETERMINES HER POSITION WITH RESPECT TO THE SATELLITE.

COMPARING THIS WITH KNOWN SATELLITE POSITION, THE SHIP'S POSITION RELATIVE TO AN EARTH REFERENCE IS DETERMINED.

I WILL NOT DWELL ON DESCRIBING THIS SYSTEM, BUT WISH TO MAKE IT CLEAR, IN CASE ANY OF YOU DO NOT KNOW IT, THE NAVY HAS THIS NAVIGATIONAL SATELLITE SYSTEM. THREE SATELLITES ARE IN ORBIT - ONE NUCLEAR POWERED AND TWO SOLAR POWERED. THE GROUND NET IS IN PLACE AND MANNED BY NAVY PERSONNEL. 18 POLARIS SUBS ARE EQUIPPED AND USING IT. THE OTHERS ARE BEING OUTFITTED. SEVERAL SPECIAL PURPOSE SHIPS SUCH AS RANGE SHIPS ARE EQUIPPED AND LONG BEACH AND RANDOLPH HAVE PROTOTYPE SETS OF SHIPBOARD EQUIPMENT FOR EVALUATION. ADMIRAL LAMBERT MENTIONED LONG BEACH'S USE OF IT ON SEA ORBIT. THE REAL TESTIMONY IS A LETTER TO CNO IN WHICH CAPTAIN PRICE STATES IN ESSENCE PLEASE DON'T TAKE MY SAT NAVIGATOR. THE UNIQUE THING ABOUT THIS SYSTEM IS THAT IN A WORLD THAT HAS BECOME ACCUSTOMED TO INDIVIDUAL SPACE SPECTACULARS AND HAS SPENT MANY BILLIONS OF DOLLARS ON SPACE EFFORTS, HERE IS THE ONLY SATELLITE SYSTEM THAT IS BEING OPERATED 24-HOURS PER DAY EVERY DAY BY MILITARY PERSONNEL IN DIRECT SUPPORT OF DEPLOYED MILITARY FORCES. AS A RESULT, THE CLAMOR OF

THE FLEET FOR THE PROTOTYPE EQUIPMENTS IS INTERFERING WITH THE ORDERLY
EVALUATION OF THE SHIPBOARD SYSTEM.

SLIDE #4

THESE ARE ACTUAL FIXES TAKEN DURING EVALUATION LAST SUMMER. THESE
ERRORS AS SMALL AS THEY ARE, ARE INFLUENCED SIGNIFICANTLY BY THE LIMITATIONS
OF THE GOEDETIC INFORMATION AVAILABLE AT THAT TIME.

SLIDE #5

WITH NO CHANGE IN EQUIPMENT AND MERELY INTRODUCING NEW GOEDETIC
INFORMATION BEING MADE AVAILABLE THROUGH THE ANNA GEODETIC SATELLITE PROGRAM
THE SAME FIXES WILL BECOME AS SHOWN BY JULY THIS YEAR. THEY ARE RATHER
DRAMATIC WHEN OVERLAID ON AN AIRCRAFT CARRIER WHICH IS NEARLY .2 MILE LONG.
IT IS NO LONGER A JOKE FOR A CAPTAIN TO SAY, "NAVIGATOR, GIVE ME A FIX." AND
TO HEAR THE NAVIGATOR REPLY. "THE BOW OR THE STERN, SIR." WE ARE NOW
PROCEEDING TO INVESTIGATE SUCH APPLICATIONS AS A/C NAVIGATION, MAINTAINING
RELATIVE POSITIONS OF SCATTERED FORCES SUCH AS SHIPS IN A FORMATION,
AMPHIBIAN SHIPS AND LANDMARKS AND FOR MARINE FORCES ASHORE. SUCH RELATIVE
POSITIONS CAN BE DETERMINED TO TENS OF FEET.

IN SUMMARY, THE SYSTEM IS BEING USED. FBM SUBMARINES, SURVEY SHIPS,

LONG BEACH AND RANGE TRACKER ARE EQUIPPED AND USING THE SYSTEM. IT IS CALLED OUT FOR ALL CVA'S, FIVE COAST AND GEODETIC VESSELS, ALL FBM AND ALL FBM TENDERS. OTHER POSSIBLE APPLICATIONS ARE BEING INVESTIGATED.

A SECOND AREA IN WHICH ASTRONAUTICS OFFERS CONSIDERABLE POTENTIAL FOR THE NAVY IS IN COMMUNICATIONS.

SLIDE #6

THE NAVY IS OPERATING KINGSFORT IN SUPPORT OF SYNCOM - NASA'S SYNCHRONOUS COMMUNICATION SATELLITE. THE NAVY CREWS ON KINGSFORT HAVE DEMONSTRATED THE POTENTIAL OF SHIP-SHORE COMMUNICATIONS BY A SATELLITE ROUTINELY AND BY SUCH DEMONSTRATIONS - AS ADM RICKETTS SPEAKING TO COMSIXTHFLT FROM HIS BEDROOM TELEPHONE AND ADM RODER SPEAKING TO COMSIXTHFLT FROM AN AIRCRAFT IN THE VICINITY OF WASHINGTON. MOST OF US ENJOYED THE OLYMPICS BY WAY OF THIS SAME SATELLITE AND THE NAVY RECEIVING STATION AT PT. MUGU. SYNCOM SATELLITE IS NOW PROVIDING ROUTINE COMMUNICATIONS BETWEEN SAIGON AND WASHINGTON.

IT IS OBVIOUS THAT THE 35 FOOT ANTENNA WHICH YOU SEE HERE IS TOO LARGE FOR OUR TACTICAL SHIPS.

SLIDE #7

THE MISER PROGRAM IS BEING CONDUCTED IN BUSHIPS TO DEVELOP TERMINALS THAT ARE SUITABLE FOR FLEET OPERATING SHIPS. MISER STANDS FOR MICROWAVE SPACE RELAY. IN THE PROGRAM THEY ARE INVESTIGATING 3', 6' AND 12' TERMINALS FOR USE WITH BOTH ACTIVE AND PASSIVE SATELLITES SUCH AS SYNCOM, WESTFORD BELT AND THE MOON.

SLIDE OFF

SHIPBOARD TERMINALS HAVE BEEN PROCURED FOR INSTALLATIONS IN TWO SEVENTH FLEET COMBATANTS THIS MONTH. THIS IS BEING FOLLOWED BY ADDITIONAL SHIPBOARD TERMINALS FOR SHIP TO SHIP - SHIP TO SHORE COMMUNICATIONS VIA DEFENSE COMSATS SCHEDULED TO BE OPERATIONAL IN 1967. BEING MICROWAVE, IT IS HIGH CAPACITY NARROW BEAM AND RELATIVELY SECURE AND FREE FROM INTERFERENCE. LIKE NAVIGATION, THIS TOO IS AN EXISTING CAPABILITY WHICH BOTH THE TECHNICIAN AND TACTICIAN MUST EXAMINE CLOSELY.

OCEAN SURVEILLANCE, OF COURSE, WAS NOT INVENTED DURING THE CUBAN CRISES, BUT THAT CRISES DID DRAMATICALLY SHOW WHAT A HOG FOR CONVENTIONAL FORCES SURVEILLANCE IS.

MY UNDERSTANDING IS THAT WE WERE QUITE HARD PRESSED TO MAINTAIN THE SURVEILLANCE TO SAY NOTHING OF BEING PREPARED TO MOUNT AN ATTACK OR AMPHIBIOUS OPERATIONS HAD THEY BEEN REQUIRED. THIS IS ONE AREA IN WHICH WE THINK ASTRONAUTICS OFFERS CONSIDERABLE POTENTIAL FOR OUR NAVY. IN A BROAD SENSE WE LOOK AT OCEAN SURVEILLANCE AS INCLUDING THESE SEVEN FUNCTIONS.

SLIDE #8

WE THINK ONE OF THE MOST INTERESTING CONCEPTS BEING PURSUED IN EXPLORATORY DEVELOPMENT AT THIS TIME IS THAT WHICH WE CALL SEAWATCH. IT CONSISTS OF ARRAYS OF MOORED-BUOYS WITH ACCOUSTIC DETECTING CAPABILITY AND SATELLITE OR AIRCRAFT READOUT. THIS INFORMATION IS TRANSMITTED TO CENTERS ABOARD SHIP OR ASHORE WHERE IT IS INTEGRATED WITH OTHER SENSOR INFORMATION SUCH AS SOSUS. THIS OFFERS THE POSSIBILITY OF NEAR REAL TIME SURVEILLANCE OF SUB-SURFACE AND SURFACE TRAFFIC ANY PLACE ONE DEPLOYS BUOYS.

SLIDE #10

IN ADDITION TO THE UPPER AND DEEP HYDROPHONES IT WOULD BE EXPECTED TO INCLUDE OCEANOGRAPHIC DATA SENSORS. THE DATA FROM ALL SENSORS WOULD BE PROCESSED IN THE BUOY AND TRANSMITTED FROM A FLOATING ANTENNA.

SLIDE #11 THE HEART OF THE SYSTEM IS THE ABILITY TO REDUCE THE DATA TO BE HANDLED OUTSIDE THE BUOY TO SOME MANAGABLE AMOUNT. HERE IS A LOFARGRAM DIGITIZED BY A SEAWATCH DIGITAL SONIC PROCESSOR. THIS WOULD TAKE PLACE IN THE BUOY WITH A RESULTANT REDUCTION OF DATA TO BE TRANSMITTED FROM THE BUOY BY A FACTOR OF ONE THOUSAND.

SLIDE #12 IN LIMITED WAR APPLICATION WE WOULD VISUALIZE ARRAYS PLACED IN LOCAL

SLIDE #13 TACTICAL AREAS. TO ESTABLISH A WORLD-WIDE NET OF BARRIERS WITH ADEQUATE SPARES WOULD REQUIRE SOME TWO THOUSAND BUOYS.

SLIDE #14 IT IS IMPORTANT TO EMPHASIZE THAT WE DO NOT LOOK AT SEAWATCH AS AN ISOLATED ASW SYSTEM, BUT MERELY ANOTHER SOURCE OF DATA TO BE CORRELATED WITH PORT REPORTS, AIRCRAFT REPORTS, SOSUS REPORTS, ETC.

HERE WE GET A LITTLE MORE INTO THE BLUE. IN THE MANNED ORBITING LABORATORY PROJECT THE NAVY HAS MOUNTED CONSIDERABLE EFFORT. WHEREAS THE OBJECTIVE OF THE PROJECT AS ESTABLISHED LAST YEAR WAS LIMITED TO DETERMINING MILITARY MAN'S CAPABILITIES IN SPACE AND SPECIFICALLY PROHIBITED OPERATIONAL SYSTEMS DEVELOPMENT, IN THE LAST MONTH THE PROGRAM OBJECTIVES HAVE BEEN CHANGED TO ALLOW DEVELOPMENT AND EFFORT DIRECTED TOWARD OPERATIONAL SYSTEMS.

FORTUNATELY OUR EXPERIMENT NEEDS LITTLE CHANGE TO MEET THESE CRITERIA AND SHOULD ALLOW US TO DETERMINE SURVEILLANCE POTENTIAL OF MANNED SATELLITES.

SLIDE #15 THE VEHICLE AT LAUNCH IS A TITAN III, A LAB SECTION AND A TWO-MAN GEMINI CAPSULE.

OUR EXPERIMENT INTEGRATES SEVERAL SENSORS AS SHOWN.

SLIDE #16 ELINT REACHING OUT A THOUSAND MILES, RADAR BROUGHT TO BEAR AT 350 MILES - AND OPTICS, VISUAL, PHOTO, LOW LIGHT LEVEL TV OVER THE TARGET FOR IDENTIFICATION.

AS FOLLOW-ON TO THE MORE CONVENTIONAL RADAR PLANNED FOR MOL WE HAVE, IN EXPLORATORY DEVELOPMENT, A SYNTHETIC APERTURE RADAR WHICH IF SUCCESSFUL WOULD FOR THE FIRST TIME GIVE US A PRACTICAL SATELLITE RADAR FOR DETECTION-GRADE SURVEILLANCE AT TWO HUNDRED POUNDS AND 20 WATTS INSTEAD OF 1500 LBS

SLIDE #17 AND 3.5 KILOWATTS. A TYPICAL CONFIGURATION WOULD HAVE BEAMS SWEEPING 225 NAUTICAL MILESPATHS. THE MOTION OF THE SATELLITE WOULD ALLOW FIXED BEAMS OBTAINING THE NEED FOR LARGE MOVABLE OR PHASED ARRAY ANTENNAE. THIS RADAR IS TO BE FLIGHT TESTED IN BREADBOARD THIS YEAR. SUCH A LIGHT WEIGHT SIMPLE

DEVICE HAVING SURVEILLANCE QUALITY RESOLUTION WOULD CONTRIBUTE SIGNIFICANTLY
TOWARD MAKING ROUTINE SURVEILLANCE FROM SPACE PRACTICAL.

SLIDE OFF

AT PRESENT, WE HAVE A CAPABILITY OF READING OUT CLOUD COVER PICTURES
FROM NASA NIMBUS SATELLITES. WE HAVE SIX NASA GROUND READOUT STATIONS FOR
EVALUATION, ONE OF WHICH HAS BEEN USED IN SARATOGA TO SUCCESSFULLY RECORD
CLOUD COVER PICTURES AND RESULTED IN A QUITE FAVORABLE OPTEVFOR REPORT.
OUR FIRST MILSPEC SHIPBOARD EQUIPMENT FOR EVALUATION WILL GO IN A CARRIER
FOR EVALUATION PRIOR TO THE NEXT NIMBUS LAUNCH. EQUIPMENTS ARE BUDGETED
FOR IN 1966 AND 1967.

WHEREAS THIS OFFERS A CAPABILITY IN THE NEAR FUTURE WE FEEL A
MILITARY SYSTEM SHOULD BE DIRECTED MORE TO A LOCAL TACTICAL REQUIREMENT
AND SHOULD BE SECURE. TO DO THIS WE ARE INVESTIGATING A SIMPLE PURE
MILITARY CONCEPT WHICH WOULD GIVE THE TACTICAL COMMANDER THIS INFORMATION
IN AN AREA OF APPROXIMATELY ONE THOUSAND MILES BY TWO THOUSAND MILES. IT
IS A SIMPLE SINGLE LINE SCAN TV CAMERA CONTINUOUSLY TRANSMITTING AS IT
PAINTS A 1000 MILE PATH.

IN SUMMATION, WE HAVE A CAPABILITY TODAY TO NAVIGATE A SHIP OR SUBMARINE TO ONE TENTH OF A NAUTICAL MILE ALL WEATHER PASSIVELY ANY PLACE ON THE GLOBE INDEPENDENT OF BASE RIGHTS. IT IS BEING USED BY OUR POLARIS BOATS AND SELECTED SURFACE SHIPS. CNO IS CALLING IT OUT FOR ALL ATTACK CARRIERS. IT CAN BE AVAILABLE TO OTHER FORCES TO PROVIDE:

1. PRECISE GEOGRAPHIC COORDINATION OF FORCES AFLOAT AND ASHORE.
2. ACCURATE LOCATION OF ASWEPS MOBILE STATIONS.
3. PRECISE HISTORY OF PLOT OF LARGE SCALE EXERCISES FOR EXERCISE EVALUATION.

EQUIPMENTS ARE AVAILABLE NOW TO INVESTIGATE THESE APPLICATIONS.

A CAPABILITY TO READOUT NIMBUS WEATHER SATELLITES EXISTS. THE FIRST MILSPEC SHIPBOARD EQUIPMENT FOR THIS SAT READOUT WILL BE IN A CARRIER PRIOR TO THE NEXT NIMBUS LAUNCH. LIMITED TACTICAL COMMUNICATION BY WAY OF SATELLITE EXISTS TODAY. SATELLITE COMMUNICATION TERMINALS ARE BEING INSTALLED IN TWO SEVENTH FLEET COMBATANTS FOR EVALUATION. IN 1967, THE INTERIM DEFENSE COMMUNICATION SATELLITE SYSTEM WILL BE IN OPERATION.

STATE OF THE ART EXISTS TO GIVE SEAWATCH TYPE SURVEILLANCE OF
SURFACE SHIPS AND SUBMARINES IN THREE TO FIVE YEARS. WE SEE COMING MUCH
BROADER SURVEILLANCE CAPABILITY WITH RADAR AND OPTICAL SENSORS WITH MANNED
AND UNMANNED SATELLITE SYSTEMS.

SLIDE #19 HERE IS, I HOPE, A SMALL THOUGHT PROVOKER. GIVEN A FORCE DEPLOYED
OVER THREE HUNDRED MILES. THE COMMANDER HAS A PROBLEM OF KEEPING TRACK
OF HIS FORCES AND UNCOOPERATIVE FORCES. HE PROBABLY IS UNDER EMCON AND
IN GREAT NEED OF COMMUNICATING. THE SATELLITE NAVIGATION SYSTEM GIVES
HIM THE CAPABILITY TO FIX THIS FORCE GEOGRAPHICLY TO 1/10 OF A MILE AND
TO GEOGRAPHICALLY COORDINATE THE VARIOUS ELEMENTS TO WITHIN TENS OF FEET.

SLIDE #20 ADD AN ARRAY OF AIR-DROPPABLE DEEP MOORED BUOYS IN A STRATEGIC AREA -

SLIDE #21 MAKE ONE PASS OVERHEAD WITH A RADAR EQUIPPED SATELLITE TO DETECT
UNCOOPERATIVE TARGETS INCLUDING AIRCRAFT. READOUT THE SUBMERGED BUOYS
INCLUDING SEA STATE AND OCEANOGRAPHIC DATA AND NOW WE HAVE ADDED TO OUR
PLOT THE LOCATION OF UNCOOPERATIVE FORCES SURFACE AND SUBMERGED.

SLIDE #22 ON THE SAME PASS OR WITH ANOTHER SATELLITE READ WEATHER COVER.
WITH THESE SAME SATELLITES GIVE THE CAPABILITY FOR SECURE COMMUNICATIONS.

YOU, AS A TASK COMMANDER WHILE IN FOUL WEATHER CONDITIONS AND WHILE UNDER EMCON AND INDEPENDENT OF FOREIGN BASE RIGHTS HAVE A NEAR REALTIME PLOT OF YOUR FORCES AND UNCOOPERATIVE FORCES SURFACE AND SUBMERGED. YOU HAVE THE WEATHER, OCEANOGRAPHIC DATA FOR ASW AND THE ABILITY TO COMMUNICATE SECURELY.

IF THIS SCENERIO DOES NOT GIVE US SOMETHING TO THINK ABOUT I BELIEVE TO CREDIT THE ENEMY WITH THIS SAME CAPABILITY CERTAINLY DOES GIVE FOOD FOR THOUGHT.

WE ARE LIVING IN A WORLD WHICH HAS COME TO EXPECT THE SPACE SPECTACULAR. WE HAVE TENDED TO LOOK TO ASTRONAUTICS AND SPACE AS A REMOTE POSSIBLE SOURCE OF GRAND SOLUTIONS TO GREAT PROBLEMS. THAT CAN VERY WELL BE THIS CASE BUT TODAY, NOW, THERE ARE SMALLER CAPABILITIES WHICH HAVE SUFFICIENT POTENTIAL TO MAKE IT MANDATORY THAT THE NAVY TECHNICIAN AND TACTICIAN GET ON NOW WITH DETERMINING THEIR EFFECT ON WARFARE.