

Memorandum

ENE-9B

9000

Chief, Office of Engineering

LT RANDOLPH

DATE:

DM : Chief, Naval Engineering Division

SUBJECT: WHEO Funds Withdrawal

: (a) O(OMS-1) memo to E dtd 8 May 1969

1. Reference (a) sheds some light on the history contributing to the unfortunate demise of WHEO. No useful purpose would be served in "finger pointing" or "nit picking" on the subject. This memo has been prepared with the objective of gaining some understanding of the past to better guide our future actions. The picture presented herein is not a perfect rendition. It was derived from documents uncovered by persons not present over the entire time span involved. Hopefully it will be useful.

2. What is the problem? WHEO as designed and estimated today will cost about \$20M to deliver. The Coast Guard had only \$14.5M available. How did this happen? The following history and summary attempts to answer this question. Each item below is backed up with some document on file. Several subjects that impinge on costs have not been included because the effect is small or not well defined. Problems not covered include: The use of 46 CFR Subchapter U, the place of ABS, Commercial vs. Navy design practice, the involvement of MARAD, problems with sub-contractors, and the rush to get bids in during the budget year.

a. After considerable discourse on the place of the Coast Guard in the ill defined national oceanographic program, a general beginning on the characteristics was transmitted to E from O in OSR-2 ltr of 2/25/65. The characteristics proposed describe generally a ship to replace EVER-GREEN. There is no mention of cost. Some characteristics are very general, i.e. "Radio - Capability of maintaining reliable radio communications from any location in the world's oceans with the exception of polar pack areas." Some characteristics are very precise, i.e. "A magazine sized for 15 tons of MK 2 demolition charges."

b. In early February 1966 both E and O responded to the draft of "The Coast Guard Role in Oceanography" in memos to CCS. These memos are interesting in that they point out the lack of agreement on characteristics required for WHEO. O points out that ice reinforcement is not needed, armament is, etc. The E memo discusses costs and displacements. As to displacement it is stated that a vessel of 2800 - 3000 tons can do the job although a vessel of over 3000 tons would be required as per the conclusions of Technical Report 309 of C&GS prepared by Operations Research, Inc. The cost estimate given was \$2.0M to \$2.5M less than HAMILTON. These numbers were labeled as rough and preliminary. Both memos recommended a dual purpose OSV/OCEANO ship.

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c. The dual mission concept was concurred in by CCS in memo to E dtd 3/25/66.

d. The SCB and its working group began putting together characteristics for a ship with OSV/ASW/HELO/OCEANOGRAPHIC capability. Operational requirements for helo hauldown on MEC's and HEC's were established about this time. On 11 August 1966 the working group proposed to the SCB a 2800 ton ship. The figure for the 25 knot OCEANO/OSV/ASW/SAR version recommended was \$12.95M. The memo states that this figure is low, should be used for comparison of the versions presented only, and included no design costs. The costs are relatively precise as concerns ASW and similiar equipment and installation costs, but does not address the costs of the scientific data handling electronics.

e. The ASW/OSV/SAR/OCEANO ship was taken to the staff of the National Council For Marine Resources and Engineering Development. It was not favorably received. On 17 October 1966, CAPT. HODGEMAN, USCG delivered to the Program Planning Officer of the Council a set of characteristics developed by CCS describing a single purpose oceanographic ship. Competition with civilian oceanographic ships became the cry. It was back to the drawing board for the SCB.

f. Vice President ltr to the Secretary of the Treasury dtd 12 November 1966 strongly urged "the latest developments towards automation" be included in the ship. It also states "I should like to be informed, and informed early, of any funding problems."

g. E memo to CCS dtd 14 November 1966 requested \$2.5M from the \$14.5M budgeted for a FY 68 HEC since the oceanographic ship alternative will cost only \$12M!

h. O ltr to E dtd 2 December 1966 outlined some details of the scientific requirements/tasks required. They were considerably greater than those called for in (a) above. They were listed as tasks rather than characteristics. Examples follow:

25 February 1966

Special Feature:
Sensor-Recorder-
Control room-
250 sq. ft.

2 December 1966

Data Processing:
(1) Process all oceano
and metro data collected
for display and transmission
to shore.
(2) Possess capability for
transmission and reception
of digital and analog data.

NOTE: The second sentence of the 12/2/66 version demands on line digital processing with analog to digital conversion of analog sensor outputs. A large increase in capability.

j. The SCB working group presented a set of recommended characteristics on 5 December 1966. This proposal covered various manning concepts in depth. The displacement was estimated between 2500 and 3000 tons. Speed, 20 kts. Ice strengthening, ASW sonar, the scientific tasks of para. (h) above, were included, but no aviation capability. No costs were given.

k. The SCB working group submitted to the SCB a revised set of recommended characteristics on 8 December 1966 adding Helo capability.

l. On 22 December 1966 the SCB approved the characteristics recommended by the working group with minor rewording. No costs were included. The revised characteristics were sent to the Commandant on 27 December 1966.

m. On 10 January 1967 the Commandant approved the SCB characteristics. The approved characteristics included a wartime conversion to ASW duties. Initial construction of the 20 kt, 119 man ship required shock hardening, helo capability, and capabilities in all scientific tasks mentioned up to that time. No costs were mentioned. This is the last approved set of characteristics for WHEO.

n. On 25 January 1967, O requested an increase capability in coring, trawling, heavy lift capability, and the addition of an acoustic system. This is pointed out in reference (a). The acoustic system addition when linked with the data processing requirements (process all data), is very costly. Apparently the impact of this addition was not recognized. Later, when the characteristics were given to the design contractors, both the acoustic and data processing requirements were taken properly to heart and the system designed accordingly. This increased the computation requirements considerably. The cost of this addition is about \$300K+ but probably more since it demands going to a second computer. The second computer is then available, and, following Parkinson's Law, got used up to capacity.

o. In mid February 1967, the design contractor's proposals were in based on the characteristics up to that time.

p. In mid April 1967 after pains taking review and a thirty day over-run in evaluation time, M. Rosenblatt and Son was contracted for the design. Shortly thereafter Texas Instrument was selected as a subcontractor for the data acquisition system, here after referred to as the NAVEONIC System (Nautical, Automated, Vessel, Environmental, Oceanographic, Navigation, Information, and Communication System). No cost limitation was given the contractor.

q. On 22 May 1967 OMB-1 memo to ENE clarified needs attached to the scientific tasks then in the characteristics. Minimum capabilities became capabilities for WHEO to have "at all times". The arctic research boat, buoy handling and stowage, biological laboratory and equipment, coring and core stowage, (refrigerated) and acoustic requirements were interpreted in a manner which increased the estimated cost of the final product.

r. From reference (c) which is a correct rendition of available records: "On 19 June 1967, in response to a solicitation requesting OMP mission support for 20 kts., OMS replied that while 20 kts. might be useful, that much speed could never be justified by the OMP mission."

"On 28 July 1967, because it appeared that costs were getting out of hand, OMS (O) agreed to a reduction in capability by deletion of

wave length sarsor (SIC)
underway STD system
near-surface microstructure system
gravity system
and overall reduction of

deep sea coring/dredging capability
data processing capability
seismic system
acoustic navigation system

The total agreed upon reduction was \$2.029M, leaving the balance of the NAVEONICS package at \$2.25M - thus a \$4.2M NAVEONICS package was "inferred" from the basic specifications, and this was known in July 1967, when the Coast Guard was still talking about a \$12M WHEO."

s. The contractor began delivering options and some cost data. On 21 July 1967 the contractor (MR&S) reported to the FCB working group:

(1) "It is not possible to design a 2500-3000 ton ship and meet all requirements.

(2) The cost of a ship to satisfy all requirements fully will exceed 12M and could run up to 19M depending upon the degree of sophistication of the data suite."

t. From reference (a): "On 9 August 1967, E to O memo refers to the 25 Feb 1965 O to E memo and reminds O that the \$12M WHEO was expected to have only about the same oceano capability as ROCKAWAY (\$150,000) and says "now O is asking for the WHEO to have every piece of gear known to exist and some that don't exist."

u. It was becoming obvious that the capability would not fit the displacement or the funds available. The WHEO Project Officer ltr. to the Chairman of the Facilities Characteristic Board dtd 9 August 1967 provided prices, for seven ship's ranging from \$13.92M to \$16.7M. The total cost given was \$4M above contract cost in each case. The inflation allowance from bid price 1966 to 1968 was taken apparently at about 5% per year. Inflation was not projected to mid '69 build time. (Based on OMS RESEARCHER bid price by American Ship). The \$4M additional cost above contract price was \$.5M low in administrative costs, \$2.0M low in NAVEONIC costs, \$0.5M low in change orders, and (since full scale mock-up was apparently not anticipated) \$0.8M low in retrofit availability costs.

v. From reference (a): On 10 August 1967, OMS "accepted" an E recommended version of the WHEO - 300' (waterline), 16 kts, with helo capability. This memo contained (for the first time?) the statement that such a ship would have "a capability greater than any other U.S. ship and would be responsive to the Vice President's charge of fully supporting the national program and would include the latest engineering developments toward automation."

w. FCB memo to COMDT dtd 16 August 1967, stated that the \$14.2M ship was minimal and recommended a \$14.2M ship of 3200 tons, 16 kts., with a length of 350 ft. The price given for the 20 kt version previously submitted was set at \$16.7M. NAVEONICS was then priced at \$2.4M.

x. Chairman, FCB memo to members dtd 28 August 1967 asks question: "What type capability can we build for \$12M?"

y. E memo to CCS dtd 6 September 1967 gave a brief set of characteristics for a \$12M WHEO (a 230 ft quasi stripped version). The cost given for the 16 kt, 3200 ton WHEO "using broad estimating techniques" was given as \$15M.

z. From reference (a): "On 12 September 1967, O advised CCS that such a ship would have inferior capabilities and would not be responsive to the Vice President's charge. Such a ship would have a capability less than several existing ships. O recommended same ship that OMS "accepted" on 10 August 1967."

aa. WHEO Project Officer memo to ENE of 19 September 1967 points out that latest version of SILAS BENT would cost \$16M.

ab. CCS memo to COMDT of 21 September 1967 recommends a \$15.04M WHEO.

ac. COMDT memo to FCB dtd 22 September 1967 approves 16 kt, 3200 ton, 350 ft WHEO at \$15.04M.

ad. WHEO Project Officer memo to ENE dtd 9 December 1967 discusses cost of adding Helo haul down. It includes the following: "Current ship cost estimates are increasing. Phase III design effort will include a detailed search for a way to save \$500,000 in construction costs with the least penalty to the ship."

ae. In January 1968 MR&S submitted the final report of Phase II of the design recommending a 3200 ton, 16 knot diesel ship at a total cost to the Coast Guard of \$16.1M. This figure was apparently based on labor and material costs of mid 1967.

af. Chief Communications Staff memo to FCB dtd 31 January 1968 recommends automated comms and points out that secure communications are required. No cost data is included.

ag. FCB working group memo to members dtd 1 February 1968 brings up the need for consideration of increasing helo capability from 10,000 lbs to 15,000 lb craft and automated communications.

ah. ENE memo to WHEO Project Officer dtd 5 March 1968 directs design to halt pending conversion to steam and automation of machinery space.

ai. The above decision was firmed by hand written note 12 March 1968 from E to Project Officer.

aj. The FY '69 budget with \$14.5M for WHEO was meanwhile progressing through BOB, and Congressional approval. The characteristics on AC&I item Ale were those being advertised.

ak. CCS memo to E dtd 13 March 1968 confirmed steam, automation, and the knowledge of some increase in displacement and cost.

al. E ltr to CCS dtd 15 April 1968 points out that \$150K additional funds were needed to design for automated steam and \$40K needed for design of automated comms. The price of construction was estimated at \$16.6M barring an unexpected inflationary trend in the next six months.

am. CCS memo to COMDT dtd 12 April 1968 states that WHEO will cost \$2.1M more than HEC by FY '69 standards.

an. Concern over WHEO's cost and where the Coast Guard was going as concerns military vs. scientific ships prompted a series of meetings, presentations, etc. to explore multi-ship buys of WHEO hull using FY '69 HEC monies. The budget cuts to one ship in FY '69 flattened this concept.

ao. Numerous cost reducing measures were injected into the design. Equipments were futured, boiler burners eliminated, habitability reduced, winches deleted, etc. The cost reductions were in tens of thousands, the deficit in millions.

ap. The design was turning up much heavier and more expensive as it progressed to near completion. The NAVEONICS costs being used were found to be low by about \$2M. The electronics personnel had arrived to work for the project officer and they soon uncovered the fallacies in the Texas Instrument estimates. (See WHEO Project Officer ltr. to ENE 1.21/69). Because of confusing wording, this letter was rewritten and resubmitted three times over a period of about a month.

aq. In early January 1969 work on the steam version was halted and work on the diesel version recommended a year earlier by MR&S began. The preliminary design version (3200 tons) was found to be too small to carry the fuel required. It also had insufficient stability. An immediate increase in weight to 3400 tons was required to correct the fuel error.

ar. ENE memo to COMDT dtd 12 April 1968 states that WHEO will cost \$2.1M more than HEC by FY '69 standards. The memo also states that the design is to proceed on the diesel design to provide for bidding by July 1969.

as. The displacement continued to grow. The preliminary weight report of MR&S as of May 1969 calls for a displacement of 3799 tons with no equipment additions!

at. Meetings were held within ENE in April '69 to review the estimate in light of the HEC negotiated price. The best estimate for a single ship price was set at about \$20M. This information was transmitted to CCS and CONDT in meetings that followed.

au. CCS ltr to E dtd 25 April 1969 scratched WHEO from the FY '69 budget pending the necessary approvals. The funds are to be reprogrammed to make up deficits in other areas, primarily ship construction.

av. E to CCS memo of 2 May 1969 provided words for use in explaining the rising WHEO costs as requested.

3. Several conclusions are rather obvious from the above historic account.

a. Contrary to reference (a) the operational capabilities of WHEO have indeed grown since 1965.

b. The design contractor provided poor displacement figures upon which to base estimates up to January 1969 and beyond.

c. The contractor had provided incorrect cost estimates through the use of poor weight estimating and a failure to keep up with inflation. All estimates (with one exception) being low.

d. The cost estimates provided to the Commandant have not been good or timely.

e. The Commandant, CCS, or even the FCB (in some cases) have not been provided the price that matches the characteristics.

f. Early estimates by engineers have frequently been based on hardware entirely different from that intended by the operators.

4. The problems of projects overrunning estimates in cost and time are not unique with the Coast Guard. Coast Guard personnel are not dishonest or lazy. The planned program and budget system, inflation, technical complexity, an ever increasing work load on management, and unsettled politics have conspired to bring about the loss (for the present at least) of an oceanographic ship. It is unrealistic to assume that more money than budgeted will be made available for such projects. It is also unrealistic to expect really good cost estimates so far in advance as are required by the budget system.

5. Recommendations:

When the budget is fixed, and will be firm, the Coast Guard should design hardware to meet that fixed budget price.

b. Since the FCB working group has not apparently been able to provide the necessary communication between operator and engineer the "project" staff should have regularly scheduled meetings/briefings for the Program Manager and cognizant Operations representatives to insure continuing exchange of information on design progress as it effects characteristics and costs. There must be constant understanding of what is desired, what is being designed, and what it costs.

c. All characteristics should be delivered by ENE with a price tag, its probable range of deviation, when it is good for, and other pertinent information. The Commandant should always have the best price estimate to match the characteristics.

d. The Program Manager/Director should order or rate characteristics by importance. Working with the Program Manager/Director, the project staff should then attach a price to each characteristic. In cases where a total cost to the government cannot be attached a cost per change should be used (i.e. +1000 miles endurance = + \$50K). If the estimated cost goes up as the design progresses, the project officer should then notify the Program Manager/Director that the least important characteristic(s) must be deleted. If after a specified time the Program Manager has not delivered up more cash through reprogramming, the characteristic would be deleted with only E authority required. This authority would have been essentially delegated by the FCB with their approval of the ordered characteristics. Such a procedure could result in ordering a Rolls Royce and receiving a Volkswagen, but it's still transportation and at the advertised price.

e. Lastly I recommend the enclosed draft memo be sent to the Program Director to give him an accurate, though brief, history of the WNEO design project.

Encl (1) : Draft Memo E to O