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Military Operations Research Society (MORS) Oral History Interview

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## MORS Naval Heritage Interview

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As the title indicates, this article is about the role of the US Navy in the early history of the Military Operations Research Society (MORS). To understand why the Navy played a central role in the creation of MORS, it is necessary to go back to the beginning of military operations research (OR) itself.

OR had its origins in the study of military operations. It began when, having developed radar, British scientists were then asked to develop procedures for its use in an air defense system. This was research focused on operations and was a fundamentally new employment of the scientific method by scientific personnel.

## THE BEGINNING

The Operational Research Society in the United Kingdom says that operational research as an organized activity dates from 1937 (the British say “operational” and we say “operations”). The date is related to the development of radar. The theory of radar was largely known since the days of Maxwell and Hertz in the late 19th century. In the UK, a simple demonstration in February 1935 using a BBC shortwave signal showed that aircraft reflected radio signals. In December 1935, a five-station system of early warning radar stations code-named Chain Home was authorized. Trials conducted in September 1936 indicated equipment problems in the prototype system. The problems were resolved by April 1937, and by the summer of 1937 an expanded network of 20 Chain Home stations was in check-out operations. Robert Watson-Watt led the team that developed radar at the National Physical Laboratory.

The beginning of operational research is described by physicist E. C. Williams:

*“I was a junior scientific officer at the Bawdsey Research Station in the Air Ministry. This was the research establishment engaged in the development of what is now called radar. Towards the end of 1937 I had just finished a series of experiments in jamming our own radars so that we could be prepared for enemy jamming if it happened—as indeed it did. I was then assigned to join a team to find out how best to use the radars in what we would now call the “total system” for intercepting and destroying enemy aircraft.*

*I and others in the team came under the direction of Harold Larnder.*

*“Now we had to have a name to describe us and what we were doing. The rest of the establishment was engaged on the normal work of research and development and design of radar equipments. We were beginning to find out how best to use them. The term “operations” has a specific connotation in the Armed Services, and we were now beginning to be concerned with operations. So, one or other or both (and I cannot remember which) of Sir Robert Watson-Watt and A. P. Rowe coined the term “operational research section” to put on the organization chart over our names simply to distinguish this new kind of work from the normal work of a research and development establishment” (Williams, 1967).*

Early 1938 attempts to use Chain Home to direct RAF fighters to intercept airliners did not go well but during the Home Defense exercises in mid-1938 its usefulness was proven. Chain Home was the world’s first integrated air defense system and ground controllers successfully directed interceptors to targets 75 percent of the time, day or night. Chain Home was capable of aircraft detections at ranges up to 100 miles.

Chain Home required intense human interaction both to direction-find on each target and to filter reports from many radar stations into a coherent air picture. Chain Home stations were connected by telephone and able to exchange information and data as well as pass it on to the Filter Room at Fighter Command. The Chain Home system gave Fighter Command 20 minutes to put fighter squadrons in the air, vector them toward the inbound hostile aircraft, and to dynamically assign squadrons as needed. It allowed the RAF to use its fighters far more effectively.

Chain Home was based on radar detection of aircraft. Although most of the major combatants discovered radar at almost the same time, the British were leaders in realizing its potential and by the outbreak of war Britain had a fully operational air defense system based on radar. (This information is available from various sources, including several Wikipedia postings on the subject “Chain Home.”)

The Battle of Britain lasted from July 1940 to the end of October of that year. Hitler’s Fuhrer Directive of 16 July 1940, “Preparations for a landing operation against England” (Operation Sealion), tasked the

# MORS Naval Heritage

Dr. David Schrady, FS

Naval Postgraduate School,  
dschrady@nps.edu

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Luftwaffe to destroy the Royal Air Force (RAF) (Keegan, 1990, pp. 88–102). This did not happen, and on 17 September 1940, Hitler announced the postponement of Sealion. Attention was then turned to bombing London to destroy the will of the British people to continue fighting. This did not happen either and Nazi Germany suffered its first defeat. “Chain Home strongly swung the balance of air power in the direction of defense” ([wikipedia.org/wiki/Chain\\_Home](http://wikipedia.org/wiki/Chain_Home)), and the smaller RAF prevailed.

At the height of the Battle of Britain, Prime Minister Winston Churchill wrote, “It is by devising new weapons, and above all by scientific leadership, that we shall best cope with the enemy’s superior strength” (Churchill, 1940, p. 3, paragraph 7). All of the main operational commands of the British armed forces subsequently established operational research sections (Miser, 2000, p. 101).

## WARTIME DEVELOPMENTS IN THE UNITED STATES

British developments in operational research were watched in the United States by both the Navy and the Army. In a letter dated January 27, 1942, at the start of the German U-boat campaign in the Atlantic, Navy Captain Robert Carney (later Chief of Naval Operations (CNO) 1953–1955) recommended that an anti-submarine warfare group be established within the Atlantic Fleet (Ladislav, 1962, p. 141). The Antisubmarine Warfare Unit of the Atlantic Fleet was established on March 2, 1942, becoming the first formal OR organization in this country (Engel, 1960, p. 799). A month later, with Philip Morse from MIT and six other civilian scientists on board, the Unit took the name Antisubmarine Warfare Operations Research Group (ASWORG). Things were moving very fast because the situation was quite serious. In a letter to the CNO, Chief of Staff of the Army General George C. Marshall wrote, “The losses by submarines off our Atlantic seaboard and in the Caribbean now threaten our entire war effort” (Goralski and Freeburg, 1987, p. 103).

ASWORG developed tactics used in searching for submarines, devised plans for escorting

convoys of ships, and contributed significantly to the ebb and flow of measures and counter-measures in the Battle of the Atlantic. With the decline of the submarine threat, ASWORG was renamed the Operations Research Group in October 1944, after expanding its studies to include strategic mining, anti-air warfare, and other areas of naval warfare.

The Navy considered the use of OR in World War II to have been quite valuable. In his final report to the Secretary of the Navy on the US Navy in World War II, the CNO, Fleet Admiral Ernest King, wrote that OR “made it possible to work out improvements in tactics which sometimes increased the effectiveness of weapons by factors of three or five ...” (King, 1946, p. 173–175). Admiral King also noted that the Operations Research Group would be renamed the Operations Evaluation Group (OEG) as more closely descriptive of its functions, and that he was taking action to insure its uninterrupted continuation into peacetime (King, 1945).

## POSTWAR NAVY OR AND MORS

In addition to the OEG in Washington, the Navy laboratories started OR groups early in the postwar period. These included the Naval Ordnance Laboratory (NOL) in Corona, California; the Naval Ordnance Test Station (NOTS) in China Lake, California; the Naval Electronics Laboratory (NEL) in San Diego, California; the Pacific Missile Range (PMR) at Point Mugu, California; the Navy Missile Center (NMC) at Point Mugu, California; the NOL in White Oak, Maryland, and others. Glover Colladay and Carl Schaniel were involved in military OR at NOTS, as well as Miles Sheehy at NEL, Lewis Leake at PMR (who was later the founding president of MORS), Frederick Lund at NMC, and Robert Miller at NOL White Oak, to name a few of the individuals involved.

Those involved undoubtedly knew each other and, as needed, exchanged visits and discussions of the work they were doing. However, a forum for all those doing military OR did not exist. The Operations Research Society of America (ORSA) was founded in 1952 and the Institute of Management Science (TIMS) was

founded in 1953. Neither organization could deal with classified discussions, nor did they want to do so. It was estimated that two-thirds of the military operations researchers did not identify with an OR society, nor did they submit their work to the appropriate journals and meetings for review (Yovitz and Chase, 1963).

James Garvey was a scientific officer at the Office of Naval Research (ONR) branch in Pasadena, California, participated in discussions in 1956–1957 that led to the first military OR symposium, and was the chairman of the sixth through 10th symposia. He wrote of the historical development of MORS:

*“In the period 1953–1956 various efforts were made to bring to fruition something of the nature of MORS. These did not succeed with the reasons being intimately related to the difficulties of operating a classified symposium to the satisfaction of the entire defense community. The group of scientists who gathered at the ONR branch office in Pasadena for a series of meetings in 1956–1957 did succeed. The reasons for this were, in part, that there was a rising acceptance of the concept of the usefulness of a joint-service symposium in military operations research and the fact that the sponsor was a responsible office of a nationally recognized government agency, actively engaged in the support of scientific research within the defense community. It was also probably helpful that this attempt, though joint-service in spirit, was primarily single-service (Navy) in its original composition. That is, the Navy-oriented structure was able to initiate activity which might not have been feasible if a rigid framework of true joint-service action was insisted upon from the beginning.*

*“The essence of the policy framework established in the discussions of the variant participants in the early meetings of the planning committees were these: (1) MORS was to be understood as a complement, not a competitor to such organizations as ORSA<sup>a</sup>; (2) Thus, specifically, MORS should try to provide a forum for the presentation of classified military operations research; (3) MORS was to be understood as a joint-service symposia despite the obvious bias which would characterize it at first due to the predominantly Navy-related military operations research community on the west coast” (Garvey, 1982, p. 6).*

The first symposium was held at the NOL in Corona, California, in August 1957. MORS was not an organized association of military OR

analysts. The “S” in MORS at that time stood for “symposia” rather than “society.” The early symposia were planned and operated by a steering committee, an informal group of volunteers who were active at the West Coast Navy laboratories. Nine of the first 10 symposia were held on the West Coast though the desire to be joint service and nationally focused was always present.

Garvey included a detailed account of the first 10 MORS (Garvey, 1982). Therefore, only a few of the structural features of these early symposia are mentioned here. Working groups were added to the symposia structure with the sixth symposium in October 1960, the year in which two symposia per year became the norm. The eighth symposium brought the first publication of the classified *Proceedings of MORS*.

Garvey says the definitive change in composition from western to national and joint service focus occurred with the eighth MORS and was confirmed by the ninth and 10th symposia. With the growth of MORS to recognized national stature as a significant mode of expression of the entire military OR community, sponsorship was transferred to ONR Headquarters in Washington, DC. Beginning with the 11th symposium, ONR Washington assumed sponsorship and supervision of the symposia and hired a contractor to perform the work in cooperation with a volunteer executive committee. The contractor was Commander Vance Wanner, USN (Ret.), who operated MORS from his apartment in Alexandria, Virginia. This arrangement was not seen as entirely satisfactory and in April 1966, the Military Operations Research Society was incorporated under the laws of the Commonwealth of Virginia.<sup>b</sup> The Navy was the sole sponsor of MORS until the Army and Air Force also became sponsors beginning with the 21st symposium (1968).<sup>c</sup>

For completeness it is noted that in 1951 the Naval Postgraduate School (NPS) began a graduate degree program in OR.

*“The program was directed by the CNO, Admiral Forrest Sherman, in 1950 as an item on a list of actions stemming from World War II operations. The superintendent of NPS, Admiral E. E. Herrmann, was instructed to set up a one-year curriculum in OR at an appropriate civilian institution. Admiral Herrmann found no interest from the schools he queried. In December 1950, he and the director of the*

OEG, Dr. Jacinto Steinhardt, submitted a joint proposal to establish a six-term degree curriculum at NPS. Steinhardt, who had joined ASWORG in 1942, helped design the initial curriculum.

After considerable discussion, the Chief of Naval Personnel approved the proposal with the stipulation that the curriculum might require change if it proved to be too difficult for naval officers who had not specialized in higher mathematics" (Story, 1968, pp. 67–68).

The first class of nine officers began their studies in August 1951 and graduated in January 1953. The curriculum was the first graduate degree program in OR anywhere (Schrady, 2001). NPS is included here as part of the naval heritage of MORS because of its faculty and military officer graduates' contributions to the operations of MORS and its symposia. Additionally, NPS has hosted a dozen military operations research symposia starting with the fourth MORS in September 1959.

Heritage is defined as something transmitted or acquired from a predecessor. MORS does indeed have US Navy heritage.

## NOTES

<sup>a</sup> ORSA and TIMS merged in 1995 to form INFORMS, the Institute for Operations Research and the Management Sciences.

<sup>b</sup> MORS was the acronym for Military Operations Research Symposium until incorporation. After incorporation, MORS was the acronym for both Military Operations Research Symposium and Military Operations Research Society and the reader was supposed to deal with the ambiguity based on the context in which the acronym was used. Dick Wiles, who served as executive director of MORS from 1984 to 2000, unilaterally resolved the ambiguity by introducing MORSS as the acronym for the MORS symposia in 1984.

<sup>c</sup> This information came from examination of the *Proceedings of MORS* archived in the classified material section of the Naval Postgraduate School Library.

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