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Phil E. DePoy Interview (MORS)

DePoy, Phil E.

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INTRODUCTION

Oral histories represent the recollections and opinions of the person interviewed, and not the official position of MORS. Omissions and errors in fact are corrected when possible, but every effort is made to present the interviewee's own words.

Dr. Phil E. DePoy worked in the historic Operations Evaluation Group (OEG) and was President and CEO of the Center for Naval Analyses (CNA), later serving on the CNA Board of Trustees for 21 years. The original interview was conducted August 24, 2004 at the Office of Naval Research, Arlington, Virginia, and a follow-up interview was initiated June 17, 2014 at the 82nd MORS Symposium Heritage Session on "Early Navy and Marine Operations Research."

MORS ORAL HISTORY

Interview with Dr. Phil E. DePoy, Dr. Bob Sheldon, FS, Interviewer

Bob Sheldon: This is the 24th of August, 2004, and I'm here to interview Phil DePoy. First of all, tell us your parents' names and where you were born and raised.

Phil DePoy: I was born in September 1935 and raised in a small town, Frankfort, in central Indiana. Harry was my father, and Mary was my mother. I had one sibling, a sister, who was nine years older than me.

Bob Sheldon: Tell us a little about your parents and how they influenced you.

Phil DePoy: My father worked on a railroad in the Civil Engineering Department. He was not an engineer, and I don't believe either he or my mother influenced me in terms of my major. They did, however, strongly insist that I go to college as far back as I can remember. Interestingly, they did not even offer college to my sister who was a much better student than me. In that era and that locale, it was not common for girls to attend college.

Bob Sheldon: Where did you go to junior high and high school?

Phil DePoy: In Frankfort.

Bob Sheldon: Did you take an early interest in math and science in school?

Phil DePoy: Yes, starting with biology as a high school freshman. I decided that I liked math sometime in my high school sophomore or junior year.

Bob Sheldon: Where did you go to college?

Phil DePoy: Throughout my high school days, I assumed that I would go to Purdue University when I graduated and study engineering—since Purdue was only 20 miles from my home. While I was in high school, I was very interested in nuclear physics. I'm not certain why I had so much interest in the nuclear field, other than it was a natural follow-on to the extensive amateur research I had done with conventional explosives. The evidence of my research still exists on the walls of the garage next to my former home; portions of the walls have obviously been replaced. At the time, Purdue didn't have a separate nuclear engineering program but had a nuclear option in chemical engineering. So I spent four years in the Chemical Engineering Department, graduating in 1957.

Bob Sheldon: Can you tell us a little more about your "amateur research with conventional explosives"?

Phil DePoy: I experimented with a number of minor explosives but my favorite was nitrogen triiodide. It was easy to make and was relatively stable in the liquid form but very unstable when it dried. It was fun to paint it on desks and have it explode when someone dropped their books on the desktop.

Bob Sheldon: Where did you go after graduation?

Phil DePoy: After graduation, I received an AEC (Atomic Energy Commission) fellowship to study nuclear engineering at MIT (the Massachusetts Institute of Technology).

Bob Sheldon: How did you get that AEC fellowship for MIT?

Phil DePoy: At the suggestion of a Purdue Chemical Engineering professor, Al Sesonske, I applied for it during my senior year.

At the time, I planned to work toward a PhD at MIT, but during my first year, nuclear engineering, both in the government and in the private sector, lost support; few jobs were available in the field; and money for nuclear engineering fellowships was reduced. I feared that this would be a long-term condition so I decided to switch back to chemical engineering. I completed my master's degree at MIT and transferred to Stanford's chemical engineering program, which was fairly new at the time.

Bob Sheldon: Why did you choose Stanford for your PhD studies?

Phil DePoy: I applied for a fellowship to the MIT and Stanford Chemical Engineering

Military Operations Research Society (MORS) Oral History Project Interview of Dr. Phil E. DePoy

Dr. Bob Sheldon, FS

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Departments, and Stanford made me the best offer. During my first year at Stanford, I completed my coursework requirements, passed the necessary qualification exams, and built the equipment, a 25-foot shock tube, for my research. I made the fateful decision that I could take a full-time job (hopefully in the Bay Area) and easily collect the data and write my dissertation on a part-time basis over the next couple years. As things turned out, it took me nine years to write my dissertation and to complete the oral defense. I finished with a PhD in chemical engineering.

Bob Sheldon: What did you do your thesis work on?

Phil DePoy: Actually it ended up as two topics. The first one was kinetics of the decomposition of nitric dioxide at very high temperatures using a shock tube. The second topic was the kinetics of chemical oscillating systems.

Bob Sheldon: Who was your chairman?

Phil DePoy: My thesis advisor was Professor David Mason. Professor Mason was also chair of the Chemical Engineering Department.

Bob Sheldon: Did you meet any other notable people at Stanford?

Phil DePoy: One was Linus Pauling. When I went back to Stanford for a sabbatical in 1968, Linus and his research team had just arrived from Cal Tech. Dave Mason had known Linus when he taught at Cal Tech and offered a position to him at Stanford when Cal Tech had some problems with him. Dave gave Linus and his team several offices and a laboratory in the chemical engineering building. Shortly before I arrived, Linus wrote a letter to the president of Stanford complaining about his spaces being inadequate, without telling Dave. Dave was very upset and asked me to talk with Linus about it. We had several interesting conversations, mostly about vitamin C, which was Linus's favorite topic at the time. I made no progress with him on the space issue so turned it back over to Dave.

Bob Sheldon: Coming out of Stanford, did your thesis get you a job?

Phil DePoy: No, because I chose a totally different field. I joined the OEG (Operations Evaluation Group) prior to finishing my thesis.

I knew about OEG because when I was at MIT, a friend convinced me to audit a physics course presented by Professor Philip Morse, the founding Director of ASWORG during World

War II. (ASWORG, the Antisubmarine Warfare Operations Research Group, was established in April 1942 patterned after the "operational research" group which had been formed earlier in the UK. Later in the war, when the group was working on many issues other than antisubmarine warfare, its name was changed to the Operations Research Group, or ORG; after the war, the name was changed to the Operations Evaluation Group, OEG.) The MIT course was based on a two-volume set of books, *Methods of Theoretical Physics*, which was being written by Professor Morse and Professor Herman Feshbach. Several times in his lectures, Morse mentioned experiences he had in ASWORG during the war. Frankly, I didn't understand much of what he taught, and as it later turned out, even less of what ASWORG and ORG were about. I was fascinated by some three-dimensional graphics Morse had in the handouts so I went to his office to see him a couple times to learn how he made them. I think he had the mistaken impression that I was interested in and understood the content of his course.

Bob Sheldon: Did someone from OEG come out to Stanford to recruit you?

Phil DePoy: When I began to interview for jobs, I spoke with several chemical companies that were located in California, and I had almost settled on a position in the Bay Area when I saw a notice in the Stanford recruiting office that "MIT OEG" was interviewing the next day. I signed up to talk with the interviewer, more out of curiosity than interest. As I recall, the announcement was only for physicists, but when I mentioned to the interviewer that I knew Morse, he invited me to Washington for interviews.

The interviews were unlike anything I had experienced before. Several people posed problems to me and asked me how I would approach them, which I had never experienced in any of my previous interviews. At the end of the day, I met with Jacinto (Jay) Steinhardt who had joined the group during the war and had been Director of OEG since 1946. Steinhardt mentioned that he had spoken with Morse and Professor Robley Evans, another one of my MIT physics professors, about me. After the day's interviews, I still didn't understand exactly what OEG did, but I was very impressed by the interviews. I decided that OEG might provide me a good experience for a couple years before

finding a chemical engineering job. Besides, I was attracted by the prospect of overseas travel and working in the Pentagon with the military. So I accepted the offer and reported to work on June 13, 1959.

Bob Sheldon: What was OEG like when you got there?

Phil DePoy: At the time, OEG consisted of approximately 60 analysts, of whom 15 were in field assignments with the Navy around the world and the remainder were in an office on the fifth floor of the Pentagon. There were a significant number of analysts still in the organization that had joined during World War II, many of whom had joined directly from the physics department at MIT. The field assignments were typically one year long, with the exception of the analysts assigned to the two deployed fleets, who were assigned for 18 months. For those assignments, the first half of the assignment (nine months) was spent with the Carrier Task Force Commander aboard one of the aircraft carriers in the fleet and the last half with the Fleet Commander aboard a cruiser.

Bob Sheldon: Earlier, you said that you met Jay Steinhardt during your interview. How was it working for him?

Phil DePoy: Steinhardt was probably the best, albeit the toughest, boss I ever had. In addition to being Director of OEG, he still taught at MIT. As I recall, during the school year, he taught two days a week on campus and worked at OEG in the Pentagon the other three days, commuting back and forth by train. During the summer, he often went to one of the deployed fleets, sent the OEG representative on leave, and replaced him for a month or so just in order to keep up with Navy operational issues. By today's standards, Steinhardt was very strict and could be very difficult. Many times I heard him say that he "hired with 50 percent reliability and fired with 75 percent reliability." He had an annual quota for departures; he wanted 12 percent of the analysts to leave each year, half voluntarily and half involuntarily, and he usually reached his goal—especially in the latter category!

Steinhardt was very insistent on careful analysis and documentation of results. He himself reviewed nearly everything that went out of OEG and everything that was done by the field

representatives. Jay read every field letter that every field representative wrote, and he would write critical comments to them. (Field representatives were required to write one letter a month to Jay describing their accomplishments during the month and attaching the memoranda that they had completed.)

Steinhardt insisted on creative work. If he found people doing only the rote sorts of things (which it's easy to do with tasks such as exercise reconstruction), they would get a note from Jay. Or worse, they would get a phone call. Or even worse than that, a visit! It was a small organization in those days, and boy, we'd all be called on the carpet frequently for all sorts of infractions, ranging from those involved with the quality or quantity of our work to such things as going out of our office spaces without wearing our suit coat! And I believe Jay was responsible for OEG's survival. The fact that OEG survived in the period between World War II and the Korean War was phenomenal because very few defense science organizations such as OEG continued to exist. And the same thing occurred between the Korean and Vietnam Wars. Jay kept OEG alive, and I think anyone who worked in OEG never forgot the experience of working for him.

Bob Sheldon: You've studied extensively about the historical development of military operations research. Tell us your perspective on the early history of OR.

Phil DePoy: Discussions of the history of military operations research often start with the creation of a group of scientists working for Sir P.M.S. Blackett in England in 1939, shortly after the outbreak of World War II, and the subsequent formation of ASWORG under Professor Philip Morse in the United States in April 1942. However, as described by Keith Tidman in his book, *The Operations Evaluation Group: A History of Naval Operations Analysis*, examples of applications of science to warfare date back to Archimedes, and that true "operations research" emerged in World War I with the work by Frederick Lanchester in England and with the Naval Consulting Board chaired by Thomas Edison in the United States. Since there is very limited evidence of operations research being done between World Wars I and II, it is not surprising that most consider Blackett and Morse as the originators of the field.

P.M.S. Blackett was a noted physicist who was teaching at Manchester before the war. His research was later recognized by awarding him the Nobel Prize in Physics in 1948. At the start of the war, he joined the British Anti-Aircraft Command (AAC) as scientific counsel, and soon thereafter he formed a small group of scientists, including both physicists and chemists, into a research group to assist the command with improving the operational use of radar in the defense against German air attacks. His group was very successful and became known as "Blackett's Circus." In the spring of 1941, Blackett was asked to transfer to the Coastal Command to assist with the defense of the shipping lanes against German U-boats. He again formed a small group, which was called the Operational Research Section. His group was highly successful and after nine months, it was transferred to the Admiralty. A single analysis effort, which resulted in a small change of tactics in the delivery of depth charges, increased the kill rate from 2 or 3 percent to 40 percent and is still frequently referenced as one of the great early successes of operations research.

The British success with operations research received a great deal of attention in the US, and a decision was reached in the US Navy to form a similar group, which became known as ASWORG. In March 1942, Professor Philip Morse of MIT was asked to head the group. Morse recruited Dr. William Shockley (who received the Nobel Prize in Physics in 1960 for his work in the development of the transistor) from Bell Telephone Laboratories as his deputy and a number of other eminent scientists, mostly physicists and chemists, to join them. Initially, ASWORG concentrated on antisubmarine warfare in the Atlantic. A subgroup, the Submarine Operations Research Group (SORG) was formed in November 1943 as a result of a request by the Commander Submarines, Pacific Fleet. Other subgroups soon followed, including the Air Operations Research Group (AirORG), the Antiaircraft Operations Research Group (AAORG), the Special Defense Operations Research Group (SpecORG), and the Amphibious Operations Research Group (PhibORG), and the entire organization was renamed the Operations Research Group (ORG). Like Blackett's

group, ASWORG and ORG were very successful throughout the war, and in the fall of 1945, the Navy decided that the group should continue to exist in peacetime under the sponsorship of a university. MIT was selected as the sponsor and the name was changed to the Operations Evaluation Group (OEG).

Bob Sheldon: Do you have any favorite reports from the early days?

Phil DePoy: My favorite report is the first ASWORG study that was done during the first three weeks after the group was formed in April 1942. (ASWORG Memo 1, Preliminary Report on the Submarine Search Problem, May 1, 1942) The authors had absolutely no previous knowledge of antisubmarine warfare. Yet, their study laid the foundations of search theory, an area in which so much work has been done since that time.

One of the things that struck me about many of the World War II analyses was that most of the ASWORG analysts were very good scientists, but they didn't mind using very simple approaches to solve problems. An example of that is the analysis that I mentioned earlier that was done in England to determine what depth to set off depth charges. It was a very simple observation that if the submarine had dived very long before a depth charge was dropped, the uncertainty in its location would be great, and it was unlikely that the depth charge would damage the submarine. It was therefore recommended that the depth charge be detonated at a shallow depth. The point that Phil Morse and Jay Steinhardt always made was to carefully define the problem and then to solve it with the simplest approach possible.

Bob Sheldon: How did the early practitioners come to define operations research?

Phil DePoy: Blackett wrote two important papers, "Scientists and the Operational Level" in 1941 and "A Note on Certain Aspects of the Methodology of Operational Research" in 1943, which attracted much attention in the US. His definition of OR was simply "the analysis of data in order to give useful advice." Morse, along with George Kimball (a member of ASWORG) wrote a book after the war, *Methods of Operations Research* [Editor's note: MORS republished this book in 1998], in which OR was defined as "a scientific method of

providing executive departments with a quantitative basis for decisions regarding the operations under their control." In his book, *In at the Beginnings*, Morse said that another term for OR is "systems analysis."

None of these definitions is very explanatory of the work that was done by "Blackett's Circus," ASWORG, ORG, or OEG. I much prefer a definition that is included in a draft book by Marc Mangel, a one-time member of OEG and a professor at the University of California, Santa Cruz. "OR attempts to bring the scientific approach to problems for which the fundamental laws governing the processes are either unknown or too complex to derive from first principles." I would add to Mangel's definition of problems that there are also cases in which we might know the fundamental laws but do not know the value of many of the parameters associated with them. This is particularly true for combat systems in which we don't know the enemies' effectiveness and may not have a good idea of how our own systems work in a combat environment.

As Mangel points out in his draft book, with the introduction of Morse and Kimball's book in 1951, the introduction of modern computing about the same time, and the explosion of academic OR departments in the 1950s and 1960s, OR soon became a collection of techniques such as mathematical programming, search theory, etc. So we now have two very different disciplines with the same name. For years, these differences could be seen at ORSA (the Operations Research Society of America, later INFORMS—the Institute for Operations Research and the Management Sciences) and MORS meetings, with the people in one discipline confused by the types of problems and the approaches that people of the other discipline were using. When I was Director of OEG and President of CNA, I was hesitant to allow junior analysts to attend ORSA and MORS meetings because, as I'll explain later, the skills we were trying to develop with them were very different from the ones used by the other discipline.

Rather than trying to further expand on Mangel's definition of OR, I will talk about some of the skills that we tried to develop in operational analysis (I'll use that name to avoid confusion with the name operations research,

which I'll use for the newer discipline.) I'll refer to the training of new analysts during the period 1946 to 1962 when Jay Steinhardt was Director of OEG, and OEG transitioned from a wartime to a peacetime footing (except during the Korean War from 1950 to 1953).

Bob Sheldon: In that early historical context, how did analysts learn to do "operations analysis"?

Phil DePoy: By far, the most difficult thing to teach new operations analysts was unstructured problem solving, i.e., as Mangel describes it in his definition of OA, "problems for which the fundamental laws governing the processes are either unknown or too complex to derive from first principles." Most military operations are very complex, involve large numbers of people and systems, and have an unpredictable enemy. (As we learned from the work at the Santa Fe Institute, many combat operations are, in fact, complex adaptive processes.)

Most physical scientists had not encountered these types of problems during their education or in their previous experience, and they have to be trained to think about problems differently and realize that there are no recipes. (I have been told that an increasing number of new OA analysts have been exposed to complex, cross-discipline, collaborative problem solving in school and have an easier time learning OA.) OEG learned over many years to start new analysts with reasonably well-structured problems, even though in most of the problems, the values of the parameters were not well known. Then they would be presented with gradually more unstructured issues. We always had a few analysts that couldn't seem to adapt and would resign after a few months.

I learned more about difficulties in dealing with unstructured problems in the late 1960s. I spent a period as the director of the Southeast Asia Analysis Group in OEG Washington. In addition to our civilian analysts, we had up to 15 Navy analysts, some of whom had already served tours as aviators in Vietnam, in the group. One day, one of the Navy analysts came to me and said that he was not feeling well and needed to go to the Bethesda Naval Hospital for diagnosis. I didn't hear from him for a few days and was concerned that he might have a serious health issue. A few days later, I received a call

from a Navy psychiatrist who asked me to come to the hospital to discuss the case. It turned out that our analyst had experienced a major breakdown, and the psychiatrist wanted to know more about his behavior leading up to the crisis. I was allowed to meet with the patient for a short time, but he was very angry and wouldn't speak with me.

A couple weeks later, the psychiatrist called me to report that they had discussed the case at their weekly seminar, and that one senior psychiatrist had told everyone that he was the only person in the room who understood what had happened to our analyst. The psychiatrist explained that he had majored in physics and had taken a job with RAND in the early 1950s. After a short time, he had a breakdown and explained that he couldn't deal with the lack of structure in what he was trying to do. After he recovered, he went to medical school and became a psychiatrist. In discussions with the senior psychiatrist, I learned how he reacted and realized that some of our former employees who hadn't seemed to grasp the work might have been unable to deal with the lack of structure. (For several years, I enjoyed calling it the "RAND disease" and telling my friends at RAND that the disease had originated there.)

Bob Sheldon: I know that INFORMS has a prize named after Jay Steinhardt, so his name is widely recognized in the OR community. How did Steinhardt influence the development of the analysts at OEG?

Phil DePoy: The second most difficult thing to develop in operations analysts is critical thinking. I think nearly every professor I had in graduate school felt that they were teaching "critical thinking." I learned when I arrived in OEG that Steinhardt's definition of critical thinking was much different than anything I had encountered before. Nearly every document that OEG analysts produced, including letters from the field representatives, was circulated to all of us with a "route slip" listing all of our names. We were expected to make comments on most of what we read, and Jay read everyone's comments. We also had weekly seminars in which everyone was expected to offer comments. Periodically Steinhardt would meet with each of us, and the quality and quantity

of our reviews were discussed along with the quality and quantity of our products.

When I was President of CNA, I noticed that our new economists were significantly better at critical thinking than most of our other new employees. Nearly all our economists came to us from the University of Chicago, so when I decided to take a job there after I left CNA, I wanted to learn how their economics faculty taught critical thinking. Whenever I was available, I attended the seminars in the economics department and sat in on some classes taught by Gary Becker and Jim Heckman (both Nobel Laureates in Economics). It didn't take long to understand why they were so effective in teaching critical thinking. I also found that some professors in other departments at Chicago were equally effective, such as John Mearsheimer in the Political Science Department. One technique used by several professors was to begin some classes with a strong statement about something the students were studying. The students were expected to actively debate the professor and were graded on the content of their arguments. Often the debates would become quite heated. Before the end of the class, the professor would review the student's arguments, point out their errors, and explain what they should have questioned. It was evident that Steinhardt used something akin to their teaching methods, and he was far more successful at making us think critically than anyone I had encountered, that is, until I moved to Chicago.

In all my interactions with Navy staffs, I was very impressed that senior officers were almost always receptive to critical assessments. Even during combat operations—perhaps especially during combat operations—they would always listen and discuss my observations thoroughly with me despite being extremely busy. I had one experience that I have never forgotten. Near the end of the Vietnam War, I spent a few months with a staff on an aircraft carrier to evaluate a new experimental weapon. I observed that the Commander, a Vice Admiral, was only sleeping three to four hours per day. He slept about two hours late at night and an additional one to two hours each afternoon by going up to the signal bridge of the carrier and lying in the sun. I was very concerned about one thing that was done repeatedly during major

strike operations and wanted to talk with him when none of his staff were present. So several times I met him on the signal bridge and discussed the issues with him for at least 30 minutes. I was unable to convince him to change the operations, but he never once asked me to leave him alone. When I left the ship, I expected that he was probably angry with me even though he never displayed it. About six months later, someone sent me a copy of his congressional testimony that he was called back to Washington to give. He had discussed the Navy strike operations in detail and, at one point, had said that I had not agreed with the way one phase was being conducted. He said that he felt obligated to tell them because he had a lot of respect for me and was still concerned that he may have made the wrong decision.

In later years, after the Admiral retired from the Navy, we became very close friends. A few times we discussed our interactions during that period aboard the *USS Enterprise*. He said he had to make so many life-and-death decisions that he was always more comfortable when he had an experienced OEG representative aboard to give him critical feedback. He said that he never could depend on it from his staff officers, even though he had an excellent staff, and reminded me of how much other feedback I had given him that I had long since forgotten. There is no question that the military rank system often inhibits critical feedback, which was recognized by Blackett, and was the reason that both Morse and Steinhardt emphasized critical thinking so much. The Admiral told me that he learned to depend on OEG during the Korean War when he worked with John Coyle, who had been my mentor when I joined the group.

One thing I experienced with some admirals, and which was also experienced by other analysts, was that admirals would sometimes confide things in us that they would not tell their senior staff members. I never understood it. One incident which I will never forget occurred when I spent nearly four hours in a Hong Kong hotel room with an admiral immediately after he learned that his son was missing in combat. He sobbed the entire time, and it was a very difficult experience for me. Afterward, we went to a meeting with his senior staff, and

he behaved as if nothing had happened. One or two officers came up to him to express their sorrow, and he waved them off. A few staff members mentioned to me that the Admiral was the "toughest man" they had ever known since he showed absolutely no emotion. I didn't tell any of them about my earlier experience with him.

Bob Sheldon: In those early days of OR, what was important for the analysts to know about "operations"?

Phil DePoy: One of the first things that Blackett learned was that it is essential for the operations analysts to have significant exposure to actual operations. Since most military operations are complex, no written or verbal description is adequate to gain an understanding of them. As I mentioned earlier, shortly before ASWORG was started, Blackett sent one of his analysts, Peter Pearman, to Washington to meet with Morse and Shockley. Blackett emphasized very strongly that the analysts had to be stationed with the operational units. This was easier said than done in both the UK and the US Navies. Neither Navy had experience with embedding civilian analysts within operational staffs, and there was a great deal of opposition to the practice, even though a famous scientist once said, "If instead of sending the observations of able seamen to able mathematicians on land, the land would send able mathematicians to sea, it would signify much more to the improvement of navigation and to the safety of men's lives and estates on that element" (Isaac Newton, 1694). Initially, the British appointed the analysts as officers in order to make the transition easier. The leadership of the US Navy recognized the potential value and, from the first, embedded the analysts aboard ships with the senior operational commands.

Morse developed a rotation plan among the analysts in which they spent six months with an operational unit, then rotated back to Washington for six months, thereby keeping each analyst half time in the fleet and half time in Washington. He felt that six months was the maximum that he wanted them to be with any one command, since if they stayed longer, they would be assimilated within the staff and effectively become too close to the Naval officers, and they

would be less likely to raise questions about practices and decisions. He also felt that the six months back in Washington permitted them to share what they had learned with other analysts.

In later years, it became more and more difficult to maintain a rotation plan even close to the wartime plan. By the time I arrived in 1959, OEG had gone to one-year deployments with most commands, followed by two years in Washington for all but the very senior analysts: hence a one-third/two-thirds rotation. In the years following, the time at commands had to be extended longer because of spouse employment and the difficulties of moving school-age children.

There is no question that analysts develop close relationships with the staff members after only a few months, and many of them cease to critically review the command's operational practices and decisions. When I first arrived in OEG, Steinhardt said that he could tell within a few minutes of visiting a field representative if they were too closely integrated with the staff. The one time he visited me in the field, I warned everyone not to say anything nice about me! He also told us frequently that if the entire staff agreed with their admiral on any matter, it was probably wrong, and it was our job to find the problem. (Steinhardt was ahead of his time; in 1972 Irv Janis, a Yale professor, published his book *Victims of Groupthink*.)

Bob Sheldon: How did OEG allocate analysts to the field?

Phil DePoy: From their earliest days, both "Blackett's Circus" and ASWORG had a practice of assigning only one analyst to a command, which, for the most part, still is the practice. Undoubtedly, in the earliest days of both organizations, neither had the resources to assign multiple analysts, independent of the need. And because of the very limited space aboard ships, it would have been difficult to justify having two or more analysts assigned to the same command, especially during combat operations. But both Blackett and Morse had very strong opinions that if more than one analyst is stationed on a ship, they will be most comfortable talking with one another; if only one analyst is present, he or she will talk with the Naval officers and learn much more about the operations than he

or she would otherwise. Having experienced both situations, I believe that they were correct, particularly with inexperienced analysts. In my time in the fleet, we didn't have email or chat available to us, and the only way we could communicate with other analysts was by mail and Navy messages. I'm certain that this huge improvement in communications has been invaluable for all the deployed analysts.

Being the only civilian on a ship, inexperienced analysts are placed in many difficult situations since they don't understand Navy protocol, and most Navy officers don't know how the analysts fit into the rank structure. As a result, there are many "sea stories" in the fleets about faux pas committed by OEG analysts. Several of mine, committed in the 1960s, are probably still discussed in the western Pacific.

Bob Sheldon: How about the level at which OEG analysts were historically assigned in the field?

Phil DePoy: Blackett had been a Naval officer during World War I and understood military structure, so he insisted that his analysts be assigned to the Commanding Officer of whatever organization they were in. This gave analysts greater freedom to work throughout the organization and gave them "top-cover" when an officer within the command disagreed with their recommendations. For years, OEG representatives carried an ID card, which was very similar to an officer's ID card. Under "rank," the entry was "up to VAdm." This only increased the uncertainty among everyone about how to treat us, e.g., where to seat us in the Officers' or Flag Mess, but in general, the Navy handled it very well. And it does make the issue of "point-of-attachment" easier.

As I mentioned earlier, the analyst whom Blackett sent to meet with Morse and Shockley emphasized the importance of the point of attachment, so ASWORG was assigned to the Chief of Naval Operations, which continued throughout World War II and still exists for CNA today.

Bob Sheldon: What was the background of the more successful analysts in OEG?

Phil DePoy: Originally both Blackett and Morse recruited mostly physicists and physical chemists. Morse also hired a group of actuaries but it appears that they were mostly used in the

Washington office for data processing. ASWORG was made up nearly entirely of physicists, chemists, and applied mathematicians. I came to OEG in 1959 and had an engineering background, and there were already one or two engineers in the group. Over the years, OEG recruited a wide variety of disciplines and has had success in developing good analysts from most of the disciplines. Looking back over the time when I was in the organization, I believe that most of its very best analysts were physicists, chemists, and applied mathematicians—possibly because so many hires came from those disciplines. Surprisingly, in my experience, statisticians and people trained in OR, with a few exceptions, did not do well. I believe it was more difficult for them to adapt to OA, having been trained in the more structured OR environment. We had the same problem with Naval officers. For many years, we had approximately 20 officers assigned to CNA's Washington office. Nearly all of them had operational experience and about a third of them had advanced degrees in OR from NPS (Naval Postgraduate School). Many of the OR-trained officers had a difficult time adapting to the CNA environment because they expected a more structured approach to the studies to which they were assigned. The officers with advanced degrees in physics and engineering found it much easier to adapt. As I have mentioned previously, this is another area which I'm told has changed a great deal since people in many other disciplines have experience with complex systems and cross-disciplinary problem solving.

Bob Sheldon: Do OEG analysts tend to specialize in warfighting areas?

Phil DePoy: Obviously, when operations analysts are assigned to many commands, such as the Fleet Commander, they need to know about all warfare areas, but most specialize in one or two warfare areas (e.g., antisubmarine warfare) for their entire career. This is another major difference with OR in which analysts typically specialize in a few techniques (e.g., mathematical programming) and can apply them across a broad spectrum of areas. I believe this is the major problem that OR-trained analysts confront in the OA environment. I recall one case in which an OR-trained officer assigned to CNA wrote a memorandum to a senior officer

in which he said that CNA did not know how to do studies; he had not found a single study in which mathematical programming was being used (the area in which he had majored in graduate school).

Bob Sheldon: INFORMS uses the slogan "the science of better." How much was "better" in the historical OEG thinking?

Phil DePoy: Even more difficult for many analysts to accept than unstructured problems was Morse's concept of "hemibel thinking." (A hemibel is the square root of 10, or approximately 3.) Due to the types of problems encountered in OA, Morse claimed that unless the analysis demonstrates that a recommended change would result in an improvement by a factor of a hemibel or more, it is probably not meaningful. This concept was always difficult to communicate in the 1950s, but was nearly impossible after digital computers became commonplace. Having read many of the studies done by ASWORG/ORG, I don't think that many of the wartime analysts accepted it either. Having had "significant figures" beaten into me by the MIT physics department (including Morse), I always warned OEG analysts to take care not to state results to more significant figures than they could justify on the basis of how well the values of input parameters were known, but I can't claim any more success than Morse had with "hemibel thinking."

In nearly every subject I have discussed, from "what is OR?" to "lack of precision," I believe that the differences between OR as currently taught and practiced in most quarters and OA, as taught and practiced in OEG, RAND, and a few management consulting firms (particularly those that specialize in company strategies) are very obvious. In fact, they are almost polar opposites. I want to emphasize that one is not better or worse than the other, only that they are different. If I were to make a recommendation to MORS, it would be that they recognize the difference between OR and OA and try to help the community understand the distinction and to recognize that they are focusing on OR.

Bob Sheldon: Getting back to your career, what did you work on during your early days at OEG?

Phil DePoy: I was initially assigned a mentor, John Coyle, who had joined ASWORG during

World War II, and was working on nuclear deterrence issues. He was very bright and very well-regarded by the Navy. John was a maverick in every sense of the word! His father was a well-known architect, and obviously a maverick, too. I remember John telling me that after he was admitted to Princeton as an undergraduate, he was trying to decide on a major. He asked his father for advice, and his father asked him what he thought he would like to do after graduation. John said that he thought he would like to be a research chemist. His father advised him then to major in English literature because he would learn plenty of chemistry when he worked as a chemist. So John studied English literature, then became a research chemist at a company in South America. At the start of World War II, John returned to the US and joined ASWORG. John took me with him to meetings with many senior officers, including the CNO (Chief of Naval Operations, Admiral Arleigh Burke) and Admiral Rickover. No matter who asked a question, or who was present whenever he was asked, John gave his frank, unadulterated opinion. Working with John was a great experience for me and reinforced one of Jay's rules, i.e., our job was to give our best advice, not to worry about how it might be received.

I remember one time when John took me with him to a meeting with the CNO, Admiral Arleigh Burke, and three or four other senior admirals. The CNO explained that someone had proposed building floating intercontinental ballistic missile (ICBM) pods with small nuclear reactors to plant in the arctic ice. The reactor would melt the ice and power a small propulsion unit that would make the pod slowly move randomly throughout the ice pack so that it could not be targeted by the Soviets. He asked John for his opinion whether the Navy should investigate the program further. John's response was that it was the type of thing the Navy might consider, "a missile that would fire through its own ice hole." The meeting abruptly broke up with uproars of laughter and the subject never arose again!

I started out with John mentoring me and working with him, and then I moved over to the Air Warfare Division. I was there only a short time until Jay sent me to the field. When I reported to OEG, it was explained that it would

likely be two years before I would be given a field assignment. For all new analysts, a field assignment with the Navy was considered to be highly desirable. I was very fortunate to get my first assignment after only eight months, not because of anything I had done or demonstrated as an analyst, but because a field analyst had developed a health problem.

Bob Sheldon: Did your mentor at OEG help you pick up technical skills?

Phil DePoy: No, but each year, some faculty members from MIT came to OEG to give an orientation in some technical areas, such as statistics, mathematical programming, search theory, etc. They stressed that we were not expected to be expert in these areas, but they wanted us to identify an application when we encountered something for which it could be used. If it was a simple application, we would be able to do it; if it was a more complex application, we could seek help from others.

Bob Sheldon: What was your first field assignment?

Phil DePoy: I was sent to Air Development Squadron Five (VX-5) in China Lake, California, in February 1960 and spent a year there. VX-5 was the Navy's tactical evaluation and development squadron that tested new attack aircraft and weapons and developed tactics for their use. I was also assigned on a part-time basis to VX-4 in Point Mugu, California, which had the same responsibilities for fighter aircraft and weapons. I was sent to San Diego for pressure chamber and ejection seat training during my first week in China Lake, and thereafter I was encouraged to fly a great deal in tactical aircraft, which was a wonderful experience. Frequently on weekends, a Marine test pilot would take me up in a jet trainer (an F9F-8T) and demonstrate the various tactics we were developing. He would have me fly the tactics myself in order to better understand the difficulties. He also taught me how to get out of a spin—a lesson I neither wanted nor enjoyed. I was a terrible pilot but learned a lot about how difficult it was to fly some of the tactics.

At the time, the Michelson Laboratory at China Lake was working on a new class of conventional weapons, including some that were guided. Since VX-5 was designing tactics for the new weapons, the director of the laboratory

arranged for the program directors for each of the weapon systems to give me a detailed briefing on the design and status of their system. These discussions proved to be very valuable to me in my work at VX-5 but even more valuable a few years later!

One of my first efforts at VX-5 involved ways to increase the range of A-4 aircraft when delivering nuclear weapons. I was convinced that using a "cruise-climb" would provide an increase in range compared to flying to the target at a constant altitude. A "cruise-climb" is made by flying at a constant indicated Mach number so that the aircraft slowly climbs to a higher altitude as fuel is consumed and its weight is reduced. The A-4 was a single-seat airplane that had an air control system that could fly the aircraft at a fixed altitude, but did not have a mode that would fly at a fixed indicated Mach number. The pilot in a single-seat aircraft is very busy with navigation and other tasks (especially over enemy territory), and the VX-5 pilots were convinced that they would use less fuel in the fixed altitude mode because they could fly it in a more precise way than trying to keep a constant indicated Mach number when their attention was frequently diverted.

A few weeks after I presented my idea, I was flying to the East Coast in the back seat of an F9F-8T. Shortly after takeoff, the pilot told me that he had work to do, so I should fly the aircraft to Tinker Air Force Base in Oklahoma. (I later learned that this had been planned among the squadron pilots for several days.) He also told me that we needed to fly a "cruise-climb" since we wouldn't have much fuel when we reached Tinker. For the next couple hours, we were all over the sky while I was fumbling with maps and trying to keep the aircraft on-course and at an indicated Mach number. (Thankfully, flights were not within the FAA—Federal Aviation Administration—air traffic control area in that part of the country during that era.) Finally, the pilot interceded when we were about 60 miles from the airfield and had very little fuel remaining. He soon realized that he had waited a bit too long and had to declare an emergency. Tinker replied that they had a B-52 in emergency status as well and that we should hold our altitude until further notice. When we were finally cleared to land, the pilot

put the aircraft in a very steep dive and managed to reach the runway before the engine flamed out. The engine did shut down when we were on the taxiway, and we had to be towed the remainder of the way to the parking area. This story was passed throughout the entire Navy aviation community within hours, and I was reminded of it many times over the next decade or so.

I have never forgotten my first exposure to aircraft carriers while I was at VX-5. The annual Tailhook meeting was scheduled to be held in San Diego, and some of the pilots decided that I should attend. In those days, you had to actually land an aircraft on a carrier to qualify for attendance, so they arranged for me to accompany some of them to a carrier operating off San Diego to evaluate some new piece of equipment aboard ship. Although they were boarding the carrier in port, they arranged for me to fly aboard the next day in a COD aircraft (carrier onboard delivery). I was to fly in the copilot's seat and have my hands on the controls (very lightly), and they felt that would be adequate to qualify. When the time came, I boarded the aircraft at North Island, and we flew a couple hundred miles out to the carrier. When we were cleared to land, we were advised to follow a Navy fighter aircraft. As we entered the landing pattern a few miles from the ship, I spotted it and was apprehensive that we were going to land the large aircraft on such a small deck. As we were making the final turn toward the carrier, I saw the fighter and was watching his final approach. He was a bit low when he reached the ship, struck the fantail, and exploded. Our pilot pulled up and flew directly over the wreckage, which was still burning. We were then directed to another carrier about 50 miles away to land and wait until the deck was cleared. At this point, I was more than apprehensive—I had seen one landing and it didn't end well. We managed to land on the other carrier, and then a couple hours later, returned to the one which we were trying to reach. So I ended up with twice the number of landings that were required!

I loved my assignments at VX-4 and VX-5. Working with aviators was a great experience, and my timing was perfect since the Navy was beginning to transition from a nuclear mission, for which the principle mission of aircraft

carriers was the delivery of nuclear weapons, to one employing conventional weapons including both guided and unguided systems. I had been able to work on issues related to both nuclear and conventional missions. Near the end of my one-year assignment, I asked Steinhardt for an extension, but he rejected it. As I recall, I left China Lake exactly 365 days after I arrived.

Bob Sheldon: Where did you go next?

Phil DePoy: I went back to Washington in 1961, and Steinhardt assigned me to a small OEG division, the Naval Warfare Analysis Group (NAWAG), which worked with the Navy's Long-Range Objectives Group in the Pentagon. The director of the Long-Range Objectives Group was Rear Admiral Tom Moorer, who was later Chairman of the Joint Chiefs of Staff. Admiral Moorer's division consisted of a senior civil servant, two Navy captains, a chief petty officer, and five or six NAWAG analysts. I was assigned to work on two studies, one with three other analysts, to analyze the concept of a small aircraft carrier using tilt-wing aircraft to deliver Marines ashore (which more or less led to the development of the V-22 aircraft and LPH [landing platform helicopter] ships). My other assignment was to assist the aviation staff to develop the loadout, i.e., the quantity of each of the new conventional weapons on carriers. In this study, I worked with the Aviation Division in the Office of the CNO and with the new Systems Analysis Division in the Office of the Secretary of Defense. I also had the experience of giving a very short briefing to Secretary McNamara concerning the loadout study.

Bob Sheldon: What were your insights from that loadout study?

Phil DePoy: If I had the experience that I gained in the next decade at that time, I would have approached it very differently. We considered several possible conflicts in Southeast Asia and the Middle East and examined the types and relative frequencies of targets that might be encountered. We then selected the best weapon for each type of target and determined the relative requirements for each type of weapon. What I quickly learned three or four years later is that we didn't know the effectiveness of weapons against specific targets very accurately; we didn't know how well the weapons could be delivered in different weather and

defense environments; we didn't know what countermeasures the enemy may develop against some weapon types; we didn't know how frequently pilots would be ordered to attack an alternate target after they're launched; and there are many other factors that are unpredictable. Many of these uncertainties increase the requirements for general-purpose weapons, which is what was quickly learned in Laos and Vietnam.

Bob Sheldon: What did you do next?

Phil DePoy: In 1963, Admiral Moorer was promoted and became the Commander of the US Seventh Fleet in the Far East. He suggested to Jay Steinhardt that I be sent to Seventh Fleet for my next field assignment. So after a few months at Stanford to complete more of my thesis work, we moved to Japan. I was initially assigned to the Commander of the Carrier Task Force, then Rear Admiral Tom South, aboard the *USS Kitty Hawk*. Again, I was fortunate that my timing was good. When I arrived, the carriers were still assigned the nuclear mission, so the fleet conducted a lot of large air defense and antisubmarine warfare exercises, and one of the two of us (I and my colleague, Ed Vogt, who was the advisor to Fleet Commander) evaluated each of them. For analysts, the nuclear mission of the carriers presented many opportunities. In the Far East and in the Mediterranean, the carrier battle groups had specific operating areas and assigned targets, so they were on alert all the time. They constantly conducted exercises (ranging from small tests that involved a single sensor operator to exercises that involved large numbers of ships and aircraft). There was a lot of data generated continuously and a great deal of interest of the admirals in the readiness of both systems and people. Some of the exercises involved evaluations that were examined at higher levels of command; if the ship or task group didn't perform adequately, it could be replaced and ordered back to the States.

One of my first experiences with evaluated exercises occurred within a couple weeks of my arrival. One day, Commander Don Engen learned that I was aboard and came to see me. (I had met Don previously in Albuquerque, New Mexico, where he was preparing to set a low altitude speed record with the new F-4 Phantom aircraft. He was later successful, and

his record stood for several decades.) (Don was then the Operations Officer of the carrier.) He said that the ship was required to perform an evaluation of its electronic warfare systems, and they needed a Chief Observer to oversee the test and report the results directly to an admiral in San Diego. I was pleased to be asked and agreed to take on the responsibility. Don assigned six sailors to me as data collectors and gave me the official instruction for conducting and evaluating the test. I worked with the sailors for a couple days to ensure that they knew what data to collect and prepared the data collection forms. The test took several hours, and I spent a few days analyzing the results. I completed the forms from the instruction and sent them to San Diego.

About a week later, Don and the Captain of the ship barged into the War Room and screamed at me that I had ruined their careers! It turned out that the ship's scores were below the minimum permitted by the Navy, and they had been told that they had to complete the test at a passing level within one week or the ship and its escorts would be returned to the States, to be replaced by another carrier and its escorts. So I spent several days with Don and some of his officers to ensure that the results of the next test were above the threshold. After several rehearsals, they passed with flying colors. Fortunately, Don and I soon became friends again, and we worked together many times during the rest of his Naval career (he retired as a senior admiral) and later when he was the administrator of the FAA. It took several years before he was able to laugh about my first experience as a Chief Observer, but then he not only told many people but also exaggerated how poorly I had done!

Bob Sheldon: How was it being aboard ship, since you were a civilian?

Phil DePoy: One of the unusual things of that era was that there were no other civilians assigned to Navy ships. The OEG representative aboard the Flagship and I were the only two civilians in the entire Seventh Fleet. Later, during the Vietnam War, many technical representatives from industry were assigned to ships to maintain many of the complex weapon systems and other shipborne hardware. This practice continues to the present day, so the presence of civilians is no longer an unusual event.

When I first arrived with the Carrier Task Force, the Commander, Admiral South, made me a proposition. He suggested that for the first two months with him I not join his Flag Mess (which was usual for the OEG representatives), but rather eat in the Officers' Mess. He had asked the ship's Executive Officer (who had been the Executive Officer at VX-4 when I worked with them) to seat me at his table with the ship department heads, and to move me every week so that I sat next to another department head. During that week, the Admiral wanted me to spend half my time with that officer and the remainder of my time working with his staff. It was an amazing experience! I learned so much that when my two months were up, I asked the Admiral if I could continue the process, repeating the entire cycle. He turned down my request and moved me to his Flag Mess, saying that he had predicted that I would want to do that! (Years later, I learned that Admirals South and Moorer had developed this plan together.)

My tour with the Carrier Task Force turned out to be the most valuable nine months of my entire career in OEG. Initially, I was involved with exercises, including planning a very large exercise that would involve five attack carriers, three ASW (antisubmarine warfare) carriers, and loads of other forces. Unfortunately, the massive exercise had to be cancelled at the last minute due to developments in Southeast Asia. (There was a several week build-up in which daily made-up "intelligence" messages were sent to all the participants based on the scenario chosen for the exercise. With the rapidly changing political situation in Southeast Asia, actual intelligence messages were being confused with the exercise ones, and the Fleet Commander decided that the exercise would have to be cancelled.) However, I was able to design and work on a very interesting set of exercises to evaluate a new command and control system, the new Naval Tactical Data System (NTDS), which was installed on a carrier, the *USS Oriskany*, and two escort ships. The NTDS battle group had earlier deployed to the Seventh Fleet soon after the NTDS had been installed but encountered problems with the system and was unable to fully evaluate it. (One of my good friends in OEG, Erv Kapos, FS, had worked with the NTDS in San Diego so I knew a lot about the

system from reading his reports). The Admiral aboard the *Oriskany* was Rear Admiral Fred (Dick) Ashworth, who had been assigned to Los Alamos during World War II and was in the aircraft bomb bay with the weapon that was dropped on Nagasaki. We had many interesting conversations about nuclear warfare and were able to visit the museum in Hiroshima together. (An interesting side note: When we arrived at the museum, the Admiral was stopped at the door and was not permitted to enter the main part of the museum, so he waited for me and one of his officers in his staff car. The Japanese explained to us that they felt it would be too traumatic for him to see some of the displays. It was later reported in the US press that he was not permitted to visit in retaliation for his role at Nagasaki.) In order to evaluate the NTDS, we designed two separate exercises—one with the *Oriskany* Battle Group and the second with another carrier battle group. We used the same simulated raid structure against both battle groups and were able to estimate the improvement in effectiveness that NTDS provided.

About half-way through my assignment, President Kennedy was assassinated. We received notice in the middle of the night to stand by for an elevation of DEFCON (defense readiness condition) since it was not yet known who was involved in the assassination. The Admiral met immediately with four of his senior staff members and me. He ordered that weapons be loaded and the pilots be briefed on their assigned targets under the guise of exercises which we frequently conducted. Only the six of us knew that this time it might be real. I learned a lot about leadership, observing the way the Admiral handled the situation. Although I had thought about the nuclear evolution a lot, I suddenly recognized parts of the operation which I had never considered. After visiting the deck to see how the weapon loading was going (it was sobering to watch many one-megaton nuclear weapons rolling past when I realized that this time it was not a drill!) and visiting one or two ready rooms to see how far along they were with their pilot briefings, I went to my desk and thought through the entire process of launching an attack to determine if there were things that might go wrong. It suddenly occurred to me that I had never thought about

the “enemy.” We often had Soviet nuclear submarines in our vicinity, and I began to think how they might react if they had been forewarned that an attack was imminent. When a carrier prepares to launch aircraft, one of the last steps is to turn the ship (and its escorts) into the wind and to accelerate in order to maximize the wind over the deck. That could have caused the submarines to attack. So I developed a plan to turn the ship into the wind as soon as possible, but not to accelerate it since the task group frequently turns and this, by itself, would not necessarily mean that a launch was imminent. I also developed a plan to use two ASW escorts to trap submarines if they were following us. I took my plan to the Admiral, and fortunately, about that time we were told to stand down since it had been determined that the Soviets were not involved with the assassination. (I never discussed my plan further with the Admiral so never learned if he agreed with it.) The next morning, the Admiral announced the President’s death on the ship intercom, and I don’t believe that anyone on the ship connected the night’s events with the assassination. In fact, many (including the ship’s captain) complained for days about having to get up in the middle of the night to conduct “exercises.”

I was embarrassed by the fact that I had never thought about the particular issue of vulnerability when preparing to launch aircraft. If Jay were still the Director of OEG, I would probably have been part of that year’s “six percent” (the group that departed involuntarily), but he had left two years earlier when OEG became part of the newly created Center for Naval Analyses (CNA), and we were no longer sponsored by MIT. (I would probably have shot myself to avoid telling Jay!)

Bob Sheldon: What did you consider your biggest impact during that field tour?

Phil DePoy: One of the most valuable contributions I made to the Navy during that period came about soon after the assassination—and I was only the messenger! One day I received a call from a Navy Warrant Officer, Max Gunn, asking me to meet him in the Officers’ Mess for coffee because he needed to discuss something with me. I had first met Max in China Lake during my VX-5 assignment. He was assigned to the Laboratory and was, without a doubt, the

most knowledgeable ordnance person I had ever met. The squadron would often call him for advice. When I was spending my two-month "orientation tour" on the carrier, I had seen him a few times in the weapons spaces. When I met him that day in the mess, he told me that he had heard a lot of rumors about the possibility of war in Southeast Asia, and he was very concerned about the carrier's readiness for assembling and loading conventional weapons. He explained to me that the ordnance men had very little experience with the new types of weapons aboard the carrier. But even worse, during war-time weapons had to be assembled by sailors of all types on the mess decks and that the trained ordnance men had to load the weapons on the aircraft. He said there were no sailors trained to do the assembly, and the ordnance men had little experience loading conventional weapons. We talked about how we might be able to train the sailors, and he had several ideas. I went back to my desk and looked up the regulations. I found that there was a regulation against fuzing and loading ordnance on an aircraft, and then removing it from the aircraft and disassembling it. So I met with Admiral South and suggested that we ask for relief from the regulation and conduct a test in which we break out a variety of ordnance to load 10 aircraft. We would randomly select a group of sailors to assemble the weapons, and I would time the entire evolution. The Admiral consented immediately, and I prepared a message for him to send to Washington seeking the waiver. I worked with the Warrant Officer to plan the entire drill, and when the waiver was received a few days later, we were ready to go. I won't go into all the details, but the exercise was a total fiasco. We had weapon parts spread from one end of the carrier to the other, some weapons loaded without fuzes, and others that couldn't be loaded at all. The Admiral immediately ordered the ship, as well as the other two carriers in Seventh Fleet, to begin immediate and intense training for the assembly and loading of conventional ordnance. It was a godsend, because only a few weeks later, we were delivering conventional ordnance for real!

Soon after our ordnance circus, the Navy and Air Force were ordered to make some small, but very highly classified, strikes into Laos.

Because of the sensitivity of the attacks, we weren't able to use Air Wing officers to plan the strikes, so I was heavily involved in much of the planning. There was an element of competition between the Air Force and the Navy in Washington over who would be selected for each individual strike, so it was important that each attack be successful. In one of the first strikes, I insisted on at least 12 aircraft in order to have a high likelihood of success. The Air Force offered to do it with only four aircraft so naturally it was selected by the JCS (Joint Chiefs of Staff). I assured everyone that the Air Force wouldn't be successful, but they managed to destroy the target with the first two aircraft! My reputation as a strike planner was badly damaged, but in time, I learned that the Air Force Squadron Commander was "encouraged" by the Air Force Chief of Staff (General Curtis Lemay) on the phone before takeoff, and that he and his Executive Officer attacked first, the Executive Officer being instructed to take out the target with his wing if the Commanding Officer missed the target. They both released well below the minimum altitude, and both aircraft were heavily damaged by fragments from the weapons. Although I never knew, I exaggerated the story a bit and told everyone later that both aircraft were probably totally destroyed, in order to partially restore my reputation as a strike planner.

Even with this failure, I was tasked to prepare a plan for a series of strikes which the JCS had assigned to the Navy. The Admiral planned to fly to Japan to present it to Admiral Moorer and the Deputy Commander of the Pacific Fleet who was flying out from Hawaii. I prepared the plan and presented it to the Admiral in detail on the afternoon before he planned to fly off the ship at 10:00 p.m. in order to be in Yokosuka in the early morning. After dinner, the Admiral called me aside and said that he had decided that he should stay on the ship because of some operations that were going on, and that I should take the plans to Yokosuka. He suggested that I stay there for an extra day since my son had been born nearly two months earlier and I had only seen him once (on the day after his birth). That night turned out to be one of the most harrowing trips of my life. To start, we were on the catapult as scheduled at 10:00 pm. I

was riding in an A-3 aircraft with my back to the pilot. The A-3 also carried a bombardier/navigator who sat next to the pilot. The pilot was the A-3 Squadron Commander, Commander Walter Carlin, who had been at VX-5 with me several years earlier. Walt asked us if we were ready for launch, then applied full power to the engines. I couldn't see the Launch Officer so was waiting to feel the impact of the catapult. Out of the corner of my eye, I noticed a flashing red light (which wasn't a good sign). Walt suddenly said that we had a problem and might be "going in" (i.e., into the water). About that time, one of the engines started shedding blades, so I could imagine that nothing good was going to happen in the next few seconds. After a wait that seemed like hours, the steam was successfully bled off the catapult, and Walt was able to shut down the remaining engine. It turned out that an alert sailor had seen something ingested into an engine and immediately hit the alarm. In typical Navy fashion, no one (other than me) seemed particularly alarmed by this near-miss, and we were told that another aircraft would be ready in 45 minutes. I changed flight suits since I was soaking wet, and climbed into the other aircraft. This time the launch was without incident, and we climbed to altitude over the South China Sea. Within 30 minutes after launch, we suddenly felt a sharp jolt like we had struck something. No one said anything, but in a minute or so, we had another jolt. Then it continued every minute or so. Walt finally spoke and said that it appeared that we had a problem in the control system so "just in case" he was going to declare an emergency. He did so, and immediately the nearest control center (in Okinawa) responded. I still remember their call sign—it was "Tree Frog." I also remember the A-3's plane number and loads of other details that I'd not normally noticed. Tree Frog said that they were launching a rescue helicopter. That didn't reassure me at all because I knew we were several hundred miles from Okinawa. Then Walt opened the lower escape hatch and told me that when he said to leave, I should go first. I looked out the hatch and realized that the South China Sea was about six miles or so below us and there were a lot of sea snakes waiting for us to come down. I doubted that I would have the nerve to leave the plane,

but fortunately I never had to make the decision. The jolts continued, but Walt decided that he was able to hold altitude and would continue to Japan because I needed to be there by morning. I would have preferred to land at the first airfield we encountered but didn't want to be the one to suggest it. My problems didn't end there; when we arrived in Japan, the airbase hadn't received the message to have transportation to take me to Yokosuka, so I ended up on a series of Japanese trains starting at 5:00 in the morning. Fortunately, the briefing went well, and I was able to see my new son.

Bob Sheldon: Did you work with other OEG folks during that field tour?

Phil DePoy: Soon after my thrilling flight to Japan, a new OEG analyst (Howard Kreiner, a long-experienced and outstanding analyst) arrived and I moved to the Fleet Flagship. I had planned some exercises I thought the fleet should conduct and was anxious to deliver them to the Admiral. (Admiral Moorer had recently departed and had been succeeded by Admiral Roy Johnson). I never had the chance to discuss them with the Admiral because other events always took priority. Soon after I arrived on the Flagship, the Gulf of Tonkin attacks occurred. The morning after the second attack on our two destroyers, the Legal Officer, the Readiness Officer, and I flew by helicopter to the destroyers and one of the carriers that launched aircraft during the incident.

The Legal Officer took custody of the radar, sonar, and navigation logs from each of the destroyers, and he and I reconstructed the attack. After we completed the reconstruction, one of the senior staff officers from the Seventh Fleet staff took them to Manila to show to a UN delegation. After he left, I was looking at our reconstruction and suddenly realized that the radar detections of the PT boats were made well beyond the radar horizon. Again, I knew Steinhardt would have fired me if he found that I had not immediately noticed that fact. I immediately sent a message to CNA to check with the Naval Research Laboratory (NRL) and the Fleet Numerical Meteorology and Oceanography Center to determine if it was possible that we had had radar ducting at the frequencies of the surface search radars that evening in the Tonkin Gulf. I had a few anxious hours before

hearing that it was highly likely that we had ducting that night.

Despite the opinion of many people that the attack did not occur, I can say with absolute certainty that it occurred. However, it might be questioned whether an attack by two small PT boats warranted a full-scale war with an uncountable number of deaths.

After the Gulf of Tonkin attacks, Howard and I were consumed for a while with strike planning. Most of the Navy strike planners had very little training and experience with conventional weapon planning. So Howard and I traveled independently from carrier to carrier helping them, and in some cases, training officers to do conventional strike planning. There were no documents about strike planning with the newer types of weapons, so Howard and I decided that I should write one. I spent the next month writing the document and sending messages back to CNA's computer center to run models to predict weapon effectiveness against various types of targets. Finally, on New Year's Eve, I finished the document. We had 50 copies of the handbook printed, and they were flown directly to the carriers in the Gulf of Tonkin the next day.

There was an interesting follow-up to this project that field analysts sometimes encountered in those days when we had very limited communications with the home office. (There were also many advantages to having limited delays in communications. We could do just about anything we wanted and then apologize for it later.) About a month later, the Flagship was in port in Yokosuka, Japan, and I had flown down to southern Japan for a day to visit another ship. When I returned the next morning, the officer whose desk was next to mine told me that my boss had been on the Flagship the previous day and said that he was there to fire me. (Only two months before proofing this in July 2015, I gave the eulogy at that officer's funeral—he was the last living multiple Navy Cross winner, having won two Navy Crosses in World War II when he was 19 years old!) Since that officer often joked with me, I thought he was doing just that, and I made some crack about hoping that someone would fire me and get me off the ship! Within a few minutes, the Admiral's orderly appeared and asked me to

go to the Admiral's office. As I then learned, an analyst in the OEG Washington office had been writing a weaponeering manual for several months; he was naturally upset to learn that I had already written and distributed such a thing in Seventh Fleet. He convinced the Director of OEG that my manual was inferior to his and that I should be fired. So our director had flown to Japan and went aboard the Flagship to meet with Admiral Johnson. Unfortunately, he started out by apologizing to the Admiral about my manual and told him that I would be replaced. The Admiral immediately had him escorted off the ship by two large sailors, told him to be out of the country within 24 hours, and then wrote a message to the CNO and the Commander-in-Chief of Pacific Forces telling them what had occurred. The Admiral explained all of this to me and said that I shouldn't worry because the Navy would protect me. I explained that my paycheck was signed by the guy whom he had thrown off the ship, but it didn't seem to concern him. I learned several weeks later that the director had entered the OEG office on his first day back in Washington and immediately started screaming for the analyst who had convinced him to visit me. (That analyst got even with me in later years. He died after surgery, and I then learned that he had appointed me as the executor of his estate!)

I also have a sea story about Howard Kreiner. During the Gulf of Tonkin incident and for several months thereafter, he and I were the only two OEG analysts in the Seventh Fleet. I was on the Flagship with the Fleet Commander and Howard was on one of the carriers with the Carrier Task Force Commander, so we frequently communicated but didn't see each other very often.

As I mentioned earlier, for a week or so immediately after the Gulf of Tonkin incident, Howard and I started going from carrier to carrier—not together, but to different carriers—helping them with strike planning. After we had worked with all the carriers for a week or so, we arranged to meet back aboard the Fleet Flagship in order to compare notes and decide what we should do next. When we arrived on the Flagship, we were told that there was a Naval message for us from CNA. We assumed that

they were worried about us or wanted to send help or something, so we retrieved the message from the communications center. It turned out to be a notice that since we were now in a combat zone, CNA had to cancel our life insurance.

We were both very angry, and Howard decided to resign. He wrote a message to CNA either resigning or at least threatening to resign. Then we started thinking about how to get him off the ship, because the Navy certainly had no responsibility to transport him if he was no longer a CNA employee. The only thing we could come up with was to borrow a small boat with oars and start rowing. We joked that we might be able to get ashore and set up an OR group for the North Vietnamese. One of the staff officers quipped that we could probably do more for the US Navy by advising the enemy.

Some other interesting experiences in Seventh Fleet occurred when the JCS decided that it would be a great signal to the Viet Cong if we took the Seventh Fleet Flagship, a cruiser (!), up the river through the Mekong Delta to downtown Saigon. I'm certain that no ship even half the size of the Flagship had ever made it to Saigon. In any case, with a Vietnamese ship's pilot (who we hoped wasn't a member of the Viet Cong) to guide us, many US Marines with rifles behind sandbags on the deck, and a continuous flow of armed aircraft diving at us, we made it all the way to Saigon where we stayed for several days. The day we were leaving Saigon, Admiral Johnson called me into his office and told me that he wanted me to leave the ship, fly to Okinawa by commercial air, board the amphibious command ship, and observe an amphibious exercise which was scheduled to start in three days. I hurriedly packed my bags and went to the airport. I was not able to get a reservation on a commercial flight until the next day so went back into town and stayed overnight at a hotel. The next day I arrived at the airport, and when they checked my passport, the immigration official noticed that I had not officially checked into the country. They immediately arrested me and said that I would need to summon a US Consular Officer to come to the airport. (This had happened to me twice before. I had previously encountered the same problem in Manila and Taiwan. Our ship was supposed to

notify the country that a civilian was onboard before they arrived, but having only one aboard they never remembered. I learned in Manila that I should not let the US Embassy know about my problem (the US Consular Officer had suggested that I find someone to smuggle me out of the country). I called the British Embassy (which I had done in Manila because my wife was a British citizen), and they solved the problem within an hour, and I was able to board my flight. I arrived in Okinawa and took a taxi to White Beach, the port where US ships anchored. (White Beach is one of the best ports in Southeast Asia; it is very large and almost fully protected by land. There's only a small entrance to it from the sea.)

It was about 3:00 p.m. on a Saturday when I arrived at the port. I loved the US Officers' Club at White Beach and thought I would stay ashore and have dinner there. Unfortunately, I decided to go to the ship and leave my bags first, so I called the ship and they sent the Admiral's barge to get me. Ten minutes after I arrived on the ship, there was an announcement that all boating had been cancelled due to rough seas, so I was trapped. I met with the Admiral and his aide and had dinner with them in the Admiral's quarters. Several times while we were having dinner and a later discussion about the exercise, the staff meteorologist came in and briefed the Admiral about the weather. Each time, the wind had risen since his previous visit, but each time he assured the Admiral that it had reached its peak. The aide mentioned that they were showing a movie in the ship Officers' Mess, so I excused myself and finally found the Mess. There were only six or seven officers there because everyone else was at the Officers' Club—where I wished I had stayed. During the movie, I noticed that the ship was rolling more and more, and suddenly the lights went out, and the "general quarters" alarm was sounded. Over the speaker, someone was yelling "collision, collision, port side" over and over. All the officers ran out and tried to find their way to their stations in the dark. I heard one of them fall down a ladder, and he was crying out in pain (it turned out that he broke a leg). I decided to stay in my seat since I couldn't remember even the direction of the entrance to the Mess. For a long period, all sorts of announcements

were coming and suddenly there was a jolt and the ship rolled much further than it had previously. This turned out to be a collision with a ship that was dragging anchor. Then the announcement changed to "damage control party to bow, port side." With that announcement, I decided that I was going to die, and the divers would find me several days later and think I had stayed in place waiting for the remainder of the movie. It probably took the better part of an hour to restore some power, and I could find my way to the Admiral's quarters. When I arrived, the Admiral was in the process of ordering all ships to leave the port at first light (which was six or seven hours away). I learned that there were at least two ships aground, and we were going to have to wait until daylight to fully assess the damage to our ship. I assumed we were taking on water because they sealed off the front section of the ship. The next day, we were able to limp out of the port and it was determined that we would have to sail to the Philippines for repair, even though we only had a skeleton crew on board. So we limped slowly to the Philippines, which took more than a week. It was the most boring time of my life. I think I read every book in the ship's small library. (Over the next year, I was interviewed at least three times by Navy lawyers.)

While I was in in the Seventh Fleet, I had several meetings with the British "Fleet Scientist" attached to the British Far East Fleet homeported in Singapore. Peter Rose was exactly like I pictured Blackett. At one time, Peter had been an academic, a physics professor, and had joined Blackett's group sometime after World War II. He was an outstanding analyst and became a good friend. Whenever the British carrier came to the Tonkin Gulf, Admiral Johnson would receive a personal message from the British Admiral saying "My Fleet Scientist desires to meet with your Fleet Scientist." Admiral Johnson loved to respond, "My Fleet Scientist accepts his invitation." I had explained to everyone on the staff that I wanted to always meet with Peter on the British carrier since they served drinks before dinner. Peter always wore a British Naval uniform with shorts. All the officers on the US staff thought that I should wear shorts when I visited Peter.

The remainder of my tour in Seventh Fleet was busy with strike planning and analysis of strike results. Several years earlier, the Air Force had developed a very detailed simulation of the SA-2 surface-to-air missile and concluded that there was almost no chance of an aircraft surviving at an altitude above 2,000 feet or more, and that the only way to survive against the missile was to attack at low altitude, below the radar line of sight. So when the Vietnam War started, the delivery tactics were all designed to stay low—below 2,000 feet—and both the Air Force and the Navy lost a lot of planes to gunfire. The pilots on their own, without the benefit of a simulation, worked out ways to defeat the SA-2 at higher altitudes. Analysts in both the Navy and Air Force had used the simulation without considering the effectiveness of guns. Nearly all the aircraft losses in the early stages of the war were due to gunfire. Pilots had a lot of incentive to improve tactics and were able to develop maneuvers which would greatly reduce the effectiveness of the missiles and allow them to operate at altitudes where guns were not effective. So it took several months to figure out, but they changed their tactics and lost fewer aircraft per sortie for the remainder of the war.

One of my actions in Seventh Fleet that gave the most people knowledge about OEG was prompted by a discussion with the Fleet Legal Officer. I was complaining to him about the fact that there was a midnight curfew for all military personnel throughout the Western Pacific. He pointed out that I wasn't subject to the curfew because I was a civilian. He typed out a statement for me to read to the shore patrol if they questioned me. The statement was simply "I am a civilian and hence I am not subject to the Uniform Code of Military Justice." I was so pleased with my new power that I used it many times—even if I only stayed ashore an additional 10 minutes. One day in Hong Kong, a chief petty officer on the Admiral's staff came to me and asked if there were more OEG representatives in Seventh Fleet. I said that there was only one other and he was on one of the carriers. The chief petty officer then explained that he had been on shore patrol duty the previous night and had found six "OEG reps" in the Hilton bar after curfew. I told him that frequently

some more “OEG reps” came out to the fleet and always forgot to let me know. As time went on, I heard many more reports of large groups of “OEG reps” visiting the fleet! Many times, when I would arrive on a ship for the first time, everyone would start laughing and say that they always wanted to meet a “real OEG rep”.

Bob Sheldon: What was your next job after your fleet tour?

Phil DePoy: I returned to Washington in April 1965 and became director of the OEG Southeast Asia Analysis Division, relieving Erv Kapos, who had started the division and who then moved to Honolulu to establish and direct the OEG Analysis Division at Commander-in-Chief, US Pacific Fleet. At that time, we had three or four representatives full-time in Seventh Fleet, about a dozen in Hawaii, and from 20 to 25 in Washington working on various issues related to the Vietnam War. The work of the Washington division mainly supported the Office of the CNO, particularly the Air Analysis Office. The division included up to 10 Naval officers who were assigned to CNA, up to six Navy enlisted men who had advanced degrees in science or engineering, and eight to 10 OEG civilians.

During this period, I also served as a part-time analyst in the Air Analysis Division in the Office of the CNO. I worked on several interesting studies in the latter role. One of these studies was an analysis of the potential cost and effectiveness of a fence around the northern part of South Vietnam. Secretary McNamara had proposed that a high chain-link fence be constructed for several hundred miles along the northern and northwestern borders supplemented with land mines. Not surprisingly, we found that the cost was prohibitive, a multiple of the US GNP (gross national product) at the time. Unfortunately, we were never able to brief Secretary McNamara. The Admiral who directed the study decided that none of the four of us assigned to the effort should brief Mr. McNamara and that he wanted a “professional briefer.” So he requested that one of the briefers from the office of the Commandant of the Marine Corps be assigned to him. I must admit that the Marine briefer was good. He had a great voice and was very professional. We spent several days preparing the briefing and working

with him on his presentation. When the day of the briefing came, the four of us filed into the briefing room and sat at the very back. Then the members of the Joint Chiefs of Staff filed in and sat at the table. Finally, Mr. McNamara and his deputy arrived and sat at the head of the table. Our Admiral introduced the briefer, who started out by saying “Secretary McNamara, Mr. Vance, Generals, and *Animals.*” The entire group (excluding the Commandant) started laughing so hard that a few choked. After about five minutes, things quieted down, and the briefer tried to start again. But the group would start laughing again whenever he spoke. Finally, Mr. McNamara said that we would have to try again on another day and left, still laughing. The others then filed out. Finally, our study group and the briefer were the only ones left. That was the last time we saw or heard of the Marine briefer, and the briefing was never rescheduled.

Another interesting study that I did was to determine how many six to eight-month deployments that various types of pilots could make to Vietnam and have at least a 50 percent chance of survival based on our projected loss rates. The results were closely held for a long time and fortunately loss rates improved. At that time, the highest loss rates were with the photo reconnaissance aircraft, and the number of deployments was approximately 1.0! Between January 1962 and June 1973, the Navy and Marine Corps lost 711 fixed-wing aircraft in combat and an additional 391 operationally.

During this tour in Washington, which lasted about 20 months, I made two trips to the Seventh Fleet, each for a month or less.

Bob Sheldon: Did you return to Seventh Fleet again for a full-length tour after that?

Phil DePoy: No. In January 1967, I moved to the Sixth Fleet. When I left Washington, I thought I would be living in Villefranche, located between Nice and Monaco, and was looking forward to a pleasant respite from the war and relaxing on the beach in southern France. Unfortunately, by the time I arrived in Europe, I learned that the Fleet Headquarters, which had been in Villefranche since 1948, was being moved to Gaeta, Italy, a small coastal village halfway between Rome and Naples. The Fleet Commander was Vice Admiral Dick Ashworth,

with whom I had worked in the Seventh Fleet. The Admiral had determined that he wanted both my colleague, Gene Palmour, and me to be on the Flagship with him and to visit the two carriers for major exercises. Both Gene and I preferred that at least one of us be on the carriers, but the Admiral was persistent. For the next two months, we worked on some ASW issues, including an analysis of a recent major exercise. ASW was a major issue in the Mediterranean due to the number of Soviet submarines that were always present. In March, Vice Admiral Ashworth was replaced by Vice Admiral Bill Martin, a famous aviator from World War II and with whom I had worked in Washington when he was the deputy director of the Aviation Division in the Office of the CNO.

Gene and I stayed busy with planning for a major fleet air defense exercise until late April when a coup took place in Greece and the Flagship and one carrier battle group were sent to the area and our exercise had to be postponed. After the coup had settled down, the Flagship was sent back to France for a one-week port call in Villefranche, which we were anxiously anticipating. The day before we arrived in France, the Admiral aboard one of the carriers asked that Gene and I spend the week with him to develop some new plans for the air defense exercise which had to be rescheduled. I tried to convince Admiral Martin that he needed us in Villefranche, but he explained that he couldn't turn down a request for help from a subordinate. Gene and I were flown to the carrier by helicopter a few hours before the Flagship entered port and returned to the Flagship a week later immediately after it came back to sea. The Flagship remained at sea for three more weeks before returning to Gaeta. We were looking forward to being home since we had been at sea for nearly six weeks. We arrived in Gaeta on a Friday and learned that the Director of OEG, Jim Tyson, was arriving on Saturday morning to visit us. We spent the weekend with Jim and on the following Monday, I accompanied him to the ship for breakfast with the Admiral. Admiral Martin asked Jim how long it had been since he had been on a carrier, and Jim told him that it had been many years (Jim had joined OEG directly from MIT during World War II but hadn't had a field assignment for more than

a decade). The Admiral immediately called his aide and told him to arrange an aircraft to fly Jim and me to the carrier (which was operating off Naples) for lunch. I protested that I had been at sea for the past six weeks, but the Admiral assured me that it was only for lunch, and I would be home in time for dinner. So I drove Jim to Naples and we boarded our plane to fly to the carrier.

Jim hadn't flown aboard a carrier for a long time so he asked me what he should do to prepare for a carrier landing. I explained that the COD aircraft was so slow that he wouldn't even feel the landing. When we hit the carrier deck, I thought we had crashed. It was the hardest carrier landing that I had ever experienced, including many landings in jet aircraft, and we were both dazed. When we disembarked, Admiral Geis and his Chief of Staff were waiting for us on the flight deck. The Admiral apologized for our hard landing and explained that the ship had been ordered to go to the Middle East at high speed and they had to take us aboard flying downwind, which was the reason the landing felt more like a crash. He also explained that the ship would soon be out of range of Naples so it would be necessary to launch the aircraft immediately. I was pleased that I wouldn't have to stay aboard for lunch when the Admiral added "Phil, Admiral Martin wants you to stay aboard with us." I protested that I didn't have any other clothes with me so would have to come out later, but he said that they would find clothes for me. So I watched the plane take off without me and went to the War Room to find out why we were headed to the Mideast and to find out where I was going to find some clothes, a razor, and a toothbrush and wondered what my wife and son would think while they were waiting for me for dinner at home.

I received a message from Admiral Martin apologizing for my change of plans and telling me to examine the fleet's readiness to conduct strike operations. Over the next two weeks, I checked on the numbers and types of aircraft on both carriers and the ordnance on the carriers, aboard the only ammunition supply ship in the area, and in the NATO storage depots. I didn't know what targets we might have to strike or even whom we might be attacking, so I developed a list of likely targets wherever we

might be sent. I found some shortages in some types of ordnance and found that the ordnance in the depots was not assembled and the parts were scattered among several locations. I also examined our defensive issues, particularly in the waters off Egypt.

Two weeks after the cancelled lunch, the Fleet Flagship arrived and I was able to return to what seemed like home. Within days, the Arab-Israeli Six-Day War started on June 5, 1967, and I felt like I was back in the Gulf of Tonkin even though we weren't conducting strikes. With two carrier battle groups and some amphibious ships, the fleet covered a large area. Most of the time was spent moving the fleet back and forth from the coast. The JCS would order the fleet pulled back from the coast a few hundred miles, then would order them to close within two hundred miles, always at high speed. The Admiral's staff began to worry about fuel levels on all the ships. Gene and I were given the task of determining what US-flag commercial tankers were in the eastern Mediterranean and to devise a plan to refuel the fleet ships. We contacted the OEG representative in London who was able to provide us the locations of all the tankers near us, so we were able to develop a plan, which fortunately never had to be used.

On June 8, I was sitting in the War Room with Admiral Martin discussing the air defense exercise that Gene and I had designed and hoped to conduct after the war concluded. The Communications Officer, Ensign Phil Dur (later an Admiral) rushed over and told Admiral Martin that we had a ship, "Rockstar" (which was the code name for the USS *Liberty*) under attack. The Admiral, who had a lot of combat experience in World War II and Korea, calmly ordered the carriers to launch all the aircraft that were armed and ready. Within minutes, the USS *America* began to launch. Gene and I walked out onto the open bridge adjoining the War Room to watch the launch. The Commanding Officer of the carrier was Captain Don Engen (whom I mentioned earlier), and I remember waving at him.

Meanwhile the Air Operations Officer determined that there weren't enough tanker aircraft on the two carriers to fuel all the aircraft that were airborne if they flew all the way to

the *Liberty* and back. He told the Admiral who calmly ordered that the aircraft should continue to the *Liberty*, which meant that some planes would end up in the water. Within a short time, a message arrived from the US Ambassador in Tel Aviv saying that, "Israelis believe that they may have mistakenly attacked a US ship. They offer their abject apologies." The Admiral read the message, thought for a short time, and then ordered the aircraft to return.

The Flagship and carriers then raced toward the heavily damaged *Liberty*. As soon we were within helicopter range, Admiral Martin flew to the damaged ship, and then his helicopter flew back with some of the injured sailors. Other helicopters began shuttling between the *Liberty*, the Flagship, and the carriers with more wounded sailors. In total, 34 sailors were killed and 171 seriously injured in the attack.

In this event and many others in the Gulf of Tonkin, I was very impressed in observing many admirals under pressure, making life-and-death decisions which would affect many people. In the Pacific, I had been with Admirals South, Weisner, Moorer, Johnson, and Cooper in many crisis situations. All of them and Admirals Ashworth and Martin had similar backgrounds. They were all aviators who had flown a lot of combat missions during World War II and the Korean War. They all behaved the same in a serious crisis. They remained very calm and carefully, but quickly, made decisions. As a result, nearly everyone around them remained calm.

After the war, Admiral Martin decided that I should go to London with one of the officers on his staff to brief Admiral McCain (John's father) on the ordnance issues that I had discovered. As had been my previous experience with Admiral McCain, we were able to complete about half of our briefing before he threw us out of his office. When I returned to the ship, Admiral Martin approved the plan for a series of air defense exercises. A few months before I went to the Mediterranean, the Navy had conducted a large study directed by Rear Admiral Zumwalt (later the CNO) and several analysts from CNA to determine the number of escort ships required to provide adequate defense of a carrier battle group. They used large simulation models and developed a recommendation for the numbers

of air defense and submarine defense escorts that were needed for each battle group.

We designed a series of exercises with different numbers of escorts in order to verify the results of the air defense simulations. We recorded all the voice nets and the data links. We even took radiosonde measurements (via atmospheric weather balloons) throughout the exercises in case radar performance appeared to vary. When we analyzed the exercise results, the optimal was between three and four escorts with a significant degradation in effectiveness as the number of escorts increased beyond that. The results were counterintuitive, and I couldn't explain them. I hoped that something would turn up in the data link recordings so I sent a message to a friend at the Johns Hopkins University Applied Physics Laboratory (JHU/APL), a Navy University Applied Research Center. I asked them to analyze the recordings and explained that we had no way of paying for it, but would forever be indebted to them. They did a very thorough analysis of the recordings, and the answer to our mystery became obvious. The data link used a "roll call" technique, so it became saturated as the number of participants increased and hence the reporting delays increased rapidly, resulting in the poorer effectiveness with more escorts.

After another sabbatical at Stanford (from February 1968 to January 1969), I returned to Washington and was appointed director of the Systems Evaluation Group, CNA's systems engineering organization. I succeeded Julio (Jud) Fermi, Enrico's son, in the position. SEG at the time had approximately 20 analysts, including a mix of systems engineers and OEG-experienced physicists. Many of the analysts were involved with the development of conceptual design models for ships, aircraft, and missiles. Most of the other analysts were assigned to projects to develop requirements for Navy systems. Whereas OEG worked with Navy operators, SEG worked with the air and surface systems commands in Washington.

Bob Sheldon: What was the difference in the kind of work you were doing in the Systems Evaluation Group?

Phil DePoy: It was much more engineering-oriented than operations-oriented work, that is,

analysis related to the design and cost of systems rather than the employment of systems.

In September 1972, I was sent back to Vietnam to assess the effectiveness of a newly developed weapon. The test was highly classified, and few people were given access to information regarding the system. (I can't imagine that the system is still classified, but I won't give details about it just in case.) The test was sponsored by the Commander-in-Chief Pacific, and the only officer in Seventh Fleet who had full access to the details of the weapon was Vice Admiral Damon (Hutch) Cooper, Commander of the Carrier Battle Groups. One of my colleagues, Don Muir, went to Hawaii to work directly with Admiral Gayler, and I joined Admiral Cooper on the USS *Enterprise*. The plan was to drop three weapons in North Vietnam and monitor their effectiveness. We expected the entire project to take about one month. The weapons were dropped soon after I arrived. I spent a few days monitoring the weapons, and since we received no feedback, I started working on some other projects for the Admiral. I had first met Admiral Cooper the day after the Tonkin Gulf attacks when he was a Carrier Commander (I mentioned earlier that I had visited a carrier with two other members of the Seventh Fleet staff). He was a very knowledgeable and thoughtful officer, and we had many discussions about our Vietnam strategy.

After two and a half months with no feedback from the weapons, I decided to try to figure out what was wrong. I asked a contact in Washington for more information about the system and spent several days analyzing it. I then realized that the sensitivity of the weapon was such that it would never work in the environment where it was employed. I drafted a very strong message for the Admiral to send to Admiral Gayler and took it to Admiral Cooper. He made it even stronger! I finally arrived home at the end of November, three months after leaving for the one-month assignment.

Bob Sheldon: What was your role when you returned?

Phil DePoy: In 1974, I was appointed Director of OEG—a position I was to hold for 10 years. At the time, OEG included about 65 analysts, including approximately 40 field representatives assigned to Navy and Marine

commands around the world. We had a great management group. My deputy, Jamil Nakhleh, had worked with me in SEG, and we always had a great relationship. The Director of the Field Office was Ruth Kolozy, who had been with OEG for only a short time but was phenomenal in taking care of the field representatives. My assistant, Rita Thompson, had also been with me in SEG and was a perfectionist in every way. The four of us worked together for nearly the entire decade. We also had some very talented senior analysts in OEG Washington at the time who did a great job of selecting and training new hires.

Our major problem was that, like the military services, the analysts were worn out! The decade of war had resulted in everyone spending a lot of time in the field and having many lengthy absences from home. We had too many field assignments to fill, as a result of some bad management decisions (for which I had shared the responsibility). Further, interest in defense issues had decreased among prospective hires. Although we were able to hire a few excellent analysts, we were unable to find enough because we were experiencing a heavier-than-normal amount of attrition. We had never hired women as analysts because they were not able to live on board Navy ships or even to visit ships for more than a day or so, and hence were unable to gain the experience they needed.

We finally reached agreement among the OEG management that we had to hire some women and hope that the Navy and Marines would accept them. This, unlike the decisions regarding the field program, turned out to be the correct decision at the right time. The first group of women we hired did amazingly well. One of them, Christine Fox, spent her first field assignment with the Navy Fighter Command in San Diego, a difficult place to be the first woman analyst. She handled it so well that she became the role model for Kelly McGillis in the *Top Gun* movie. Christine later headed the defense side of CNA (including OEG), then was director of Cost Assessment and Program Evaluation (CAPE) for the Office of the Secretary of Defense for three years, and for six months she served as the Acting Deputy Secretary of Defense where, whenever the Secretary

was out of the country, she was the first woman to direct the War Department or the Department of Defense.

Another woman among the first that we hired is Kathryn McGrady. In her first field assignment, she was assigned to the Commander of the First Marine Division in Camp Pendleton, California. While she was there, the Marines deployed to Saudi Arabia for Desert Storm. Since we thought that women were barred from the front lines, I visited the First Marine Division in Saudi Arabia and suggested to the Commander that we could replace her prior to the invasion if he wanted. He treated me somewhat like the Seventh Fleet Admiral treated my boss a couple decades earlier, and told me that he would not give her up under any conditions. Within a few days after my visit, he took Kathryn up to the front lines with him. When they tried to return, the helicopter had some sort of problem, so Kathryn had to stay overnight. I have no doubt that the entire event was arranged for my benefit, to show me that she was able to go wherever he needed her! Kathryn is now President of CNA.

There have been many other success stories among the other women that we hired, despite the difficult times that they faced during the early years when women were being integrated into the services. Both the Navy and the Marine Corps deserve a lot of credit for their efforts to make it work.

Bob Sheldon: Your resume mentions the NATO Systems Science Panel. What kind of work was that?

Phil DePoy: I was appointed as the US Representative to the NATO Systems Science Panel in 1976. I was a member of the panel for four years, serving as chair during my last year. The Systems Science Panel was one of several panels serving under the science side of NATO, which was originally (in 1952) called AGARD (Advisory Group for Aerospace Research and Development) but the name was changed to the NATO Research and Technical Organization (RTO) in the mid-1990s. When I was with the Systems Science Panel, our responsibility was to sponsor meetings on various systems science subjects, and we had a fairly large budget to sponsor research projects throughout NATO. Our panel met once a quarter in Brussels.

It was a very interesting experience. The panel had some very impressive members. The member from Turkey had a PhD in OR and had taught at Case Western Reserve for several years before returning to Turkey as the second or third most senior member of the government. The French representative had taught systems engineering for several years and was then a senior member of the French government. The British representative had been at one time in Blackett's group.

Each of our meetings lasted only two days, so each of the members had to review all the applications for research projects from their country and make a recommendation whether it should be considered by the entire panel before coming to Brussels.

I had one experience which was quite embarrassing but led to a great friendship. In two subsequent quarters, the panel received an application from Professor Andy Sage for research on very large-scale complex systems. I recognized Andy's name because he had written systems engineering books and papers, but I had never met him. Reading the applications, I decided that the work which he described could not be achieved, so I did not recommend funding it. After the second turn-down, I thought that I should look at some of his published work and try to learn more about the type of research he was doing. When I found two of his papers on large-scale complex systems, I was astounded. He had written them more than a decade before the Santa Fe Institute was founded, and before few other engineers or scientists were even interested in the subject. I immediately called him and arranged to meet him in his office at the University of Virginia. I apologized and assured him that his future work would be considered and, if I had my way, funded by the panel.

From that time on, we stayed in touch and cooperated on a number of efforts. He was an outstanding systems engineer and had a unique sense of humor. In 2004, MIT changed the name of their systems engineering department to "engineering systems" and redirected it into research and education concentrating more on complex systems. They scheduled a symposium on the new subject. I called Andy to determine if he planned to attend, and he said that MIT was

the only institution that would move into an area in which other people had been working for 25 years and schedule an international symposium to announce it!

Bob Sheldon: How was it that you eventually finished your dissertation at Stanford? And why did it take you so long?

Phil DePoy: I established a record of sorts in the length of time between my oral defense and final submission of the thesis. A professor whom I didn't like demanded that I change something in the written thesis. I refused. So every time that I was reaching the time limit (I believe it was two or three years) I would wait until I was back in Vietnam and send a letter asking for an extension. The kind lady who handled such things would send me a letter granting me another year. This continued until I received a note from her that the war was over, and I must submit the thesis! So I reversed my "stand-on-principle," made the insignificant changes, and mailed it to her.

Bob Sheldon: Did you use any of your chemical engineering background in your work at OEG and CNA?

Phil DePoy: I used very little of my chemical engineering background. I did use some of my nuclear engineering background at times. It once got me in trouble with Admiral Rickover. I found an error in a document which he had signed, so I called a civilian on his staff whom I had known when we were both students at MIT. Admiral Rickover explained to me that if he ever needed my help, he would call me. He later told someone that what the Navy doesn't need are smart economists designing Navy ships. My civilian friend believed it was targeted at me.

Bob Sheldon: Did you ever have any direct contact with Morse at OEG?

Phil DePoy: After I moved back to OEG, I invited Philip Morse, the founding director of ASWORG, who was still teaching at MIT, to visit us in the fall of 1981 to see what had happened to OEG since his last visit in the 1950s. He came for a day during which we gave him an idea of how OEG then operated and introduced him to several of the analysts. I scheduled him with six or eight of our best analysts, leaving him alone with each of them for about a half hour. At the end of the day, I asked him what he thought

about what he had seen. He thought for a minute or so; then replied, "I think you should close it down. When the next war starts, start a new group and you'll be able to attract better people." It wasn't exactly the response I was wanting, and it made it difficult when our analysts asked me what Morse thought. I used the easy way out, saying only that "He was impressed." Morse had written the same recommendation in his book, *In at the Beginnings*, published in 1977, so I should have known better than to ask him. I did approach Morse about an idea that I had to invite all the living members of the World War II group back the following spring in 1982 for a reunion, given that it would be the 40th anniversary of the founding of ASWORG. He was enthusiastic about that possibility and said that he would definitely participate.

We were able to locate nearly all the World War II ASWORG analysts who were still living and invited them to spend a day with us the following April. We also invited the CNO and Morse to be the principal speakers. I told our people that we should plan for no more than half of them to attend since many were located on the West Coast, and it was a long way to travel for a single day program. In the end, I believe that nearly 80 percent of the invitees attended. It was great fun to hear their stories (much better than my sea stories!). I asked several of them why they came, given the distance and the fact that it was only a one-day affair. They all said that their time in ASWORG had been the most exciting part of their lives, and they just wanted to see their friends one more time, many of whom they hadn't seen since WW II, and bring back many of their memories.

In discussions with Morse during his visits, and with Jay Steinhardt who directed OEG from 1946 until 1962, I believe that OEG has stayed true to most of the principles that Phil established in 1942. First, Morse defined operations research as the application of the scientific method to the solution of complex problems. (OEG still considers this to be their major role.) Secondly, Morse felt that analysts had to be assigned to the operating forces so that analysts could develop a good understanding of operations and of problems that are encountered in the operating environment. (This has remained as OEG's practice for the full 74 years of its

existence.) Morse also believed that it was important not to leave analysts with any operational unit for more than six months. (As stated earlier, this is the one practice that had to be changed even before I joined the group 57 years ago.)

After Morse left ORG in 1945, he returned to MIT for a brief period. In 1946, he became the founding director of the Brookhaven National Laboratory where he stayed until 1948. After another brief stay in Cambridge, Phil was persuaded to become the director of research for a newly formed government organization, the Weapons Systems Evaluation Group (WSEG), where he served until again returning to MIT in 1950. (WSEG later merged into the newly formed Institute for Defense Analysis [IDA].)

The book written by Morse and Kimble, *Methods of Operations Research*, resulted in the Japanese Defense Agency formation of operations research groups in each of its services. The Navy wanted OEG to work with its cousin in the Japanese Admiralty from the time it was formed. Jay Steinhardt visited the group when he was director, and I believe that the other directors between Jay and me also visited it when they were in Japan. I don't know who or when the idea of visiting them on a quarterly basis was developed, but we did it for a few years in the 1960s and 1970s. On the door leading to their offices, there was a sign in English, "OEG." I think it was the only sign in the Admiralty that was not in Japanese and suspected that they put it on the door only when one of us was visiting. The group was very enthusiastic about OR, but we hadn't been very effective in teaching them. I remember that on one visit, I derived an expansion for a solution to a nonlinear differential equation and showed them how to use the second term, i.e., the slope, to estimate the values of two effectiveness parameters from some data that they had collected. On my next visit, they proudly handed me a large stack of paper in which someone had derived the third through eighth terms of the expansion. (At that point, I knew that I had failed to get my point across!)

Bob Sheldon: How did your leadership role at CNA evolve?

Phil DePoy: In 1985, the Navy replaced CNA's sponsor, the University of Rochester, with the Hudson Institute, which was founded

by the brilliant physicist, Herman Kahn, formerly of RAND. Unfortunately, Herman died suddenly between the time that Hudson was selected and when it took over as CNA's sponsor. Tom Bell, the president of Hudson, became the chairman of CNA's Board of Directors and soon thereafter appointed me as the acting President of CNA. Later, the CNA Board appointed me as president. I had mixed emotions about taking the new position. I loved my former job as OEG director because I was able to remain close to Navy operations and analysis and knew that the new position would distance me from both. However, Hudson selected an outstanding board, and I enjoyed working with them and learned a great deal from the individual members. I had always felt (and continue to feel) that most nonprofits are poorly governed, and our new board was a huge improvement for us. Among the board members were General Bob Barrow, former Commandant of the Marine Corps; General Al Haig, former Army General, President of United Technologies Corporation, Secretary of State, Chief of Staff to the President, etc.; Admiral Bob Long, former Commander of Pacific Forces; Dan Evans, former Governor and Senator from the State of Washington; Bill Gates, Sr., attorney (and father of the founder of Microsoft); Jim Schlesinger, former Secretary of Energy and Secretary of State; Fletcher Byrom, former CEO of Coppers Company Inc., and 11 others of similar backgrounds. It's difficult to find an equivalent board anywhere, and this board was only paid for their expenses!

Bob Sheldon: What were the major changes during your tenure as President of CNA?

Phil DePoy: The major change was the board itself. It took a much more active role in governing CNA than the universities that had sponsored CNA during most of its existence. It was also a period of rapid growth for the organization. I was very uncomfortable with rapid growth since my experience had been that we tended to hire with less care than in normal times, and it then took several years in which to sort out some of the analysts that shouldn't have been hired in the first place. In fact, I was always out-of-step with most managers. I always preferred being a part of an organization which was truly excellent, whether or not it has any growth at all. That was also the attitude

of Steinhardt. He often talked about the period after World War II when OEG had to downsize. They went from 65 to 25 analysts in one year, but he was proud of the fact that he lost fewer people than a proportional amount from the upper half in terms of ability and potential.

Bob Sheldon: Did you have any problems with retention in OEG or CNA?

Phil DePoy: Certainly during and immediately after the Vietnam War we did.

Further there was a drop in interest in defense issues at that time, and recruiting new employees was difficult. But over most of its existence, OEG did not have enough attrition. Keeping enough analysts in the field requires a constant influx of new people. After a few years of rapid rotation to the field and back, most analysts want to stay in Washington for longer periods. We never had attrition near the rate that Jay required, but fortunately, we were able to attract enough people from the remainder of CNA to man the assignments.

Bob Sheldon: What were some of the significant things that happened to CNA while you were president?

Phil DePoy: During the time I was president, CNA was involved in many interesting analytical projects such as the determination of requirements for the Navy's new A-12 aircraft (a program that was later cancelled). Also, we were named the program manager for a new highly classified air defense system and were able to conduct some very interesting tests in the fleet.

The most memorable part of the job for me was our near-involvement in the "Ill Wind" procurement fraud scandal that was centered on the office of the Assistant Secretary of Navy (RDT&E) and involved many private firms. The investigation and prosecutions continued for a long period. Although we had no direct involvement and in fact were credited by the *Washington Post* as being one of the "whistle blowers"—this wasn't true, at least we didn't intentionally "blow the whistle"—but some of our actions contributed to the realization that there were major problems in the Navy's acquisition system.

In 1989 I realized that there were some conflicts of interest between CNA and our sponsor, and I approached the Navy with the idea of

making CNA an independent organization, similar to most of the defense FFRDCs (federally funded research and development centers), such as RAND and IDA. The Navy agreed, and CNA became independent in the summer of 1990. About six months before the change, I notified our board that I would like to leave CNA when the transition was complete. I had been thinking about a change for several years and thought that this would be an ideal time. I had greatly enjoyed my 30+ years with OEG and CNA, but as I told the board, I wanted to do something different “before I died.” I agreed to stay on as a senior fellow to complete some projects with which I was involved, including direction of a study of concepts for the next generation aircraft carrier and establishing an analytical support team for the 1993 Navy and Marine base-closing effort. I also got involved, along with Christine Fox, in directing CNA’s combat analysis efforts in the Persian Gulf War.

When I agreed to extend my time at CNA, I thought it would be for six months to a year, but it turned out to be a full two years. I finally departed CNA in the summer of 1992 and became the president and CEO of the National Opinion Research Center (NORC) at the University of Chicago. It was a huge change for me from CNA. Being on a campus again and dealing with such a great faculty was wonderful, and learning about survey research was fascinating. NORC had pioneered complex studies in health, education, labor, mental health, housing, aging, and substance abuse, and dealt with many government agencies with which I had little experience. I enjoyed my job very much but I left after eight years, not because of being tired of what I was doing, but because eight Chicago winters had exhausted me!

Bob Sheldon: What kind of work did you do at NORC? Was it something like Gallup polls?

Phil DePoy: NORC doesn’t do polling. It does major surveys, mainly for the federal government. In a sense, they are adjuncts to the census. Some are longitudinal surveys in which the same respondents are surveyed at one or two year intervals for many years. Probably the most well-known of NORC surveys is the General Social Survey which has been conducted since 1972. It is an in-person

survey of demographic characteristics and opinions. Until 1994, it was conducted each year. Since then it has been conducted at two-year intervals. We also prepared the annual “Best Hospitals” issue for *US News and World Report*. In addition, NORC is the home for several multidisciplinary research centers of university faculty members.

Bob Sheldon: How do they pick their samples?

Phil DePoy: NORC has a group of excellent statisticians who are responsible for sampling.

Bob Sheldon: Were your results ever scrutinized or questioned for credibility?

Phil DePoy: Oh yes, frequently.

Bob Sheldon: How did you respond to those challenges?

Phil DePoy: All of our work was well-documented, from survey design and sampling to the analysis of results.

Bob Sheldon: How large a group was it in Chicago?

Phil DePoy: Our total staff was on the order of 300.

Bob Sheldon: What was your next job?

Phil DePoy: I then decided to accept a position of “distinguished visiting professor of warfare studies and chair of expeditionary warfare” at the Naval Postgraduate School (NPS) in Monterey, California (where the winters are much milder than Chicago!). I hoped to be able to do some research in several areas that I had encountered during my years with the Navy and to have time to document some of my experiences. But within a matter of weeks after arriving, the Admiral in charge of NPS asked me to form an Institute of Systems Engineering. NPS had already started to teach systems engineering, but the Navy was pressuring them to increase the effort. An old friend, Walt Laberge, was, at the time, retired and living near Monterey. Walt had been the first program director for the Sidewinder missile at China Lake, Director of the lab at China Lake, Assistant Secretary of the Air Force, Under Secretary of the Army, and Vice President of Lockheed. He called one day and said that he would join me on a part-time basis if I became involved with the new Institute. (He later admitted that his wife was tired of having him home all day after he retired, so he needed to escape!) Walt and I started the Institute in early 2001.

Bob Sheldon: What was involved in setting up the Institute of Systems Engineering?

Phil DePoy: Since a systems engineering and a systems engineering management curricula were already in place, there was not a great deal to add at the creation. During the first year, we began teaching in some of the warfare centers via television. That program has now expanded and the last time I checked, NPS has more than 400 students in the centers enrolled in a systems engineering program leading to a master's degree. We also created an annual class project in which the on-campus class was assigned a major systems engineering project. The first year, we assigned the systems engineering class, in conjunction with the ships systems engineering class (that was located in the engineering school), a project to design two small high-speed ships, including one that could carry a number of aircraft. The group did an excellent job, and some people claim (or blame) the study for leading to the LCS (Littoral Combat Ship).

Bob Sheldon: Who determined there was a need for this curriculum?

Phil DePoy: It was requested by the Vice Chief of Naval Operations, Admiral Don Pilling.

Bob Sheldon: Do you know what the basis for his decision was?

Phil DePoy: The lack of "systems thinking" had been an issue throughout the Defense Department as military systems and "systems of systems" had grown more complex. He felt that more officers should be educated in systems engineering.

Bob Sheldon: What else did you do at NPS?

Phil DePoy: In 2001, at the request of the CNO, the Navy had started a program in Executive Education at NPS in which they brought 20 senior admirals to the campus for 10 days each month. We took them to visit IT companies in Silicon Valley and had corporate executives come to the campus to explain how modern IT firms were managed. The founding director of the effort left NPS in 2002, so I was asked to take over his responsibilities, in addition to those in the Meyer Institute of Systems Engineering (which had then been named in honor of Rear Admiral Wayne E. Meyer who had been the first program manager of the AEGIS project). I managed the Executive Institute for one year and

enjoyed meeting many executives at firms such as Apple, IBM, INTEL, Sun Microsystems, and Kleiner Perkins. I continued to manage the Meyer Institute until the summer of 2005 when I decided that it was time to retire.

I moved back to the Washington area, but I have remained as a member of one advisory board (Applied Physics Laboratory at the University of Washington). I served for six years (four as chairman) of the Department of Homeland Security Science and Technology Advisory Committee. Recently I was appointed as a Senior Fellow at the Applied Physics Laboratory at Johns Hopkins University.

Bob Sheldon: I noticed on your bio that you have awards from the Army, the Air Force, the Navy, and the Defense Distinguished Public Service Award. How did you manage to get all those different service awards?

Phil DePoy: I was Vice Chairman of the Army Science Board for three years, from 1978 to 1981. And then I was on the Air Force Science Advisory Board from 1983 to 1987.

Bob Sheldon: What kinds of studies did you do for the Air Force?

Phil DePoy: The largest one I remember was concerned with airfield vulnerability. It was a very interesting effort. I had directed the study for several months before the Air Force Chief of Staff discovered that I was the director. Knowing my Navy background, he ordered that I be reassigned within the Science Board with the comment that "they have put the wolf in the hen house!" I strongly resented the implication that I was "spying" on the Air Force and resigned from the board.

Bob Sheldon: Do you have any hobbies or professional activities to keep you busy now?

Phil DePoy: I play some golf, albeit poorly.

Bob Sheldon: Looking back, how do you feel about your overall career as an analyst?

Phil DePoy: I am often asked if I am sorry that I worked in OR, rather than engineering, for so many years. I respond that if I had known in 1959 what OR (or OA as I have used the terms) was, I would not have joined OEG. But given that I did, I'm very pleased and can't imagine that any other career would have been as rewarding in so many ways. From the adventures; the vast numbers of very interesting people I have been associated with in OEG, CNA,

the military, and the government; and the fulfillment of working on so many important issues could not have occurred in any other career. The only downside that comes to mind is that my career was very difficult for my family. My long absences, and even more important the uncertainty in the length of absences, were damaging, but it was not any worse than many military families endure.

As I think about my career, I am amazed at the amount of effort that the Navy made in educating and training me and my colleagues in OEG. (I should mention that when I say "Navy," I mean "Navy and Marines.") I have mentioned several instances when the Navy went out of the way to educate me, e.g., flight experiences at VX-5, experience in the Pentagon with Admiral Moorer, the orientation aboard the USS *Kitty Hawk*, and there have been many, many others. I have always felt that I could never do enough to repay them but only hope that I have made a significant partial repayment.

Bob Sheldon: Do you have any parting shots?

Phil DePoy: I have talked about my own experiences and have said very little about the many great contributions that were made by my colleagues and are still being made by OEG. Keith Tidman reported in his book, *The Operations Evaluation Group*, on many contributions that were made by OEG analysts through the late 1970s, and I hope that someone will document many of the more recent efforts.

I want to thank MORS and particularly Bob Sheldon for this interview. It has given me a chance to document many of my experiences that I have wanted to preserve. Bob has been incredibly persistent (for more than a decade!) and immensely patient in the process, and it never would have occurred without him.

I would also like to thank a number of people who were kind enough to read this lengthy interview and make very substantial corrections and suggestions for improvement, including Alan Brown, Christine Fox, Wayne Hughes, Jamil Nakhleh, Ferd Neider, Gene Visco, and my wife, Norma Lou.