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INTRODUCTION

Mr. Vernon M. Bettencourt, Jr. was MORS President 1991–1992 and was elected a MORS Fellow in 1998 and Wanner Laureate in 2005. Mr. Bettencourt was the Director of Analysis and Chief Information Officer for the Deputy Chief of Staff, G-3, (DCS, G-3) HQDA from 1999 until his appointment as the Deputy Chief Information Officer/G-6, US Army, in 2003. This interview was conducted on two separate occasions in the Pentagon, Army G-6 office: October 11, 2005 and November 22, 2005.

BOB SHELDON: It's October 11th, 2005. We're at Vern Bettencourt's office in the Pentagon. First of all, state where you were born.

VERN BETTENCOURT: I was born in Ventura, California in October 1947.

BOB SHELDON: Give us your parents' names and how they might have influenced you in your career and education.

VERN BETTENCOURT: My dad's name was Vernon M. Bettencourt. My mother is Eunice E. Bettencourt. They were both high school graduates. My dad was a junior college graduate.

I have one sister. My parents were both very keen that we receive college educations, so that was number one. About the beginning of high school I began to aim towards attending a military academy. So they were careful to talk to some friends who were educators, and helped on the selection of high school electives, et cetera, that would point towards an academy and an engineering degree. I can still remember the amount of help my mother gave me in proofing papers. So I would say they were pretty influential.

BOB SHELDON: Where did you go to high school?

VERN BETTENCOURT: San Marcos High School in Santa Barbara, California.

BOB SHELDON: Did you take an interest in mathematics or science in high school?

VERN BETTENCOURT: I took the advanced mathematics and science curricu-

lum at high school and ended up with first semester calculus in high school. I was interested in science in high school, but my real interest was attending one of the military academies and the math and science piece were prerequisites. Extracurricular activities such as Scouting and Key Club were also preparation. Boy Scouts and Explorers were a great personal and organizational leadership opportunity that I really enjoyed. I ended up as the head of all Eagle Scouts and Explorers in our county. Heady stuff for a 16-year-old.

BOB SHELDON: How did you choose your military academy? Did you apply to all of them?

VERN BETTENCOURT: It was medically chosen. My dad flew B-24s in World War II. He was an Army Air Corps pilot—not Air Force. So I aspired to attend the Air Force Academy, but my vision wasn't sufficient.

BOB SHELDON: What Theatre did he fly in?

VERN BETTENCOURT: He flew in the European Theatre with the 15th Air Force, initially out of North Africa, and then out of southern Italy. Stephen Ambrose wrote a book about that—*The Wild Blue: The Men and Boys Who Flew the B-24s Over Germany 1944–45*. George McGovern was in it as a B-24 pilot. That group was my dad's group. He often talked about combat but I didn't appreciate what he had been through until I read the book and served in Vietnam. Aircrews had the highest attrition in WWII.

BOB SHELDON: So you chose West Point as a fallback?

VERN BETTENCOURT: Because of my vision. I couldn't get into the Air Force Academy, and my Congressman suggested that I apply for West Point. Which I did.

BOB SHELDON: Did you take any prep school or did your high school adequately prepare you?

VERN BETTENCOURT: No. It was high school. I ended up as the first alternate for West Point from my Congressman. I was ready to go to the University of California at Santa Barbara in electrical engineering as a major. I was lying in bed on the morning of the last day of June of 1965 and the phone rang. It was the Congressman's office saying, "Can you be at West Point not later than noon tomorrow?" Just like Stonewall Jackson—except for the phone.

Military Operations Research Society (MORS) Oral History Project Interview of Mr. Vernon M. Bettencourt Jr., FS

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MILITARY
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The primary candidate had received a four-year full scholarship to Yale. He decided he'd rather do that than go to West Point and then to Vietnam. So he mailed his rejection back. In those days, from California to Washington, D.C., took about 10–12 days for a letter to get here, so they must have gotten it the day before. They called and I was literally speechless. My dad said, "Yes, we'll get him there." So I flew all night and got to New York and up to West Point. There was one lady in the administrative building that knew I was supposed to be there. She gave me a 3×5 card with her name and phone number, and she said, "Show this to all the upper classmen, because none of them will know you're suppose to be here." So everywhere I went, I showed this card. And they said, "Okay." But then I had to move companies, and I was always a week behind everybody else from starting out late.

BOB SHELDON: Any strong remembrances of your West Point years? Good or bad.

VERN BETTENCOURT: Yes, I met my wife there, so that's a very strong remembrance. (*Laughing*) She is still with me today. She attended Ladycliff College, which is right down the road from West Point. We met her freshman year, my sophomore year. I was 18; she was 17. Having watched my daughters at that age, I can't believe that we decided at that point that we were the ones for each other.

It seems like cadets and middies are divided on military academies. Either they really enjoy it, and try to adhere to the system; or they enjoy it, but try to get around the system. Or they just don't enjoy it. I was one that enjoyed it and tried to work with the system. It was, for me, a great four years. It was during the Vietnam era, so we were removed, if not ostracized, from our peer group for being in a military academy. Certainly back in coastal southern California—that was not exactly a popular career choice at the time. But I'm very glad that I did it.

Let me expand on this a little. I still have a periodic sense of wonder that I actually became a West Point Cadet, let alone graduate. That early morning phone call was clearly the "Tipping Point" of my life. All else follows from that: my marriage and daughters, and now granddaughter, my profession and career, and

my values. I read Steven Covey on effective leadership. He talks about personal values and mission. For me that is straight forward: God, Family, Duty, Honor, Country. All since has been focused on attempting to live those values. West Point taught me that. It also gave me a great military and engineering education, as well as a leadership testing ground. I was fortunate enough to command Company D-2 the last two of three cadet details Firstie Year. What a tremendous learning experience.

BOB SHELDON: Did you select a branch and get what you wanted?

VERN BETTENCOURT: Yes. I was high enough in the class that I was able to choose the branch that I wanted. I don't think they do it anymore, but when I was there, between our junior and our senior year, in the summer, we would take a tour of the major TRADOC schools for the branches that we could go at the time. The five combat arms. We'd go to each of those schools and they'd put on demonstrations, and we'd learn what it was to be an officer in that branch. When we went to Fort Sill, one of the things they did was take us out to the direct fire range where we conducted direct fire with 105mm Howitzers against car bodies. I was the gunner, and we were firing at a yellow Volkswagen. I can still see it in the scope. We got a direct hit. The door flew about 100 feet up in the air (*Laughing*) and I said this is all right. This might be a good way to go. So I chose Field Artillery.

I thought that it would be good to get a little seasoning before I went to Vietnam, so I chose Germany for a first tour.

BOB SHELDON: Back to the academy. Did you feel adequately trained academically in your math and science when you later took some more advanced courses? Or do you wish you'd studied harder and did more?

VERN BETTENCOURT: At the time, you were only allowed two electives and I took social science electives. But we still had a pretty rich engineering and math science background in the core curriculum. In engineering I certainly did and in science I did. The method of instruction in the mathematics has changed a little bit. When we were there, it was more about memorizing theorems and corollaries and proofs. And being able to write and recite

those in class when you were studying calculus than it was about understanding what was really going on in the calculus. So that was lacking in the curriculum. When I got to Georgia Tech in grad school and took the first quarter summer refresher courses, that was the first time I really understood what calculus was all about. Because they take the applied view down there. In the curriculum at Georgia Tech, we did have a math proof course and a math logic course. So we did get that. But the calculus was applied calculus, and that's where I really learned what calculus was all about.

BOB SHELDON: Back to being a young artillery officer in Germany, where was that?

VERN BETTENCOURT: In Zirndorf, Germany which was just outside of Nuremburg. With the 4th Armored Division first, and then it was reflagged to the 1st Armored Division.

BOB SHELDON: Did you do maneuvers close to the wall with East Germany?

VERN BETTENCOURT: You mean the border with Czechoslovakia. We did have emergency defense positions up on the border with Czechoslovakia. We were opposite Czechoslovakia, down in Nuremburg. We had positions there and then of course, Grafenwoehr where we used to go to fire was up near the Czechoslovakia border, also. One of the ironic issues—we would do that during the day, and then on the weekend when you'd go to the commissary, and you'd go to the meat department, a lot of the beef was from Czechoslovakia. (*Laughing*) Even though we were facing them as enemies, capitalism still applied.

PETE DAVIDSON: Was the reflagging part of an Army reorganization? Were they pulling back troops?

VERN BETTENCOURT: I believe that was just part of a reorganization in Army flags. There may have been a little bit of a downsizing. This was in late 1970, early 1971, that we reflagged. That may have been the beginning of the tail off of Vietnam. We didn't pull anybody out of Germany. I know that. But as a First Lieutenant, all that was echelons above my reality at the time.

BOB SHELDON: Were you involved in REFORGER (REturn of FORces to GERmany) exercises?

VERN BETTENCOURT: Yes, there were REFORGERS. We participated in those. With the artillery, if you're an artillery lieutenant, when the maneuver arms go out to the field, you went out with them as fire support team leaders or forward observers. Then when you went to the field to fire—we usually fired twice a year with our cannon. Then you go to the field for a month at that point. So we were gone a lot when we were over there. I've often thought about the fact that artillery—between the use of computers and mathematics, and the fact that artillery supports the maneuver arms, that's pretty good preparation for operations research in the Army, because of the combined arms view you receive. In one I was a controller for a division in which GB George Patton III was Assistant Division Commander. Of course, the main command post was "destroyed" so command went to Patton at the Alternate TOC with me telling him what he was or was not allowed to do. That was an experience!

BOB SHELDON: Did you have some close encounters with your Cold War enemies?

VERN BETTENCOURT: We would go out on recons for our emergency deployment exercises, and the officers would go forward to the border and recon our actual positions. At that point we did see them. At that time the artillery was nuclear-capable, so I was in the Personnel Reliability Program as part of the nuclear program. It was difficult to travel to Berlin if you were in the program so I never did that.

BOB SHELDON: Did your family enjoy living in Germany?

VERN BETTENCOURT: My wife really enjoyed it. Our first daughter was born over there. When I took command of my battery, I had a First Sergeant Jim Jones, and his wife was Gerda Jones who was a German, and the both of them were just tremendous people. Let there be no doubt that the fundamental strength and glue of our Army is the NCO Corps. It was a strange relationship because during the day, I was the Battery Commander; he was the First Sergeant. It was proper and respectful. But then at night or on the weekends, particularly after our daughter was born, we were new parents, and our parents were back in the states. So Jim and Gerda were the surrogate grandparents for our daughter.

His oldest daughter was about two years younger than my wife, so it even fit chronologically. Randy had a good time with Gerda, and they did a lot of good for the Battery. Both of them were very involved in the life of the junior enlisted in the Battery, and tried to help them, because times were economically tough for the junior enlisted. They did a lot of work with food stores and all that kind of stuff with the junior enlisted. We also got to tour in the Bavarian area, and down into Austria and Italy. We enjoyed that.

BOB SHELDON: Was it a two-year assignment?

VERN BETTENCOURT: It ended up being 2 ½ years. I volunteered to go to Vietnam. I was in command so I would have finished out the three-year tour otherwise. I commanded for about 14 months.

BOB SHELDON: Where did you go to in Vietnam?

VERN BETTENCOURT: By the time I got there, there really weren't many U.S. units except for some aviation units. I was a district senior advisor down in the Mekong Delta for a Vietnamese Infantry Major who was the district chief.

BOB SHELDON: What kinds of advice did you give him?

VERN BETTENCOURT: We had some artillery down there and U.S. helicopters and Tac Air support so I was able to help. We also had the Vietnamese artillery. I was certainly able to help with Vietnamese artillery. A lot of it was coordinating U.S.—these days we'd call it stability support or nation-building—building schools, water wells, canals. So a lot of it was the support resources that we could bring. Mainly funds from our regional commanders. We also helped them with communications. Ironically, that's what I'm doing now. We participated in patrols with them, but by that time, they were very skilled in patrolling. So there wasn't a lot of help that we could give them in tactics, but we could give them fire support and resources.

BOB SHELDON: Did you come under fire while you were there?

VERN BETTENCOURT: Yes. A couple times we did. Both on patrols and in Base Camp. One Base Camp battle was an all night

affair. What we were able to do is bring in U.S. artillery and air. There wasn't much U.S. artillery, so the main thing we had to offer was either Air Force or Army attack helicopter air. We could bring that in for them, but infantry tactic-wise, they were in good shape by that time. This was 1972–73.

BOB SHELDON: How much time did you spend there?

VERN BETTENCOURT: I spent five months over there, and then war ended and I came home.

BOB SHELDON: Were you one of the last ones to pull out?

VERN BETTENCOURT: Yes. I came out in April 1973 as we were shutting down the districts and the regions at that point.

BOB SHELDON: Was your withdrawal chaotic?

VERN BETTENCOURT: No. We got out before that happened up in Saigon. The main thrust of the North Vietnamese was coming in the central highlands in the north towards Saigon, and we were in the delta below any of that. So no, it wasn't chaotic.

BOB SHELDON: What was your next assignment?

VERN BETTENCOURT: After Vietnam, the military personnel center really didn't know what to do with all of us that were coming back. The most expedient thing they could do was dump us all into the advanced course. In early to mid 1973, at Fort Sill there were several advanced courses. I think there were four of them that were going on simultaneously. Usually there's two in session. But at this point there were four because they had such a class load from the people coming back from Vietnam, plus the ones that had been scheduled to come normally. At the time the advanced course was nine months long. That gave the personnel system time to adjust as to where to put all these people.

BOB SHELDON: The advanced course that you took, that was artillery?

VERN BETTENCOURT: Yes. That was artillery. But pertinent to our discussion here today, what they had—which I don't believe they have now—were electives. The first six months were pretty artillery intensive. Then the last three months you took electives. I had two or

three electives, and I took Operations Research electives. That was my introduction to Operations Research, in the electives of the advanced course.

BOB SHELDON: What topics did you cover in those courses?

VERN BETTENCOURT: There were certainly elementary probability and statistics, linear programming, and there was also some cost analysis, net present value and macro-economic analysis. As I was taking these courses, I began to get interested in the discipline so I talked to the instructors. A couple of them were fellow artillery captains and then there was the head ORSA guy in the instructional part of the school who was a Major.

I asked, "Is there much math involved in this?" And they said, "There's a little math, but basically you take a lot of management science type courses." I think all of them had been to Georgia Tech. I was interested in getting an MBA degree at the time, and I talked to Branch. Branch, which was the military personnel people, was interested in sending people to graduate school because again, that was a way to prolong this big bubble of people that had returned from Vietnam. It was also a way to get a bunch of officers with advanced degrees. So they were pretty amenable to people going out of the advanced course to grad school. I called Branch and said, "I'm interested in an MBA." They said, "Absolutely not. People go at night and weekends and get those. We don't need any MBAs." I said, "What's the closest I can get to that?" They said, "Operations Research." And I said, "Okay."

So I talked to these instructors. In fact, that's what caused me to take those electives, to find out more about what this was. The instructors said, "You take a couple of math courses, but mainly you take business and management courses." So I said, "That sounds pretty good."

Then I began to take the electives and I was enjoying those. So I called Branch back and said I would be interested in an ORSA curriculum. I said, "Where are the schools?" And they said, "There's the Naval Postgraduate School in Monterey, California, there's Tulane, and there's Georgia Tech." And there were a couple others, but those were the main ones. I said I'd be really interested in that Monterey school

because I'm from California. And they said, "Okay."

I heard nothing for a couple months, and then I got this big thick packet in the mail from Georgia Tech. I opened it and there was an example curriculum with six or seven courses in the Mathematics Department. To include math logic, which was a graduate level course, and a bunch of other math courses. Probability and statistics, calculus, et cetera. I took this packet over to the instructors and said, "What is this? You said not much math." (*Laughing*) They looked at it and said, "They signed you up for ORSA *engineering*. We took ORSA *business*." In the Army there were two disciplines of ORSA. There was business—which is mainly economic analysis. And engineering, which was the operational effectiveness piece.

There was another guy in the advanced course—Steve Pryplesh, who's now a retired Colonel. He was in the advanced course prior to me, but it was only a two or three-week offset, because we're all there together. He was from northern Virginia, so he signed up for Georgia Tech to be close to home, and he got sent to Monterey. (*Laughing*)

So the Army in its wisdom gave us our assignments. That's how I ended up in an ORSA program.

PETE DAVIDSON: At this time it was ORSA—it was still just a specialty code? So you're an artillery guy with this extra skill?

VERN BETTENCOURT: Yes. It was not a functional area 49. It was a specialty code. We still did the dual tracking at that point.

PETE DAVIDSON: So when you got out of grad school, the idea was you'd go somewhere and do ORSA work to pay back for your education.

VERN BETTENCOURT: Right. You went to graduate school for two years and then you had a three-year ORSA utilization tour. From there you'd usually go back to your Branch, in my case field artillery. But my utilization tour ended up being back at Fort Sill, in combat development. So that keeps you with your Branch. I think that was a good thing to go back there and do artillery-related analysis. I thought it worked out pretty well doing it that way. Because you stay current and known in your Branch—number one. And number two,

you're working on the future of your Branch. So that when you're ready to go back to the Branch, in that three-year tour when you're serving in the Branch, you will begin to experience some of the things that you were doing the analysis of. Plus doing Operations Research Analysis you learned a heck of a lot about artillery tactics and capabilities, and organizations. And also the maneuver capabilities and organizations, as you did the combat models. So I thought that was a pretty good assignment for a new artillery ORSA.

PETE DAVIDSON: Did the courses you took at Georgia Tech apply to the models and things you were building? Monterey has its own special military OR courses but I know Georgia Tech does not. How did those two play together?

VERN BETTENCOURT: There was a guy there, a retired Army Colonel, Griff Callaghan. He was the daddy for all of us that were there. At the time the Army was investing pretty heavily in graduate education. And at the time I was there, there were at least 50 or 60 Army officers and about 30 of them were in ORSA. Griff Callaghan tried to arrange the curriculum so that there would be some military examples and case studies in the curriculum. Of the 30 Army ORSAs, I think 10 were in the Management Science Department and 20 of us were in the Industrial Engineering Department. We took modeling and simulation, but it was more related to industrial applications than it was to military. One of the things that Griff did was try and arrange for thesis topics that were military topics, where we could apply Operations Research techniques and theory to a military problem for our thesis. We had the thesis, but effectively it was about a semester of work, spread over two or three quarters. Ironically it turned out the sponsor of my thesis was the Operational Test and Evaluation Agency Technical Director, Walt Hollis!

BOB SHELDON: Was Griff Callaghan on the faculty?

VERN BETTENCOURT: Yes. He was one of the professors in industrial engineering. Now he's a Professor Emeritus; he's getting pretty senior now. He obviously doesn't teach anymore. But I got there in December of 1973,

so this was a while ago. (Note: He passed away in 2006.)

BOB SHELDON: Any other notable professors you remember from Georgia Tech?

VERN BETTENCOURT: Douglas Montgomery who wrote a lot of books in modeling and simulation. He also did some response surface work. I did my thesis in response surfaces, and he was my advisor. J. J. Jarvis did a lot at Georgia Tech and was very active in INFORMS. Ron Johnson did linear programming. Those are the three that I remember. Plus Griff Callaghan.

BOB SHELDON: E. B. Vandiver mentioned Griff.

VERN BETTENCOURT: That would have been in the same context in the education of some ORSA officers that went to the Center for Army Analysis (CAA).

BOB SHELDON: Going to Fort Sill for your next duty assignment. What were some of the early problems you worked on as an ORSA?

VERN BETTENCOURT: I went to Fort Sill and they had a pool of ORSAs in the combat development Branch that worked on what was called the 'legal mix' series, and where the 'legal' came from I don't know. But the mix was the force structure of artillery. This was a pre-QDR look at the force structure of the artillery force. That was the legal mix series, and I think we're up to legal mix five or six by now.

BOB SHELDON: Is it still called that?

VERN BETTENCOURT: No. It's not called that officially, but to this day, if they want to do an artillery mix study, people will say we need a legal mix like study. The terminology is still around. It's not the official title. The head of Combat Developments was Colonel "Bulldog" Drummond who later became a two-star general and headed both TRADOC Combat Developments and later OTEA. Lieutenant Colonel Ron Renfro was the head ORSA out there and there were a bunch of people under him. Steve Pryplesh, who I mentioned earlier, was one. Joe Antonetti, who is an analyst with Lockheed. Al Resnick—he took my place down at TRADOC as the Assistant Deputy Chief of Staff for Combat Development, and he's still down there. So there was some very good ORSA talent there.

I was assigned to the TRADOC Systems Manager (TSM) for Remotely-Piloted Vehicles

(RPVs). It was a new office that was just forming when I got there, and was, in fact, the first TSM office to stand up. I was assigned as an analyst for that office in January of 1976. That became the Aquila RPV which was never fielded, but served as a trailblazer for the UAVs the Army has now. The major analysis effort of the office was a cost and operational effectiveness analysis on the RPV. This was the initial study done on this type of capability. Today we would call it a capabilities analysis more than a COEA. We ended up with several alternatives among the RPVs, and we had three different capabilities of RPVs that we looked at in the study to try and see which mix of these capabilities would improve the combat effectiveness of our Army formations the most.

That was the main effort and there was a lot of work involved since it was a new capability. We had to develop the doctrine, the Tactics, Techniques, and Procedures (TTP), the mission profiles, the data, and the models. There wasn't a model that represented an RPV, or I guess I should say not well. If you used the DMSO definition of simulation, which is a method for implementing a model over time, it was a model. One of the biggest issues we had was how do I model an RPV?

BOB SHELDON: How did you model it?

VERN BETTENCOURT: We modeled it pretty much as an airborne sensor. The "model" we created included a lot of probability detection work with triggers that if it detected a significant target, it would go into a target attack mode, or a field artillery spotting mode is the better way to put it. It would then begin to loiter and call in artillery fire. So we had to bring in the accuracy of its target location—target location errors, the accuracy of its spotting, as well as the timing of its communications back to the ground station and how much time it would take for artillery to react and fire on those coordinates that it was calling back. That was a piece.

We also recognized that we had to include airborne survivability of the platform. We fundamentally used helicopter survivability algorithms for that one. Then we needed to add electronic warfare—the survivability of the data link up and down. We used various ARINC algorithms to model the data link and

its vulnerability. ARINC was an Air Force contractor and we worked with Rome Labs up at Rome Air Force Base to borrow them for our use.

One of the studies that I did personally was to analyze the survivability of the ground equipment to artillery attack. We found that if the enemy could directionally find the ground station or the launch platform, et cetera, the enemy had the ability to destroy that with enemy artillery. It was a neat little analysis. We looked at it as you created a remote antenna and moved it out X number of meters, what was the affect on the probability of survival of the ground station? That actually did change the design of the unit to include a trailer that had a remote antenna that could be erected, and a generator to run it. So that affected the structure of the unit.

Finally, as a TSM shop, we had to conduct a cost analysis. That was another thing that I got involved in. How much would one of these things cost? Were there any cost efficiencies that could be had? We also looked at training. What was the best way to train crews for this thing? We also provided the legal mix crew with our algorithms for use in the legal mix simulations because they wanted to model the RPV as part of the future artillery.

BOB SHELDON: Did you have any field experiments?

VERN BETTENCOURT: Yes, we did. The Army created an RPV platoon. Lockheed built the Aquila RPVs; that little wooden propeller right over there (on the wall in Vern's office) is from one of them. The launch platform was rail mounted on a five-ton truck that launched it out like a catapult from a carrier. We also created a ground station with a data link. The most troublesome piece was the recovery effort, because the RPVs didn't have wheels and couldn't land on a runway.

BOB SHELDON: You had a big net?

VERN BETTENCOURT: Exactly. We had a big net. The requirement was that they had to operate from unimproved areas, in the forward area. So when it started, the design was that it took off with a catapult, so the engineers figured it ought to land like it was on a carrier, too. So it would approach the landing area and drop a tail hook and then fly over a net, which

was horizontal and try and hook the tail hook, and flop down in the net. We had several instances of RPVs coming in too far above the net or too far below the net, which was disastrous. Or right into the side of the net trailer. We had a lot of trouble with that. In the end they put the net vertical, and then the RPV just flew into the net. They took the tail hook off and just flew it straight into the net, and the net worked fairly well.

We had a lot of interesting times. We were flying them at Fort Huachuca and one RPV lost the lock on the data link and flew off into the sunset into Mexico. (*Laughing*)

The reason it was at Fort Huachuca was the airspace, but also the Army didn't know exactly, was this an intelligence asset or was it a target acquisition asset? So what they did is took a senior Intelligence Colonel—Sherwin Arculis, or Arcy, from the MI school. They moved him to Fort Sill and created the TSM. The TSMs are somewhat equivalent to the program managers on the material side. So you had a combat developer which was a TSM, and a material developer which was the program manager (PM). They could ensure equality of technology and engineering versus operational requirements. Arcy was bemused, at best, with what a COEA took, but he understood its importance and was a very supportive boss for an ORSA Captain.

They put the MI Colonel in charge of a bunch of artillery people at Fort Sill, and then assigned the whole office to the Combined Arms Combat Development Activity (CACDA) at Fort Leavenworth. We were at Fort Sill. I was attached to the office so I wore the Fort Sill patch, but the rest of the office wore the Fort Leavenworth CACDA patch, but were residents of Fort Sill, until they could decide.

It turns out now UAVs belong to the Aviation Branch so neither the MI nor the artillery ended up owning them. They belong to aviation in the Army now.

BOB SHELDON: Was the stuff you learned from that study relevant to your current job as CIO?

VERN BETTENCOURT: I think some of the data link work helped. Certainly was. The use of a central ground station to control several UAVs or RPVs at the time. I think that was

very relevant, also. And the value of intelligence and intelligence information to the ground operations. I think that also is probably pretty pertinent to what I'm doing now. From an ORSA perspective, I think it was a very good experience in that everything was groundbreaking. We weren't replacing the tube on a tank with a different caliber tank gun. This was an entirely new capability. As I said before, doctrine, TTP data, training, models. All of it had to be built from the ground up. It was very educational. The work we are doing now in CIO/G6 with the satellite comms, Internet Protocol Joint Network Node down to battalion level is equally revolutionary. LTG Boutelle, the CIO/G6, was a PM and then PEO. So with my TSM and TRADOC experience, I think we make a good pair to help bring a totally new system into the force.

BOB SHELDON: Any other projects you worked on at Fort Sill during your ORSA tour.

VERN BETTENCOURT: No. This was pretty time-consuming. I ought to point out a couple of the illustrious people from Army OR that I met as a result of this study. I was a mid to senior level captain doing this work. The head of—at the time it was TRASANA (TRADOC Systems Analysis Agency) at White Sands was Wilbur Payne. So I had a lot of association with Wilbur and particularly his people down there in doing this work. The senior analyst that would come to our senior advisory group meetings from the Pentagon, from the office of the Deputy Under Secretary for OR, was E. B. Vandiver, and there started a long friendship. Whenever he would come to Fort Sill for an RPV, study, I would be his escort officer and have to meet him at the plane and drive him around. He claims that the set of orders appointing me his escort officer have never been rescinded. As far as he's concerned (*Laughing*) I'm still duty-bound to perform that function and do so on Civil War and fly fishing trips regularly. The Chair of our Study Advisory Group was Colonel Max Noah at TRADOC, who later became a three-star general and Comptroller of the Army.

BOB SHELDON: Do you have any Wilbur stories?

VERN BETTENCOURT: The thing that struck me was Wilbur never wore a tie, no

matter where we were. He never wore a tie to a meeting. He'd always wear his Mexican shirt. Take his shoes off and put his feet up on the desk. One of the things that, in retrospect, strikes me about Wilbur is that with the experienced military or civilian analysts, he was very demanding in the review of the studies and in our COEA and SAG meetings. With a new analyst, whether it be military or civilian, which I was in this case—a new military analyst—he was very tutorial and attempted to mentor them more than point out the errors of their ways like he did the senior analysts. That definitely sticks out in my mind with Wilbur. Later, as an OR instructor at West Point, I had Wilbur lecturing classes. He wore a tie!

BOB SHELDON: Do you recall any words of advice that he gave you on your study?

VERN BETTENCOURT: Keep it simple was clearly one thing. Because with the new capability, what we were trying to portray was pretty intricate. Also he talked about making sure that we incorporated the effects of other complimentary systems to make sure that we were showing the true value, and not overstating the value of the new systems. He told us to make sure our base case was robust, taking into account other complimentary or related capabilities that were out on the battlefield. Finally, that we had to present results to the general using terms that decision makers could understand.

BOB SHELDON: Coming to the end of your tour as an ORSA, you were looking forward to getting back to artillery?

VERN BETTENCOURT: Yes. Although as I said earlier, I definitely think for a young officer that a tour at your Branch school is a good ORSA tour. However, I don't think there's a lot of opportunity for that anymore. The TRADOC school ORSA rosters have really been cut back as we've downsized. Most of the TRADOC ORSAs are now in TRADOC Analysis Center (TRAC). So you really don't have that opportunity now, except for a few people. I thought that was very valuable. I was at the artillery school two years, then I was curtailed to go to the Command and General Staff College at Fort Leavenworth.

A guy named Auggie Fucci—Major Fucci at the time, took over the study and completed

it. Years later, Auggie, as a contractor, worked for me here in the Pentagon. So that came full circle.

I had a very enjoyable year at Fort Leavenworth. That was a great school. I enjoyed very much doing the large operations plans and orders, and I think my experience at Fort Sill and Combat Development really helped me in that area. The new strategy and tactics that they were trying to teach up at Fort Leavenworth was what we had been working with all along in our studies. So that came easily to me, because I'd been dealing in it, in a future sense.

BOB SHELDON: What years were you at Fort Leavenworth?

VERN BETTENCOURT: 1978 to 1979. A couple of things stick out there. One, there were electives again at Fort Leavenworth. But this time if you had experience like I did, you were allowed to teach the electives. I taught a combat modeling elective, which was more a combat war gaming elective. We had some of the ORSAs in the sections act as assistant instructors and helped as our section mates do the war gaming. We also taught a couple of the periods on theory of war gaming, et cetera.

The other thing that sticks out in my mind about Fort Leavenworth was the first day I walked into the room and went to my table, they were two-person tables—and there was a guy sitting at my table that had a funny looking uniform on. Turned out he was a Danish Infantry Major. Ulf Schieybu. I said to myself, "It's bad enough I've got to get through Leavenworth. Now I've got to carry an allied officer through with me?" (*Laughing*)

It turns out Ulf spoke better English than I did. Ulf knew a lot more about maneuver tactics and doctrine and strategy than I did. We had a grand old time. Provisions for an allied table—a table that has an ally at it—were that you could talk during your exams. And you got 50% more time for an exam, because obviously the U.S. officer was explaining what the questions meant to the allied officer. Of course, in our case, Ulf, who could read and speak and write English better than I could, didn't have that problem. But we still followed the rules that you could talk during your exams and have extra time!

Both of us ended up as Honor Graduates of the course. I'm not saying there's a correlation there, but (*Laughing*) there might be.

Ulf later commanded an Infantry Division in Denmark, and then his final tour, he commanded the Danish National Guard and retired as a Major General.

Interestingly, after we finished Fort Leavenworth, he went to Monterey and took a quarter of Operations Research courses.

BOB SHELDON: One quarter?

VERN BETTENCOURT: One quarter, and then went back to Denmark. Another important thing about having an allied officer at the table was that you were invited to the allied parties at Fort Leavenworth. At Fort Leavenworth the goal was that your division would have a party once a month. Your section would have a party once a month. The allied core would have a party once a month. And then the geographic region of allies would have a party once a month. So that averages out to four parties a month. That was another very good thing about having an allied tablemate. From Fort Leavenworth I was sent to Korea.

BOB SHELDON: As an artillery officer?

VERN BETTENCOURT: Right.

BOB SHELDON: Where in Korea?

VERN BETTENCOURT: Uijongbu, which is north of Seoul. North of the "No Smile" line, we used to say. I was the Assistant S-3 of 2nd Infantry Division Artillery.

BOB SHELDON: Were you a Major?

VERN BETTENCOURT: I was a brand new Major. I got promoted to Major just before I went to Fort Leavenworth and then went to Korea. I was the Assistant S-3. The division commander was a guy named 'Barbed Wire' Bob Kingston. He had two mottos of training. Fit to Fight, and Train as you Fight. We did a lot of training. That's basically what we did. Except for the fact that my family wasn't there, it was the best artillery professional tour that I had.

BOB SHELDON: How far were you from the DMZ?

VERN BETTENCOURT: Seoul is about 20 miles from the DMZ, so we were about 15 miles. We were north of Seoul. One of the things that I really enjoyed there was General Kingston demanded that every post have a de-

fense operations plan. We didn't have one at Camp Stanley, which was the Division Artillery (DIVARTY) headquarters. So as the Assistant S-3, I got to put together the operations order for the defense of the camp. We had DIVARTY headquarters. We had an artillery battalion. We had an attack helicopter squadron and an observation helicopter company that belonged to DIVARTY. We had a maintenance company, and a couple other things. And then very near, within about three kilometers of our compound was an engineer company compound. As part of their defensive plan, they fell into our compound. So I had all these assets to play with. About 10–15 kilometers away, but well within our artillery range, was our general support 155 Battalion so we could plan mutually supporting fires for the two posts.

I read some Korean War history while I was there and what amazed me reading about the battles and then being there—particularly during the winter, it was absolutely amazing to me that Army soldiers could fight in that winter. I have never been through a colder winter than in Korea.

BOB SHELDON: Mud, too?

VERN BETTENCOURT: During the winter there wasn't mud. It was frozen. But during the summer there was mud. I don't know how they fought during those winters. It's just incredible to me that they could do that. The sacrifices of the American soldier are beyond words. Another thing that struck me. You mentioned the mud. In Korea, the terrain—it's either hills, muddy rice patties—which are increasingly disappearing—or towns. There's no classic northern plain maneuver area in Korea. So you can clearly see that, in large part, it's an infantry and aviation fight over there.

Another thing that was a precursor to this assignment was that with those hills, the incredible difficulty of communicating over there. I read in the Korean War books that, for instance, the artillery forward observers couldn't communicate with their batteries to call in fire, because their radios weren't working. I said to myself, "Thank God we won't have that problem here." Then you get out on that terrain and guess what? You can't communicate back because of the hills. It's incredible. We get around that now with satellite commu-

nications. But this was in 1979–80. We didn't have a lot of satellite communications.

BOB SHELDON: Was Kim il-Sung, the elder—

VERN BETTENCOURT: Yes. Kim il-Sung the elder was there. The year I was there, we had a coup in South Korea and they deposed the president and General Chun took over. I was the DIVARTY Staff Duty Officer that night and had to order DIVARTY to heightened readiness. So that was an interesting year.

BOB SHELDON: A full one-year tour?

VERN BETTENCOURT: Yes. From there I came back to Fort Ord, California to the 7th Infantry Division, and was again an Assistant DIVARTY S-3. After a short time, I went down to a composite battalion as the battalion operations officer. We had three batteries of 155 towed Howitzers, and one battery of eight inch self-propelled Howitzers in that battalion.

BOB SHELDON: In the late 1970s and early 1980s, the military services had logistics problems with shortages of spare parts and maintenance backlogs. Did you?

VERN BETTENCOURT: Oh, absolutely. Particularly at Fort Ord. Back to some combat development experience—when I got there, it looked like the 7th Infantry Division was going to be drawn down. So the question was, would we go to three Cadre brigades where we had a small Cadre in each brigade? Or would we warehouse or mothball two brigades worth of equipment and have one full-up brigade? Those were the issues we were going through for about the first half of the time that I was there. Then the Army began to put more emphasis on light infantry divisions and the 7th Infantry became one of those. Then the issue was, how do we modernize into a light Infantry Division? For instance, the unit that I was in, the 6th Battalion, 80th Artillery, had the old World War II M114 towed 155mm artillery. It turned those over and it got the M198 modern towed 155mm artillery. The eight inch battery became a Multiple Rocket System Battery, an MLRS Battery eventually. The division quickly modernized. In the late 1980s it was one of the divisions that ended up going to Panama for the combat.

The artillery couldn't fire at Fort Ord, so we would go to Camp Roberts, down in central

California. As it turns out, Camp Roberts is about 30 miles from my mother's birthplace. It is also home of an Army teleport site which is pertinent to what I do now. Network Enterprise Technology Command (NETCOM), that reports to this office, mans that teleport site at Camp Roberts. So I've gone to visit our units there at Camp Roberts where I used to go fire.

We would fire there, or we would go to Camp Irwin down in the desert if we wanted to do a long road march. My experiences with what is now Fort Irwin, the National Training Center, was a sleepy little National Guard post, down in the California desert where we could take our guns and fire wherever we wanted to fire. It's certainly not that way anymore. We used to road march the guns down there and fire. That was another interesting two years.

I really have enjoyed all my Army assignments. I can't say I had a bad assignment. After two years there, this organization called MORS had a symposium at the Naval Postgraduate School (NPS), as MORS does every few years. I got a call from Colonel Al Grum (later retired as a Brigadier General) who was the head of the Engineering Department at West Point. He and Lieutenant Colonel Dick Clarke, who was the head of the Engineering Management part of the Engineering Department at West Point, and controlled the OR courses in the engineering department. They wanted to meet with me at the MORS symposium to discuss a teaching assignment at West Point.

BOB SHELDON: Which year was this?

VERN BETTENCOURT: Had to be 1981. I need to backtrack. When I was at Georgia Tech in my degree program, Branch started to say, "Where do you want to go?" I said, "I'm going to go teach at West Point." And Branch said, "Okay." So I started corresponding with the Engineering and the Social Sciences Department. The Social Sciences Department had a course in econometrics. They were interested in me teaching, and it was fine with Artillery Branch. They didn't mind.

Everything was moving along to where I would go to West Point and teach after Georgia Tech. And then some little old lady in tennis shoes in the utilization branch of MILPERCEN compared the slot at West Point—here comes this ORSA business engineering thing back to

haunt me—the slot at West Point in econometrics was an ORSA business slot. I was getting a degree in ORSA engineering. And she said, “You can’t go. That’s not a valid utilization.” So Branch (Artillery) said, “Fine, if he can’t go there, we can use him at Fort Sill.” Ironically it turned out that at the end of my first year at Fort Sill, when I got my first officer evaluation report as an ORSA, there was somewhere on there that indicated graduate-level utilization tour or not. That block wasn’t checked and I said, “Why isn’t this checked?” They said, “The slot you’re in is not a graduate-level degree required slot.” (*Laughing*)

So I’d been denied going to West Point to teach, and they’d sent me there to a slot that was equally inappropriate. Eventually they changed the TDA (Table of Distribution and Allowances) and got that slot straight.

After I graduated from Georgia Tech, I kept corresponding periodically with both the Social Sciences Department and the Engineering Department. By the way, the guy trying to get me to the Social Sciences Department was Major Barry McCaffrey, who went on to some fame in the Army. So Engineering had me on record. Apparently what happened is they had an ORSA instructor who broke his leg and then his leg was set at West Point, and when they took the cast off, it hadn’t healed so they sent him to Walter Reed. It turned out that he had bone cancer so he got medically retired. That left them with an emergency vacancy on the staff.

Al Grum liked to have experienced ORSAs on the staff. He didn’t like to have many young ORSAs, because his philosophy was you ought to be teaching the cadets from experience—not from a textbook—which I agree with. So when this vacancy came, they looked through their files and said, “Who’s an experienced ORSA that we could pull in here?” They called me, and I called Branch and Branch said, “You’ve been an Assistant DIVARTY S-3 twice. You’ve been a battalion three. There’s not much more you can do in the artillery branch as a major.”

So they asked and I came over to the MORS symposium and interviewed for a position at West Point in 1981. I was the first officer they’d ever seen in BDUs, so that created some excitement at MORS. We had just gone to those and not many people had seen somebody in BDUs.

I interviewed there and they asked me if I wanted to go to USMA and I said sure. So in the summer of 1982 I left Fort Ord and went to West Point to teach in the Engineering Department.

BOB SHELDON: Other than interviewing for a job, did you go to any working groups at that MORS symposium?

VERN BETTENCOURT: No, I didn’t. I came over from my battalion S-3 job, interviewed, and went right back to my battalion S-3 job.

BOB SHELDON: What courses did you teach initially?

VERN BETTENCOURT: When I got there, OR really wasn’t a major, but they had a series of OR courses. It was the two senior level OR electives that were the capstone electives: Operations Research 1 and Operations Research 2.

BOB SHELDON: Linear programming and optimization?

VERN BETTENCOURT: Yes. Probability and statistics, linear programming, combat modeling, how to do a study, dynamic programming. We taught how to do COEAs, war gaming. We used the McClintock theater model that was the precursor to JSIMS and JWARS and that series of models. The courses were pretty robust. It was a compilation of the NPS curriculum, and the reason was that Bob Dees was there. Bobby ended up retiring as a Major General from the Army. He had been to NPS and he and Al Grum and Dick Clarke designed these courses to be a mini-NPS curriculum.

When I finally received my orders to go to West Point, I was able to leave the division three months early and I went to Monterey to audit OR classes at NPS. That is when I took the combat modeling course from Jim Taylor, search and detection theory with Washburn, and a couple other courses. I went over and audited a quarter en route to West Point. That was a benefit of being stationed there at Monterey because it didn’t cost West Point anything.

BOB SHELDON: Just time off from your job?

VERN BETTENCOURT: Actually, I signed out of 7th Infantry Division. Signed into West Point. But just stayed right there in quarters, for that quarter. So that worked out great.

I taught those two OR courses for the first two years. The last year I was the department research officer and taught an independent study elective called ER 489. Cadets that had taken the first course had an extra elective and could do an independent study in Operations Research. I had three of those and we worked on the McClintock theater models. During the first two summers, I worked at the Army War College on verification and validation of simulations. During the final summer, I ran the department New Instructor Training program.

BOB SHELDON: This would have been 1981 to '84?

VERN BETTENCOURT: This was 1982 to '85.

BOB SHELDON: Pete, when did you graduate?

PETE DAVIDSON: 1981. I left a year earlier. I didn't like the OR course so I took civil engineering.

VERN BETTENCOURT: Yes, the Department of Engineering at the time had three major curricula. It had weapons engineering, civil engineering, and engineering management. When they went to majors, you could major in operations research or engineering management, or a myriad of other things. But the cadets have to take a sequence of two core engineering courses. They can take engineering management as a core engineering course. So the interest in the engineering management group of courses exploded. It ended up that now there is a Department of Civil Engineering, a Department of Mechanical Engineering, which there always was, but the weapons systems folded into mechanical. And there's a Department of Systems Engineering which has the ORSA courses now. I have the honor of serving on the Board of Advisors to the Systems Engineering Department.

I taught for two years at the senior level and had several students who are still around. One is Willy McFadden, who stands out and has been President of MORS. Debbie Barts—this was in '82, the first female class graduated in 1980, so females were still new there. Debbie won the award as the best OR cadet that first year I was there. And there's several other students that I still see around here. Richard Statts who's at MITRE was one of my students.

Each year I had somewhere between 30 and 40 students and it was neat because we spent the whole year together. I taught both OR courses. That was unusual for them to have one professor for the whole year. Colonel Al Grum's philosophy was that the best possible class would be for the instructor to walk in, have a lesson planned, walk in and say, "Is there anything on anybody's mind?" And a couple of cadets would raise their hands and bring up an issue and it might be engineering, or it might be ORSA, or it might be Army football. Then you spent the entire hour talking about what the cadets wanted to talk about. That was his idea. Somehow you worked in your learning points. What a great philosophy! These were cadet students, but in less than nine months they would be second lieutenants. They need the practical wisdom.

Colonel Grum was very much into applying what you have learned as an ORSA out in the Army, trying to draw for them how they would be using the skills—not necessarily the ORSA itself—but the skills of ORSA in their work when they went out into the real Army. Having seniors, they were interested in what's going to happen out in the real Army. So I really enjoyed those three years.

BOB SHELDON: Did you get to MORS while you were there?

VERN BETTENCOURT: Yes, I did. My first MORS Symposium (MORSS) was in 1983. I got to MORSS twice while I was there.

BOB SHELDON: Present a paper?

VERN BETTENCOURT: No, I just went as an attendee those years.

BOB SHELDON: Do you recall anything from those MORSS?

VERN BETTENCOURT: My general impression was that was really the first time that I began to see OR from an Air Force and a Navy perspective. I got a little Navy perspective out at NPS, but not that much, not really seeing studies per se. I saw search and detection theory submarine detection problems and that kind of thing. But I think the main thing that I saw at MORSS was the other services' use of OR. That sticks in my mind.

And then the fact that MORS as a society represented OR as a profession. I think those

are the two things that stuck in my mind from those early MORSS.

BOB SHELDON: Did you like teaching?

VERN BETTENCOURT: I liked being with the cadets and working with them. So yes, from that perspective I enjoyed the teaching part. I certainly did not just get up there and lecture, and start at one end of the board and go to the other end of the board. I didn't enjoy, nor did I do that. Nor did Al Grum want us to do that. It was a very participatory classroom and I did enjoy that.

PETE DAVIDSON: As you've gotten cadet interns here in the Pentagon, have you found that they follow the same type of curriculum and show up with the same skill set as when they enter their senior year?

VERN BETTENCOURT: Yes, they are. I think they've got their math basics, and they've got some of their OR basics, like what is a linear program. They're much more skilled in the use of computers than the cadets were when I was teaching. It is a little bit of a quandary in that you'd like to get them here when they had some of that senior capstone applied education so that you could use them to really do some studies. But they're really not ready for that when we get them here as interns. Usually we get them between their junior and senior years, so they haven't had those capstone courses when they come here.

There have been a couple of very sharp ones. When I was working for Walt Hollis we had a female—I can't remember her name—but she was extremely sharp. I had her do some work on analyzing the accuracy and effectiveness of precision munitions. What we try to do is have them brief a senior individual when they're done with their two, or three, or four weeks here. At that time we had an Under Secretary of the Army, Mr. Ambrose. He was very interested in Operations Research and I was working for Walt Hollis at the time, who worked for Ambrose. So we sent this cadet up to brief Ambrose on her project, her analysis. She briefed him, and he liked what she had done. Two days later he was receiving a briefing from one of the program managers. In fact, I think it was in an ASARC, Army System Acquisition Review Council. That's chaired by the Under Secretary and the Vice Chief of Staff.

They're giving a briefing about the effectiveness of these precision munitions, and Ambrose goes, "Wait a minute. That's not what I was told the other day." We get this phone call down to the office. He had stopped the ASARC and was calling for the cadet to come up and brief what she had done. She briefed them, and the PM said, "She's right." So that's probably the epitome of cadet project work here in the Pentagon. That was back in the late 1980s.

BOB SHELDON: Getting ready to leave West Point, did you want to go back into artillery or stay an ORSA?

VERN BETTENCOURT: I wanted to go back to artillery, but that didn't work out, so I went straight ORSA. In the capstone courses we had a series of five lectures and they paired up with what we were doing: COEAs, linear programming, reliability analysis, cost analysis, or whatever we were doing in the class. We'd get some of the senior analysts in the Army to come up and give a lecture to the cadets. The final lecture was always Walt Hollis would lecture about whatever he wanted to lecture about, on Operations Research in the Army. So he came up, and while he was there, he said, "What are you doing when you finish here?" I said, "I don't know. I'll probably go back to an ORSA tour somewhere." And he said, "How'd you like to come work for me?" I said, "Yes, I'd really be honored to come work for you." So from West Point I came down here to work for Walt.

BOB SHELDON: Mr. Hollis had done his background work on you?

VERN BETTENCOURT: I think that was Al Grum and his affect. I think he had talked to Walt, and Walt had an opening for one of his military assistant slots.

BOB SHELDON: What projects did Walt have you work on?

VERN BETTENCOURT: At the time Walt had three or four Senior Executive Service and, when I first got there, two military assistants. One of the military assistants was the XO and did a lot of admin stuff, but did a little bit of Operations Research. The other military assistant did fulltime Operations Research duty. The thing that impressed me was that the military assistants were not treated as assistants to the SESs. Walt divided the Army pie up, and the

SEs took slices and the military assistants took slices. So we worked directly for him. You can't really say the military assistants were co-equal to the SEs, but for all intents and purposes, you were co-equal to the SEs as far as what you were doing and how you were representing Walt.

That has always stuck with me and impressed me, because usually a military assistant would be supporting an SE. I did field artillery. I also did—by that time it was FA 49—the ORSA professional development, and modeling and simulation (M&S) in general. And the U.S.—Republic of Korea Analysis Symposium that goes on every two years.

BOB SHELDON: Was the workload pretty intense? With all those responsibilities.

VERN BETTENCOURT: It was intense. In retrospect I thought it was intense, but having been through the GWOT pace up here in the Pentagon for the last three or four years, I would say no. I would say nothing has been as intense as the work is now.

The thing that I really enjoyed was that once you started clicking with Walt, it could take two or three or four months, or maybe you never clicked with Walt. But once you did, you had full rein. It was charge and report back when necessary. I really enjoyed the latitude and the authority that I was given as a lieutenant colonel. You learned very quickly to play the Hollis card. That hey, this isn't me—this is the Deputy Under Secretary that is doing this. That was pretty heady stuff, but you had better be operationally and technically correct.

Having had two other ORSA tours, one of the tenants that I tried to stick with was to not only present a problem to the analysts whose work we were reviewing, but also try to suggest ways that they could get around the problem that they had. I would do a lot of research on how they get around this problem that we've uncovered. It's one thing to be a kibitzer and say, "I don't like the way you did that." It's another thing to say, "I don't like the way you did that, and you ought to try this way." Or not just, "I don't like the way you did that," but, "You have violated the assumptions of that algorithm by the way you're using it." There was a lot of that. I found that to be interesting and challenging.

The other piece was that Walt found out that—because I had just come from the academy and had refreshed myself by teaching this stuff, and had the year as the research officer for the department—that I could do what he called his little back-of-the-envelope projects. So a lot of times I'd found myself doing some quick analysis to try and inform the office on what should we be doing on this system, et cetera.

One that comes to mind was the XM 80 protective mask that some testing had been done on the masks in contaminate chambers, on the mask's sealing and protecting capacity. The Army had determined that this one company would be eliminated from producing the mask because their masks were failing these tests. So they eliminated the company and then there was a lawsuit. The company sued and this went to court and the company hired a statistician named Tukey.

BOB SHELDON: The famous statistician, John Tukey?

VERN BETTENCOURT: Yes. They hired him to try and defend the fact that they should not have been eliminated, and that the Army's testing was faulty. The issue was the size of the sample. It was a small sample. So we went through a lot of statistical theory, and found the bootstrapping technique where you go and sample several times from a small population. We showed that at a statistically significant level, their mask was failing the tests. This went into court, and Tukey in court said, "The Army statisticians are using the correct technique here, and I can't really refute what they're saying." So that was interesting for a back-of-the-envelope statistical analysis.

As a representative of Walt, I got to meet the whole Army OR community and the Army testing community. That was very interesting and informative.

The Korean OR symposium—we had it twice during the three years I was in his office. That was a lot of work and entailed six trips to Korea.

Another back-of-the-envelope analysis that he had me do was a seventh trip to Korea to look at the tunnel situation under the DMZ. There had been two tunnels discovered. The intelligence analysis said there had to be more

tunnels, but we weren't discovering them. So he sent me over to take search and detection theory, apply it to the tunnel problem, and see if there was anything that could be done in the way we were doing the search or the equipment, et cetera. My conclusion was that we really had to work on the sensors that we were using. It was not a case of the number of sensors or the search pattern. It was the physical capability of the sensor that had to be improved.

Ironically one of the Army labs sent a scientist over to look at the same situation. Two independent visits. And we both came to the same conclusion. The PhD from the technical perspective and me from the OR perspective, that the weakest link in the search and detection problem was the capability of the sensor. That was just another one of the back-of-the-envelope kind of analysis that I did in that office. Ironically (maybe not!) less than six months after my visit they found a third tunnel!

BOB SHELDON: Did you see any transitions in the 49 career field in the three years you were there?

VERN BETTENCOURT: A couple of things. One, there was a downturn in the number of people we were sending to graduate school. That was pretty much an economic issue. The other thing which we never solved at the time, but at least began to make noise about it, and begin to try and get a solution, was the role of Operations Research officers in combat units or operational units. We were trying to get Operations Research officers and civilians out with the units when they were operating.

BOB SHELDON: Did you see any payback for that in Desert Storm?

VERN BETTENCOURT: In Desert Storm we did get some officers over into the higher headquarters, and we got analysts into the lessons learned field of Desert Storm. But they weren't embedded in the units. That's been a long, hard fight which we have now finally reached a conclusion. We now have in the new Army modular units, at division level we have one or two ORSAs.

At the corps and above level, in what was called the UE_Y, now it's called Corps and Armies, there are three ORSAs. We have them on the unit TDAs, so they're actually part of the

units now. That's a major step forward for our Army operations research.

The other thing that began to happen as part of our initiative was that TRAC and CAA began to associate with the field units and began to put teams out when these units went on exercises, mainly corps and above. The ORSAs would do some analysis in support of the units. But the problem is, when you're just doing that during an exercise, unless you're habitually associated, you don't have a lot of credibility. I mean, you're always starting from square zero if you're just doing it during an exercise. Now there are habitual associations with the Army component commanders of a COCOM. Both CAA and TRAC have that association, and now we have the officers in the units. So there's been a lot of progress there.

BOB SHELDON: While you were in DUSA(OR) did you work closely with many of the Army analysis agencies like CAA or TRAC?

VERN BETTENCOURT: We worked with all of them: AMSAA, TRAC, CAA, the Cost and Economics Analysis Center. And, of course, with Walt's interest in tests and evaluation, at the time it was called OTEA, the Operational Test and Evaluation Agency. We worked with them a lot. We worked with Air Force Studies and Analysis, with Jim Bexfield and Clayton Thomas. We also had associations with Rand and some of the analytic contractors like Seth Bonder. Most analysts don't see that crowd, but when you're working in Walt's office you do. So that was also a tremendous learning experience.

BOB SHELDON: And you were associated with MORS a little more then?

VERN BETTENCOURT: Yes, I was. Walt was the Army sponsor of MORS, so he had one of his SESs as the sponsor's rep. There were times when that sponsor's rep couldn't go to the sponsors meetings or the board meetings, so I attended. The first MORS board meeting I attended—it might have been an executive council meeting—was at Wayne Hughes' house out in Monterey, California. That was in 1985.

I remember they voted on something and I raised my hand and Wayne sternly said—Wayne was the President of MORS at the time—"Sponsor's reps don't vote." (*Laughing*) So I put my hand down pretty quickly. But I

was voting in favor of Wayne's proposal. Then in 1986 I got elected to the board.

BOB SHELDON: That was while you were working for Walt?

VERN BETTENCOURT: Yes. I worked for Walt from 1985 to '88. The first time.

BOB SHELDON: During your first tour working for Walt, did he give you some personal mentoring?

VERN BETTENCOURT: Yes. I think the main thing—and in fact I was just using this last week with some of the folks around here—one of the main things that he got across to me was that it's important when you're on a staff, or when you're anywhere else, that you put yourself in your boss's shoes. So that when you bring an action to that boss, you have thought from his or her viewpoint. And you bring an action that is a complete action with recommendations on what the office or the boss ought to be doing at a particular meeting, or in reviewing a particular document, et cetera. That you not just pose issues, but you bring solutions. Also that you bring all of the relevant information that the boss will need when they go to a meeting. As a younger analyst, one might say, "The boss ought to be able to figure that out." As you go along and get a little more senior and experienced, you realize—particularly here, they're bouncing from meeting to meeting. And they don't have time to figure that out. That's the job of the action officer. Putting yourself in your boss's shoes and taking all of the requisite initiative that is required to work a complete action from that perspective, I think is one of the big things that I learned. And like I say, I'm applying that to our action officers here in the CIO almost on a daily basis.

The other thing that I learned was that there is a basis of knowledge. There is an algorithm. There is a methodology. If nothing else, there's the OR process which I taught up at the Academy. And that needs to be applied. If you do that, things that other people will have forgotten or not thought about will come to the floor. That's another thing that I clearly learned in that office, particularly in doing some of the back-of-the-envelope analysis, but also in reviewing some of the larger analysis that the Army analytic agencies, or some of the other

service analytic agencies that we would get to review.

A couple of times Army agencies brought up analyses where they had violated the assumptions of the algorithm. If you don't take the time to look at the algorithm, you're not going to know that. A thoroughness in preparation and an expansive enough viewpoint, even as an action officer at the SES level, these are the things that need to be solved. And then how would you recommend that they be solved and why.

That was elite stuff for a lieutenant colonel. But once I got that down, or realized that's what he was asking me to do, I think we began to click pretty well.

BOB SHELDON: Is Walt the exception in the Army community for utilizing back-of-the-envelope calculations to base decisions? Or have you been able to use that elsewhere in the community?

VERN BETTENCOURT: There are others in the community. I know some like that in the test and evaluation community, given the time they have available from the time that the test results are in until they have to be briefing a senior review group or a acquisition review group, they do a lot of set piece statistical analysis. But they also do some very good back-of-the-envelope analysis. I see it there.

Our officers that are out with the units are certainly doing that, to good effect. Gene Woolsey at the Colorado School of Mines is famous for teaching those techniques. We send some officers there, in large part, for that reason. So that the Army has some people that are skilled in back-of-the-envelope quick reaction analysis techniques.

BOB SHELDON: Were you setting yourself up for a follow-on assignment, or did Walt have an assignment in mind for you?

VERN BETTENCOURT: When I approached the end of three years, in that tour, I began to look around for where would I go from here, knowing that—this was 1988—in '89 I was eligible to retire. Walt and General Dave Robinson, who was the head of TRAC at the time, approached me with a proposition regarding TRAC Monterey, out at NPS. The issue at the time was that the Army leadership, and in particular the Army analytic leadership, felt

that TRAC Monterey was not producing things of value. I grew up in California, and the thought was I probably wanted to retire out there. So the proposition was, "If you're going to California anyway, how about if you take over TRAC Monterey and see if you can reinvigorate it? If you can, great. If you can't, we're going to shut it down."

That was a no-lose proposition, and it got me back to California, got me back to Monterey. So from Walt's office, I went to TRAC Monterey.

BOB SHELDON: TRAC Monterey is still alive today so you must have done the right thing.

VERN BETTENCOURT: We did a lot of work with the NPS faculty to make sure that TRAC Monterey was not just a tenant. That it was well integrated with the faculty research program and with the student research program at NPS. With the knowledge that I had of the Army ORSA community at large from being in Walt's shop for three years, we were able to get research projects that were relevant to what the Army was working on at the time and also to string together research projects. One of the main things we tried to do is to create a field of research and the preeminent one out there was in model and simulation—combat modeling. The JANUS model. To string together some consecutive student research projects that would advance issues that the Army wanted.

The other thing that we had there was TRAC Livermore. There were two TRAC officers at Livermore National Labs that were working on combat modeling. General Robinson, by that time it may have been General Bob Howard, and Mike Bauman, who was the deputy of TRAC at the time, attached those two officers to me. So I had TRAC Monterey and TRAC Livermore. So I usually spent the equivalent of one week a month up at Livermore working with those two officers.

They were out on the end of a long tether, so it was a lot of work to get them working on combat modeling issues that were of interest to the Army. They were working on, a model called CONMOD (Conflict Model), and the Army had put several million dollars into CONMOD.

Walt called one morning and said, "I want you to evaluate CONMOD, and I want you to tell me if the Army ought to keep it or not. And if we ought to just terminate that project or not." It was becoming controversial with the amount of money that was being spent. And where was the return for that money? So one of the major things we did was set up an evaluation of CONMOD and conduct it. We had 30 people that we brought in to wring out the model. We looked at the requirements document for the model and what Livermore said they were going to deliver. Then we wrung it through a user feasibility test on was it delivering this or not? The result was we terminated the model.

BOB SHELDON: Was there any salvage value from CONMOD?

VERN BETTENCOURT: There were a couple. It was one of the first object-oriented models, so there were a lot of lessons learned on the object-oriented aspect. There was some detection. There was some modeling of sensors that was helpful, and we salvaged that. But the major issue was that they were looking for light under the lamppost. We had told them that the issue the Army needed most was, "How do I model command and control?" That's what we wanted them to work on. What they did was work on everything else: mobility, attrition, target detection; not command and control. So after three years and at least \$10 million of effort, when we evaluated the model, it was all red in command and control. There was nothing there so we terminated the project.

BOB SHELDON: Any other success stories?

VERN BETTENCOURT: There was a lot of work on JANUS by the students. A Navy student used it to analyze the effectiveness of the Theater Land Attack Missile (TLAM), and the Navy used that analysis in some of their acquisition decisions on TLAM. That was neat, that you had a Navy student coming over to an Army agency and using an Army model. But what he was doing was modeling the affects on ground forces of TLAMs, and JANUS could do that.

Another big effort that we had was the National Training Center, and the tapes—the data—from the training events that were com-

ing off of the instrumentation down at Fort Irwin. They went to an Army Research Institute (ARI) office at Presidio Monterey, which was just down the street from NPS. So we set up a partnership between Rand, Santa Monica, TRAC Monterey, and ARI Monterey to do some analysis of the data that was coming out of Fort Irwin. Rand has since put out several studies which were pretty important on the effects of things like intelligence and scouting in the battle. He who has the best scouting and fights for information will usually win the battle. They were drawing some of these conclusions from those databases that were there at Monterey. What we were doing at TRAC Monterey with the help of student research and some of our staff research was to work a way to bring the data from those data tapes into the JANUS model. So that the students could then fight alternatives of battles, altering various attributes. Rand also had JANUS and, in our partnership, they began to use it for the same purpose.

BOB SHELDON: Which professors did you work with on the NPS faculty?

VERN BETTENCOURT: Wayne Hughes, Jim Taylor, Al Washburn, Peter Purdue. And another professor in the field of simulated annealing who was also working on complexity theory. So we had some students working with him on taking JANUS results and trying to use simulated annealing, and some of his efforts turned out pretty well.

The command-and-control professor was Mike Sovereign. We were working with Mike, particularly on the CONMOD evaluation at Livermore. If it could do command and control, what would that be? The theory of command and control.

BOB SHELDON: Had you already made your decision to retire from the Army at Monterey?

VERN BETTENCOURT: About halfway through the tour out there at TRAC Monterey, we made the decision to retire, and it was a family decision. Part of the issue was that although I was very happy in Monterey, my family was not happy in Monterey. So it was a one-sided family decision. Our oldest daughter was a senior in high school when we took her out there. She's very socially adaptive and ac-

tually it was a great year for her. She still has friends there. She went on from Monterey High School to Cal Poly and started her college career there.

The reason it was a good year for her is when you go from Fairfax County high schools to Monterey public schools as a senior, she spent all but one course over at Monterey Peninsula College. Because there was nothing at the high school that she needed to take after having her first three years of high school here in Fairfax County. For the younger two, who were in middle school, it was effectively the same thing. They just were not challenged nor were they happy academically. As a father who has spent his later years in an academic discipline like OR, that was not a good thing to hear from your kids. We were investigating private schools in the Monterey area, but they were prohibitively expensive.

Then there was my wife. Her education was as an elementary school teacher. But what was happening was every time I would move, she'd go to the bottom of the priority list and have to work her way up from substitute teacher to teacher. So when we got out to Monterey the first time, she said, "This just is not enjoyable, always going to the bottom of the stack again." I suggested, "You ought to think about the civil service. It's everywhere I go." So she got on as a temporary card punch operator in the purchasing department of Fort Ord as a GS3. Then she began to work herself up, and when I was in Walt's office here in Washington, at the end of that tour, she was a GS12 at the Navy yard working for the Military Sealift Command as a contracting officer.

When we went to Monterey, she had to take a three-grade downgrade to a GS9 purchasing agent again over at NPS. So she was not exactly a happy camper either. The good part was she was, among other things, the purchasing agent for TRAC Monterey. So (*Laughing*) although there were some squabbles about, "Are you authorized this or not?" We had a family thing going. The other good thing about TRAC Monterey in the purchasing area was that our money came from TRAC, went to Fort Ord to the Army Finance Office, and then was transferred to NPS to the Navy finance office where it became two to three-year money.

When it was Army money it was one-year money, and you'd better damned well spend it during that year. But over in the Navy, it became research money. It became two to three years. Number one. Number two, if the Army wouldn't allow us to do something, we would claim, "Our money is with the Navy so we're going to purchase this with the Navy." If the Navy wouldn't let us do it, we'd revert back to the Army and say, "We know our money comes from the Army so we really ought to follow the Army." (*Laughing*) You could play the two ends against the middle. So that was all good financially and administratively.

But anyway, we made a family decision to retire. As I looked around, the opportunities for a military ORSA person in California were not that great. You could go down into the LA area with Rand, or you could go with Livermore. Or you could go into the San Jose area with one of the metal benders like FMC. But we decided it's probably best for the kids to come back to northern Virginia where they could get back into the Fairfax County school system. So we retired and moved back here.

BOB SHELDON: 22 November, 2005. We're in Vern Bettencourt's office to continue our interview. I want to backtrack to discuss your professional engineering license. What's the story behind that?

VERN BETTENCOURT: Actually it is an OR-related issue. I was on the faculty at the engineering department at West Point. West Point was the first engineering school in the nation. But in the 1983–84 timeframe, it was not an accredited engineering school. Air Force and Navy were accredited with the Accrediting Board of Engineering Technologies, ABET. So in the recruiting for the academies, this was being used against West Point. If a candidate were asked, "Why are you interested in going to a military academy?" and they'd answer, "I want to get an engineering education." then the Air Force and Navy recruiters would immediately say, "Why would you ever want to go to West Point? It's not an accredited engineering school."

Also for our graduates, we had gotten down to two states—Pennsylvania and Virginia, who would administer the engineering exam to West Point graduates, because they

had not gone to an accredited school. So that was creating a problem for particularly the civil engineer officers. And Pennsylvania had announced that it wasn't going to test West Pointers anymore, so we were down to one state that would test. For those reasons as well as the quality of the education, the Dean and the Board of Visitors at the Academy decided that they wanted to become an accredited engineering school. So all the people on the engineering faculty and disciplines were told, "If at all possible, you need to get your professional engineering license." The OR branch of the engineering department looked around and discovered that one of the licenses was a professional engineer of industrial engineering, and that's where OR came in under this process.

There were several of us who had to get our EIT, Engineering in Training exam. We had to pass that before we were eligible to take the professional engineering exam. The EIT exam goes across all the disciplines of engineering: math, chemistry, physics, Fluid dynamics, and all of this good stuff. So we had to go back and study in all of these basic undergraduate disciplines, if we hadn't already taken the EIT exam. Several of us hadn't because we weren't becoming engineering officers.

We were taking brush-up courses with cadets and reading all of these old or these very new disciplines for us—a lot of us swore that there was a whole new row on the chemical table of elements from when we saw it as cadets. But we had to go through that. That was an all-day exam. We took that exam, and then got our grades back. Then we had to go take the professional engineering exam, which actually compared to the EIT, was a cake walk, because it was focused on, in our case, industrial engineering.

There were six questions that you had to answer out of ten, three in the morning and three in the afternoon, and you could choose. Of the six, four of them were right out of our courses that we were teaching in Operations Research. One that I chose was related to courses I'd taken at Georgia Tech, because I was in the Industrial and Systems Engineering Department at Georgia Tech. So industrial engineering was somewhat familiar to me. And

one was just kind of a guess question that I tried to work through.

Another anecdote was that Rensselaer Polytechnic Institute was where the exams were to be given. But because we were from West Point, and New York wouldn't test us, we had to coordinate with Virginia to have exams sent to New York to administer to us. So they were passing out the exams and they passed out civil engineering, mechanical engineering, structural engineering. They went through all of it, and then they said, "Does anybody not have an exam?" Two of us raised our hands. We were the two OR, and they said, "What are you?" And we said, "Industrial engineering." They didn't have the packets. Virginia had not sent them. So they called Virginia and it ended up that we went back to West Point. Virginia hired one of the other instructors in the Engineering Department. They paid him \$50 to proctor the exam to us the next day, and we sat in our offices at West Point and took the exam.

BOB SHELDON: And passed?

VERN BETTENCOURT: And passed. Right.

BOB SHELDON: So you're a licensed engineer in the state of Virginia?

VERN BETTENCOURT: Yes. Industrial Engineering. The Academy did get accredited. The maximum period was six years that you'd be accredited for, and it did. It was a significant event for the Academy, and they had to add the ABET courses as they were called. ABET cadets had to take one or two additional courses to get enough hours of engineering, and practical engineering to qualify for ABET accreditation. We had to reclassify one of the classes in military topology and change it to land sciences or something like that. We needed one or two more credits of applied engineering and we were able to get it that way. But it did help the academy, and it helped the curriculum and the OR cadets, as well as the other accredited disciplines. Folks there are continuing to take the engineering exam.

BOB SHELDON: Did you ever use that license for anything after the fact?

VERN BETTENCOURT: No. (*Laughing*)

BILL DUNN: You are a former 49. Where do you think the Army's 49 Program is going?

VERN BETTENCOURT: The 49 career field has always been an extremely healthy career field for the Army. If you look right now at the three and four-stars we have around the world, several of them are 49 officers. A couple of the four-stars are 49s. Three or four of the three-stars are 49s. So it's been a very healthy career field.

There's some issues with the single-track philosophy that we've gone to now. Some people are beginning to say that we need to re-look at the decision that an officer can only be a war fighter or an analyst. That you can't be both. I was here when you could be both, and we would alternate. If you look at the name of the discipline—Operations Research—it's very important that the military officers maintain their military currency.

It's also important that we pair them with civilian and contractor expertise to get the analysis done. But to have all ORSAs being strictly ORSA is an issue. There's nothing wrong with a few single track officers who get PhDs, and specialize in ORSA if they want to. But I think there is some risk if we don't allow officers to alternate.

Conversely, one of the real successes of Army ORSA recently has been that we've been able to place officers out in operational units. In Desert Storm, in the initial parts of the initial phases of Enduring Freedom and Iraqi Freedom, there was some difficulty in getting the ORSAs into theater. But now they're in theater and integrated in at the division and corps level, and they're performing great work out there. That's been a real success.

In the meantime, in the new modular Army units at division and corps and theater, there are now 49s on the TO&Es (Table of Organization and Equipment) of the units. So there will no longer be a question of should the ORSA deploy into the initial combat. They will go as part of the units that they're on the TO&E for. That's been some real healthy development in Army OR. It's more like a return to our roots, because that's where we grew up in the application of the scientific method to military operations. So that's been a real advancement for Army OR.

At the same time, we need to re-look at the personnel management issues. With the current

OPTEMPO for our officers (GWOT rotations, for example), it is very difficult to send an officer to school for two years. Army leadership is wrestling with this issue.

BILL DUNN: There's been talk about whether the 49 program was declining or going to go off the map. And in the Army—and other services, too, but I'm more familiar with the Army—those retired ORs have been rich recruiting sources for analysts in industry. So without them, that's going to leave a serious dent in the kind of people that contractors are able to hire.

VERN BETTENCOURT: I agree with you. And in fact, I've made that point in discussions. People talk about we'll just cut military—mil to civ, and we'll get our ORSAs that way. My question when I hear that has been, "And where will those ORSAs come from?" Because as you say, right now they're coming from 49s that are retiring. If you don't have that pool, where are you going to get military experience and knowledge of ORSAs? I think it will be a real dilemma.

BOB SHELDON: Let's go back to Monterey and pick up where you were retiring from the Army. Tell us why you came back to Virginia.

VERN BETTENCOURT: I really enjoyed doing military OR. And as I looked around California, and where would I do military OR in California, it pretty much boiled down to the San Jose arena or the Los Angeles arena. Either one of those had issues of the cost of living, the traffic, which sounds ironic since my decision was to come back to northern Virginia. But both of those seemed to be fairly prohibitive. The quality of life, the cost of living, et cetera. And also the redundancy of job opportunities. In other words, my perception was that there were only a few military ORSA job opportunities at each location in California, whereas back here in the D.C. area, there were multiple job opportunities. So I made the decision then to come back here. My job search focused on a couple of for-profit companies and a couple of the FFRDCs. In all cases, the networking necessary to do that had been facilitated through MORS. My choices came down to going with an FFRDC or going with a for-profit firm. I chose to go with the small 8A for-profit firm, in large part because I felt that the FFRDC option

would always be there. This 8A option probably wouldn't be, and so I chose to go with a smaller system engineering firm.

BOB SHELDON: What kind of work were you doing?

VERN BETTENCOURT: I was basically doing analysis, and M&S. I came in and immediately was put in business development in those areas for the small firm. We were able to get a couple of fairly lucrative contracts and did support for the Army and also for what is now J8 on the Joint Staff.

BOB SHELDON: What major projects did you take on?

VERN BETTENCOURT: In J8, a lot of the effort was in the running and modification of TACWAR. We had people down there working that and doing analysis. For the Army, one of our big contracts was for TRAC Leavenworth in beginning to help contract out some of their analytic capability. In other words, as they had funds, but not people to do analysis, it was to create a team of analysts out there with tools and direct requisite experience and capability to do the type of analysis that TRAC Leavenworth does at the upper tactical and operational levels of land combat.

BOB SHELDON: How long did you stay there?

VERN BETTENCOURT: I stayed there a little less than 16 months, and then made the decision that I really wanted to be closer to the action of the government. So I transferred to MITRE Corporation, over in McLean.

BOB SHELDON: What part of MITRE?

VERN BETTENCOURT: I started out as an Army advisor to one of the technical divisions. Then MITRE started to form technology centers, and one of them that they formed was the M&S technology center. These were department level organizations at MITRE. So when that was formed, I became the assistant department head of the M&S technology center. As we went through the work, it became obvious that really that center was functioning in two areas.

One was the true technology of M&S with an emphasis on C3I, which is what MITRE does. Another pocket of work was developing the applications of the M&S, to do analysis in C3I issues. We saw that we were getting more

and more of that applications type of work at MITRE. We saw that not just in our department, but elsewhere in that division of MITRE, supporting not just the Army, but supporting also the Navy and OSD. The Air Force has its own separate part of MITRE up in Massachusetts. But supporting the Joint Staff, OSD, the Navy and Army in other departments, they were beginning to do analysis of C3I issues using M&S.

The division had three technology centers: modeling and simulation, networking, and artificial intelligence. After about a year in the technology center, our Technical Division Director, Andrea Weiss, went up to MITRE management and was allowed to form what we called the Synthetic Environment Applications Department (SEAD).

So the three technology centers kept the pure technology project work. And any kind of applied analysis came in to the SEAD, and I became the department head of that. Effectively we ran most of the work for the division, and then we would matrix out to these centers, and also out to the other departments in MITRE that had C3I subject matter expertise.

BOB SHELDON: Were you building new models or improving legacy models?

VERN BETTENCOURT: We were doing both. Most of the research was in the new models. Of course, we matrix'd back to the M&S technology center. A lot of what we were doing was focused on modeling of command and control. And also how do you reflect in combat modeling outcomes the influence of command and control systems and intel systems.

BILL DUNN: As I recall, when you were with MITRE, you were spending quite a bit of time out at Fort Leavenworth.

VERN BETTENCOURT: Yes. We had projects with TRAC Leavenworth and also with the National Simulation Center on incorporation of command and control into the Army combat models that they had at the time. We were doing some research on bringing artificial intelligence into automated command and control modeling. Not modeling of automated command and control, but automated command and control modeling. We did a lot of work in those areas.

BOB SHELDON: You were in a MORS leadership position at that time?

VERN BETTENCOURT: By the time I got to MITRE, I was Past President.

BOB SHELDON: Let's backtrack then and cover more of your MORS history.

VERN BETTENCOURT: While I was still in Walt Hollis' office as his military assistant, I attended a couple of the Board meetings as the acting sponsor's rep. And then I think in large part because of the paucity of uniformed military on the MORS Board, I was elected to the Board of Directors in 1986 and served on the Board for twelve years after that. After I was elected in 1986, I chaired several committees at MORS mostly on the administration management side of the house. I chaired the audit and membership committees in 1987 and chaired the management committees in 1988. I also chaired one of the C4ISR workshops. In 1992 I chaired the C3I Measures of Effectiveness workshop that took place at Fort Leavenworth.

BOB SHELDON: Were you at MITRE at the time?

VERN BETTENCOURT: In 1992 I was at MITRE. I began my MORS presidency at the systems engineering firm, but shortly afterwards transferred to MITRE and finished out my MORS presidency at MITRE.

BOB SHELDON: What other roles did you play on the MORS Board?

VERN BETTENCOURT: I started with the Board of Directors position, and continued up through the admin and management track. Secretary Treasurer in 1989, Vice President of Administration in 1990, and then President in 1991. I was also the advisor to the M&S advisory group, and also the working group advisor for the symposium.

BOB SHELDON: What were the issues that you tackled when you were VP and President?

VERN BETTENCOURT: One the issues that I'm most proud of is as the Membership Committee Chairman. That was when we began to define the classes of membership. When I became the Membership Committee Chairman, there was no membership other than the Board of Directors. So in that year, we tackled the issue of what should be the classes of membership and recognition that we have for the

MORS members. What should be the voting routine and all of this. Part of the issue was people who we now call members, were beginning to feel a little bit disenfranchised. They were beginning to ask questions about, who are the members of MORS? At that time it was the Board of Directors—period.

The other issue was that since the Board of Directors was fundamentally the only avenue for involvement in the administration and running of the society, that we were getting a lot of retreats on the Board. And one of the issues was, how do we allow for this knowledge and experience to exist, but yet turn over the Board and get more involvement on the Board and younger membership on the Board? That's where the idea, the genesis of creating the Fellows originated. So we looked at the membership as those who had attended meetings, and then the Board was the elected Board, and then Fellows as our senior advisory members if you will.

We brought that to the Board through committee, and were able to get it adopted while I was the Vice President of Administration.

BOB SHELDON: You chose that an individual's membership would be current three years after attending a MORS meeting? How did you arrive at three years?

VERN BETTENCOURT: We looked at what was the repetition of folks. We looked at particularly the mailings of *PHALANX* and Dick Wiles gave us some statistics on how many people were receiving it from attending a meeting. There was a knee in the curve at three years. After three years, people would either come back to a meeting, or else they would just drop out of it. So we chose three years.

Also, if you look at the rotation of the meetings, about every four years they revisited geographic sectors, like D.C. or California or New York. They go in about a four-year cycle. So if you were good for three years from the time of the meeting, by the time it got back you had renewed your membership.

BOB SHELDON: How was your relationship with the MORS sponsors?

VERN BETTENCOURT: I think we had a very good relationship. One of the issues was the special meetings. When I began as President, I was not exactly happy with the number

in the queue. We were just beginning to realize how important the special meetings were as far as the ability to rapidly respond to the Sponsors. The ability to focus on a topic and provide responses to the Sponsors on a topic of their interest was crucial. We also were discovering that this was a great generator of membership from communities of people that didn't go to the annual symposium, and they were also a source of funding for the Society.

One of the issues that I thought important was the number of proposed special meetings was too small, so we worked hard to generate a queue of topics that carried over through the years. In doing so, we worked hard to be responsive to the Sponsors.

Another thing was that, taking the presidency in 1991, Desert Storm and Desert Shield were just taking place so we put emphasis on a rapid turnaround special meeting on OR in that conflict.

Back to the early 1990s, late 1980s, the Berlin Wall came down and there was talk of drawing down the military. We were, in fact, headed that way. From a strategic perspective of MORS, there was concern about what was the effect on the Society. Would the membership and the revenue of MORS drop off?

So we began to do a lot of planning on what would it take to maintain MORS as a viable society if the military budget declined. We then began to look at other key structures for the symposia: the potential of additional appropriate sponsors, and different concepts for special meetings. Luckily the budget and the membership did not drop.

As an organization of volunteers, with a Board which only meets twice a year, I think strategic planning is very important. You need to have a clear plan from the beginning so the Board and members can work their pieces in the interim. The Executive Council spent our time immediately after elections coming up with a strategic plan for the year to include the Symposium and special meetings. Chris Fossett had been doing some similar work at GAO and was a tremendous help. As was Lannie Elderkin from the legal perspective, and of course the MORS administrative staff. Part of our planning was to review the fundamental purposes of MORS. One of the things that gener-

ated was the MORS professional journal, and during the year I was President, we got that. E. B. Vandiver implemented it the next year as President.

BOB SHELDON: For the record, you came up with the name MCAP (MORS Coveted Acrylic Paperweight).

VERN BETTENCOURT: That term was first used at the symposium in Monterey. David Chu was our keynoter. At the time I think he was the Senior VP at Rand and he agreed to come speak to us. I had the new acrylic paperweight as the gift. I gave it to him and I told him, "You should be honored to be the first recipient of the MORS coveted acrylic paperweight award."

BOB SHELDON: Was that brand new at the time?

VERN BETTENCOURT: Yes. I'm fairly certain that David was the first one to receive it. And the name MCAP stuck.

BOB SHELDON: Going back to the special meetings . . .

VERN BETTENCOURT: It was in line with our strategic plan of trying to cut expenses so that we could maintain the Society if our revenues dropped off.

BOB SHELDON: Two perennial topics for MORS special meetings are VV&A and M&S. Since both of those are in your arena, how do you feel about MORS success in holding those?

VERN BETTENCOURT: In some of the tough issues, you might not have total successes, but I think in the overall science of M&S, I think MORS has played a critical role. If you go back to the DMSO policies the definitions are very familiar. The VV&A: Verification, Validation, and Accreditation. Those terms that provide a structure of looking at M&S came out of a series of MORS workshops that Jim Sikora and Marion Williams conducted. And that has stuck; that's still there today. On how we evaluate models and simulation for acceptability for use in training and analysis.

In the C4I area we held a couple workshops. The one that I held, and one that preceded it, that looked at the use of M&S as a C4I tool. The definition of metrics and MOEs that a lot of people still use began in those workshops.

How can I measure command and control in models and simulation? General Dutch

Shoffner gave the keynote address at the workshop that I chaired, and his topic was command and control. He talked about the differences between 'command' and 'control.' One being an art; the other being a science. The services asked for the transcript of that speech, because it was really one of the first recorded discussions of what's the difference between 'command' and 'control,' and what does that mean for analysis of M&S.

I can't vouch for the other services, but I know that in the Army you still see that distinction today in definitions. Because it's the art of command, battle command, and the science of control. So I think MORS has definitely played a role. One of the things that the workshop allows you to do is to focus on a topic and to try and provide the sponsors something of value coming out of the workshops.

Unfortunately, I don't think MORS has yet broken the code of where a Working Group in the symposium can continue a thought process and produce something of value, other than of course, the joint collaboration that's extremely important. The peer review and collaboration of individual papers within a Working Group are very important. But what these special meetings allow you to do is to focus on a topic. Begin with an agenda that you want to accomplish and then accomplish it. Even if it takes one, two, or three workshops to do it.

BOB SHELDON: How many years did you spend at MITRE?

VERN BETTENCOURT: I spent five years at MITRE, and I was a department head for about two years. That division reorganized and I became the Army program manager for that division. I was the program manager for all the Army work that the division was doing. I did that for about six months. And then I became the associate Army program director for MITRE. There was an individual who, for all of MITRE, oversaw MITRE Army programs, and I became his assistant at that point about three to six months. Then I was hired as a senior executive in the Army down at TRADOC, and it was a major decision to leave MITRE.

BOB SHELDON: Did some friend of yours actively recruit you, or did you find out about the job opening?

VERN BETTENCOURT: Through the MORS network, I found out that the Army was about ready to announce a new senior executive position, an assistant deputy Chief of Staff for combat developments at TRADOC headquarters. Having been in Walt Hollis's office for three years and observing the SESs up there, you're always saying to yourself, "I could do that if I ever had the chance."

So when this job became available and was announced in open competition, I applied for the job. Not in anyway thinking that I would get it, but thinking that it'd be good experience to go through the process. I then learned that there were about 50 applicants, a couple of them were sitting SESs, a couple of them were retired general officers. Then I became absolutely convinced that I would not get the job, but said, "This'll be good experience to go through the application process."

Meanwhile, being very happy at MITRE and realizing that it's okay if I didn't get job, I'd still have a good job at MITRE and I had good work to do in the OR community.

BILL DUNN: But you didn't move down to Fort Monroe.

VERN BETTENCOURT: No. I was a geographic bachelor for a year.

BILL DUNN: How'd that work out? I mean, as far as wear and tear on you.

VERN BETTENCOURT: Actually, it wasn't that bad. There's a TRADOC shuttle that goes from Fort Belvoir down to Langley Air Force Base and then comes back. At the time it was doing that maybe three or four times a day. So I could go down on Monday morning and come back Friday afternoon, lugging paperwork all the way. It worked pretty well.

The difficulty was at the time—and this is in the mid 1990s, is that there was a freeze in government hiring for the most part. So my wife who had been in government contracting out there and had left the government and now was trying to come back in—there were no jobs for her in the Tidewater area. So that was a draw to come back to Washington, D.C.

But I do need to say that when I went in to interview with General Lehowicz for the position, one of the comments that he did make was, "I'm honored to be interviewing a Past President of MORS for the position here in our

organization." So even there, MORS was a great help in getting the position.

BOB SHELDON: So you spent a year there?

VERN BETTENCOURT: Right. I spent a year down there and then Walt Hollis called and said that one of his SES positions had come open, and he would like to transfer me from TRADOC up into his office.

BOB SHELDON: What was your big project that year at TRADOC?

VERN BETTENCOURT: One that I really remember is a thing called a war fighting lens analysis. What that was, or still is, is an effort to integrate the requirements and priority of the systems across all the battlefield operating systems. And to prioritize between trucks, Howitzers, tanks, command and control systems, et cetera. How do you prioritize those requirements?

BOB SHELDON: You applied your OR skills to that?

VERN BETTENCOURT: A lot of decision analysis and subjective skills. As part of this decision analysis, we brought in quantitative analysis as part of the evidence that was considered by the panels that were doing a prioritization. We did a loose Saaty analytic hierarchy effort. We, in combat development, did a lot of the prioritization of the work that TRADOC Analysis Command (TRAC) performed. Their budget came through us. So we did some of the prioritization of what they were doing.

BOB SHELDON: Did you work with Mike Bauman?

VERN BETTENCOURT: Mike Bauman was and is the Director of TRAC.

BOB SHELDON: How was that working relationship? Did you travel to Fort Leavenworth a lot or bring his guys to Fort Monroe?

VERN BETTENCOURT: TRAC has an office at Fort Monroe and we worked a lot with his office there. He had a couple GS15s at Fort Monroe, because he was not only the director of TRAC, but he was also the deputy Chief of Staff for studies and analysis at TRADOC. So his deputy Chief of Staff office was there at Fort Monroe. So we worked with that office. He did a lot of studies for us, and we ended up going out to Fort Leavenworth and White Sands, also.

That worked very well since we were both ORSAs.

BOB SHELDON: Moving back to the Pentagon to work for Walt Hollis, what was that job?

VERN BETTENCOURT: Fundamentally the same job I had as a Lieutenant Colonel. As we discussed earlier, he divided up his workload fairly evenly between the colonels and the SESs. I had aviation. I had M&S. I had analytic techniques. And I had what today we would call analytic human capital. Much to my chagrin, I did not have field artillery. We had a field artillery uniformed officer and he kept field artillery.

BOB SHELDON: Was that a new position?

VERN BETTENCOURT: No. It was an existing position. But the subject matter would switch around based on the experience of the analysts in the office.

BOB SHELDON: What analytical issues did you oversee?

VERN BETTENCOURT: One of the major issues that we had was how to do what I'll call Mission Area Analysis, which was somewhat akin to War Fighting Lens Analysis. How do you do more than analyze something in the functional stovepipe in which it exists? How do you look at the value of the system across a family of systems, and then across an army of systems? General Ed Anderson who was the Army Assistant DCSOPS, was asking us those questions. How can your analysts help me prioritize across battlefield mission areas? We in the Army had been doing a thing called value added analysis—CAA had been involved in that. General Anderson had us link together some analysis starting at AMSAA with a system modeling analysis, then TRAC for tactical and CAA provided the Army-wide analysis.

BOB SHELDON: So it's not like the Total Army Analysis.

VERN BETTENCOURT: Actually we used a lot of the techniques and the data and results from that, but it was focused on combat effectiveness in a certain area. The area was attrition of combat vehicles but it was attrition by all means. Mines, artillery, air, Army air, and direct fire; rather than just in the stovepipes.

BOB SHELDON: Did your perspective of M&S and analysis change going back to Walt

Hollis's office, as compared to what it was when you were at TRADOC?

VERN BETTENCOURT: I would say only as far as a better appreciation of what the political civilian decision makers needed out of the analysis. As I look back, as a younger military officer, I was more focused on the technical and military correctness of the analysis. As an SES, I'm still interested in that, but now I'm more attuned to, "What's the purpose of this analysis?" And, "What's the ultimate use that the civilian decision makers are going to make of this analysis?" As I think of it, more emphasis on definition of the problem, and structuring of the analysis to provide what it was that the decision makers would need out of it. If there were any difference, I think that would be it.

BOB SHELDON: In your relationship with the analytic agencies and CAA and TRAC, as you worked for Walt, did you work directly with those folks?

VERN BETTENCOURT: Yes. That was one of the great joys of that job. In that office you would see across all of the analytic agencies in the Army, and the FFRDCs, and OSD and the Joint Staff, and industry. So you would get an appreciation for techniques and expertise throughout all of those different elements of the analytic agency.

Not so much with the Navy, but with Air Force Studies and Analysis. Walt's office formed a great partnership with Jim Bexfield, Clayton Thomas and Jackie Henningsen in performing analysis and incorporating Air Force effects into Army analysis, and vice versa.

Of course, during the QDR period, that friendship was tested but never broken. That was one of the great joys of working in Walt's office. Harkening back to my days as an instructor at West Point, every once in a while Walt would ask me to actually do analysis, and that was a lot of fun, also, to do quick turnaround, back-of-the-envelope analysis.

Working with the agencies, I know one of our challenges in Walt's office was an attack on AMSAA; maybe the Army should contract it out, disband it. We mustered all of the analytic agencies in support of AMSAA because it was, and is, the source of Army data. You can't do analysis in the Army without AMSAA and its

data, and it was also the source of most of the physical algorithms in our models. Those were some exciting times when we were defending AMSAA, which we successfully did.

BOB SHELDON: How did you defend it?

VERN BETTENCOURT: We gathered all of the other Army analytic agencies and training agencies, which also use AMSAA data. We brought them into the Army leadership and said, "Perhaps you don't understand what AMSAA does." We had testimonials from all these other agencies that said, "Without AMSAA we won't be able to do this, this, and this." It's the foundation of the Army analytic community and the Army training community and a lot of the test and evaluation work.

BILL DUNN: One of the things that's happened to AMSAA is they've taken away all their military personnel except one. Do you think that's had an impact?

VERN BETTENCOURT: It undoubtedly has had an impact. I think AMSAA ought to have at least a couple of military in each of its divisions to throw some mud on the numbers that it's producing. Civilians do an excellent job, but I think it would be better if it had some junior military up there, in addition to the one they've got.

BOB SHELDON: From your vantage point working for Walt and overlooking the analytic capabilities of the Army, how do you feel about the capabilities of the Army to do analysis? From TRAC, Monroe, CAA. How do you feel that's evolved over your thirty years of involvement in the Army analytic community?

VERN BETTENCOURT: The Army analytic community does excellent work. I think it's the flagship of the service analytic communities. My perception and experience is the other services also do excellent analysis. Theirs is contracted out more than what the Army contracts out, because we have our in-house analytic agencies.

One of the things that the Army needs to work on in its analytic structure is that right now—my experience is two years out of date—but I think it's in large part—I'll call it a project-based analysis. What was called a COEA is now called an AOA. If there's a system going through the acquisition process, we do excellent analysis in response to that acquisition pro-

cess. CAA has a broader mission and does some broader periodic analysis, looking at a Total Army Analysis, et cetera. I think we could do a better job, Seth Bonder used to call it a warm base of analysis. Analysis that is there and ready to go when we've got an issue. Then we don't have to generate a large analytic process to answer an issue. In other words, we've got analysts that are keeping data and models warm by doing analysis that's not caused by the acquisition process.

The new challenge of the JCIDS process may help us in that arena. Theoretically, you should be doing analysis identifying capabilities and capability gaps prior to the start of the acquisition process that then narrows the analysis down to looking at specific systems or capabilities. That more broad analysis is the type of thing that I'm talking about. That says here's the Army fighting the war. Now what are its capability gaps? Right now I don't think we have the systemic impetus to do that type of analysis. Nor do we have the resources to do it in the analytic community. I've been a proponent of what I call activity-based costing of systems. If the system is going to go through the acquisition process, I believe it ought to pay for its analysis. The resources that we put towards the analytic community ought to go towards these more general and broad analyses that are developing the capabilities and requirements for a system. There's studies out at the Defense Acquisition University that say that in the first 20% of expenditure of resources for a system, 80% of the system is defined. You have defined 80% of the overall eventual expenses of that system. So that first 20% of effort is extremely important to get it right. If you don't, and we've had experiences—things like Sergeant York in the Army—if you don't get it right, you're going to pay a huge cost later on down the road.

I don't think our system of analysis in the Army right now is geared towards that. I think it's a resource issue. The analysts would like to do it. It's just where do they get the resources to do that, if they've got the demand of the acquisition process that they currently have.

BOB SHELDON: You talk about the analysts and the M&S tools. How do you feel those

have evolved over the thirty years that you've been in the business?

VERN BETTENCOURT: I can continuously draw parallels between that area and the area I find myself in now with this CIO business, in IT and information management. First of all, the Army has a good set of models. I think that there is work to be done, and I would have said this before I was over here in the CIO world—but one of the weakest areas is the modeling of command and control. There's a lot of work to be done there, and it's a very tough area because it's not a physical area. I can't write a command and control equation equivalent to one that says this is ballistic trajectory of a tank gun or this is the mobility coefficient of a tank. There's not a physical, mathematical equation to be written. So it's a very tough area.

I think that the battle lab interactive modeling is getting us well down the road in this area. That's one of the best approaches. But that being said, I think that we do have a good set of models, particularly for our weapons systems and transportation systems. One of our tendencies that we've got to get away from, and I think we're getting away from what I call the big bang theory of modeling, in lieu of what I call the wing-walking theory of modeling.

The wing-walking theorist says, "I've got a model that works. I see that I need to move to another modeling capability. But I'm not going to let go of this model that works. I'm going to try and improve it, so that I can keep hold of it, and grab hold of the objective that I want." I think that more times than not, we don't do that. We go to the big bang theorist who says, "I've got this model that works, but it's not object oriented." Maybe it's not on the right platform. Maybe it's not service oriented, architecture based. So I'm going to discard that, and I'm going to start from scratch, and build a new model. Our experience is that's absolutely the wrong way to do it. There are a lot of model acronyms in that graveyard, both in the Army, the other services, and DOD and Joint Staff.

BOB SHELDON: Let's get to your transition from Walt's office to the G6.

VERN BETTENCOURT: There was a five-year stopping off point in G3. I came to Walt's office in 1985 and 1995, and I left in 1988 and

1998. That's easy to remember. So Walt says this year it's about time for me to come back again, because it's 2005. (*Laughing*) When I was in his office, one of the areas that I had was Army M&S. In about the 1996 timeframe we formed the Army M&S Office (AMSO), that was headed by an O-6. The other services' M&S offices had SESs and of course, DMSO had an SES. The Army had M&S domains, and each of the domain leads was either a general officer or an SES, and then you had this O-6 trying to deal with them, and enforce standards. You also had a bunch of unruly GS15s over in the Army M&S offices that needed leadership. One of which was Bill Dunn (conducting this interview). So there was desire to get an SES over there. There had been a manpower survey in G3. And they were going to draw down a couple O-6s in G3. Walt, at the time, didn't have O-6s in his office, and he wanted a colonel in his office. G3 needed to get rid of a colonel, and G3 wanted the SES in AMSO, which was assigned to G3. So we worked a trade where an O-6 and a GS15 went to Walt's office, and the SES position went to G3. So that's how I moved over to G3. By the way, the G3 at the time was General Tom Burnette who was a West Point, Georgia Tech, ORSA, and also ORSA/computer science. He got a double Master's Degree at Georgia Tech. He was anxious to get an ORSA SES over there in G3, so I went to work for him. I worked for a year as the head of AMSO. Then John Riente, who was the Technical Director at G3, retired. I moved up to replace him as initially the Technical Director, and then that job changed to Director of Analysis, and CIO, which was more descriptive of what the technical director was actually doing. I had that job for four years, so five years total in G3.

BILL DUNN: When you were director of analysis, that was a time of big change in the DOD and Department of Army. We had new programs like Army Transformation and Objective Force. General Shinseki said he wanted to rapidly field a Brigade Combat Team. And then ultimately the beginning of the Army Future Combat Systems, and so with these new programs, which were unparalleled from previously, and with you being director of analysis, what new analytical approaches did you

see needed to be done? And what did you direct?

VERN BETTENCOURT: One of the main jobs of the director of analysis in G3 was to assign analysis tasks for the Army. The G3 is the Army tasker. My office determined what analysis tasks would be done by TRADOC, by TRAC, Army Material Command, i.e., AMSAA, or the Army staff, i.e., CAA. The majority of it was tasked out of G3. One of our efforts was to ensure that our taskings were very clear. We talked earlier about developing the problem statement, and the scope of analysis, et cetera. We would spend a lot of time making sure the taskings defined what it was the analytic agencies needed to do. Not how; but what.

Another thing that took a lot of our effort was, there was a lot of change going on at the time. So we made a lot of effort to make sure that we were integrated across G3 to anticipate any analysis that would be required, rather than react to OSD saying, "You're not going to pass this milestone because you don't have analysis to support it."

So we tried to anticipate and define the analysis that would be required. For example, one issue was the Army's operational response in Kosovo. The press and other agencies alluded to the fact that the Army couldn't deploy fast enough to Kosovo. We went to CAA and commissioned a transportation analysis that looked at what had to be moved, what were the assets to move it, and what were the ports, if you will, the airport assets both at the origin and at the destination.

CAA developed a great set of graphs that showed that the issue was not so much the unit, or even the aircraft available to move the unit, but it was what was being allocated at the far end of the line as far as ramp space for carrying Army units. That went all the way up to the Secretary and Chief of Staff of the Army. And they used that in their discussions of how the Army was able to move in that situation. Be that as it may, the perception was out there on the beltway that the Army was heavy and slow and couldn't respond, which was not the case.

Another issue was the Army's need for a medium weight element. The G3 convened a very senior group of GOs and SESs with a work group of O-6s below them. I think it was called

the Army Transformation Working Group. They worked for four or five months to help define what we need to do, if we're going to transform the Army based upon the perception and the reality of what happened in Kosovo into the new combat environment that we were finding ourselves.

The first time that the head of the O-6 working group briefed the G3, he had a list of ten inhibitors to getting his job done. The number one inhibitor was, "I've got too many analysts involved." (*Laughing*) His attitude was, they're going to slow me down and I don't need them to design a new Army.

When the final product was presented six months later, Major General Bob St. Onge who was the Director of Strategy, made the unsolicited comment that had we not had the analysts involved, we never could have accomplished what we did. So that made us feel pretty good about the work that we'd done.

That was a lot of quick reaction effort. Looking at a synergy of analysis across the Army. By that I mean there was a lot of transportation and theater level effectiveness, combat effectiveness work, done by CAA. Transportation. Strategic responsiveness. How far can we get, how fast? How much combat service support do we need once we get there? How are we going to get that? A lot of work done by AMSAA on new or otherwise currently available, but not in the Army inventory, systems. AMSAA looked at some of the medium weight fighting vehicles around the world and some of the medium weight cannons, et cetera. So AMSAA was doing a lot of that system level physical analysis.

Then TRAC, taking the AMSAA results—this sounds like the work that that General Anderson had us doing a couple years before. TRAC took the performance analysis that AMSAA had done, and cranked that into their tactical and operational level models, and looked at how would these systems perform in units. A lot of that was done in models. A lot of it was done in I'll call it battle lab interactive analysis. Where we were looking at different types of combat, somewhat similar to what's going on now. Peacekeeping. One of the things that General Shinseki wanted was a full spectrum unit. In other words, I could go all the

way from high level combat down to peacekeeping and stability operations. How did these different systems and unit organizations function across the whole spectrum?

When you got down to the bottom end of that spectrum, stability ops and peacekeeping, there weren't a lot of good combat models for that. So TRAC was doing a lot of war gaming work in that area. We did all of that with a bunch of different alternatives, and we brought that into this group and I think that was a great help to the group. General St. Onge said he couldn't have done it without us. So I think that was one of the main initiatives in the new ways of doing analysis.

I don't know how new it is, but it was a new way of combining all sorts of different types of analysis techniques, stitching together or synchronizing all of the Army analytic agencies, which is what we did in G3.

Then the Army launched off and General Shinseki wanted a responsive acquisition to get that medium weight unit. This was still pre-9/11, but he wanted this quickly.

BOB SHELDON: Was this about the time General Shinseki dedicated the new CAA facility at Fort Belvoir?

VERN BETTENCOURT: Actually this was after that, because CAA was at Fort Belvoir when we were doing this work. We did some of the war gaming at Fort Belvoir at their new facility. Shinseki had a lot of urgency to get a new combat vehicle and equip into the force as rapidly as we could. So we did a lot of work with OSD PA&E and OSD ATL, to go through a very abbreviated acquisition process, to acquire what is now the Stryker vehicle.

The main thing that the analysts at OSD were looking for was what's the combat value of a unit with this vehicle? We looked at the testers to evaluate the vehicle, because we were purchasing "off the shelf", with minimum modifications. It wasn't a case of designing a vehicle. We knew that in order to meet the Army's timelines, it had to be an off-the-shelf purchase. But the real issue for OSD was, "Do we really want that kind of vehicle?" It was a combination of work by AMSAA, TRAC, and CAA to justify that, "Yes, we need that vehicle." One of the turning points was the TRAC analysis, but then feeding that into war games

out of CAA, in which we had OSD analysts participate. We used several different scenarios around the world that came out of the threat community. As we tried to deploy different configurations of Army units to these potential hot spots, the OSD analysts could begin to see the value of this vehicle. I think that played a large role in getting the Stryker vehicle adopted into the Army.

There's also a lot of work by AMSAA on the survivability of that vehicle, because it's not an Abram's tank. It's not a Bradley. It's a wheeled vehicle, medium weight. So AMSAA did a lot of work on how many of those things could you put in a C-130 and how far could it fly once you got them in there.

There was a lot of work across the Army community, but in less than eighteen months from the time we said we need a vehicle like that until the Strykers were rolling onto Fort Lewis, we were able to do that in less than eighteen months, and short-circuited a lot of issues. We spent a lot of time with the OSD analysts making sure we understood their issues, involving them in our analysis so that they could see where we were getting our results.

The next phase of that was the Future Combat Systems (FCS). There was less urgency in that, because we have the Strykers coming in. Then we had to define, if we don't buy off-the-shelf, if we developed systems, what should they look like? What would those capabilities be, and what do we need? Again we had to stitch together a lot of analysis. Walt Hollis said it was the most difficult analysis the Army ever did. We were able to get through milestone A and B with OSD. But FCS is still progressing along under development. It's spinning out technologies into the evolving current force. So it's a vital program in the Army right now.

BOB SHELDON: When Walt Hollis called it the most difficult analysis the Army has undertaken, how would you qualify the difficulties?

VERN BETTENCOURT: I think in at least three dimensions. Number one, people begin to realize the importance of the network, and net centrality to the FCS system of systems. That was difficult because here we are again trying to model and analyze command and control,

and now a force whose doctrine is net centrality. I would argue that the new doctrine of the U.S. military is net centrality. So that's a preeminent attribute of that force. And the modeling of that and the analysis to that is very important. So that was difficulty number one.

Difficulty number two is that FCS is a system of systems. We call it 18+1+1. There's 18 platforms, plus one is the soldier, plus one is the network. So there's in effect 20 systems that comprise a system of systems. All of those are variables requiring analysis.

Number three is—it's a full spectrum force. So it has to be able to fight under conditions of high level combat across the spectrum to low level, including medium, low intensity conflict, and finally peacekeeping and stability operations, deterrence. Across that entire spectrum, around the world where we were deployed. We had to selectively pick scenarios to use in analyzing this force. And oh, by the way, what did a unit look like? How many levels of command were there? I mean, much of this was uncertain.

It was a totally new force with new doctrine, potential new organizations, et cetera. So all of that had to be looked at and it consumed the Army analytical community for about two years.

BOB SHELDON: Did that require substantial modifications to your models and simulations to capture those things?

VERN BETTENCOURT: Yes. The most substantial were in the areas of the network. By varying the model parameters on the platform, you could portray the platforms. They go so fast, they have this radar cross-section. They have this ballistic cross-section. They have this lethality. They have this vulnerability. You could vary these parameters in existent models and do an adequate job of portraying the platforms. One of the most difficult issues was the network. We got at that by focusing the Fort Knox battle lab on being an FCS battle lab. That wasn't its title, but effectively that's what it was. They went into great effort to adapt models and analytic techniques, i.e., interactive war gaming to be able to portray the network.

On some of the exercises, we would go down there and there'd be a big, white 18-wheeler outside the battle lab with a bunch of

models and analysts from Fort Monmouth that would act as a surrogate for the network. These were connected via DIS and HLA into the regular combat model so that you get a higher fidelity into the network.

Another challenge was modeling the dismounted soldier. The future combat force is very intense in its combat formations with infantry. As we recognized the need and the type of operations that we think we're going to be in, and are currently in, it requires a lot more infantry. A lot more dismounted. We want them to be much more capable. You could envision every dismounted soldier has a small computer each having and generating his own situational awareness. So we had to upgrade our models to be able to handle them and portray their value.

BILL DUNN: MORS has tried to answer the call on a few of these things, like net centrality. We had a special meeting on that. Do you think that MORS needs to do more work in this area?

VERN BETTENCOURT: I just read an article last night and, in fact, brought it in to scan and send it out to several people, some of which are my analysis friends. This article was written by the OSD Office of Force Transformation. They are doing some studies, and they've briefed me on some of their studies, to try and establish the value of net centrality. I really think that MORS should go to school on what they're doing, and ought to look at what could MORS contribute to the methodology that's being used in these studies, and to the tools that are being used in these studies.

This goes back to when I was the President of MORS and Desert Storm had just taken place. While we're still in the fight, and will be for probably a few more years, we're in a net centric intense dismounted fight. We ought to go to school on that. What does it mean? What are the metrics? What are the tools we need to analyze it? To model it, et cetera. I think MORS could be of great value to step into that briar patch and look at it.

Several MORS members are doing that. We've got Army analysts over there. The Center for Naval Analyses has analysts over there periodically. The Air Force has some. Rand is doing some work in that area. Marines too. A lot of lessons learned. This is clearly relevant, if

not in Iraq but elsewhere, for years and years to come, I believe we're going to be in this fight. So it would behoove MORS to take a look at this and see where they could help. I would say that even if I were still in G3 and not over here in CIO. That belief is one of the reasons that I came over here. I thought that this was the center of action for a while, on the way we're going to fight in the future.

BOB SHELDON: Let's talk about your transition from G3 to CIO. How did that come about?

VERN BETTENCOURT: I ought to cover one other event that's not exactly MORS related, but certainly significant. During my time in G3 was the attack on the Pentagon. My other duty in G3 was the CIO of G3. As I said, General Tom Burnette, while at Georgia Tech got dual degrees in OR and computer science. So when he brought me over, he gave me the CIO job and he tried to persuade me that it was really an outgrowth of being an analyst and modeler that you'd also assume the CIO role. I'm not sure I ever accepted that, but he argued passionately in that regard. He didn't have to argue. He had three stars and I had the equivalent of one, so it was a short argument.

Certainly a significant emotional event was the attack on the Pentagon. The Navy operations center got hit hard. I'm not sure of the numbers, but I think the hardest hit was the Army staff. Certainly when we gathered the next day in what is now the Information Technology Agency, which is one of the offices that works for us on the technical side—to assess the Pentagon network and where were the outages and the destruction, it was very clear that the Army was the hardest hit among the staffs. And within the Army, the G1 and the G3 were the hardest hit. Our entire network in G3 was destroyed. So that became a very real 24/7 month-long effort to reconstitute our lost capabilities.

We reconstituted. We had all our users back online in less than 48 hours, and they were all throughout the Washington, D.C. area, but we got them up.

BOB SHELDON: Did you lose personnel, too?

VERN BETTENCOURT: G3 lost two personnel. The real hit in the Army was the Office

of Administrative Assistant. He lost 40-something people, because the aircraft came in right in the middle of their offices. And Army G1 lost quite a few people.

The other staffs, G8 lost two. We lost two. CIO I don't think lost anybody. They were in the inner ring, so they lost their offices, but they didn't lose people.

That was a tremendous effort by both contractors and government personnel to completely bring everything thing back up again. But it was quite an experience, and quite a bit of cooperation with the other Services and the Army. Particularly since we were the worst hit, a lot of cooperation in providing us personnel and assets to get back up again. One of the things that certainly did was raise our awareness of Continuity of Operations (COOP) and the requirements for that.

In 2003 the deputy CIO Dave Borland decided to retire. General Boutelle who was the incoming CIO, looked at the operations in Afghanistan and Iraq. He wanted an SES who was operationally oriented as his deputy, wanted somebody who had been in the building and knew the building, how the building worked, as his deputy.

He and Dave Borland looked around and somehow decided that I might fit that. Also I had been a thorn in their side on the Army CIO executive board as the G3 CIO. (*Laughing*) General Boutelle had been a two-star during the 9/11 effort, and had been down there almost every day with us when I was representing G3 in the reconstitution of the Pentagon network. I was also on a MITRE Red Team that evaluated his creation of the Central Technical Support Facility when he was a PM. So they began to recruit me to come into this position. It was very difficult to leave the ORSA world and come over here, and I did turn them down several times.

But they were persistent, and I think two things really caused me to come here. One was that I was convinced that the most important thing that we were working on, looking at society, looking at the military, was network and information technology. And I thought, for the foreseeable future, that would certainly be one of the most important technologies that we were working with. And one of the most im-

portant capabilities. I think that the net centric force has validated that thought. This is an extremely important technology.

For one, for the abilities and capabilities that it gives the force. For not much investment if we bring in COTS products, because we can bring in COTS products onto the military system and provide a network. We've demonstrated that.

Second, culturally and socially if you look at Generation X and Y as they come up, this is how they think it operates. If you ask us, "What was said about so-and-so or what are the important points of the topic?" We'll turn to our bookshelf or our file cabinet and we'll look for a piece of paper. If you ask Generation X or Y, who are our soldiers and emerging civilian leaders, they turn to Google. They get on the network. I mean, my daughters do it all the time. And so do the younger officers and soldiers. This is second nature to them. So it was obvious that was going to be a key piece of our military in the future.

The other thing that attracted me here was the ability to be the second in command of the office that was going to bring us into that future. Those are the two challenges I think that drove me to say, "Okay, I'll let go of the ORSA world and come over here." But I don't think I've completely let go of the ORSA world. I mean there is a need and we play in that role for analysis of command and control. We're looking with TRAC at M&S tools for command and control. And what do we need to do? What are the capability gaps there? Where do we need to improve? Build the old C2 MAWG—Modeling and Analysis Working Group. Trying to resurrect that.

BILL DUNN: Did you develop some analytical capability with G6 or were you relying on the Army analytical community to do your analysis?

VERN BETTENCOURT: We're relying on the Army analytic community. We did a strategic reorganization in G6 and I put that on the plate of one of our two-stars. And he has a person that is dedicated part-time to analysis and M&S. Also our technical director, Dr. Ed Siomacco, is working with Kent Pickett and Mike Bauman and Pam Blechinger on what do

we need—what are the capability gaps in M&S for command and control.

My longer term goal is to eventually get an ORSA on the staff here, or at least access to an ORSA somewhere who is dedicated to command and control M&S and analysis. Currently, we use the Army analytical community, as well as Rand and MITRE in those roles. Also we have some of our contractors like Booz Allen and SAIC that we use in those roles.

Now we have to consider a new type of analysis, for me, called business case analysis. As we look at changes to the Army network, not just on the tactical side, but on the institutional side, and in the post camps and stations. As we go through that, we try to do business case analysis that says, "Is this justified, and what's the best approach to server consolidation, single directors of information management at a Post?"

There is analysis that's done. Gartner—which is pretty much an IT analysis house—that's well known, does work for us and does business case analysis. In fact, they came in and said we're going to brief you on a study, and they briefed me from an IT CIO perspective. And I, being an ORSA, was expecting to hear a study briefing. So it went kind of rough until I walked them around the walls here and said, "Do you see these ORSA plaques? These mean something. And when you tell me you're going to brief me on a study, I expect problem statement, assumptions, alternatives, methodologies, tools. The ORSA process." So now they've come back and briefed me on that. They've been in here for a total of about four hours. And it turns out they did a very valid study, once they briefed in ORSA and not a CIO. So there's a whole new branch of analysis that I'm interacting with now that I wasn't over in G3.

BOB SHELDON: I see you have a couple of Civil War prints and memorabilia around here. What's your interest in the Civil War? Did that rub off from E.B. Vandiver?

VERN BETTENCOURT: Sort of. When we left California and I came back to Virginia, one of the personal goals I had was to do battlefield tours, and battlefield reconnaissance and learn more about the Civil War. Since going to the military academy, I've been very interested in military history. So I said, "It's pretty stupid to

be living here in Virginia, and not take advantage of what's right here in the local area."

Also, growing up in California, we really didn't study the Civil War. It was a distant thing out there. So I came back with that goal, and then discovered that Van had this passion. So yes, we do go out together. We enroll in Northern Virginia Community College Civil War courses every year and go out on battlefield tours with them.

BOB SHELDON: What did you learn from your study of history that might apply to your work?

VERN BETTENCOURT: Clearly the effects of terrain. That's one of the great things about being able to visit the battlefields. The effects of terrain. The effects of communications and lack thereof in the Civil War battles. And the whole time dimension in the Civil War battles, and how communications and speed of platforms, i.e., horses and feet, versus motorized and armored platforms. The whole pace and scope of battles. And how truly small in space the Civil War battles were. Yet how vicious they were. And the inability of the commanders to analyze what was going on and to understand the effects of some of the weapons that they had—the new weapons coming in versus the formations they were using, and the terrible toll that that caused in the battles.

BOB SHELDON: They could have used a good CIO back then.

VERN BETTENCOURT: CIO and also operational analysts that said, "Dummy, these bullets travel pretty straight and fast now that we've rifled the bores. You maybe ought to get down and disperse." (*Laughing*)

BILL DUNN: And if they would have had better Intel.

VERN BETTENCOURT: Yes, that's very true. The Army Signal Corps started in the Civil War right out here in Manassas. So that's another important piece.

BOB SHELDON: You're out of the 49 mainstream now. But if you were giving advice to young military analysts, what would you tell them?

VERN BETTENCOURT: I would say if you're going to do military OR, the distinction there is the military piece. So if you're a military officer, you need to do everything you can to

learn the organizations, and weapons, and systems, and doctrine, and tactics of your branch of the service and how it all fits into the joint picture. That's what you bring to the analysis as a military officer, primarily. And if you bring great technical analytic credentials and expertise, all the better. But what I believe we're looking to you for is to bring the military reality and validity to what we're trying to do.

You need to concentrate on that as you go through your career. Warriors march to the sound of the guns. Analysts ought to go to the sound of the guns to do their work as much as they can.

If you're a civilian, government civilian or contractor civilian doing military analysis, to some lesser degree, you need to learn how the military service or services you're supporting operate and what they do on the battlefield and their capabilities. But I think there's more emphasis on the technical expertise that you would have in your ORSA techniques.

As we've gone into operations other than high or mid-level mid-intensity combats, operations that we now find ourselves in, the ability to bring other analytic techniques that are not standard military, M&S set piece models—create the model, get the results—but bring in other things like interactive war gaming. Like tabletop war gaming. Like business case analysis. Saaty analytic hierarchy techniques. All these techniques that aren't normally associated with military OR that we were doing back in the 1960s and 70s and 80s. I think the ability to apply these techniques to these new problems that we've got is something that the civilian analyst, the contractor, and the military analyst, ought to work on.

We look to the analysts to bring scientific methodology and scientific rigor, and unimpeachable ethics to the analysis of problems. And to point out to the decision makers what the decision makers' alternatives are, and what the pros and cons and risks of each of those alternatives are. That's what we're looking at the analysts to do. So the use of the scientific methodology, the OR process, absolute ethics in analysis are things that I think are vitally important for the military OR analyst.

One of the true values of MORS is that it is a joint body. Two great values—at least for the

government—of MORS is it can conduct classified meanings, and secondly, it's a no penalty joint forum, where people who normally might not talk to each other and bare their souls, feel free to do so. In today's world, which is very much a joint world, the analyst needs to think and analyze jointly. So another piece of advice that I would give to the young analyst is to make sure you don't get stove-piped in your service and your battlefield capability. Make sure that as you're doing your analysis, that you're doing a broad-based analysis, considering the contributions that the other services and agencies can bring to your fight.

BILL DUNN: You were fortunate in that you got to work with and for people like Wilbur Payne and Walt Hollis and E. B. Vandiver and Mike Bauman. How did that help you?

VERN BETTENCOURT: Not to be patronizing but it was absolutely invaluable. I try and remember as I go through my daily actions the care that I think those people took—maybe not so much Mike Bauman, who is younger than me (*Laughing*)—in developing a young analyst. I think that they clearly saw that—in the Army's current terminology, the development of the bench was of great importance. So I try and remember that as I work with the young civilians and officers that come into the CIO shop, and out in the Signal Corps. All of them were very understanding of mistakes, at least one mistake per topic, and were willing to take that into stride and help develop young analysts. I think that's been invaluable, and I would hope that I continue to repay that debt as I go through the "senior phase" of my career.