

## AEDC Technical Society Luncheon

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AEDC, TN

Peter, Thank you for inviting me back to Arnold – it had been about ten years, I think. It was described by the commander back then as the best kept secret in the Air Force, in terms of the quality of life. I think it probably still qualifies. Your technical capabilities certainly aren't a secret, and they are a world-class as they have ever been.

Colonel Panarisi, Dr. Kraft, thanks for your hospitality and the opportunity to understand your visions for AEDC. I'm impressed. And, thank you all for both participating today and for supporting your home technical society, whichever it is.

Obviously, I believe that my Institute, the American Institute of Aeronautics and astronautics, has a home for anyone who works here. You are all aerospace professionals, and that's our community of interest. We're smaller than some of our sister organizations – IEEE is probably 10 times our size – but the vast majority of IEEE members work outside aerospace. We are the largest society in the world dedicated solely to the aerospace professional, with about 29,000 professional members and 7,000 students. I just happen to have some applications with me.

Peter Montgomery put me a little back on my heels with his invitation to speak with you today. As you might expect from both my current job and 37 years with the Air Force, I've had more than my share of speaking gigs. If you'd like to talk about space transportation or satellite operations or space architectures or satellite communications, or NRO and DoD space acquisition I probably have something in a file I can update. Same if you want to talk about AIAA. But Peter suggested I talk about me. I don't think I've ever done that before, and I'm afraid it makes for a pretty short talk.

I was born in Brooklyn. Entered the Air Force in 1966. Retired from active duty in 2000. I'm married, have a 21 year old son who thinks he's majoring in Basketball at college. And I'm not dead yet.

Are there any questions?

OK, so what Peter really said was "Lessons learned over your career." The challenge is not the lessons; it's the "learned" part. And isn't that the case for all of us. So many lessons, and so many times we don't learn from them. I've been married about 30 years. My wife still asks me if I'd like to go shopping with her on Saturday. I still ask "why would I want to do that?" So many lessons, so little learning.

Let me start with a big lesson that took more than my Air Force career to learn, although I certainly had plenty of chances. That is, quite simply, that no significant space program will be delivered on the

schedule or cost that either the government or the contractor promises. One of the hardest things for a senior manager to do in the acquisition business is to say “no” to a good idea that appears to fit within the budget, or for which budget can be argued.

My first active duty assignment after graduate school was in the Air Force Office of Scientific Research. From there I went to the Pentagon, to the Directorate of Space, where I was the Program Element Monitor for the Air Force Satellite Communications System. AFSATCOM, from the Air Force perspective, was mostly about terminals, with transponders on the Navy’s Fleet Satellite Communications System in geostationary orbit and a classified host providing coverage over the poles. The standard terminal that was to go on B-52 aircraft – several hundred of them, was estimated at about \$50,000 for the electronics and about the same for the installation – hardware and labor.

It was a pretty important program – the first reliable, global communications system, unless you think HF was reliable over the poles in which case you probably also believe in Santa Klaus. The estimated costs and SPO-generated schedules were rolled into the budget in a heartbeat. This was in 1973.

We planned our first terminals to be installed in 1976, with the first satellite to be launched that same year. The satellite, trivially simple by today’s standards, was launched in 1978. And, as with every space system I’ve been associated with, the terminals lagged the space segment in being fielded.

At the time, I doubt anyone was deliberately misleading anyone. I certainly wasn't – contractors and the program offices had consistent, logical program management and test plans, production and launch schedules, and were fully funded to the requested amount. What could go wrong? So that's what I briefed up the chain. In reality, every aspect of the program was breaking new ground, and the costs were probably off by an order of magnitude.

There was nothing fundamentally wrong with AFSATCOM – it's in our nature to be optimistic about our ability to meet technical challenges. The fact that the equipment to test whether the terminal receivers met spec didn't exist, because the receiver were supposed to be more sensitive than any existing test equipment, seemed like just another engineering challenge.

I guess I'm a slow learner, because I've seen the same phenomena reoccur on several generations of GPS satellites, MILSTAR and Advanced EHF satellite communications, SBIRS, NPOESS and a host of smaller programs. We are eternal optimists, and to a lesser extent we are trapped in a procurement system that rewards delays. I challenge you to show me a contractor, or at least the CFO, with a cost-plus contract that doesn't welcome things that increase cost and schedule – which therefore increase revenue and outyear bookings.

A related lesson learned is that those of us who spent most of our careers in government really have very little understanding of how our industrial partners work, from a business standpoint. During the 18 months between when I retired from active duty out of the NRO and when I went back with the Air Force as Pete Teets', the Undersecretary's, deputy for military space, I consulted. I did it long enough to learn that I didn't want to do it any longer, and also long enough to learn a little about how industry leadership is rewarded – what were the metrics.

It was enough of an eye-opener that when I went back in government I asked Aerospace Corporation to get with Boeing and Northrop Grumman and Raytheon and Lockheed Martin and on a non-attribution basis develop a course about this subject that was used to train our senior program managers about what drives their industry counterparts. ROI, EBITA, revenue, bookings, cash flow, accruals, overhead costs, award versus incentive fee, investment capital, depreciation – all those terms that I had heard but didn't really appreciate how they drove behavior.

It was used for a couple of years, but I think it's probably on a shelf somewhere, once another generation of government leaders were able to convince themselves that we already knew everything about private business that we needed to know, and there were too many important things that needed to be done to afford a day or two in training.

The challenges with that string of programs I mentioned were rarely one specific technical problem. Sure, on a program like NPOESS there were, and maybe still are, problems with a sensor design. But the bigger problems were system-level. Too many different things on the same satellite bus. One sensor that demanded absolute stability, and another that had to be in constant motion. Perhaps most fundamental, an acquisition strategy that had the government overseeing the design and development of many major, independent instruments. We took them through CDR, and then competed a contract to integrate all of them on a satellite bus and interface with a completely new ground system. It would trivialize a very complex situation to say that virtually none of instruments that passed CDR were, in truth, anywhere near that level of maturity. So, while I certainly won't defend Northrop Grumman's accountability in the failure of NPOESS, in many respect they accepted an impossible task. However, I think they did it with their eyes open.

It's hard for a senior manager to focus at the systems level. We've been trained as scientists and engineers. We're problem solvers. When there's a problem, we want to look for root cause and focus on that.

One of the best managers I ever worked for – and I was blessed to work for many – was Lt General Forrest McCartney. As a colonel he was the SPO Director in that AFSATCOM SPO I mentioned; and his deputy was colonel-select Bernie Randolph who went on to command Systems Command as a 4-star. You think the dozen or so of us in that SPO

weren't running hard all the time? McCartney got promoted to BG and became the head of satellite communications at what's now SMC, the Space and Missile Systems Center. Years later he commanded SMC, but this was in the mid-1970s.

At the time, then-TRW was the prime contractor for the two largest communications satellites, FLTSATCOM and the second generation of the Defense satellite Communications System, DSCS II. McCartney had a pretty small office that looked south. Another captain and I were in his office one day and asked why he didn't move to a larger office on the other side of the building, more consistent with being a general officer. He pointed out the window where, a couple miles away, was the TRW facility at One Space Park. He said, Robert, they are building my two most important satellites in that building, and I want to be able to keep my eye on them, all the time.

General McCartney certainly had his share of programs with problems. One of his management techniques was to schedule meetings involving himself, his program director and their industry counterparts. When he was the 3-star SMC commander, that usually meant the company program manager AND the company president.

Every Saturday. 8 AM. Until the problem was solved, or at least being addressed properly.

He never failed to get their attention.

Another lesson that I took too long to learn was the impact of the marching army. In the late 1990s, when I was at the NRO, we were faced with a parts problem. It manifested itself on orbit, but the part was being used on several other major NRO and DOD programs, and dozens, maybe hundreds had to be replaced.. In once program, the satellite had been fully assembled and was in final test prior to launch.

When I heard the estimated cost to correct the problem, which in my mind meant simply replacing a part with one that met the spec, I was flabbergasted. Think 8 zeros. OK, much of the satellite had to be disassembled to replace the part, and subsequent satellites basically had to stop in their fabrication cycle while the new part was identified or fabricated, qualified and installed.

What I hadn't realized was that when the flow on those satellites stopped, basically the entire workforce that was involved began marching in place, waiting to proceed. Run the numbers: Today, a million dollars buys about four man-years on a space system contract. A six month delay – not out of line considering what's involved in fabricating and qualifying a part and a redesign – with a program that has 2000 people on it means 1000 man-years of marching army, or \$250 million dollars. A quarter of a billion dollars simply to get back to where you were when the problem was identified.



You can't tell that workforce to go home and come back in six months. And the workforce isn't even all at the satellite factory. When the launch slips, the workforce building rockets also slows down, and the workers at the launch base have nothing to process. One launch delay leads to several others, whose workforces start marching in place. The ripple effect of a small problem is amazingly large, and generally invisible to all but a few senior managers.

Back in that AFSATCOM SPO, I was the Terminal Segment manager. Collins was our prime for the basic radio in the terminal, the ARC-171. It was also going to serve as the line-of-sight UHF radio in a number of high-end aircraft, including the then-being-developed and tested AWACS. We were having problems with the radio, and were putting as much pressure on the company as our \$3 million dollar a year contract would allow. Fixing things might cost a hundred K or so, and we were slipping things out to stay within our budget.

One day, Colonel McCartney got a call from the AWACS SPO Director. His budget was about \$350 million a year. He explained that his test program was facing a stoppage because our radios weren't ready. His marching army was going to cost about a million dollars a day, while we were trying to save a few tens of thousands of dollars by stretching out some fabrication. Needless to say, I got to spend some face time with Colonel McCartney until we figured out to accelerate rather than stretch out the deliveries. We had no idea that we were impacting something else at that level.

Probably the most remarkable person I ever worked for was General Chuck Horner. He'd been the air boss during Desert Storm, and was given Space Command and his 4<sup>th</sup> Star as a "thank you" after the war. I was a new brigadier when we both showed up in Colorado Springs in June 1992. I was the AFSPACE XP, and had only been there a couple of months when he called me into his office. I saw him pretty regularly at staff meetings or when we had XP-related stuff that he needed to see. This was one-on-one, first time that had happened, and I didn't know what to expect.

He had a personnel folder on his desk, opened it, looked at it, looked at me and said "Dickman, how did you ever get promoted?" Well, if you ever dealt with General Horner, you know that he didn't say it exactly like that, but my wife wouldn't be amused if I used the same language he did. I think he could make a sailor blush. His point was that I hadn't had a command – at any level. I didn't serve in the war, I didn't fly airplanes, and I'd never been stationed overseas. He'd lived with certain metrics all his career, and I didn't fit.

Then he told me that my good friend, Jimmey Morrell, the commander of the 45<sup>th</sup> Space Wing at Cape Canaveral and Patrick AFB had been diagnosed with cancer. He'd retire, maybe in a month, maybe in a year, and when he did, I'd replace him. Horner said he thought I could be a pretty good wing commander, and he didn't want me to prove him wrong. Then he told me that General McPeck, the Chief of Staff, has

decided to move the ballistic missiles from Air Combat Command to Space Command, so in the meantime as the XP, I needed to figure out how to do that.

I never learned what Horner used to evaluate people, but once he decided to trust you, he was as good about empowering you as anyone I've ever known.

The Titan IV rocket was my biggest joy and biggest headache while I was at the 45<sup>th</sup>. When I got down there, one had been sitting on the launch pad for more than a year. At my last staff meeting before leaving the Headquarters, Horner had asked me, in front of the whole staff, whether I was going to give it a building number once I got there. He came down and spoke to the local AFA chapter. The quotable, and often quoted, line was "I'm not going to pick on Titan tonight. That's like beating a tethered goat."

As we got the first Titan IV Centaur ready to launch, I knew that the staff back home was giving him regular updates, because it wasn't going smoothly. On the day of launch, we got pretty far into the countdown and then had to scrub for something – I forget what. But, I figured that since it was the first of this big rocket, and it was carrying the first MILSTAR satellite, and he knew we were supposed to launch, I'd call and give him an update.

I explained the scrub, and he asked “Did it blow up?” Of course, the answer was “No.”

“Are you going to try again soon?” Yes, tomorrow.”

“It’s OK to call me when it goes, because you’re going to be very excited and you’ll want to tell everyone. Or if it explodes. But otherwise, you should be worrying about your rocket, not about me. The staff here will have a good time telling me all about the scrubs. That’s what staffs do, tell about other people’s problems– because they really want to be doing what you are doing instead of what they are doing.”

I never called him about an Ops issue again – launch or scrub.

Not long after that, at our morning stand-up, my Ops Group commander explained some problem. There were a couple of approaches, which he carefully explained – obviously pushing the issue up to me. I recalled another Hornerism, a paraphrase of one of Colin Powell’s Rules: “Don’t make someone else’s choices; don’t let someone else make yours.” My answer to that young colonel – who went on to become a general officer and command the missile wing at Malmstrom – was “Good explanation, Clint. Let me know what you decide and how it turns out.”

As I said, I was blessed to work for some really capable and remarkable people. But I have to say that General Horner and Pete Teets were in a class by themselves. I can’t imagine two more different people. Teets

entire career was in industry – one company. Horner was all military. Teets was a careful dresser, tall and trim; Horner is a big man, and usually looked dumpy. Teets was polished, Horner could be amazingly crude. With both, you knew exactly where you stood – Horner would tell you, Teets would give you “the look.” Anyone who ever worked for Pete knows “the look” and you hoped it wasn’t aimed at you. Both were smarter than a whip and as honest as the day is long.

Teets retired from Lockheed Martin as president and COO in 1999. In December 2001 he was confirmed as the Air Force Undersecretary and appointed both the DoD Executive Agent for Space and the Director of the National Reconnaissance Office. About a month later I came on as his deputy for military space – Dennis Fitzgerald was his Deputy at the NRO. When Pete took the job he had to divest himself of all ties with industry. In fact, he had to take out insurance for his Lockheed Martin pension, so that his retirement income was assured no matter how Lockheed Martin stock or any aspect of their business fared.

As some of you may recall, not long after his arrival the Air Force was faced with a procurement integrity problem. Darleen Druyun ended up going to jail, and coincidentally Boeing was discovered to have illegally obtained and retained proprietary Lockheed Martin information that could have given them an advantage in the initial Evolved Expendable Launch Vehicle procurement. It was clear that there would be sanctions applied to Boeing, and since the issue was space launch vehicles, the logical person to make the final decision would be Peter B. Teets.

However, Pete was “from Lockheed Martin” and the general counsel’s office came to him and recommended that he recuse himself from the decision – let the Secretary make the final decision instead. Pete gave the person that infamous “look” and simply said “If I can’t make a decision like this, I shouldn’t be in the position.” He did make the decision, obviously with lots of staff trying to help, and I never heard anyone suggest that it wasn’t fair and appropriate.

The Air Force Core Values are “Integrity first; Service before self; and Excellence in all we do.” They were codified in 1995, when Ron Fogleman was Chief – no slouch in the Integrity category himself and another former boss that belongs in that short list with Teets and Horner. Pete Teets’ example of personal commitment to Integrity stands out in my mind because it would have been so simple to dodge any risk of being accused of lack of integrity by doing what the lawyers suggested, and passing the buck up to the Secretary.

The other bookend in my lessons learned about Integrity came in college. I was in ROTC before there were scholarships. I graduated in 1966, during Vietnam, and most of us were in ROTC, to be honest, because if we weren’t commissioned as officers we were going to be drafted.

As with most schools at the time, exams were always proctored – some faculty member was always in the room. Our junior and senior years, ROTC was a 3 credit hour course, so grades mattered. I will never forget our instructor– a newly-selected Major who would end up being killed upgrading to his Vietnam aircraft not very many months later – passing out our exams and then saying: “You are members of the United States Air Force, and going to become officers. There’s no need for me to stay with you during the exam.” He walked out the door, and closed it behind him.” Integrity first – even back then.

Teets and Horner and Fogleman and countless others in uniform and out, in government and out, were role models to me, especially in how to live my life. In your profession – in our profession – integrity has to be at the core of what we do. Sure, a falsified result on a test can end up killing someone when a design ends up being flawed. But far more damaging would be if the American public no longer looks to professions such as yours as the bedrock upon which the nation can build.

So, let me conclude by saying that I envy you. I envy you being here, in this great part of America. I envy you doing cutting edge work. I envy you dealing with success and failure in ways far more concrete than a monthly balance sheet. I especially envy Colonel Panarisi having command here. And I applaud your service to the nation and to the men and women who serve it.

Thank you and God Bless.

