

The Past Is Prologue - A Panel of ITEA Presidents

A conversation moderated by Matt Reynolds

This article is the result of a panel discussion held on 16 September 2021 as part of the 38th International Test and Evaluation Symposium. The panel was moderated by Matt Reynolds, the 7th president of ITEA. He posed a series of questions to panelists and each provided answers in turn. The lively discussion is revealing and entertaining on personal and professional levels. The editor thought ITEA members would enjoy the conversation, which follows the figure below.



Figure 1: Top Row, left to right: Mark Brown, Bill Keegan, Rusty Roberts
Middle Row, left to right: Pete Crump, Gene Hudgins, Stephanie Clewer
Bottom Row, left to right: Matt Reynolds, Pat Sanders

Matt Reynolds: Hello everybody and good morning or good afternoon, depending on the time zone you are in. Early in the planning of this Symposium it was decided to have a panel of presidents of ITEA, past and present, to share their perspectives on where T&E and ITEA have been and where they are headed. The theme is The Past is Prologue. In other words, the past determines the future. This is the first time the presidents have gotten together to compare their thinking and it's kind of exciting. ITEA has been around for four decades

and it's the first time we have done this, so I look forward to it.

Eight presidents have been able to join us today and the order they are listed in the Program is the order of their terms as president. I served a little prior to Pat Sanders' term.

- Patricia Sanders, Ph.D. (1998 - 1998), Independent Aerospace Consultant
- Rusty Roberts (September 2010 – September 2011), Georgia Tech Research Institute

- Stephanie Clewer (September 2011 – September 2012), Systems Application & Technologies, Inc.
- Mark Brown, Ph.D. (September 2012 – October 2014), Vice President, Scientific Research Corporation
- Gene Hudgins, (October 2014 – November 2016), Director of Test and Training Environments, KBR
- Bill Keegan (October 2017 – November 2019), Executive Vice President, Equator Corporation
- Pete Crump (November 2019 - current), Georgia Tech Research Institute

A word about the presidents. I happened to have kept many if not most of *The ITEA Journals* over the years, and my wife loves the way I have them stacked in the corner. In anticipation of this session, I thumbed through many of them. Doing so reminded me of how T&E has changed, expanded, and improved over the years. Also, it became clear how ITEA has been a facilitator of that movement. The presidents all did their part to make that happen. They did it not only during their presidential terms, but before and after their terms. They did service in their local chapters, on committees, and on the board of directors. So indeed, these presidents are an ITEA brain trust, individually and collectively. I am delighted today to have this opportunity to bring them together.

Okay, now, getting down to business. I have several questions for the presidents to address. The audience is welcome to provide your own questions or comments in the chat box. We'll take time at the end of each question—there are four of them—to allow the panel members to respond. The four questions are somewhat phased into the past, present, and future asking the presidents what got them into T&E and how technology changed that career.

First question, and it's a two-parter.

Q: Initially, what attracted you to T&E as a profession, and how did the rapid technology changes impact your career?

Rusty Roberts: I had the presidency in early 2011 or so. I was privileged to have really two overlapping careers. I was a career Army officer and then a career engineer, basically a technologist. And these fields led me to a field of providing, prototyping, and developing technologies which benefit the warfighter. I was an Army guy but I did a lot more for the Navy and the Air Force pilots in terms of testing and training. So, I saw these technology advances throughout my Georgia Tech career after my career in the Army. And, it drove me to experimenting and testing these technologies in

realistic military environments; I focused on that. I am a T&E'er, but I'm really more of a technology provider for the test and evaluation community. I got to see those technology advances up close and personal and am still doing that today.

Mark Brown: It's kind of interesting, when I was president of ITEA, the first article I wrote for the Journal posed this same question to our membership: "Why did you get into test and evaluation?" But my story is, I didn't seek to go into test and evaluation. I just sort of stumbled into it. And my perception is that most of our membership was the same way. I started off working for the Air Force and the first job I was offered was doing flight test and first-article testing for new technology being inserted into USAF aircraft. My career started with that fusion of technology and testing. I left the Air Force civilian ranks to go to the US Army civilian ranks overseeing the development of advanced technology. But all of those T&E principles that I learned working in the Air Force were ingrained in me and I incorporated those principles in the technology development efforts. Like Rusty I'm a technologist, I'm a geek. Eventually I wound up at Test Resource Management Center (TRMC) as the principal scientist for the Test & Evaluation/Science & Technology Program when it was just starting up. That was really the fusion of my T&E experience with my technology development experience. It's where I think we have to continue to focus as a community because it gives us (the T&E community) the cutting edge we need in order to test tomorrow's technology with yesterday's facilities and infrastructure. I believe we need to be in the position where the technologists are actually fostering improvements to testing. So, my story is that I didn't look for a career in test and evaluation — it sort of found me. And I like it.

Bill Keegan: I was on my way as a colonel coming out of the War College to work for the State Department and be a Deputy for Military Policy. I was told, instead, to go to the office of the Defense Department's Director of Operational T&E (DOT&E) because they cancelled the orders to go to the State Department in some kind of interagency spat. I ended up overseeing Unmanned Aerial Vehicles and fire support systems and later to be the senior military assistant, where I had involvement in oversight of nearly everything. I would say that one of the most important things is to have an open mind when you jump into test and evaluation because it is bit of a niche profession. If you go after the toughest assignments, you get the biggest rewards. That attracted me to T&E and my attraction to it came, like Mark, after I got into it. And then I found it to be almost a

vocational calling to look out for the troops that use these weapons that we develop. And the second part of the question is how technology changes impacted the career? Well, I would say that the biggest changes are just to be open to the biggest and most challenging problems facing the department. Those are apparent all the time. And as technologies become more complex and things become more difficult, the need for T&E has increased dramatically even though the pushback against it is frequently pretty intense. And while a lot of things have changed, a lot of things have not changed. The core principles of testing, I think, remain pretty much the same. What has increased is the need for rigor in developmental testing even more than before. We have these long programs that sometimes go on for decades before full deployment of the system; therefore, you're so invested in these programs that if you don't do good developmental testing and set the conditions for successful operational testing, then you can really be behind. I just encourage everybody to go after it. And there's a lot of commonality obviously not necessarily between systems, but there is commonality between different types of testing and of course, across the services, and across industries. Like I said, I started out as an Army tester, then I got into all the different programs, working for Tom Christie, the Defense Department Director of Operational T&E. It pretty much culminated recently when I was the Director of T&E in Australia in a government billet. Being the director there was a life experience, especially since it's mostly naval. And I will say that if you stick to your core principles and actually engage in learning throughout your career as a tester, these doors open for you if you're willing to put in the effort.

Gene Hudgins: I would say I joined T&E kind of begrudgingly. I came home from Auburn in 1988 and I was just kind of goofing around the house. And my dad said, "Boy, are you going to go get a job?" And I was like, "I guess so." And so, I went to an interview a couple days later at Eglin Air Force Base. I remember it was a Tuesday and I thought, no way will they make me start before Monday. And they called me back and they asked me to come to work on Thursday. So, I was actually pretty upset that I had to go to work on a Thursday, which kind of ruined my upcoming weekend. That was 33 years ago and I've been doing it ever since. Obviously, I've liked it. The part about the changing technology is that I would say I was amazed back then and still am amazed that ranges tend to be on the trailing edge of technology, really ancient stuff that I was working with. That led me to the path of working improvement and modernization projects and to eventually go to work for the Test Resource Management Center, where

they are conscientiously trying to bring new technology into the test ranges and get them away from the 1960s wire wrapped TTL (Transistor-Transistor Logic) circuit boards and stuff that I was working on back then that are still around on ranges. I do see some recent changes taking place, really making conscientious efforts to bring new technology into T&E, on the analysis side especially. So, I think we're getting there but it is still surprising how old some of the technologies are on some of the ranges.

Stephanie Clewer: I had a similar story to Gene's in that I like to say that I got involved out of a little bit of dumb luck. I was going to college down in St. Mary's College near the Patuxent River Naval Air Station and I was a psychology major. My goal was to work in school systems as a guidance counselor. Senior year, a guy from Pax River taught a human factors psychology class; it fit in my schedule so I took it. And I remember him taking us on a tour of Pax River. I went home and I was working with children, and out of that dumb luck, someone told me about a job at the Army Aberdeen Test Center in Maryland. At the time it was called the CSTA (Combat Systems Test Activity). It was in human factors and I got the job because I actually knew what it was, because I'd taken that class. I often wonder, I can't remember that professor's name, but if I could go back and say, hey, look, I actually made a career out of that. That's my story.

Pete Crump: I'll pile on to that as well. Like Gene, my first T&E job was at Eglin, but I went in through the old Range Systems SPO (System Program Office), which was doing acquisition of range instrumentation, threats and drones and things like that. I didn't really know ITEA then. It wasn't until I got shipped out to Edwards Air Force Base that I actually joined ITEA in the Antelope Valley chapter in 1995. And that was a real eye-opening experience for me, because all I knew at that point was Air Force range stuff. I got to meet the China Lake guys, and the Army guys down in Arizona and New Mexico. So, it really opened my eyes a lot and, like everybody said, except for an eight year detour and go-to-war stuff, I've been in T&E ever since.

Pat Sanders: I was working an analytical issue and design problems in a development program on software in Colorado Springs. We finished the development and it was time to go find another job. The job that I found was at the Air Force Operational T&E Center (AFOTEC). That kind of got addictive and I stuck with it for forever, it seems. I think the thing that impresses me, as we have moved forward and continue to do so, is the amount of complexity in the systems we have to test now. It's not just that you're testing an aircraft or a

radar or even a ship, which is pretty complex in and of itself. But there's so much interoperability and so many things that have to work together in order to actually have an effective system. And it gets very difficult until you're almost at the end to get it all together to test it that way, which limits how many data points you actually get. Right now, I'm doing work with NASA. The whole development program to go to the moon, or back to the moon, involves things that they buy commercially, that they set the requirements for but they're buying as a service, and they have things that are provided internationally. You can set requirements and interface requirements, but you still have all these pieces. And then you have the stuff that NASA is developing itself in-house. And in order to get it all to play together, you get about two test opportunities, one uncrewed and one crewed. There's an awful lot of work that has to go into the build up to those final tests in order to have acceptable mission assurance. It doesn't get any easier.

Matt Reynolds: I'll tell you a bit of my own story. Like many of you, it was accidental that I wound up in T&E. When I was in college, the Naval Sea Systems Command sent recruiters to try to get engineers to join their workforce. I became intrigued by the idea of working for the Navy, working for the military, which I had always admired. So, I accepted the job. And when all my college courses were over, I showed up in Washington, DC, on Constitution Avenue. They had me set up with several interviews that day. And the first one I went to was in the shipbuilding program office for a nuclear-powered guided missile cruiser. The idea of working on a cruiser construction program intrigued me and I accepted that assignment. Within that program, there was a small Tests and Trials Office where I was sent for an interview. I interviewed with other offices, but in the end I selected the Tests and Trials job. The first day they gave me a set of ship building specs. Have you ever seen one of them, four inches thick? But I immediately jumped to the test section because that interested me. And indeed, that was my start—my career in test and evaluation—and the timing was great. This was the early 1980s, which was right around the time that Office of Management and Budget Circular 109 and some of the try-before-buy requirements were instituted. The Navy initially thought they wouldn't apply to ships. It certainly did for weapon systems, but the Navy soon learned from OSD (Office of the Secretary of Defense) and closer reading of the legislation, that yes, ships had to undergo independent operational testing. The DOT&E asked the Navy 'how are you going to test it?' Basically, they were asking for a T&E Master

Plan, but the content and format of such a document hadn't even been formalized yet. I pulled together a team who knew the tests and trials a ship and its systems were going to go through and we wrote a plan, which the Navy submitted to OSD. The plan included Operational T&E, to be conducted by the Navy's Operational Test and Evaluation Force. That had never previously been conducted on an entire ship. About a month later, DOT&E responded that the plan was acceptable. I was at the right place at the right time. Try-before-buy and operational T&E became more common, better known, and we had a better idea of what was expected by all of the participants. The NAVSEA Directorate that the cruiser program belonged to managed all surface combatant ships in NAVSEA, and was headed by a two-star Admiral. The Admiral decided that T&E was getting so much attention that he needed someone on his staff to oversee it. Since I had coordinated the development of that master test plan for the cruiser program, I was assigned to the job on the Admiral's staff. A few years later, NAVSEA realized that it was having a lot of questions and problems regarding T&E — and some programs were not doing well in OT&E events. So, it established a Command-wide T&E office. I was selected for that job and was given 10 billets to accomplish it. The rest is history. Once again, I was at the right place at the right time. In 2002, I retired from NAVSEA and became an independent consultant. It was a great career, and I've learned so much. And my involvement in ITEA played a big part in it. While I worked in NAVSEA, I was a founding member of ITEA. I was a new guy taking a new course. And some of the people in that course, particularly Dr. Allen Matthews, encouraged the students to help him form a T&E professional association. That's when ITEA was born and I was in on the ground floor of that too. During the following decade, I worked on several committees and eventually was elected to the Board of Directors, then was elected President. So, it's just awesome. I've loved my T&E work, and I credit ITEA with enabling that.

Stephanie Clewer: Let me interrupt you one second to say ITEA loves you too and we commend you for being the ONLY member who has attended every single Symposium. It wouldn't be a Symposium without you.

Matt Reynolds: Thank you very much. I myself was going to try to squeeze that bit of history in some time, but I thank you for bringing it up. Well, it's very interesting how we all got there, at the times we began. It wasn't recognized that there was a T&E workforce. It was certainly there but it just wasn't necessarily organized in any way. It has come a long way, but I think that

ITEA has done a lot, especially in the Defense Department, Homeland Security, the FAA, and other government organizations. In some of the consumer products, T&E has come to be accepted as not just something that's done at the end of the program to verify that the design will work the way it's supposed to. It continues to be very exciting. I'm absolutely amazed at the content in this Symposium, the speakers, the ideas, the initiatives — they're all masterful and give me great hope for the future, the future of T&E, and the future of ITEA.

Q: What prompted you to join ITEA and to invest your time and energy heavily in it to the point that you were willing to hold the office of president? Many people would find that intimidating, but we all ended up doing it for one reason or another.

Rusty Roberts: ITEA in my mind is somewhat of a unique organization because it's relatively small. The small community is all focused on providing and testing technologies which benefit the warfighter. So, it's a nice blend of engineers and operators that get together for different symposia, workshops, and other events. It actually enhanced my professional development not only on the technical side, but the programmatic side and how government works, et cetera. But selfishly, I got to meet all of the test and evaluation community, both government and civilian leaders. And through my years of service on the Board, culminating in the presidency, I got to cement some relationships that last till today. George Rumford, just to throw out a name, is one that I've known for 25 years now. And we had a science and technology workshop in Atlanta where we hosted the Special Operations Command (SOCOM) Science and Technology advisor, a former astronaut. That is what led me to stay with ITEA. Being the president is really just an opportunity for me to give back to the organization. And I had fun that year and a half. This panel right here gives you an idea of how we stay in touch informally, but also formally. We've cemented those relationships for many, many years.

Gene Hudgins: Rusty, that's funny that you mention George Rumford because it was that Atlanta ITEA workshop that was my first one. Steph and I were there and we were working on a CTEIP project called Foundation Initiative 2010 to create the Test and Training Enabling Architecture. Between George being there and wanting to have an exhibit, we saw ITEA as a good venue for us to promote things that were being built at the enterprise level for the T&E community. And that's why I've stayed involved. We were creating things for what was back then DOT&E and now TRMC. We kept participating

in it as a venue to let the community know what we were working on. The second part of the question, about why did you become a president, that's funny. It relates directly back to George as well. George was on the Board of Directors. The office of the Judge Advocate General at the TRMC made the decision at the time that he could no longer be on the Board of Directors and he called me up and asked if I could finish out his term because he didn't want to leave them hanging for the last couple of years. So once again, this is the story of my whole T&E career. I begrudgingly said, yeah, I guess I'll finish out your term. Like all things that I think are one-and-done kind of things, I wound up staying on, going through all of the successive board positions and becoming President. It was because I was a fill-in for George. But once again, I figured out that I did like it and I really like the community and I was learning a lot and it is really beneficial and that's why I stuck with it.

Mark Brown: It's funny the way we have all worked together. I think I was the technical chair of that Atlanta ITEA workshop. I got involved with ITEA because I went to work as a contractor for the DOT&E as the principal scientist working with Wynn Atterbury. And Wynn was starting the ITEA Test Technology Reviews (TTRs). Wynn asked me to get involved with it. I did and that led to my further involvement with ITEA. Back in the early days, Rusty and I did a lot of the TTRs together, then the symposia, and ultimately, I was elected to the Board. I ended up as Secretary, then Vice President, and finally President. Next year will be my 12th year on the board. I guess I'm a glutton for this stuff and it's why I stay involved. It's not ITEA or test and evaluation. Rusty said up front, we're a small community. It's this relationship between those of us on this panel, those in attendance, and the folks we work with. That's why I've stayed, it's a relationship, it's a family.

Matt Reynolds: Mark and I were exchanging some information back and forth before the Symposium. You brought the point up, beautifully I thought, that one of the really big benefits you feel from ITEA, one of the things you've gotten out of it most, is the contact with other people. People in ITEA have just absolutely been super and sharing their time and knowledge with the Association, but also with every one of us individually. I've never had a problem calling someone up with a question, someone that I didn't know all that well, another ITEA member, and having met them at symposia and things like that, was a way of unlocking the door. And everyone always went out of their way to be very helpful.

Bill Keegan: That's a good point, Matt. One of the things that got me into ITEA was the late, great Ernie

Seglie, whom I'm sure most people here knew. He was a really great mentor of mine and a very good personal friend. He used to tell the Director and everybody he met, including calling up every single operational test agency commander, saying "This is your Association; this is the glue" and not a lot of people in that position in government today are doing that specific thing as advocacy (for ITEA). His driver with that was to get me involved in ITEA because it was important. But also he understood the criticality of T&E education and the fact that this was not contract based — it wasn't like an NDIA thing; it was all about educating the workforce and basically creating a common understanding of best practices that really benefited a lot of people, especially young people in test and evaluation or even first-time people in T&E — people who had never been in T&E before. Obviously, we visited Pat Sanders and people in all different programs and the Missile Defense Agency (MDA) and every place else and going to big test events. But, we also visited a lot of small programs. I can tell you, when you get to those programs that are not so well known and not so big, you'd be surprised at how many T&E practices are not done well. And this is why I think ITEA becomes so important when you get the support of leadership in both government and industry. That crosstalk solves a lot of problems in that you end up creating somewhat of a common language. Let's call it Esperanto for T&E. It creates a level of commonality that allows people to communicate. I've been to some programs where there's total disagreement on what a TEMP should have in it. Obviously the 5000 series DoD directives drive things for defense related programs, but that kind of discussion doesn't need to take place. We really are kind of the guardians, along with the Defense Acquisition University (DAU), on what standards are. I would not underestimate the value of ITEA for both government and industry leaders, especially industry. We started that initiative through DT&E with ITEA and the NDIA ICOTE (Industrial Committee on Test and Evaluation). If you remember back, we talked about the Chief Developmental Tester in industry becoming a requirement. A lot of these things were pushed by our T&E organizations, especially ITEA. It basically facilitated common understanding, a common language, and I would say, separating the wheat from the chaff and taking a lot of things out of the way that were harmful in T&E. I think it's just a great thing. One thing I'd like to do is whatever Ernie Seglie did to get me in T&E, I think it's great that I repeat that behavior to get others in it. And I hope others do as well.

Pat Sanders: I can echo the value of having a mentor. As I mentioned earlier, I was brand new to T&E

when I went to AFOTEC. I was also cognizant that I didn't know a whole lot about it and I was in a sort of niche of what all of T&E is. The mentor I had at that time was Marion Williams, whom I think most of you know. He encouraged me to join ITEA when it first formed. So, like Matt, I'm a founding member of ITEA. I learned a great deal through the interactions, through all the contacts, through all of the people you could call, people you could lean on. It was worth sticking with; it was really important to stick with through the career, up to the time when I was President. I probably had the shortest tenure as president of most of you. I ended up having to resign for the perceived legal conflict of interest with the job I had. But I still felt it was a place that I could go and I still belonged to it, I still was a member, and I found that I could call on ITEA professionals for advice, for action, for caring for the profession, which became part of my actual career job. But it was important that there was this entity there that would be the standard bearer for the standard, for the practice and the best practices, and the professionalism of it all.

Matt Reynolds: One of the things that Bill and you both alluded to was the support we've had from OSD, DOT&E, DDT&E, etc. I've always been impressed with how open and supportive they've been of ITEA. And they're very quick to sign up, when they can, for our events to be speakers and all sorts of involvement. On several occasions, I had to consult with Pete Adolph and he was always very responsive. I got to know Pete through ITEA on several occasions and met him at meetings. All these people were very generous with their time. At events, they would stick around afterwards and talk about issues of the day. You might write that off and say we were helping them implement their policies and agendas. But I think it was more than that. I found it very, very helpful to know these people, to get to understand them, and to feel like it was someone I could come up to in a crowd and ask a question. We are a small community, but I think it's very tight knit; it always has been. Building on what Mark said at the beginning of this discussion, it's a small group and we're all very close and trusting and want to be helpful and mentor each other. You can't ask for anything better. I've been involved in many associations, engineering associations of one type or another, but I haven't seen anything with the close camaraderie and sharing that ITEA has.

Pat Sanders: I would add that you said, for somebody like Pete Adolph, ITEA was helping to further his agenda. But I think ITEA also helped to shape those agendas.

Matt Reynolds: Absolutely! Which made us all feel good. We could influence and they were open to being influenced and to openly discuss where they were—when they agreed and disagreed with us—which gave us further insight into what they were thinking and often providing further insight on how best to work on them to convince them otherwise.

Bill Keegan: That's exactly right, what Pat just said. It's kind of great, and it's also funny. I have a vignette about that. I was chairing a panel at the podium and I posed some really difficult questions. Brian Simmons from the Army T&E Command was up there, and someone from the Navy, etc., and from multiple agencies up there. And what I exposed by asking these tough questions were things that they didn't know and they ended up coming up with an inter-service agreement right there on the stage because they recognized that they had all these misunderstandings about each other. The value of it was good. I think it's also important that it's against the T&E community's culture to just be an echo chamber, a bunch of yes-men, right? So, there's real value in finding out ground truth of what's really going on everywhere. Because if you just listen to yourself and your staff, you're not really getting the whole picture of the problems that a lot of these people are having out in the field. Not to mention at the ranges and in the test labs or things like that, you find out why it's taking so long for a contractor to come up with a fix to a problem with software for flight controls. You find out all kinds of interesting things about how bureaucracies affect these engineering behaviors. I say we keep it up.

Q: From what you've learned and experienced over the years in T&E, what career advice would you give to the next generation of testers? Based on your own experience, if someone brand new to T&E walked in your door and asked for your advice, what would you tell them?

Mark Brown: I shared this with Matt earlier. I adopted the phrase, *Semper Gumby* – Always Flexible. It is the unofficial slogan of the Coast Guard and the Marine Corps. It is a philosophy I try to use in my personal life. The best advice you can give anyone, especially a young person in this career field, is to stay flexible. That test is not going to go the way you expected it to; in that experiment, something is going to go wrong. If you are so dead set that it must be letter perfect and follow theory, you're going to be greatly disappointed and frustrated. So be flexible and adapt to the situation. We are all blessed with incredible brains; use those brains to solve problems. Don't get upset or mad because it didn't go the way you planned. Our job

as testers is to figure out where the fringes or edges are, where things break. You're doing your job if you find those points, where things break. Remain flexible in the journey because you spend a lot of time at work, a lot of time in the career. You better enjoy what you're doing because you spend a lot of time doing it. Those are the two best pieces of advice...I don't care if you're going into test and evaluation or any other profession.

Bill Keegan: I would also like to say something along the lines of actually seeking challenge. That's how you become good at your job, in your profession. Don't ever settle into a position and remain static there. That's true also, like Mark said, with almost everything. But more importantly to T&E specifically, after having been deeply involved in some complex programs, more recently submarines and things like that. One of the things I think is important is that we don't pigeonhole ourselves just in T&E, or just in Operational Test. We should be willing, especially as leaders but also as individuals, to float between engineering and test jobs and different types of T&E, developmental or operational testing. I think there's a lot to be learned when you actually see problems from a different perspective. I've had an engineer tell me: "We don't need to test that because I didn't design it to fail that way." That guy needed a T&E assignment. We also have testers who don't appreciate the difficulty of the problems that need to be fixed, and the complexity and how balances are affected when you fix one thing and it affects something else. Young people throughout their career need to take advantage of all of these professional opportunities; leaders need to facilitate that. One thing that would be good for government, and I don't know how many government people are listening, would be to figure out a way where young people can actually find it easier to spend time in government, then in industry, and back and forth. We don't really need testers to learn that much about bureaucracy — that will happen. We need people to learn about hard engineering and the skills of testing. And on the flip side in government, to have oversight of that and to really be good at making sure you take care of the troops that use this equipment and make sure they can accomplish a mission. I think those together round out the T&E professional.

Stephanie Clewer: I just wanted to say one thing and that is I think this message came out in the question before this, and that is finding a mentor. Finding a mentor is very important, even if you luck into it the way I did at Aberdeen. First, Ray Pollard then Brian Simmons, who believed in me and had me go to those events. That's where I got a circle of strong people throughout the community, in industry and in government, and

that network that everybody else talked about. Then my mentors expanded to people like John Bolino. Having a mentor that believes in you and will support you in broadening your perspective and in learning new things, doing details, whatever it takes. What I say to people like us gray beards is, be a mentor. Find that young person at the event and walk them around and introduce them to other people so they can benefit from what ITEA can give you, both personally and professionally.

Gene Hudgins: What I would say, Matt, is that T&E is really important. There's a reason that we have these processes where you have SILs (System Integration Laboratories) and ISTFs (Installed Systems Test Facilities) and hardware in the loop, and open-air testing. I still see people or programs wanting to skip processes and steps and not follow good systems practice. And it almost always comes back to bite them when they don't do things in a methodical way. And then the other part of the question, I see the influence of T&E kind of ebb and flow across time. Sometimes it becomes "we don't like those T&E'ers and we don't want to listen to them" and all that. But right now, we're in a time period where I do think programs and high up government people are listening to what the test and evaluation community has to say. I do think we're having a lot of influence on acquisition programs right now. It's a good time to be in T&E.

Pete Crump: I'd echo that. As the current president of ITEA, I see the effects of COVID, especially the last couple of years. Also, the younger workforce doesn't work the same way we worked. They don't have a plan for getting into a job and staying in that job for 20 or 30 years. There really aren't any good formal mentor-protégé arrangements at a personal level. There is no longer explicit government support for professional associations like ITEA or NDIA or AFCEA or whatever, fill in the blank. Rusty and I have worked together and we're trying to push down to the younger engineers to get involved in these professional associations, make connections through them so that you can branch out. You see how other people work, you see what they did when they were faced with these challenges. You build relationships that you can use. Like you were talking about Matt, you can go up to somebody and say, Hi, I work T&E down at Eglin and I heard about your program through ITEA. Can I talk to you about how you solve X, Y, or Z? I worry about keeping the young engineering staff and T&E'ers engaged into the future. I have a 22-year old daughter and sometimes I wonder if the easiest way to connect with her is to text her. I can't call her, I can't be with her, but I can text her and she'll get

right back. So I have to figure out how to 'text' people for ITEA.

Matt Reynolds: Something was on my mind as the last few of you were making your points, and at the previous session on the T&E workforce. Some of the discussions were fascinating in that there are a lot of great ideas, a lot of good initiatives out there. But they all in many ways point to the fact that we're not as well organized in a T&E business as we should be perhaps, in terms of being able to support the more complex programs of the future. By complex, I mean, what we're testing is no longer just a system. It's enterprises of systems, it's policies and procedures, it's data. Everything has to be verified because we're finding out that the weak point can be any one of those and even in other areas. So, T&E is getting more and more expansive. The T&E workforce needs to be trained in many different disciplines, not any single person necessarily. But we have to have a good mix of all of them on any program. So, the job is getting tougher. And I'm thinking the role of professional associations, in our case ITEA, is going to become all the more important. We've done a masterful job in the past. But we need to do more in the future. I'm not being critical of anything or anybody. What we've done is amazing. It's just the job isn't getting any simpler. I think we're on the right path and you folks with your thinking, your involvement, have really helped us come a long way. I think we're an exemplary association and fulfill our mission very well. As a matter of fact, I want to give ITEA special recognition. I was on the website the other day. I purposely went on there to read our mission statement. Please think about it as you read it. "Our mission in ITEA is to advance test and evaluation globally by providing professional development resources, best-practices, network, and learning opportunities for the T&E community." That is a mouthful and it's inspirational. But more importantly, I think ITEA is doing that very well. And I've certainly seen it in everything we've done in recent years... and in this Symposium in particular. I really look forward to this pandemic being over when we can all meet together, look each other in the eye, call each other names or whatever. We will meet at an Irish pub and it would satisfy me. I'll be great with that when that time comes; I'm counting the days.

Bill Keegan: Hey, Matt, I just noticed something in the remarks. Malcolm Tutty from Australia and Brian Gillett from the UK, our good friends there, and I obviously lived with them for four years recently, they just called out this agreement between Australia, UK, and US for strategically important reasons on the submarines. Obviously, that will extend into other areas as far as the

relevance and how it impacts other programs. But it goes to show how important it is for us to work together as T&E people. Not everybody has the same level of a T&E workforce or infrastructure. Our allies, especially the Brits and the Aussies, are just so great and they're just so important to our team. Working together is just so important for the freedoms we enjoy. I just wanted to call them out and recognize that. Please read the news and you will see some big deals that are going on in the world right now regarding nuclear power in vessels and support from us within the Indo-Pacific region. That's happening in real time with our testers right now. And there's Americans, Brits, and Aussies all working together in the T&E world to make this happen well.

Pat Sanders: I would echo what Bill said about diversifying your background to strengthen your profession. Broadening is really important because, to really understand what the value of your testing is, you really have to understand what the complexities are of developing, designing, and fixing. If I do a foot stomp in just one area, I say treat T&E as a profession, not a job. It must be treated like a profession that you live with, grow in, expand and be a part of a community.

Matt Reynolds: Pat, how far away from that do you think we are?

Pat Sanders: I really don't think I have the pulse on that right now. I don't think it is for the current generations coming up because they have more tendency to jump around. Which can be good if you do what Bill was suggesting and get a broad perspective. You have to feel that you belong to a profession.

Bill Keegan: I don't think that it's something you necessarily just work toward and achieve and then you're done. I think this is a continuous thing that requires our attention.

Q: We've talked about the T&E work force and what it needs to focus on in the future, which fit in nicely with the previous panel on the T&E workforce. Separate from the workforce—the people—what would you suggest that ITEA as an organization be prepared to do in the future to best serve its constituents, the profession, and its members?

Gene Hudgins: Cure COVID so we can have in person meetings as a first step. When I first started thinking about this, we always talk about having these lower-level workshops down to where we get the working-level people involved in ITEA, instead of just high-level people. Get down and focus a lot on demonstrations and training and try to get working-level people participating and attending workshops that are done at the different technology levels.

Pete Crump: That's a good point and I'll pile on. COVID has forced us to get creative about how we get education offerings out to the ITEA membership. Lena Moran found this Acelevents platform that has been excellent for us for a number of workshops and two Symposia now. But then there's also the Lunch and Learns. We've been pushing out these Lunch and Learn events, 45-minute events that you can do at your desk, virtually, though they don't take the place of in-person events. We went to the MDO workshop in El Paso back in July. It was fantastic to get back together and then the COVID Delta variant shut everything back down again, and since then it's just been fits and starts. To build off what Gene said, being able to offer more workshops, maybe that's some hybrid event, in-person and virtual, maybe all virtual, maybe all in person — just more of them and at a finer technology grain, more working levels like Gene said.

Matt Reynolds: Well said, that's very appealing. That should be an initiative of ours in the near term. Again, we won't be able to do much with it until COVID is over, whenever that's going to be. But you're right, there's certainly more to be done in the way of educating and mentoring the T&E workforce. ITEA seems to be well equipped to do that with the people, with the mission, with the dedication. So hopefully this will come about. And certainly this is the right group of people to vote on that for starters.

Mark Brown: In the last question, Pete talked about his daughter and how he communicates with her using texting. Several of us have pointed out the fact that the younger workforce, our future, has a different work style and work expectation. They have a more mobile ideology where they work at one job for a while and change jobs. They are more mobile than my generation where people generally worked at a job for a longer period of time. We have seen a decade of changes in our profession unlike any time prior. Not only in technology advancement, but in our workforce composition. We have to be ready to adopt new ways of "doing business" in ITEA and address the way the next generation works and communicates. Doing things the way we have always done them won't work in the future.

Rusty Roberts: Hey, Matt, let me weigh in on a couple of things. So even with changes of jobs and stuff, I bet you that the test and evaluation function, if you will, will carry with them over jobs. So being in the ITEA organization should help them even if they do different jobs. But I would recommend that the organization make an effort to find those people that don't even know that they are T&E'ers. Everybody on this panel

somewhat accidentally became a T&E'er. We may use the fact that we belong to other organizations, but then realize that those people that we meet outside of ITEA might rightfully belong in ITEA as well, much like the panel members we have here today. The other thing I wanted to say was that as leaders of organizations or people, with authority and budgets and stuff like that, to go ahead and budget for the people to join professional societies and take those trips. In the scheme of things, it's an insignificant amount of money for the travel and the return on investment is so vast. Let's assume you can't give people the salary or bonus that you'd like. But you can send them on trips and reward them in other ways, such as ITEA conferences. At Georgia Tech, we allow them to go to the ITEA conferences and present a paper, which furthers their promotion opportunities. I would just recommend to the organizations out there to seriously consider your organization's commitment to not only ITEA, but to other organizations as well.

Bill Keegan: I think also we need to support the current leadership of ITEA, Pete and his successors, by realizing that we need to set the conditions as an association. The young people aren't going to show up on their own. That's part of the mentorship thing, leading by example, that I think that we as ITEA leaders and even as the government people in an advisory capacity, need to make sure we maintain contact with senior leaders in the test community and engineering community and acquisition. Make sure they not only show up themselves, but encourage their people to be dragged along with them to these venues to attend, listen, and learn. There have been some real high points. Pat, if you remember, we had a conference in Las Vegas and we had 400 to 500 people in the room as a minimum. We filled the entire place and every single senior leader in OSD T&E, in the Army and the Air Force; everybody showed up. I realize that we go through certain peaks and valleys with that. We've been in a little bit of a valley for a while. I think we need to kind of "crack the code" as the overarching team, past and present, people who have the contacts in government, to make sure that we don't stay in that valley very long. Once you get the involvement of the leaders, I think you'll see that it naturally flows; that the people will come with them for a variety of reasons.

Matt Reynolds: Rusty, you mentioned that Georgia Tech will fund someone going to a conference if they're giving a paper.

Rusty Roberts: That's a carrot. We pay them to attend anyway, but use the fact that they can give a paper as a carrot. It's not the budget situation, it's more of an opportunity or a platform for the person.

Gene Hudgins: We have the same policy at KBR. If you present a paper, they pay for you.

Bill Keegan: Besides the conferences, we also have *The ITEA Journal*. One of the things we should encourage is the chance for young people to team together, three or four people, whatever, under the leadership of a mentor. I know Ernie Seglie had done this a number of times. We got people to jointly publish who had never published before. That's a great thing for young engineers and testers to be able to do in *The ITEA Journal*. And, quite frankly, not just T&E information, but some developers to put some of that out there so we understand what they're doing. It gets them published and I think it adds a lot for young people; I think they like seeing their name in print.

Matt Reynolds: As you were saying that, I was thinking through my career and meetings I've gone to. Sometimes I had to pay my own way. But after a while, you get pretty heavily invested. In my case in T&E, I always felt it was well worth the cost or whatever. I think we want to instill that in some of the younger people so they understand the value of that. Nothing beats a symposium, I think, an in-person symposium. And it's not just the papers, it's the luncheon together, sitting down at a table of people you don't know, meeting and finding out what their jobs are. Maybe going out for a few beers in an Irish pub in the evening. There's just so much value in that. I can't say enough about it. And also to hearken back to something that I want to give a lot of credit to. I told you I was thumbing through some of the old Journals, pretty old and some recent ones, too. Wow. That is jam-packed with great material very well written on hot topics du jour. Sometimes I'm amazed to reach back and say, oh boy, here we were 15 years ago and someone published an article on artificial intelligence. I thought that was just invented five days ago. Not quite. But nonetheless, the material in there is great and kudos to Dr. Laura Freeman and her predecessors. It's been awesome over the years. And even by itself, I think it's a big selling point for ITEA. I think it would be great if some of the folks would take their *ITEA Journal* into the office and leave it on a desk and cause people to ask "Oh, what's this about" and zip through pictures of previous symposia, et cetera. I'm really high on ITEA. It's meant so much to me. And I think it can and should be to the future of T&E. And that future is very bright, but it's not getting easier.

Gene Hudgins: There was one last comment that just came in from Paul McNamara regarding if we really think there's that big of a return that people would pay to be members of ITEA on their own. This goes back to whether it's paid corporately or paid individually.

Rusty Roberts: We agree and it's a good point, Paul.

Stephanie Clewer: We need to make it more appealing to the newer generation who's interested in different types of venues or different types of topics. How do we make them want to join?

Pete Crump: That's the challenge that we've been facing. Bill talked about peaks and valleys. I was thinking about that earlier today. I don't remember who went through sequestration. I think it was Chas or Mark or somebody, but 2014 was tough times; this is tough times. We go through good times and bad times, so we'll muddle through and make our way. It's important that, and I've been telling the board this a lot, that we be able to reach down into our organizations and make connections with that next generation. Rusty and I have had this conversation in a lot in other contexts. We've got one guy named Anthony Argento, a great guy. His first ITEA workshop was El Paso and he's like, I want to be a member. I said "Exactly. You have the right skill set, you have the right temperament, the right attitude. I want you to be involved." It seems awfully labor-intensive to get them one at a time, but that's almost what you have to do.

Mark Brown: And the infection will spread.

Gene Hudgins: You can see at that last MDO that tutorials are really big producers. A lot of people come in just for tutorials because you focus on the training part. We had very good turnout for the tutorials.

Matt Reynolds: I think the stand-alone courses do very well too. Any parting remarks, any other questions, anything that needs to be said before we wrap this up?

Sentiments of all: I enjoyed being with all you folks. I wish it was in person.

Pete Crump: Let me read what Lena just stuck in the chat. "We rely on our Chapters to spread the word, get involved and get these young folks involved." And that's a really good point. Thanks, Lena, for pointing it out. It really is. Other organizations aren't structured necessarily like we are. We have Chapters and Chapters are local. And someone said all politics are local, but we are trying to energize at the Chapter level, the leadership of the Chapters, and get them engaged with reaching out to those people that they work with. I'm not just in a T&E organization as you have all pointed out, but in the development environment as well. So, we're working on it right now.

Matt Reynolds: I'm not up to speed on this. How strong are the Chapters today compared to ten years ago or whatever?

Pete Crump: We have fewer of them, fewer active Chapters. We have 30 chartered Chapters and 20 active Chapters. And some of the active Chapters are active

Chapters of a few. On the plus side, we're growing back up. Charlie Garcia and Jerry Tyree at White Sands Missile Range just got the White Sands Chapter standing back up. That's a big deal because it had gone dormant; they're re-energizing. The MDO conference got it back on everybody's radar, so that's a good thing.

Matt Reynolds: Hopefully, maybe better times are ahead. We've got to get past this pandemic and a few other things. The demand is there, the need is there. I was really taken by the information of the T&E workforce and all that's going on there. It just reinforces the fact that technology is racing ahead. That's not going to stop. And it's certainly not going to make the job of testing any easier or simpler. I will end with a little bit of a story, a personal story that goes back many years ago. I was in a meeting with a Navy captain. It was actually an OT readiness review. Afterwards, he and I were chatting; the results were pretty favorable and he was in a good mood. He told me there are two things that the best T&E'ers seem to have in common: gray hair and hemorrhoids. The gray hair makes you look distinguished and the hemorrhoids give you that look of concern.

Thank you all very much. It is great to see you again, even virtually. Thank you for your contributions. There was a lot of energy that came out of the ideas here. I hope it lasts and takes foot. I certainly will promote it wherever I can. You're also strong proponents of ITEA; I don't doubt you will do the same. Thank you, Lena. You are awesome.

Panel: And thank you Matt for putting it together.

Closing Remarks

The theme of the Symposium was "Evolution of T&E in an Age of Rapid Technological Change." In deciding how to transform the video most expeditiously from the panel discussion to text that could be rapidly edited, it seemed appropriate to resort to modern speech recognition software. Danielle Kaufman, editor of *The ITEA Journal*, graciously processed the video file. The result is a plain text file containing one paragraph and 11,564 words. This article resulted from listening to the video while manipulating the text file into discrete conversations. That was almost as enjoyable as the panel itself. I will share a few amusements from the transcription.

The spoken phrase "T&E" was rendered as "teeny". In the discussions it was often followed by "workforce" or "resources". "T&E'ers" was variously rendered as "teenagers", "teen years", and "tea and ears". "Testers" was rendered as "gestures"; "testing" as "test thing"; and "ITEA" as "IT", "idea", and "IKEA". Finally, several panelists referred to something Gene said. The phrase

“Gene said” was rendered as “Jay-Z”. And, of course, there were entire sentences and paragraphs that I could not begin to penetrate or ascribe meaning, usually due to network issues with the speaker’s connection.

This illustrates that machine learning is not all that different from human learning. Sometimes it produces really helpful results; sometimes it’s inscrutable and

confusing; and sometimes it’s entertaining even when it didn’t intend to be. □

Acknowledgment

Special thanks to Danielle Kaufman, editor of *The ITEA Journal*, for processing the mp4 video file and saving me many painful hours.



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