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**Remembrances of Duane McRuer
on the 10th Anniversary of His Passing**

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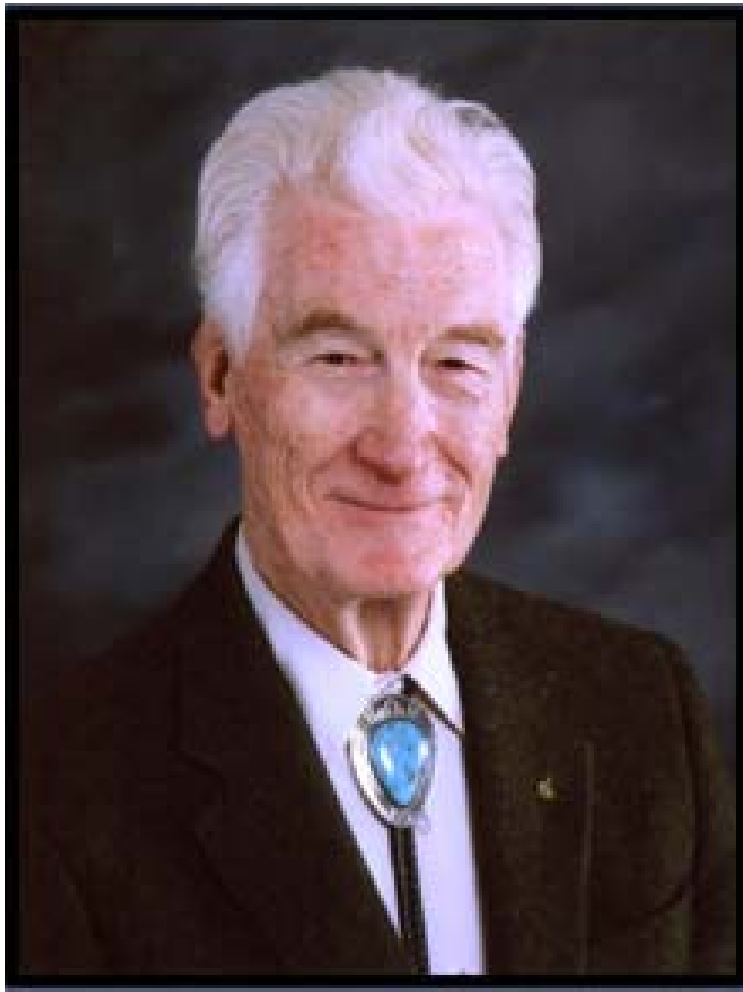
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INTRODUCTION

Duane Torrance “Mac” McRuer passed away 10 years ago, in February of 2007. While he participated in many technical committees over his career, it goes without saying that the closest to his heart was the Aerospace Control and Guidance Systems Committee. Mac’s technical accomplishments have been well documented and his work continues to be cited in the works of his peers and more importantly the younger generations of engineers and scientists. Inspired by Dr. Alexander Efremov from the Moscow Aviation Institute and a member of ACGSC, the purpose of this document is to collect personal remembrances of Mac to share with current and emeritus ACGSC members. If those reading this document feel so inclined, additional remembrances may be submitted to David Klyde (dklyde@systemstech.com) for inclusion in future version.



Duane “Mac” McRuer
1925 - 2007

“HELPING THE NEW GUY”

A Remembrance of Duane McRuer by Shawn Donley

I started working for the Navy in the fall of 1971, hired just out of undergraduate school to work on control systems for the flight control branch at what was then the Naval Air Development Center in Warminster, Pennsylvania. Their charter was primarily R&D, with a bit of fleet support thrown in to keep us grounded. My very limited resume at the time included a couple of undergraduate control courses and a few technical summer jobs with hands-on hardware experience. But my undergrad focus was control systems for radio communications; things like antenna pointing servomechanisms and variable delay lines for radio astronomy interferometer antenna arrays. What I knew about flight dynamics at the time would fit on a paper airplane.

My boss, Charlie Abrams (another colorful figure) took me under his wing and assigned me to help with a R&D study he had going with STI, who he said was the best in the business when it came to control law synthesis and analysis. We made a trip out to Hawthorne to go over the progress on the effort. Charlie and Mac were long time associates and friends. That's when I first met Mac. To a very young engineer just starting his career, he was tall, distinguished and imposing figure of a man. I had already heard about his accomplishments at Northrop and felt quite nervous to be in the company of someone with his expertise and experience. As I recall, Bob Ringland, one of STI's senior engineers assigned to the project, started to go over the technical details. Something about “t-theta-2” and other strange words emanated from Mac and Bob as they showed us sigma Bode-root locus plots, a graphical analysis combination I had not seen before. It was abundantly clear that knowing a little about antenna servos wasn't going to help me survive the day.

Then, to my absolute horror, Charlie excused himself, saying he had to make an important phone call and left the room. It only took about another minute or so for Mac and Bob to notice my glazed-over eyes and panic stricken face. They put the presentation slides down (they were physical slides in those days) and for the next hour or so I got a crash course in fixed wing longitudinal flight dynamics. To this day, I think Charlie and Mac had planned this all in advance, but could never get either to admit to it. But Mac was like this. He would take time out of his busy day to help you understand something or get over some technical hurdle. This “new guy” owes him a debt of thanks, for what happened that day and again many other times during my career.

Mac had another side that I only saw once. I never knew him to raise his voice or openly exhibit anger, but he could, in a sparsity of words, make you feel like you just hit brick wall. It was the fall of 2005. Mac was one of the founding fathers of the Aerospace Control & Guidance Systems Committee (ACGSC) whose mission is to provide a forum for discussion, development, and rapid dissemination of technical information related to aerospace control and guidance systems. The national organization which was sponsoring our ACGSC meetings was not happy with us. In the new leadership's view, the purpose of the ACGSC was to solicit and cull papers for the national organization's large conferences, not hold technical interchange meetings of our own. This flew directly in the face of the original intent of the committee (see history at <http://www.acgsc.org/history.php>). As the committee's vice-chair, I witnessed a discussion between Mac the national organization's president, who was outlining what we as a committee were going to do moving forward. After he was done, Mac simply responded in an even and steady voice “We were here before you were around. We'll still be here after your gone.” End of discussion. And indeed, the ACGSC is still very much alive!

“MOSCOW ON THE PACIFIC”

A Remembrance of Duane McRuer by Dr. Alexander Efremov

I remember the seventies of the last century – not the best period for USSR – US relations, the period of so-called “iron curtain” between USSR and the other world. But in spite of it this curtain had some holes. One of them allowed to get the foreign scientific journals and books. It was the time when I became interested in pilot-vehicle system investigations, and their application to practical engineering tasks. Through the literature, I have known the names D. McRuer, I. Ashkenas and others, eagerly read their articles on pilot modeling, handling qualities and dreamed to see these people in the future.

I did not suspect that this future will be soon. The matter in fact in 1972 the agreement on the exchange of Soviet Union and American professors was signed by L. Brezhnev and R. Nixon. It allowed the Russian scientists to work almost a year in the American universities. Such possibility gave me the chance to work 10 months at MIT in 1976 - 1977, in prof. Larry Young’s Pilot-Vehicle lab as associate fellow. At the end of my staying, Larry and his colleagues helped me to visit some US universities and research centers. One of them was the Princeton University where my host was prof. D. Graham. After the seminar during our talk I told him about my plan to visit West coast, in particular NASA Ames and Stanford University, and a dream to visit STI. Prof. Graham immediately called to D. McRuer and agreed my visit in his company.

It was April, the wonderful period for the visit California – beautiful part of US. At STI, I saw a tall man with smiling face and red hairs (as mine too). We spent almost a day with him, Irving Ashkenas, Wade Allen, Richard Peters. and others. D. McRuer presented me some of his articles and reports (which I kept them in my office up to now). I saw here the simulator for the driver – automobile interaction investigations and got many useful information which I used in my following research at my lab in Moscow aviation institute. The evening of this day we spent together with the Mac, his wife Betty and colleagues. This day was full of impression for me and I talked about it to my friends and colleagues when I returned back. By the way D. McRuer is the well-known name to the Russian engineers and scientists working in dynamics of flight, control system design areas. His articles papers, books are widely used in Russia in research and design process.

After my return to MAI, I started to work in pilot-vehicle system area rather intensively and the results were presented at a number of international conferences. Maybe it was the reason that I received the several grants from the international organizations. It was very interesting period when the “iron curtain,” which I wrote above, disappeared and even US Air force was allowed to give contracts to the Russian scientists. One such contract I received in 1994, and Wright Lab sent my final report to Mac for the evaluation. I was extremely happy to get his positive review on this report dedicated to the development of PIO tendency prediction criteria. I appreciate very much his and Ralph A’Harrah’s initiative and active participation in organization of my lectures sponsored by AGARD at American National Academy of Engineering, SAE ACGSC Meeting, STI, and Wright-Patterson AFB. During this visit, I spent several unforgettable days at Mac’s home where I felt the kind and friendly atmosphere of the home and atmosphere of his tender love to his wife Betty.

At the end of nineties Mac offered me to be the member of SAE ACGSC committee, which I accepted with high honor and pleasure. Current year is the seventeenth year since I had possibility to participate at the meetings, where the scientists from the different American and international organizations discuss openly the results of their very interesting research.

In the different periods of my life I had some of the teachers who influenced on me as the person and scientist. One of them is D. McRuer, or Mac, as colleagues and friends called him. I am very grateful to Mac for his support, assistance, for his influence on me, on my students, on aviation, and I am proud that I knew this great man.

“ROSENCRANTZ AND GUILDENSTERN ARE DEAD”

A Remembrance of Duane McRuer by David Klyde

While this is my 30th year at Systems Technology, Inc., the company is celebrating its 60th anniversary in 2017, so I joined a mature company back in 1987. At that time the company was more of an inverted pyramid where most of the employees had been at STI for 20 or more years. For a young pup from Cal Poly, the halls of STI could be pretty intimidating. Most intimidating was the 6’4” Duane McRuer. In my early years at STI, I did not interact with Mac on technical work to any significant extent. It wasn’t until he “retired,” and returned to STI as a consultant that I spent long hours working with Mac on furthering our work on pilot-induced oscillations. This was, shall I say, a mellow version of Mac. He was easy to work with, patient, and a great teacher/mentor. Mac as leader of STI was much more intense as he tackled new technical areas, while also leading a company.

Luckily in my early days at STI, I was too naïve at the time to shy away from a good lunchtime conversation. As one who fully embraced his “geek” card from an early age, I considered myself a connoisseur of Shakespeare with a strong comprehension of Hamlet. I guess I felt ready to go toe to toe with Mac on the subject. Silly me. There is a scene in Hamlet towards the end of the play, where the tragic hero returns to Denmark after thwarting a plot by his uncle, the king, to have him put to death by the King of England upon his arrival in the country with his friends Rosencrantz and Guildenstern, who were taking part in his uncle’s plot. After thwarting the plan, Hamlet, in a soliloquy, refers to his uncle as a military engineer, “Hoist with his own petar’.”

So, what does this have to do with Mac? While I can no longer recall exactly why, I used this Hamlet quote in conversation within ear shot of Mac. Now, you knew you were in proverbial trouble when Mac started his comments with a drawn out “weeeeeeeeeeeell... let me tell you young man...” What followed was a minor dissertation on military history and the true meaning of what it means to “hoist with his own petard.” For the curious, it literally means “cause the bomb maker to be blown up with his own bomb.”

Mac was known for these dissertations on many topics as he was a true renaissance man. It’s not that he was a know it all, it was that he was curious about everything and studied these things with the same passion that resulted in his professional achievements such as the crossover model. More importantly for me, this lunchtime episode opened a door for me to Mac that was completely separate from work. Over the next 20 years our discussions would not only cover Shakespeare, but also aviation history, civil war history, national parks, California missions, and many others. Before he passed, Mac left me a number of books on these subjects from his personal library that are now cherished in my own.

To return briefly to Hamlet, Claudius was indeed hoist with his own petard and as the messenger revealed at the end of the play as he looked over the carnage, “Rosencrantz and Guildenstern are dead.” Mac, on the hand, lives on in our remembrances.

“MT. WHITNEY AND THE INFIELD FLY RULE”

A Remembrance of Duane McRuer by David Mitchell

Part 1: Mt. Whitney

I started at STI in April 1977, working part-time while finishing my undergraduate studies at UCLA. I got the job by responding to a classified ad in *The Los Angeles Times* newspaper (I still have that ad, by the way), but knew nothing about STI prior to my first interview. Before going to work at STI, I had been in a Co-op Work-Study program at NASA Flight Research Center (renamed Dryden FRC in 1976, now Armstrong FRC), and a dozen or so of my friends and colleagues from FRC were planning a hike up Mt. Whitney for the summer of 1977, so I planned to join them. We were going to drive to Whitney portal in the morning, rest there for the day, hike overnight (a night carefully arranged to coincide with a full moon), and reach the peak at sunrise.

Somehow – the details are gone from memory – the subject of the Mt. Whitney hike came up with Mac. Up to that moment, I had had almost no direct contact with Mac; I’d met him, of course, and I was gradually learning of his, and the company’s, past work, but I had no idea that he was such an avid hiker. When Mac heard about the hike, he became intensely interested, so much so that he called me into his office – the first time I’d been there, one-on-one.

If you know about Mac’s passion for hiking, you know what came next: while I *thought* I was prepared for the hike, Mac made it clear that I was not. For *three hours*, I sat in his office as he covered in great detail everything I needed to know – from conditioning before the hike to proper nutrition on the day of the hike to selection of socks through headgear. It was, frankly, an almost overwhelming amount of information, and I can distinctly recall thinking at some point: *how do I charge for this time? Do I get paid for sitting here? What work should I be doing right now?*

As a postscript to this story, the hike went off beautifully, nine of the 10 of us who started made the trek (the one who didn’t had spent his “rest” time at the Portal smoking cigars, so go figure!), and the group got to hear from me about all the great things I’d learned. After the hike, Mac told me about a Basic Mountaineering Training Course offered by the Southern Section of the Sierra Club. I guess he helped create the course and wrote the manual for it; I’m sure someone more familiar with the course knows more about that than me. The course has evolved over the years and now exists as the Wilderness Travel Course, I took it in 2007 (and take my word for it: it’s an incredibly valuable course, even if you’re an experienced hiker), I learned that the lead instructor for my group had gotten his Sierra Club Instructor rating sign-off from... Duane McRuer.

Part 2: The Infield Fly Rule

Mac, as you know, was a very learned man. He was an avid reader (how many of you STI alumni remember sitting in the lunch room listening to him recap articles he’d read in *The New York Times* newspaper?), and I learned almost from Day One (which was in April 1977, by the way) that there wasn’t much that stumped him. In my over 16 years working at STI, I saw that, in the rare instances where he wasn’t conversant on a topic, he was adept at steering the conversation to a topic about which he was.

Which leads to this story: sometime in 1978, with only about a year’s experience at the company, I was working at my desk in an office I shared with Rich DiMarco, when Mac walked in. Since I’d had very little direct interaction with Mac, his very presence was intimidating enough: I hoped he was just looking for Rich, not me. But no, he sat down in the chair next to my desk.

You can probably imagine my first thoughts: *am I about to be fired? What bad news am I gonna hear?* And it only got worse, as Mac’s first words (well, he might have said “hello” or “good morning,” or something like that, first, but I don’t recall it) were: “I have a question for you.”

Holy crap! There was a moment of sheer panic as my entire career flashed before my eyes. Mac wanted to ask *me* a question? It had to be a trick – he was going to test me, and if I got the answer wrong, I knew I’d

be out the door looking for a new job! How can he possibly want to know something I know and he doesn't?

So imagine my relief when his question, in almost these words, was: "I've been wondering about the infield fly rule in baseball – can you explain it to me?"

It was a surprise that he'd picked me to ask that question instead of researching it somewhere else, but remember that there was no Google, or world wide web, in 1978 – people actually talked to other people to learn things (egads! what a barbaric idea today!). I was, at the time, a season-ticket holder for California Angels baseball, so I guess he figured I'd be his best source.

While there were numerous occasions after that encounter when Mac asked me questions just to see if I knew the answers, that was the only time he ever asked because he really wanted the answer.

“MAC THE TEACHER”

A Remembrance of Duane McRuer by David Schmidt

I first met Mac about 35 years ago, in the early 1980s. I had seen him before, and had heard him speak, but I had not met Mac yet. It was during a conference, AIAA AFM I believe, and I was listening to his presentation, with which I had some technical problems. Being young and very foolish, I challenged him on some of his statements more than once during the questions after his presentation. He politely answered each question, and finished his presentation.

I remember clearly, the room was full and I was standing near the back near the center isle. After he finished, and the session chair began to introduce the next speaker, Mac picked up his things in front and started walking very purposely up the center isle – towards me! Mac was a tall guy with a long stride, developed from hiking up all those mountains. And his walk was more like marching. His face was serious but calm. I stood my ground and our eyes locked (again, young and foolish). After reaching me, he quietly whispered, “Can we talk outside?” I said sure (y and f again). I was prepared for a tongue lashing. But he was very calm, and clearly explained in detail the errors in my thinking. For about 15 minutes he professorially cited the theoretical and experimental evidence STI had developed to support his presentation. And after words I was impressed and more receptive of his position. I was also relieved.

A couple years later, Mac suggested we collaborate on some research and I eagerly agreed. The topic was multi-axis man-machine modeling, and Mac was interested in how the Optimal-Control Pilot Model would measure up. I had been working with the OCM, and STI had some experimental data we could use. It was a great project. We completed the study and co-authored a journal paper, which I much appreciated as an academic.

The lessons I learned from Mac here were several. First of all, calmly and with facts win over your skeptics. With patience, turn skeptics into collaborators. Also, since Mac had not been a fan of the OCM, he demonstrated an open-mindedness and mental curiosity by proposing to use it in this study. Finally, be clever! Mac was in a no-lose situation proposing the collaboration. If the OCM worked, he was a hero. If it didn't he could say, “I told you so!” I miss him.