

# 76| Aerospace Neuropsychology – With Dr. Randy Georgemiller

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**Speakers:** Randy Georgemiller, John Bellone, Ryan Van Patten



**Intro Music** 00:00



**John Bellone** 00:17

Welcome, everyone, to Navigating Neuropsychology: A voyage into the depths of the brain and behavior, brought to you by INS. I'm John Bellone...

**Ryan Van Patten** 00:25



...and I'm Ryan Van Patten. Today we speak to Dr. Randy Georgemiller about aerospace neuropsychology. Randy is a board certified clinical neuropsychologist at the Federal Aviation Administration, Office of Aerospace Medicine. This is a unique topic that is not regularly covered in our graduate school and fellowship programs so many neuropsychologists and trainees may not know a lot about it. But, as you'll hear from Randy, neuropsychologists serve a critical function in the evaluation of pilots and air traffic controllers, and there's a need for more of us in this subfield. Plus, the topic is inherently fascinating and Randy does a great job of explaining a lot of the nuance of how we can think about high stakes assessments of cognitive abilities in these very high functioning people.

**John Bellone** 01:16

One quick disclaimer, Randy asked us to make the following statement on his behalf. The views expressed are those of the presenter and do not reflect the official policy or position of the Department of Transportation, the Federal Aviation Administration, or the US government.



We also wanted to mention that we recorded this back in March of 2021 and Randy makes a comment at one point about how most pilots are grounded due to COVID-19. This may or may not still be the case on August 1 and beyond with more people getting vaccinated and flying commercially, so we just wanted to make that caveat.

And, with that, we give you our conversation with Randy Georgemiller.



**Transition Music** 01:52



**Ryan Van Patten** 02:01

Randy Georgemiller, welcome to NavNeuro.



**Randy Georgemiller** 02:04

Thank you very much. I'm really pleased to be invited.



**Ryan Van Patten** 02:06

This is going to be a great topic, so let's start simple. How would you describe aviation neuropsychology?

**Randy Georgemiller 02:13**

Well, interestingly, even your choice of words actually, it's such a young field that we haven't really arrived at one term for the subspecialty. You can call it aviation neuropsychology. It's been called aeromedical neuropsychology. I tend to use the term aerospace neuropsychology, number one, because it aligns with the current labeling that we use within the Federal Aviation Administration for the part of the agency that I work in, which is Aerospace Medicine. It also reflects the fact that civilian aviation now extends into space, right? So it's a little bit more inclusive term.



It is basically the application of neuropsychology, which is the study of brain-behavior relationships and the measurement of that in an aerospace context. So it's using all the tools that clinical neuropsychology has to diagnose, treat, and document suspected brain related impairment. In this context, it's clinical neuropsychology tools applied to the assessment of pilots, air traffic control specialists, flight crews, in a civilian and military context. There's a lot of overlap between the civilian and the military side, and we can get into that, but there's some significant differences as well.

**John Bellone 03:47**



Excellent. What's your sense about how many neuropsychologists are currently doing this kind of work? Is this field growing? You said it was young, so I'm assuming it's growing.

**Randy Georgemiller 03:59**



Yes, I can tell you that formally. We, at the FAA, within the Division of Medical Specialties, we have 100 neuropsychologists that are on our eligibility list and 50 psychologists that are on our eligibility list. It's not a certification, there is no certification within aerospace neuropsychology. If you think of it as if you are on an insurance panel, for instance, you are eligible to provide services to a group of patients. That's similar to what our eligibility list is for neuropsychologists and psychologists. We strive to have a panel of providers that can meet the needs of the aviators that are out in the community. So, for instance, I've been on board at the FAA since 2018 and one of the things that I did was a geospatial analysis. We looked at where our providers are and where aviators are around the country, and tried to come up with an index so that we can have an equitable distribution of providers where there are airmen. We've really been striving to do that and part of my job is recruiting people that are appropriate to be providing the service.

We have pretty basic criteria for being included on our eligibility list. Board certification or eligibility in neuropsychology is basic. Obviously, licensure is critical. Then we have a couple unique components that set neuropsychology in this context apart. One is specialized training in the HIMS program, and we can talk about what that is and what that entails and the history of it. HIMS was really at the forefront of promoting psychology in the aviation sector. Then the other has to do with training in one of the specialized cognitive screening tests that we use, which is called CogScreen-Aeromedical Edition, which, again, is a significant part of the history of psychology and neuropsychology's entrance into the aviation sphere and we can certainly talk about that as well.

So those 150 folks on the panel, that doesn't reflect people that do human factors research, some neuropsychologists are devoted to that. It does not include our colleagues in the military, who get specialized training to be aeromed psychologists. They don't have a neuropsychology designation, but they have a psychology designation. I find that the best fit for neuropsychologists in the community to provide the kind of services that we need are people that have forensic backgrounds - people that do fitness for duty evaluations of other professions, that are safety sensitive workers, people in the medical fields, other transportation, firefighters, police officers. That's really the best fit because we really strive for our forensic quality evaluations in the kind of work that we do.

**Ryan Van Patten** 07:37



If a neuropsychologist has the qualifications you mentioned - licensure, board certification, or eligibility and the others - and they want to start doing these FAA evals, how would they go about that?

**Randy Georgemiller** 07:49



The best would be to contact me. What's great is everyone in our area of work tries to maintain high visibility and availability to both the people that we serve, the airmen, and the providers in the community. Half of my job is coordinating with community based providers and helping them provide the kind of quality of services that we require. So the best is to email me. I'm always available. If I can just give that out now.

**Ryan Van Patten** 08:23



Yeah.

**Randy Georgemiller** 08:24



So it's [Randy.J.Georgemiller@faa.gov](mailto:Randy.J.Georgemiller@faa.gov). There are other ways of reaching us, but that's most direct. I can make sure that you get access to the panel, as well as we're really the single source out there for information on aerospace neuropsychology. So we provide that service as well.

**John Bellone** 08:55



Great. Well, you'll be getting an email from me.

**Ryan Van Patten** 08:57



[laughs]

**John Bellone** 08:57



I've been thinking about doing this work. [laughs] One of my old colleagues was doing this kind of evaluation for the FAA and I've been thinking about it too. Is there a way to get training specific to this population? Or what's the training look like when you do get paneled?

**Randy Georgemiller** 09:16



Sure. It's very limited right now. There is not a formal training or experiential track that you can follow as we're developing other subspecialties in neuropsychology and psychology. It has traditionally been people that have come out of the military that have had aeromed experience or people that have just kind of fallen into it. Actually, that's how I came upon aerospace neuropsychology. I was the head of a neuropsychology lab at a hospital and they had an ancillary substance abuse facility, a primary care facility, so residential. I practice in Chicago, and so they had contracts with the airlines that were in that Chicago hub. So I had experience working with people that served this population and did evaluations with airmen and collaborated with a psychiatrist who was interested in the field and just kind of went from there.

Right now, the training that is available is, as I mentioned, the HIMS program that was started in the 70s. HIMS stands for Human Interest Motivations Seminar. It was a false flag. They wanted to come up with a treatment program for airline pilots that had problems mostly with alcohol. It was a major problem. At that time, if you were found to have problems with alcohol, like if you blew positive on a Department of Transportation screening or you got a DUI or there was a complaint about you and substances, that was a career ender and there was no way back. As we know, alcohol dependence, which is the most typical with airline pilots, is a chronic

disease that is treatable. There was recognition of that in the 70s. It was an outgrowth of the whole employee assistance program that was so popular at that time. But they couldn't use the word alcohol. It was so stigmatizing. So they came up with this weird acronym, HIMS, for the program. It was a collaboration between the Airline Pilots Association, the Union for Pilots, the FAA, and major airlines. They developed a treatment monitoring program so that pilots could get back into the cockpit, hopefully, time efficiently. The airlines lose huge amounts of money. I had read before and it was presented to me that to replace an airline captain costs millions and millions of dollars in lost time training, moving people up that were lower levels and things like that. So to be able to provide that service, there needs to be training and two of the critical professionals in the HIMS program were psychiatrists and psychologists. So they developed a training program, which has been going on since the 70s. It's a three day program. So that's a requirement for a psychologist or neuropsychologist to be on our panel. There's the basic training that brings together all three of those components. Then there's advanced training once you go through that. It's a yearly three day program as well. That was pretty much it.

About nine years ago, a group of neuropsychologists that were very involved in aviation neuropsychology decided they needed more. That the HIMS program was mostly focused on physicians in terms of the professionals, and they needed to have a forum to talk about cases. At that time, there was not a staff neuropsychologist at the FAA. So it was kind of a pickup game. It was a group of about 10, 15 neuropsychologists who decided to meet, they would get together for a couple days before the HIMS training. HIMS always takes place in September, it's in Denver, and so they would just tack on a few days in the front end. They called it the Aviation Psychology Seminar. It's now been around for nine years. Sorry, it would have been nine years if they met last year - everything's on hold because of COVID. It now accommodates yearly more than 100 neuropsychologists and psychologists that get together for training. It's not a requirement for being on our list, but anyone who wants to be proficient and provide quality service will avail themselves of that training. Good news is the FAA now is the sole sponsor. Again, because it was a pick up thing everybody just kind of pitched in and did it as kind of a very collaborative, collegial kind of time. But now the FAA is willing to take that on, so we're sponsoring it beginning this year. It's going to be a teleconference because of COVID. But we're still planning on 2022 to have an in-person meeting. Anyone who, again, is interested in that can contact me as we were working on the program right now and we'll be rolling out additional information. Great part is, because it's a teleconference, we're not charging anything. You'll be able to get

CE's through the American Psychological Association. So it's really a win-win for everybody.



**John Bellone** 15:21

It's very cool. So it's not like the FAA has capped it at 100 neuropsychologists. They're looking to grow their network is what I'm hearing. Is that right?



**Randy Georgemiller** 15:29

Absolutely. We have parts of the country that are sorely underserved. Certainly, I think we have most of the major airline hubs pretty well covered with a few exceptions. For instance, we no longer have a HIMS neuropsychologist in Hawaii. So right now, pilots need to travel usually to LA to get evaluated. That's really unfortunate, it becomes very costly. The other thing to know too, is the HIMS program is mandated by Congress. So we're able to put greater specifications on how the services are provided. So HIMS neuropsychologists are exclusively able to provide services for pilots, mostly first class, and we can talk about class system, but airline transport pilots that are in the HIMS program must see a HIMS neuropsychologist. Otherwise all the other kinds of problems that we evaluate, people can go to the community. They can see whoever they want. We always counsel airmen not to do that, not because of a restraint of trade thing. But we need to have a quality evaluation that meets our requirements. Otherwise, it's a loss of time and money to the airmen because it may not be an acceptable evaluation. Because of some of the moves that we've made to secure our test batteries, the regular neuropsychologist in the community won't even know what tests we require for the evaluation. So it really can hamper the certification process for the airman if they don't see someone who's qualified.



**Ryan Van Patten** 17:13

This is good background information for everyone to know. I think a lot of our listeners know about neuropsychology, of course, but less about aviation. I know less about aerospace neuropsychology and aviation. So you mentioned the difference between commercial aviation, general, and military. Today we're focused primarily on commercial, FAA, big airlines that we think of and the pilots of those planes. To give us some context, can you briefly tell us about the differences between aviation commercially, general pilots, and military aviation, especially from the perspective of neuropsychologists?

**Randy Georgemiller 17:51**

Absolutely. Let me just give you a sense of the immensity of what we're talking about. I have a very poor recollection of numbers, so I'm actually looking to make sure that I give you something accurate. We're talking about medical certification for pilots, civilian pilots, and the FAA processes approximately 450,000 applications a year. That extends to three classes of aviators. There's first class, so those are airline transportation pilots. So the folks that you see that fly you on the major airlines, the regional carriers. So anybody who is carting people around for money, they're first class. Second class can include people that, again, for money are carrying cargo. People that are like crop dusters. People that fly helicopters for the police department or your local TV station. Then third class are general aviation pilots. So those are people that do it for sport, for fun, for leisure. Some of them may use it for business purposes. For instance, like in Alaska, a lot of people that's their mode of transportation up there. But that's for personal use, so those are third class pilots.



In the military, you have a broad range of pilots as well. The huge difference there, and I couldn't really give you the numbers in terms of the number of pilots there, they have a much more rigorous process, as they should, for screening people on the front end that want to be pilots. So there's a significant washout of young people that enter the military as officers that want to be pilots, and then they have a really significant monitoring process. They've got eyes on pilots like we cannot. We were talking 450,000 applications a year, there's no way that the FAA can keep tabs on that many pilots as rigorously as the military does. The military also, their medical certificates also extend to flight crews, air traffic controllers, and such. The FAA has a parallel process for air traffic controllers. Our medical qualifications for air traffic controllers parallel those that we have for airmen. But they don't technically fall under these same requirements. Except for some air traffic controllers, and I don't mean to get in the weeds too much, but some air traffic controllers are not employed by the FAA. So if they're a contract air traffic controller, they need a class two medical certificate and they have to meet all the requirements for that.

**John Bellone 21:09**



These are fascinating distinctions. So to move into what a pilot actually does, the tasks needed to do that role, can you paint a picture of the cockpit for us from a cognitive standpoint? So what specific tasks are pilots performing while on the job?



**Randy Georgemiller 21:28**

As I shared with you guys before, I'm not a pilot, and this is blasphemy, but I can only tolerate flight. That's so different than many of my colleagues who are passionate about aviation. But the sophistication of cockpits varies greatly. I had a misconception about aviation thinking that all the high tech, all the very demanding technical skills are exclusively in the cockpit of a commercial airline plane. That's not the case. So right now, you can be a third class pilot, general aviation pilot, and have highly, highly sophisticated equipment that you're working with. You can be flying a jet, right, as a general aviation pilot. It's not just like a little stick and rudder, that we kind of conceptualize in terms of a little Cessna that you're flying around. So the task demands are different. Actually, one of the issues with high tech flight and longer flights for airline pilots is the monotony. So, we have things like continuous performance tests to look at how well you can maintain your vigilance, whether it's visual or auditory. They have long periods of time in which they have limited stimulation, but still have to be aware enough and responsive enough when needed.

The task demands are as you would pretty much expect. So working memory is huge. Being able to interact with the tower, and be able to take complex coded directions and recall them and then implement them. So working memory is huge. Processing speed is huge, as we think about the environmental interaction between the cognitive skills necessary to fly. Again, I'm not a pilot, but processing speed is huge in terms of being able to take in information efficiently and respond to it. Memory skills, as you could expect. Visual spatial skills. One of the key predictors of flight performance on the CogScreen, that we can talk about in a bit, is mental rotation - being able to keep in your mind's eye the position of something when it is rotated. Then the biggest of them all - executive skills, huge. How that is measured, there's a lot of controversy in the field. Some people that are very tied to the whole ecological validity issue would like to rely heavily on simulators, for instance. I mean, that's the way to sample the desired behavior that matches the environment in which the behavior is going to be displayed. As neuropsychologists, we have that struggle with that. Again, because I'm not a pilot, I've never been in a simulator. But what I know about it is it is reliant heavily on routines that have been overlearned. So even though you're in a simulator, and they say, "Okay, well, now you're going to lose the fourth engine, what do you do?" That's all stuff that they've practiced and you want them to practice, right? You want them to be competent. But does it really address pure novel problem solving? Those are things that our laboratory tests are uniquely designed for. When you have a naive subject, I think we're really able to tap someone's skills in a way that you can't through something like a simulator. But that's one of the struggles in the field. We do use that for validation. So criterion

based testing, in terms of CogScreen and other tests are validated against performance in simulators. So it is a struggle.

**Ryan Van Patten 26:08**



The tasks required to be a pilot, the high level of cognitive functioning and all the domains you mentioned, I think, vigilance and sustained attention might be undervalued and underappreciated. I, myself, am also not a pilot. I feel like I can try to imagine what it might be like to be in a cockpit and to be multitasking, really to be switching, communicating rapidly, having to stay vigilant for so long, so much time. I can imagine that but I don't really know. It's good for us to start to think about that if we are going to be cognitively evaluating these people, pilots. So one aspect of piloting, cognitively, that is of interest to me, are checklists. I've learned about this through a book, Atul Gawande, his book, *The Checklist Manifesto*, where he talks about how useful this sort of compensatory cognitive strategy is for so many high functioning people like surgeons and pilots. Can you say a few words about how pilots use strategies like this to offload some of the heavy cognitive burden from their own brain to sort of the external environment? Because they can't make mistakes, right? We can't have a slip here and there or else it's a very dangerous situation.

**Randy Georgemiller 27:28**



Right. Checklists are part and parcel of aviation. Even general aviation pilots have to keep logbooks of everything. I mean, the record keeping and the lists that one needs to go through are immense. It also dictates the situations in which they can fly. So, for instance, some general aviation pilots are typed only for being able to fly when they can visually see what's going on. Others are instrument rated, for instance. So the demands are matched to the qualifications and the checklists that they have to go through have to match the situations in which they can fly. You're absolutely right, it can relieve some of the burden and allow them to focus on the imponderables - the things that you cannot anticipate, the kinds of things that arise in many, many situations. Unfortunately, I'm not familiar with that book, and it's one of many, many books I haven't read. But thank you for recommending it, and I'll check it out.

**John Bellone 28:49**



My understanding is that an important factor in flight accidents is pilot error. The job can be emotionally taxing and it can be cognitively demanding. So neuropsychologists can potentially play an important role here. I don't know if you

feel like this possibility of pilot error is maybe underappreciated, or does the larger aerospace community understand that this is a big factor?

**Randy Georgemiller** 29:17

Oh, absolutely. So fatalities and accidents, weather, human error. Those are the two majors. The human component is about 80%. We're putting up very good equipment into the air. So, unfortunately, it's user error that becomes the problem. Then you're left with how to predict who is going to be most vulnerable to error. So the FAA definitely recognizes that disqualifying conditions are at the heart of what leads to accidents and we have the safest federal airspaces in the world. Part of that is due to this vigilance and looking at disqualifying conditions. So anything that can either lead to sudden or subtle incapacitation, that threatens the safety of the federal airspace is what we're looking for. The medical conditions that can lead to sudden or subtle incapacitation are really at the heart of what we do in medical certification. So the FAA has relied heavily on our skills going back to the 1980s, really. There was a study in the '80s that basically indicated that the FAA was not looking carefully enough at psychological and cognitive issues. This was true in the military as well. Going back to World War I, World War II there was some evolution there. It was relying heavily on psychiatric interviews, physical exams. There was a greater recognition in World War II, in the military, that psychology could play a role. We're all familiar that the birth of clinical psychology was in large part because of the military, and the part that they played in both in selection and in treatment during war. There had been this recognition. Unfortunately, it wasn't until 2018, that the FAA formally had a neuropsychologist under the federal air surgeon, but they've relied on neuropsychological consultants for decades to help inform policy as it relates to the evaluation of neurocognitive conditions. I kind of lost part of your question, I think.



**John Bellone** 32:12

No, that was perfect.



**Randy Georgemiller** 32:14

Was it? Okay.



**John Bellone** 32:15

We'll talk a little bit more about the cognitive and psychiatric symptoms that could potentially lead to error in a second, but before we go there, I wanted to talk quickly, again, about fatigue. We mentioned it earlier and the importance of vigilance. But, you know, fatigue is clearly an important issue for commercial pilots. They might

work long hours, often crossing time zones. They obviously need to be alert and vigilant. Their tasks might be punctuated by periods where they have to be really cognitively active and then others where they are essentially not doing much is my understanding, also not being an aviator. [laughs] But can you tell us about the FAA guidelines for sleep and fatigue and what the FAA does to combat that potential problem?

**Randy Georgemiller** 33:02



Actually, that in and of itself, doesn't qualify as a medically disqualifying condition. So that wouldn't be pretty much in my bailiwick. Definitely airlines set standards for how many hours you can work without a rest period. You're absolutely right, there's lots of research, especially in the military sector, on fatigue and how they try to minimize fatigue. In the past, they have even used some pharmaceuticals to help with fatigue. That's not true in civilian aviation. But really the only times that we would be looking at sleep related issues is where there was a sleep disorder. Obstructive sleep apnea is very, very common, especially with our aging population of airmen who are susceptible to that. But in and of itself, the Office of Aerospace Medicine really doesn't deal with normal sleep rhythm issues.

**Ryan Van Patten** 34:13



Great. I'd like to take this opportunity to put in a plug for the book, Aeromedical Psychology, which is a great book. A lot of the background for this conversation comes from that book. I should say the editors of that book are Kennedy and Kay. But Randy, you authored a chapter on the aging aviator. I'm saying this now because I'd like to ask you about aging in aviators. We know, of course, that older pilots have cognitive changes to contend with, as do the rest of us. Things such as age related reductions in processing speed that are very relevant to their jobs. But they also have more experience that they've built up over time, potentially wisdom on their side. The concept of cognitive reserve has been used for driving, for example - professional drivers have driving reserve. I don't know if anybody has thought of an aviation reserve, but that's something to consider. So tell us about the FAA age 65 rule for commercial pilots. Then, just in general, this issue of pilots aging and when do we think they may no longer be competent to do their jobs.



**Randy Georgemiller** 35:18

Absolutely. I believe both of you have an interest in geriatrics. Is that...?



**Ryan Van Patten** 35:23

That's correct. Yeah.

**Randy Georgemiller** 35:25

I remember that. One of the things that I find fascinating in talking about aging and aviation, it is a great example of how government regulation, societal trends and perceptions, cognitive science and clinical neuropsychology come together. You mentioned the age 60 rule. So there is a societal trend in developed countries of people extending their lifespan, people choosing to work later in life. I'm certainly an example of that. So the graying of the workforce extends to aviation as well. The Civil Aerospace Medical Institute, which is part of the FAA, it's housed in Oklahoma City, did a study '83 to 2005, found the overall number of aviators was shrinking and getting older. The top age band that they studied at that time was 56. They found that there was a 55% increase in aviators over the age of 56 over the course of this study. So contrast that with age discrimination legislation, the Age Discrimination and Employment Act of '67 where you're not supposed to adversely affect people in the workplace based on their age. Well, in 1960, we instituted the age 60 rule prohibiting airline transport pilot captains and first officers to fly for major airlines past the age of 60. We were out of sync with other developed countries in terms of civil aviation policy. Most countries at that time extended it to the age of 65. There were some countries, I believe, that it was purely based on performance. As long as you were able to perform, you could serve in that role. So that rule was changed in the US in 2007, and it was called the Fair Treatment for Experienced Pilots Act of 2007. So what that basically did was say that you could have a cockpit crew person who was between the age of 60 and 65, as long as there's only one of them. [laughs] So we didn't want to give full confidence in their capabilities, but we could tolerate one of them. It was a great demonstration of neuropsychology's contribution to governmental policy and social policy, really.



So the first was a study looking at accident rates, archivally looked at a 12 year period. They found, regardless of class, and at that time only class one, that they were limited in terms of the upper limit that they could look at. But if you looked at all classes, there is no age restriction for class two or class three, so you're able to look at older pilots there. Accident rates actually declined with age and level out at the age of 60. There was a little bit of a bump later on, but on the whole it leveled out. This was followed by a relatively small sample of 40 pilots, aged 41 to 71 that were seen for neuropsychological evaluation. I was in private practice at that time in Chicago and we got to see a portion of that sample of 40. They were tested with CogScreen and a rather limited battery of standardized neuropsychological tests as well. There were no indications of significant decline or aeromedically significant cognitive problems in that sample of 40. They were not fully representative of the aviation population at that time, but it was a selected group of people that fared quite well. After that change in 2007, the US General Accountability Office did a

study in 2009, so a two year sample, and they showed that there are no accidents or incidents that resulted from this change of pilots being 60 or older.

So, all that being said, realistically we just can't deny that there are some potential safety concerns with aging pilots. We know that neurocognitively, there are declines with age. As it pertains to aviation, the most consistent findings are that with advancing age, there's, as you'd expect, reduced processing speed, associative memory, dual tasking, divided attention and concept formation. So in the light of that, why don't we find these kinds of increased accident rates with aging? What we do know also that the least affected as it relates to aviation are motor speed, motor coordination, and tracking, that those stay pretty much the same. So there was an attempt to address this by putting aging aviators in an aviation context. In other words, using simulators. Also looking at the correlate of cognitive skills as it pertains to the simulator. So, for instance, perceptual processing had to do with instrument monitoring, environmental scanning, memory was recalling air traffic control instructions, and novel problem solving was addressing non-routine or emergency situations. What they found was there were moderating effects, as you'd expect. When we talked about those reserves, or that kind of resilience or insulating effects of experience and qualifications, the aging pilots that had higher ratings in terms of instrument ratings and things of that sort, had more hours of air time, they performed better. Well, it figures. So there are some suggestions about how we should address older pilots in terms of more recurrent training, monitoring them more frequently, things of that sort. Also, there were concerns in that population, in that sample that they looked at, where there's some people that had some incipient dementia or mild cognitive impairment. That was always a problem with that group. Obviously, anyone who has abnormal aging or a pathological condition, they will definitely be disqualified for aviation. But one of the most intriguing parts of all this, that I think is a moderating effect, too, is and I think, Ryan, you mentioned wisdom. It wasn't really in the aviation sphere that it was studied, but in other settings, where younger people tend to make decisions that are more directly related to immediate gain whereas many older subjects that were studied, were able to look at the interconnections, the long term gain. More characteristic of a chess player, for instance, seeing several moves down the line, what the interactions are, and the impact. So I think the overarching challenge we face in making medical certification decisions for older pilots is the fact that there are also no age adjusted runways. I mean, we're so used to looking at age corrected norms, which is appropriate in terms of making general statements about people's capabilities, looking at clinically relevant conditions, but we also have to balance that with the demands in the aviation environment. They don't care if you're young or old. So that's one of the challenges that we face is balancing that. So

being able to understand that we make accommodations for age, and we do have some age related norms for aviators, and we do reflect on those. But also appreciating that, ultimately, the demands are the demands and they're dictated by the environment in which the person is functioning.

**John Bellone** 44:50



Yeah, those norms will be interesting to talk about in a minute. It's also interesting the balance between aging and experience. Just to clarify, classes two and three don't have any age limit. Class one, one person in the cockpit can be older than 60 but the other one cannot. Is that the only restriction?

**Randy Georgemiller** 45:14



Right. Then the upper limit is 65, they will be out of the cockpit.

**John Bellone** 45:19



No matter what. Okay. For class one, they can move to class two or three if they want to, I'm assuming.

**Randy Georgemiller** 45:25



Right.

**John Bellone** 45:26



Okay. I'm wondering if there's much diversity these days in terms of pilots - from race and cultural backgrounds and also gender differences. Are most pilots still white men, which I'm assuming they were for most of history?

**Randy Georgemiller** 45:53



Yeah, especially with class one pilots, because the tradition was post World War II, it was primarily aviators from the military that then retired or left the military transitioned into civilian aviation. So that still is the reality, that in terms of class one airline pilots, predominantly white male. I believe recently, maybe like 7% are female. I believe that I'm remembering that correctly. Certainly, in terms of general aviation, there are no restrictions. I think typically, males have just been more interested in aviation for whatever reason.

**Ryan Van Patten** 46:46



I'm interested if there are efforts to diversify the pool of pilots across gender, race, etc. I'm guessing this is a little outside of your area of expertise, Randy. This might be at the level of individual airlines, for example. They are hiring the pilots, right?

**Randy Georgemiller 47:01**



Yes. Well, everything's quite fluid in the age of COVID. In terms of aviation, there are many people in that industry that are just not working right now. So I don't know how that impacts hiring and what the environment will look like post COVID in terms of aviation. Certainly, the airlines that I'm familiar with have very active diversity missions in terms of their hiring. But how that actually translates, I'm really not sure.

**Ryan Van Patten 47:37**



Yeah, that's fair. So, Randy, we've touched on cognitive and emotional symptoms in pilots. Obviously, this is very central to us as neuropsychologists and what we are doing when we evaluate them. Something that's especially unique, I think, about this group of people that we should be aware of is that their symptoms don't necessarily need to reach the threshold for a clinical diagnosis in order to impact the pilots ability to do their job well. These jobs are so high demanding that we need them to be functioning at a very high level. So subclinical symptoms can be relevant. For example, a stressful divorce or a transitory lack of sleep and mood disturbance could impact their ability to do their job well. An adjustment disorder or even no DSM diagnose disorder at all. I imagine this is a challenge to neuropsychologists doing these FAA evals. How do you think about this and what advice do you have for neuropsychologists trying to measure subclinical symptoms?

**Randy Georgemiller 48:36**



Probably the distinction that needs to be made is actually the medical decisions that are made in the Office of Aerospace Medicine are not reliant on DSM criteria or ICD criteria. For instance, the diagnosis of substance dependence is - I don't know if you'd be better to call it liberal or what but it will include some folks that would come under the rubric of substance abuse in DSM or ICD would be qualified as substance dependence, which is a disqualifying condition. Ultimately, the burden rests with the airman. They must ground themselves if for any reason they are unable or they judge that they're unable to fulfill the obligations associated with their medical certificate. That has, as you mentioned, Ryan, it has nothing to do with "Oh, I'm waking up and I have a major depression today." No. It's, "I'm not clear headed today." There are a whole host of medications, over the counter

medications, that aviators have to be aware of as being self grounded for a specific period of time - analgesics and things of that sort. That really falls on them.

So, how it relates to neuropsychology is that the neuropsychologist and the psychologist need to be aware of the FAA designations of what are significant conditions that are disqualifying and they are captured in federal regulation. CFR is codified in federal regulations. The federal air regulations indicate which are disqualifying conditions, both specifically and generally. But the overall purpose of those diagnoses is anything that would lead to sudden or subtle incapacitation and threaten air safety. It's that broad. So the neuropsychologist has a lot of leeway and needs to make a very prudent judgment. Let me just say, by the way, the neuropsychologist does not make that determination. That's actually one of the fallbacks for the community-based neuropsychologist. Is for you to be able to say, in good conscience, I don't make this determination. Ultimately, the person who does is the federal air surgeon and other people that are designees that make that decision. I, as the evaluating neuropsychologist, give my best judgment as to whether I think this is aeromedically significant. Aeromedically significant means it could impact safety and your ability to execute the responsibilities of a medical certificate. It's kind of circuitous, but it is accurate. I always counsel neuropsychologists - we definitely want a precise and concise opinion, but there are times in which you've got to punt. You're just not quite sure. So you just describe it as best you can, what you found and the characteristics of the individual that you evaluated, and then you defer to the federal air surgeon or one of his or her consultants to advise in that concern.



**John Bellone** 52:30

It's nice that that final call doesn't rest on our shoulders. [laughs]



**Randy Georgemiller** 52:34

Absolutely. No, not at all. Not at all. I encourage the neuropsychologist to say that up front. It helps us rapport, it reduces some of the anxiety. Because a lot is at stake, right? These can make or break a career, for instance.



**John Bellone** 52:49

Yeah, good point. I've heard about aeromedical waivers for certain psychiatric conditions and treatments. Can you just quickly mention something about that?

**Randy Georgemiller 53:01**

Sure. The military usually uses the term waiver. That is someone who has a disqualifying condition that meets certain requirements that would allow them, under certain circumstances, to continue to function. The terminology that's used in the FAA is special issuance. So this is a special issuance authorization, and the letter that you get from the FAA will say you have a medically disqualifying condition, but we've given you a special consideration and under these circumstances you can continue to fly with these modifications. So as they relate to neuropsychologists and psychologists, there are several conditions that you would need to know and appreciate that would be medically disqualifying. Pretty much without exception, if you have a psychotic disorder, disqualifying. Major depression that is recurrent, disqualifying. A personality disorder, and we have that in regulation have our own definition of personality disorder. So it's something that you can point to that says that this is a dysfunctional behavior that we have seen on a periodic basis, and that would be disqualifying. But past that, there are other conditions that under certain circumstances, you can be granted a special issuance. We've already talked about alcohol dependence, for instance. If someone meets all the requirements, and they're pretty stringent in terms of treatment, monitoring, and ongoing aftercare, you can return to the cockpit. Previously, anyone who was taking an antidepressant medication was disqualified from flying. 12 years ago, the FAA instituted a special issuance with certain classes of SSRIs - some of the most traditional ones, Prozac, Zoloft, Celexa, Lexapro - and under certain circumstances, aviators can get back in the cockpit with the proper monitoring with those metaphor medications in their system. It was an attempt to respond to the fact that we know that, at any one time, about 10% of the population is depressed. For some reason, there were no aviators that were depressed. So we needed to be able to open it up and have a reasonable way for them to be functioning and flying safely. So 12 years ago, when the SSRI policy was begun, there was an amnesty period where people could come clean without any negative consequences, as long as they entered into this program.



**John Bellone 56:05**

Yeah, it makes a lot of sense. Let's move into more of the neuropsychological evaluation piece. From what I've read some of the more common referral questions from aviation neuropsychologists, include pilots with HIV, or traumatic brain injury, substance use, as you mentioned, possible mild cognitive impairments, ADHD, depression. Can you tell me if I missed anything from that list? Just give us a brief overview of the unique aspects to assessing these conditions in this population?



**Randy Georgemiller 56:39**



Sure. Yeah, there are seven standardized psychological and neuropsychological protocols in the FAA. You mentioned ADHD, substance abuse and substance dependence, the SSRI protocol, and for HIV. Then because there are so many generally disqualifying conditions, we have a protocol for a psychological evaluation, potential neurocognitive impairment, and neuropsychological evaluation. So a little bit more generic and they each have distinctive characteristics. They've been crafted to look at the unique characteristics of cognitive deficits that you'd expect, and applying aviation norms where we have them. Most of these protocols include CogScreen, since it is a cognitive screening test that has been developed and normed on aviators so that we can look past just strictly clinical norms or population norms and we can look specifically at how aviators should perform.

**John Bellone 57:52**



When you say there's different protocols, are there different test batteries for the different potential diagnosis?

**Randy Georgemiller 58:00**



Yes. All employing standardized tests that most neuropsychologists already have in their test batteries or in their labs in their offices. But because we're trying to be time and cost efficient - I should mention, all this comes out of the pocket of the aviator who's being evaluated, we don't have evaluations that are paid for by the FAA. So we try to be respectful of people's time and money. Some of the batteries are designed to be one time evaluations versus periodic evaluations. The best example is HIV. We have a standard protocol that class one HIV positive pilots must be seen on a yearly basis and class two and three may be seen every two years. Now we're taking a look at that. Again, we did an archival study two years ago looking at 10 years of data with HIV positive pilots. I was really pleased because that was one of the first projects that I got to get involved with after I was employed with the FAA back in 2018 because it was a protocol that was sorely in need of being updated. It was initiated in 1995 when we had these really effective medications that were rolled out the the CART meds and hadn't been touched since. We were able to look at the literature, update what the neuropsychological test battery should look like, and then try to look at this archival data to get proper risk mitigation in terms of the frequency of evaluations that we're doing.

**Ryan Van Patten** 1:00:02



Right. I'm glad we're moving into talking about batteries and cognitive tests. Randy, you've mentioned the CogScreen-Aeromedical Edition or CogScreen-AE several times, probably because it's so important. After reading about it, it was one of the topics I really wanted to ask you about. So it is part of the core FAA battery and is the test that neuropsychologists unless they're doing these evals are unlikely to be familiar with because it's specific to assessing aviators. So it's a 45 minute or so computerized cognitive battery. Can you tell us what it measures, how it's used? From what I've seen, the psychometric support is strong, both for physiologic validity, like detecting mild brain trauma and ecological validity, such as predicting simulator performance. So can you give us a brief overview of CogScreen-AE?

**Randy Georgemiller** 1:00:57



Absolutely. So as we mentioned, it was kind of an outgrowth of some of the deficiencies that the FAA was recognizing back in the '80s in terms of how they were evaluating airmen. There was a three stage process of research that took place in the '80s. It was finally released in 1995. It was originally exclusively normed on airline pilots. We had some age related norms for large carriers, because we had a large enough sample, but non-age corrected for small and regional carriers. There were no norms for general aviation pilots. There was a process of gathering additional data with third class pilots a couple years ago and that reached up to I think the top age went into the 80s. It was a sample of a little over 200 pilots at that time. So I hold to the fact that this is a screening device. While it is comprehensive in terms of the domains that it measures, it is not the final word. So anyone who does poorly on this test is judged based on performance will be seen for a standardized battery of tests to either confirm or disconfirm what we originally saw with CogScreen. But it measures attention, memory, visual perception, sequencing, logical problem solving, psychomotor speed coordination. Something that's pretty unique, but which is critical to aviation, is dual tasking. That's a combination of a working memory task, like a one back measure, with a visual motor task of visual tracking. Then executive functions. It was developed, it looked at comparing different phases of flight, in terms of takeoff, landing, and everything that happens in between. It was designed for repeat testing. There's a pretty much unlimited number of sessions that can be run. It provided a summary score that is really helpful. Neuropsychologists are not the only ones looking at these test scores. So, as you can imagine, with 450,000 applications, not all of them are getting CogScreen, obviously. But there are physicians, medical review officers that are looking at these test results. So they need a summary score to help them with some kind of categorization. So there's a logistic regression probability values score that was done on a subsample of aviators with known brain related

impairment. So it has some predictive ability there. Then base rates for speed and accuracy, and throughput, which is performance per time interval. Some other additional tasks that look at some executive skills, the ability to maintain set, perseveration, things of that sort. So CogScreen now is used in both a military and civilian environment. It has a really broad application. But as you mentioned, Ryan, if you're not doing aviation neuropsychology probably don't need to have this test because it's not normed on the general public.

**Ryan Van Patten 1:04:54**



Right. But if you are or you're interested in it, then it's really important to know about. Thanks for giving that overview. Something else very relevant to cognitive testing that you touched on earlier that I'd like to linger on for a few minutes. You had mentioned there are no age corrected runways. So what this is referring to, in my mind is this idea of criterion referenced indices. For high stakes occupational evaluations, such as pilots or physicians, we might make the argument to use a criterion rather than using norm referenced indexes. In other words, all pilots should be held up to a high standard, regardless of their age, years of education, or other factors. If we have a 63 year old pilot, we don't want to just use age based processing speed norms for 63 year olds and then call it a day because that pilot needs to perform at a very high level in the same way that a younger pilot does. So cutting people a break, so to speak, using norms could allow unsafe pilots to fly. I'm not trying to pick on older pilots, per se. We've talked about the importance of wisdom and experience as well. But an alternative model to what we're used to as neuropsychologists, we're used to just using norms age education, but this other model is thinking about a criterion like a high standard of performance that all pilots need to achieve. So how do you think about this issue?

**Randy Georgemiller 1:06:23**



One of the things that makes that really challenging in the civilian sector is the aviation population, there have been changes. For instance, when CogScreen was normed, they also did a battery of tests that included IQ testing. The mean IQ was 118. If you look at our current aviation population, because of various factors, that they're not coming - the military aviators were a very select group, for instance, and that's who we were really measuring back in the '80s, when we were doing this testing. Level of IQ has changed. It's more approximating the general population. So that makes it very challenging. Also, we don't have baseline testing on everybody. That's one of the really fortunate things that the military has is all their aviators are tested on the front end. That's how they're selected for aviation. It is a challenge. So we talked earlier, one of the options would be to put everybody in a

simulator and see that that would be the criterion, not laboratory tests. Actually, because many of our tests bear no resemblance to anything in aviation, people who are not familiar with neuropsychology are quite critical of the tests that we do because they don't see the relevance. It impacts their motivation and their effort when they're doing the testing, for instance. So it is really challenging. I think one of the research approaches that I like the best is being able to selectively test certain flight related skills using a simulator and looking at the cognitive tests that would be related in terms of domain specific performance. I think that's probably where we need to go. But that is a huge undertaking. The funds necessary for doing that sort of thing are really substantial.

**John Bellone** 1:08:46



Yeah. Makes a lot of sense to me. I would imagine that symptom minimization might be the norm. Pilots might be motivated to not be forthcoming about certain symptoms. I would imagine that malingering or symptom invalidity is probably not as much of an issue in this population. Is that the case? If so, how do you potentially deal with symptom minimization?

**Randy Georgemiller** 1:09:09



Yes, a huge issue. Yeah, as you can imagine, effort and openness are two issues that neuropsychologists and forensically trained psychologists should be very familiar with. The press of high stakes evaluations affecting employment, pursuit of a passion that needs to be acknowledged and fit into the equation of evaluation. We do not incorporate any effort testing in our protocols. I can usually tell when a green aviation neuropsychologist does an evaluation because there'll be a TOMM or there'll be some other kind of effort measure and you're wasting your time. In terms of minimization, it goes even further. You added the fact that many pilots may not be predisposed to being aware of and articulate emotional states. I think that's a fair characterization. It's not really advantageous to do a lot of navel gazing while you're in the cockpit, if I can just put it that way. So it presents a definite challenge to assessing psychological and behavioral factors. Face valid self report measures. I see a lot of my psychiatry colleagues that are doing these evaluations. They like the fact that we do tests, but they don't do the kind of tests that we do. So they rely on these self report measures. I find them absolutely useless. On the rare occasion, where they do pop positive for something, I take that really, really seriously. I recently looked at an eval and they did a CARS. So this person was acknowledging a whole series of ADHD related symptoms as an adult. I took that very seriously. I've never seen one be positive in an aviation setting. So that's why we rely more frequently on more sophisticated measures like the MMPI-2 for looking at validity

and openness, and the willingness to acknowledge symptoms. So that's why there's a heavy reliance on record review. We recommend going very deeply into VA records, military records, academic, driving records, and being able to look for inconsistencies in the report of the airman. Then collateral sources are huge - talking to peer pilots, certified flight instructors, their reports, spouses, friends - it's not unusual to do these kinds of collateral interviews. We also have a validity challenge. Airmen don't like to, and this is a positive characteristic employment wise, they don't like to walk into uncertainty. They do not like being a naive examinee. CogScreen was breached a few years ago. Someone was able to get access to it and sold access to the test online and it was very popular for a period of time until we shut down. Anecdotally, I have seen manuals that have been written up by airmen shared with other airmen with test items. I don't know if you know people, and you don't have to acknowledge anything, but in school, you always cheated from the smart kid, right?



**John Bellone** 1:13:01

[laughs] No comment.

**Randy Georgemiller** 1:13:02

[laughs] I've been told. So you would never want to work off of one of these manuals. But you will see them attempting to represent some of the math items on the WAIS, some of the information items, they will give representations of what some of the visual spatial items are on CogScreen. So we have had to go to extraordinary means to maintain the integrity of our test protocols. You can go online, the aviation medical examiner guide will tell you everything having to do with medical examinations for aviators. It's a great resource. We used to publish all of our protocols there. So you could go and say, "Oh, ADHD, I'm going to take the following 10 tests." We pulled all of that information out. You cannot publicly see what our protocols are currently. We have them on a secure website that we control access to. So our HIMS neuropsychologists, HIMS psychologists, they get access. Selected medical personnel from the FAA do. We've been able to protect that as well. We had a workgroup that convened over the last two years looking at alternate test batteries. So when you are trying to do the standard battery and you get some indication that you're getting outlier scores, or you're finding that people know the upper end information items on the WAIS, here's the go to place. We give a series of tests that are approved as alternates and we also provide some guidance about how to detect people who have information that they really shouldn't have. They're supposed to be naive subjects.



**John Bellone** 1:15:07



That's really interesting. Like effort testing on the other end, effort is too good. That's interesting. Test security is obviously important for any neuropsychological population that we're looking at, but especially in these high level professionals. I did just want to highlight something you said earlier, because I think it's really important that when we do these evaluations, these aviators, it's their livelihood, it's their passion, it's their identity that's potentially on the line here. Anyone doing these evaluations should take their job very seriously because of that. So I just wanted to highlight that you mentioned that earlier.

**Randy Georgemiller** 1:15:43



There's the folks that could potentially lose their career. Then I see on the other end, very young people who are now able to go and get a college degree and get their aviation credential. One of the heartbreaking things that I've seen is people, mostly young men but some women as well, enter these programs are passionate, they perhaps have a long family history of people that are aviators. I found out, in the South, 16 year old boys - when I was growing up 16 to get my driver's license. 16 year old boys, in the South in particular, like to do their first solo flight. Then they go get their flight physical report that they took Strattera once, or they took Ritalin once. They may have been inaccurately diagnosed with ADHD, that puts a screeching halt to everything. It may jeopardize their academic career at that point. So, yeah, we're helping with making significant life changing decisions.

**Ryan Van Patten** 1:17:00



For sure.

**Ryan Van Patten** 1:17:12



So, Randy, you alluded to or started to talk about the importance of reviewing records and doing a very thorough background, review of history for these pilots. We've probably spent more time talking about testing, is there anything else that you'd like to say about records review clinical interview? We mentioned how many pilots are incentivized to minimize anything going on, which is understandable. Also information from collateral sources could be very relevant and helpful here. Any other aspects of neuropsych assessment and pilots that we haven't talked about yet?

**Randy Georgemiller** 1:17:49



We're very specific in our protocols to try to be exhaustive in terms of what records should be reviewed. There are things that you wouldn't normally think of. We had a

huge problem with aviators that were receiving VA disability compensation, which you think might be relevant to their medical certification or whether or not they have a disqualifying condition. They were not divulging that information, nor their full VA records. So we really do attempt to do a deep dive to fully appreciate the person's history. It's very critical.



**Ryan Van Patten** 1:18:34

Right.



**John Bellone** 1:18:36

I'm wondering about recommendations for these pilots who might have some cognitive inefficiencies. Is this like a forensic evaluation where the patient is not actually your client, it's the FAA who you're referring to? Do you give recommendations? If so, what might those recommendations look like?



**Randy Georgemiller** 1:18:53

Yeah, it is very similar to the forensic setting in that you're not the treater. Actually, the neuropsychologist has some significant ethical challenges that many times they consult with me to try to think through that process. All the neuropsychologists that work with us do have a commitment to aviation safety. Sometimes that may seemingly run contrary to the interests of the individual that you are examining, but ultimately not. We're concerned about the aviator's safety as well. In the case of some of these young people that I mentioned earlier, [they've] got a history of ADHD. Sometimes when I get these impassioned pleas from their parents, I do remind them that we're potentially saving the life of their child by not putting them up in a little tube in the air that can come crashing down without warning. So, there is that. But the overarching philosophy that we've adopted is we want to get the yes. So we're not there to indiscriminately prevent people from flying. But there is a recognition that to fly is not a right, it is a privilege. We're duty bound to protect the federal air space. So that's really the commitment and the thing that we try to inculcate into the neuropsychologist and psychologists. They're certainly allowed to make treatment recommendations. Those recommendations may be part of the special issuance authorization. Typically, in terms of if they're if there's some monitoring, a period of retesting, things of that sort. Hot issue, cognitive rehab. It's a hot issue in neuropsychology, it's an even hotter issue in aviation neuropsychology. The belief of many of my colleagues is you're teaching to the test. You are teaching and aviators like we talked about with how they like to practice, they would love to practice so that they could do better on the test. So that is a very controversial issue at this point. Right now, it's not something that the FAA mandates. At times, I

may be asked for an opinion about whether someone may be a good candidate for cognitive rehabilitation. I'll offer that. But it's not something that we would mandate. There are a couple colleagues that specialize in aviation neuropsychology that are also doing cognitive rehabilitation or cognitive training. They don't even agree on the terminology. But cognitive training, I think, is probably more popular. Some of those people have some credibility in that they are aware of what the evaluations are and are trying to be very respectful, that they're not invalidating the test that we rely on in terms of making these decisions.

**Ryan Van Patten** 1:22:15



Right. Well said. Before we move on from testing more broadly, I wanted to just briefly touch on the Neo Personality Inventory because it came up multiple times in my reading of psychologists and neuropsychologists evaluations of aviators. So the NEO measures the Big Five personality traits - neuroticism, extraversion, openness, conscientiousness, and agreeableness. The primary finding that I found was that conscientiousness, not surprisingly, tends to be elevated in successful pilots. So I'm wondering about the Neo, but then also in the context of impression management, as we mentioned earlier, where can we really trust the Neo results given that it might be too face valid? How might we use this test?

**Randy Georgemiller** 1:23:01



The Neo, I think, has had more popularity in military settings. It is not part of our standard battery for personality assessment. Questions around personality, I usually differ. I've a couple clinical psychologist colleagues at the FAA, who that's all they do is look at MMPIs all day. There's actually part of the hiring process for air traffic controllers. Part of the mental health screening is to take the MMPI. So they have developed very specific norms for air traffic controllers, and have actually developed some subscales that help to discriminate pretty effectively in terms of the hiring selection process for air traffic controllers. So we rely exclusively on the aviator side on the MMPI-2. My two colleagues could debate you until the sun goes down about why you don't use RF and while you're not going to use MMPI-3, and I can't speak for it as articulately as they can. But I can tell you that we rely solely on the MMPI-2 in terms of personality assessment.

**John Bellone** 1:24:26



Okay, so we have to move towards ending this soon, unfortunately. I know you have a hard stop soon here. It's too bad because we have lots of other questions for you. We'll have to be selective. I just wanted to quickly ask about air traffic

controllers, do neuropsychologists also evaluate air traffic controllers? Is it a similar sort of evaluation if we do them to the different classes of aviators?

**Randy Georgemiller** 1:24:51



So it is not routinely done. The special issuance process for air traffic controllers parallels - they have a different set of regulations that deal with medical certification. But it very much parallels the medical certification process for aviators. Usually, at the hiring phase, if someone is identified as having a disqualifying condition, similar to the ones that we've talked about for aviators, they may be set for neuropsychological evaluation. Then certainly, during the course of the tenure of their profession, if they have a disqualifying condition, they may be seen by a neuropsychologist as well. The unfortunate part is we don't have specific cognitive norms for air traffic controllers. Those of us with some experience have determined that many of the same cognitive skills and domains would be relevant to air traffic controllers and so there'll be some application of aviator norms to that population. But it doesn't hold as hard and fast for me, at least, because they weren't technically normed on air traffic controllers. There's interesting studies about continuous performance tests as one of the critical tests for selecting air traffic controllers. But our typical CPT is what, 16 minutes, 20 minutes? The ones that have been modified for air traffic controllers, they go 30 plus minutes. These people have to be masters of sustained attention and vigilance.



**Ryan Van Patten** 1:25:18

[laughs] Sounds painful.



**Randy Georgemiller** 1:26:27

[laughs]



**John Bellone** 1:26:45

But it makes sense.



**Ryan Van Patten** 1:26:48

Yeah, appropriate for their job.



**Randy Georgemiller** 1:26:50

If you ever have an opportunity to tour a tower, please do it. These people are superstars. They use what I call some kind of antiquated technology too but I've been told it's because it's very robust, and it's tried and true and that's the way they

train them. But the amount of chatter, the amount of things that are going on in there visually, they've got the binoculars looking out and they're looking at this little scope with a little dots on it. I was so impressed with their capabilities.

**Ryan Van Patten** 1:27:31



Yeah, I'd love to tour a tower. I thought you were gonna say if you ever have the opportunity to take a 30 minute CPT then go ahead and was saying, "No way".  
[laughs]

**John Bellone** 1:27:39



[laughs]

**Randy Georgemiller** 1:27:39



[laughs] No, I'm neither sadistic nor masochistic.

**John Bellone** 1:27:46



[laughs] Alright, well, Randy, this has been really an education in aerospace aviation, and it's been really fascinating. We got a couple bonus questions before we let you go. These don't have to be specific to aerospace medicine. So if you could improve one thing about the field of neuropsychology, what would that be?

**Randy Georgemiller** 1:28:09



Well, thinking specifically, again, in the realm of aerospace neuropsychology and the whole concept of ecological validity - I mean, it fascinated me when one of my emphasis in neuropsychology was in geriatrics as well. I figured it was probably good training for my future in life. But the whole concept of ecological validity in geriatric neuropsychology was huge. You know that many older adults saw no relevance whatsoever in the little laboratory tests that they were being put through. That's true with aviators as well. So looking at new and inventive ways of validating our laboratory tests against real life experiences is what I would really like to see.

**Ryan Van Patten** 1:29:06



Good advice. I love the topic of ecological validity and the idea of us putting more work into that. So our final question for you today, Randy, is what's one bit of advice you wish someone told you when you were training, or maybe someone did tell you that really made a difference in a positive way? So here we're looking for an actionable step that neuropsych trainees can take that can improve their performance and their trajectories.

**Randy Georgemiller** 1:29:34



I'm going to tell you, I've had the opportunity to train interns and residents in various settings, and the piece of advice that I always give them that they never like, so why don't I say it here is so many times trainees are looking, and I don't know if it has to do with trying to build their CV to get into the fellowship that they want or whatever, is looking for breadth instead of depth. Think about if you've ever had to go to consult with a surgeon and you were going to get a procedure, the first question I always ask is, "How many of those have you done?" Trainees many times will say, "Okay, I've demonstrated some competence with this particular test, or this particular task, or this particular skill, I'm going to move on." My recommendation always was, "Okay, so you've given 10 MMPIs. Give 100 MMPIs." You're going to have your own internal knowledge base that will interact with what you know from the literature, normatively and all that sort of thing. So, my recommendation always is to go for depth too. Breadth will come over the course of your career. You'll be pulled in many, many different directions. A lot of things you'll get to do. Like you guys doing a podcast, who would have thought that, right?



**John Bellone** 1:31:07

Not us. [laughs] A few years ago, who would have thought that.



**Randy Georgemiller** 1:31:11

Right. But you had a depth of experience from your background that prepared you for moving on, venturing out into something different. So that's the advice that I always give.



**Ryan Van Patten** 1:31:25

It's always a push-pull between breadth and depth. It sort of illustrates how this is such a lifetime commitment for us as professionals in clinical psychology and neuropsychology that we need both for sure. The generalist training initially and being a good, strong clinical psychologist broadly. But then, like you say, depth in our area of specialty is incredibly important. Yeah, giving 100 MMPIs and interpreting them over and over with different patients who vary in their backgrounds will be incredibly helpful in comparison to someone who just has done it a few times. So building up depth over time is important.



**Randy Georgemiller** 1:32:05

Right. When the trainee says, "I'm getting bored", I'd say "Well, you're just starting!" Okay, that's good. That's good. Yeah, figure out why you're bored and why you aren't learning when you should be learning. So yeah.



**Ryan Van Patten** 1:32:17

Well, this has been great. Aerospace neuropsychology, I love it. We've been wanting to talk about this topic for a long time. So thank you, Randy, for taking the time.



**Randy Georgemiller** 1:32:26

Thank you. It's been a pleasure to talk to both of you. I really want to commend you on the kind of research that you do to prepare yourself to ask me questions that many of which I can't even answer. I really appreciate it.



**John Bellone** 1:32:38

[laughs]



**Ryan Van Patten** 1:32:38

[laughs] Thanks.



**John Bellone** 1:32:39

Well, thanks. It seems like it might be easy to just talk about this stuff. But we do a lot, and particularly Ryan has a lot of prep work ahead of time. So Ryan really deserves the credit for that. It's much more difficult than it seems like it would be.



**Randy Georgemiller** 1:32:54

Well it shows. It shows, guys. To be able to pull out information from people, give the comfort level to gab on and on and on like I have for the last hour and a half, I really appreciate it.



**Ryan Van Patten** 1:33:05

Yeah, appreciate it.



**John Bellone** 1:33:06

It was great.



**Ryan Van Patten** 1:33:07

Take care.



**Randy Georgemiller** 1:33:08

Take care.



**Transition Music** 1:33:09

**Ryan Van Patten** 1:33:13



Well, that does it for our conversation with Randy. Be on the lookout for an upcoming episode with Jean Ikanga and Tony Stringer on the African Neuropsychological Battery. And, as always, thanks so much for listening, and join us next time as we continue to navigate the brain and behavior.



**Exit Music** 1:33:31

**John Bellone** 1:33:54



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**Ryan Van Patten** 1:34:06



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**End of Audio** 1:34:24