Aerospace Unplugged
Autonomy & Safety: Dual Efforts Advancing Aviation

Adam Kress

Hi everyone, and welcome back to another episode of Aerospace Unplugged. I'm your host, Adam Kress. On today's episode, we'll be diving into autonomy and automation in aviation. Now, I'm sure everyone out there is familiar with autopilot where an aircraft is essentially flying itself at cruise altitude. Now, here's a fun fact, Lawrence Sperry invented the autopilot more than 100 years ago, and Honeywell acquired that company back in the 1980s. Now, the flying public has taken autopilot for granted as long as we've all been alive, but people don't seem to have the same attitude on autonomy and aviation when the discussion shifts to potentially taking pilots out of the cockpit altogether.

Adam Kress

Now, my guest on the show today is going to help me unpack some of the nuance between automation and autonomy in aviation. Now, there's some major differences between the two, both from a technical perspective and a human emotional perspective, and we're going to touch on both.

Adam Kress

My guest is Sapan Shah. He's the Senior Director of Product Management for Honeywell's Advanced Air Mobility business. He works with all sorts of AAM companies that are utilizing Honeywell's technology. Many of these companies see a future where autonomy plays a larger role in aviation. So without further ado, I'd like to welcome in Sapan to the podcast. Thank you for joining me today.

Sapan Shah

Hey, Adam, thank you for having me here again.

Adam Kress

Great. Yes, that's true. You are a repeat guest of which we've had a few now, but pleasure to have you back. So tell me a little bit about your background, how you got into aviation, and then also how you got into Advanced Air Mobility.

Sapan Shah

Yeah, definitely. So I've been working in the Advanced Air Mobility now for over six years, but my journey in aviation starts earlier than that. Prior to that, I did some work around avionics and connectivity. And that background is very relevant now, especially in autonomy that depends so much on data, sensors, systems integration.

Sapan Shah

So at Honeywell, my work really is centered around defining the right product strategy for Advanced Air Mobility and autonomy. And the way I kind of define it is I break it down into three tracks. First, I look at what existing Honeywell products can we bring it to the autonomy and AAM market more or less as is? So like sensors.

Sapan Shah

Then the second track is: are there existing products and technologies that can be re-engineered to support the autonomy in AAM? So inceptor which we recently launched with Vertical would fit in there. We took a product that was launched for Orion spacecraft, we bring it to the Advanced Air Mobility.

Sapan Shah

And the third track is developing products and technology that doesn't exist before, like the ground control station for uncrewed operation, which is key for scalable autonomy.

Sapan Shah

And just one more thing quickly. Beyond the products, I've also focused quite a bit on partnerships because no single player is going to bring autonomy on its own because it is so vast. So Honeywell is looking to partner and form very intentional alliances with startups, with defense players to bring the right capabilities to the market quickly. Yeah, so that captures all the things I do.

Adam Kress

Yeah, excellent. So if we talk about the difference between automation and autonomy, it could be significant. A lot of automation has occurred for a lot of years in aviation and all sorts of parts of our lives that you probably don't even think about. But what's the primary distinction between automating something and making something autonomous in an aircraft?

Sapan Shah

Yeah, so first I'll start with saying that autonomy to me is a continuum, it's not a light switch. It's not going to go from zero to fully autonomous on all market segments at the same time. We're going to be very thorough and conscientious in how we can bring autonomy to various different market segments. It might be cargo drones, might be defense first before everything else.

Sapan Shah

And to specifically answer your question, the way I would break down and distinguish automation and autonomy is I would categorize it again in three different categories, assisted automation, supervised automation, and then full autonomy. And I'll explain each one of them.

Sapan Shah

Assisted automation means that the pilot, the system does not take the action. The pilot is the one that takes the action. A good example of that would be that the system, based on your location, is able to pre-select a chart or suggest a radio frequency based on your location, but the pilot has to actually do it.

Sapan Shah

Supervised automation would be like an autopilot. The system perform very specific tasks like maintaining an altitude, navigating a flight path. Going back to the previous example, it would be like the system actually tuning in the radio frequency. The pilot still has to supervise that it's the right radio frequency and has the full authority to do override it.

Aerospace Unplugged
Autonomy & Safety: Dual Efforts Advancing Aviation

Sapan Shah

Autonomous aviation is very different. That means that pilot fundamentally does not have to supervise what the system is doing. And in most of the instances, pilot does not even have the authority or the controls available to override the autonomy. And that's a big fundamental jump from automation, which could be assisted, supervised to autonomy. An example would be a uncrewed cargo drone detecting a traffic and routing around the traffic all on its own. The pilot, whether it's a remote pilot, doesn't even have all the controls to intervene into it. So that's how I would distinguish between automation and autonomy.

Adam Kress

Okay. So how is autonomy or is it being used in aviation today? One of the first things I think of is you hear about military drones. Obviously, those are not piloted. Or I guess you could say they're piloted remotely, but they fly autonomously. Is there any commercial service at this point where you have full autonomy in aircraft?

Sapan Shah

So again, I would kind of like… talk about when we talk about autonomy in the industry, I would like to encourage that we don't always jump directly to the end state because there's all these different steps incrementally in between where we are today to full autonomy. That is just a path and a journey to autonomy.

Sapan Shah

So yes, to answer your question, there are definitely operations today that are fully uncrewed. If you look at it on the small drone side, it's been over several years now around the world, as close as Texas and in Phoenix where our drones are now doing delivery, local deliveries.

Sapan Shah

Beyond that, we are all very familiar with the military operations, but I'll give you some very specific example that falls between an aircraft like a Predator or a small drone. Honeywell's working with Near Earth Autonomy, one of our partners, where we're actually taking existing helicopters that we are all familiar with, something like a Black Hawk or Leonardo's AW139. These aircrafts are today flown by multiple crews and we are removing the crews out there to enable logistics mission in a contested environment. So that that's another way where we are adding safety, not safety specifically talking about safety of the mission, but by making the mission more safe for the crew that would have to actually do it if that solution was not available. So I would say yes, there are real practical applications that are in development as well as deployed today.

Adam Kress

Okay. So you mentioned safety and I brought it up a little bit in my opening. People hear, oh, we might take the pilot out of the cockpit. We might have fully autonomous flight. Now, people will ride on an airport shuttle and they have no idea who's piloting the little train. It's probably nobody. But people, the general public I would say really take a step back when they hear that that could be a possibility someday. So first, we'll talk about the emotional side of it in the second, but first from a technological perspective, how close are we as an industry to being able to do that and wanting to do it?

Sapan Shah

Right. So I think the demand for the autonomy is definitely here. And I think that demand is here for couple different market segments. It's primarily being driven by cargo and defense. And if we were to bring a certified vehicle in the market today, and I'll talk about why can't we bring that vehicle today in the market, but if we bring a certified vehicle in the market today, there is demand to start operating that for cargo and defense logistics. I think talking about uncrewed operations for human or passenger carrying transportation, I think that's still a while away, but there is true demand for cargo and logistics.

Sapan Shah

Talking about technology, I think example that I gave you. Just last week, and so today is June 10th, right? So just last week, Honeywell did a autonomy prototype demonstration on our AW139 with Near Earth Autonomy. And that was going from one on hover to hover. So the technology is there both to convert the existing vehicles, retrofit the existing airframes to do the operations remotely or through uncrewed. And then there are also OEMs that are trying to do that with brand new vehicles. And there are lots of examples of that in the market as well.

Sapan Shah

So I would say it's not really a matter of are we there? What is needed? I think the technology is very close. I think there's a lot of work that needs to happen on the regulation side. And then more important, also a lot of work around how do we communicate that this is being done in a way that's safe and so that the broader users of the society actually trust that this is done right and then they accept it? So I think it's more than technology. It's really around regulation and the trust that we need to overcome.

Adam Kress

Well, how do you think that trust gets built? How do we overcome those who may just naturally have that reaction of being put off by all this stuff flying by itself and being fully automated or autonomous?

Sapan Shah

Yeah, I think there are a lot of different approaches. I think you mentioned early on that you get on a shuttle today at the airports and you don't know who's driving it. Is there anybody in the front or even at the remote operation center that's actually managing any of this? Yet, we are just very naturally get on it and don't even think about it. And for those of us that live or work in Phoenix, we know Waymos are everywhere and now they are just are common or are part of life. So I think one is just that as the society starts getting exposure to more and more of these operations, we will start becoming familiar and start getting used to it.

Sapan Shah

But I'll give an example here. I was at my fourth grader's classroom last week talking about my career in aviation and I was talking about generally just topic aviation and automation in aviation. And one of the kid asked me, "Is AI going to take over humanity?" And this is a 10-year-old talking about AI and ChatGPT, talking about taking over humanity. And my answer to them is like, "No, that's not going to happen in your lifetime or for several generations, we don't need to worry about it."

Sapan Shah

But specifically in aviation, we are not trying to build a AGI, right? We're trying to give very narrow authority for an aircraft to do a specific mission from one point to another. So I think that's something that we need to continue to drive, that yes, these vehicles are uncrewed, but they don't have very broad authority of going wherever they want to. It's really going from point A to point B with the following systems and rules built into it. So it's more really about education and exposure.

Adam Kress

Okay. If we shift back a little bit more to just different levels of automation within flight, how has that traditionally helped pilots?

Sapan Shah

That's excellent. So I think where we are right now in terms of assisted automation and supervised automation in a crewed aircraft where you have two pilots in the cockpit today, providing more and more of these automation, increased automation is going to reduce pilot workload on more mundane activities, allowing them to use their cognitive abilities for more situational awareness that enhances mission safety. So it's all about incrementally providing additional automation to reduce the workload, which enhances situational awareness.

Sapan Shah

A couple examples would be the detect and avoid solutions that Honeywell's building. That allows the pilot to detect whether it's weather or traffic and provide recommendations on how do you avoid it. The SURF-A solution that we are building essentially again provides pilot situational awareness of traffic on the ground, decreasing pilot workload, improving safety. So I think it's really all about additional safety that we can add to the mission. That's the added benefit to the pilot.

Adam Kress

Okay, excellent. What do you think are common misconceptions around this technology, whether it be just increased levels of automation in the cockpit or aviation in general?

Sapan Shah

I think really there are several things, but I think the biggest misconception is that autonomy is going to get pushed everywhere all at once regardless of the context. And the reality is that is not going to be the case. It's going to be a very deliberate, we are going to be very deliberate about how we deploy it.

Sapan Shah

And in some use cases, I think what we need to talk about it, the misconceptions and the benefit is that in cases like defense, humanitarian, firefighting, law enforcement, the need is urgent and real and we don't need to put the crew at risk. So I think by bringing this economy in those situation first, we're able to communicate that, hey, we are removing the pilots from high risk situation. When it comes to passenger-carrying aircraft in an urban setting over a city, I don't expect it anytime soon.

Sapan Shah

The second misconception is autonomy somehow compromises safety. And I think aviation, like we know, is a safest mode of transportation. And any new autonomous or highly automated vehicle will still have to meet the same gold standard. So we're building safety critical systems for decades, and that's the same mindset that we're going to bring, the industry is bringing with automation and autonomy.

Sapan Shah

And then the third misconception, and I kind of touched upon it, is this broader cultural fear around AI today. And I think it comes really about education is that we're not trying to give a really broad authority to the aircraft, but it's really trying to complete a very narrow set of mission and they have very narrow authority to do that.

Adam Kress

Okay. From a technological perspective then, where are we headed next? Where is the industry going? When are we going to see higher levels of automation and autonomy like, say, in the next two or so years?

Sapan Shah

So I think over the next few years we'll start seeing some real tangible progress, especially when it comes to uncrewed operations. First, I expect uncrewed cargo platforms and vehicles with simplified flight controls to be certified and in the market. So I think that's a huge milestone. You'll start seeing larger existing airframes that we are all familiar with that have a pilot today are going to be used to transport cargo remotely with a remote pilot. That's one.

Sapan Shah

Some of the helicopters and other aircraft that has quite complex controls for an average person will be highly, highly simplified. That allows somebody that's coming in fresh to be able to go through a lot of training and be able to fly these vehicles and get certified for these vehicles very quickly. But we'll still have to work with the training, but it's just the technology's going to be here. I expect that to be certified and in the market.

Sapan Shah

And then beyond that, I'll start seeing certified vision-based detect and avoid system that can not only just be used for drones because that's already in the market, but it can be start used for bigger aircraft to provide that additional situational awareness for the pilots because we've seen some midair collisions. Those are some of the things we can provide additional situational awareness.

Sapan Shah

And finally, I would say just again, last Friday we saw the administration, the president signed several executive orders around Beyond Visual Line of Sight around drones, specifically calling the FAA, DOT, and other agencies to allocate resources to make this a reality. So I expect Beyond Visual Line of Sight rules and regulations to be in place to allow for very regular and scaled drone operations, not just in selective cities, but all over the country. So in short, autonomy isn't just slowly moving. I think it's rapidly accelerating in some market segments.

Adam Kress

Yeah. Are there any autonomy advancements or developments maybe from a technical perspective that you're particularly excited about?

Sapan Shah

I think I'm really excited about the work that we are doing with Near Earth Autonomy where we are taking existing older versions of Blackhawks that are underutilized and making them uncrewed operations. I think first of all, Black Hawk is such an iconic helicopter. Being able to being part of that project is just super exciting for me personally. But then also seeing that that would actually make a difference to the warfighter in reducing the risk to them, as the geopolitical tensions increase around the world and make our national security position stronger. So I'm really excited about that particular project.

Adam Kress

Yeah, with NEA, I know that it's for use in the Army, the Army that operates the Black Hawks.

Sapan Shah

Yeah.

Adam Kress

So essentially, as part of that, then we're proving out that we could fly autonomously, but then they would need to train soldiers essentially to navigate these helicopters remotely?

Sapan Shah

Yeah, that's the exciting part about it, right? Those are the kind of questions we talked about is this is not just about having the technology ready, but now you are introducing this aircraft into the fleet in an uncrewed fashion where the fleet is not ready for it, or this is the first time they are actually encountering something like this. So how do you get the entire ecosystem ready for it? All the way from a soldier to somebody that's going to load, unload, to the radio controller. So I think as much as it is about building the technology, it's also bringing the entire ecosystem with it.

Adam Kress

Yeah. Be even more impressive if they could do it with a Chinook, right? Big, huge, heavy one.

Sapan Shah

Yes. Next one.

Adam Kress

Yes.

Sapan Shah

Next one after that.

Adam Kress

Yeah. Sapan, well, thank you so much for joining me again today. I don't remember when you were on the podcast the first time, if we asked you this one, but the final question we ask everyone is the podcast is called Aerospace Unplugged, so when you unplug and you're not thinking about autonomy and automation, what do you do to kick back?

Sapan Shah

Yeah, there's always so much to think about and learn about what's happening in the autonomy field. But beyond that, really it kind of goes down to just going, hitting the gym and sweating it out. It's going to bringing your stress level down. And then hanging out with the kids. Those are the two things I do.

Adam Kress

There you go. Well, it sounds like you said you had a fourth grader, right?

Sapan Shah

Yeah. 10-year-old boy and a five-year-old girl.

Adam Kress

Yeah. There you go. Well, good. Good, high energy, fun age, ride, run around with them for sure.

Sapan Shah

Absolutely.

Adam Kress

Well, thanks again, Sapan. And like always, thanks to all you listeners out there as well. If you want to learn more about autonomy in aviation, I encourage you to seek Honeywell's White paper on this topic. We mentioned it earlier in the show, and you can find that on the Honeywell Aerospace website. We have a link to it in the description to this podcast as well. Thanks again, everyone, for listening, and we'll catch you all again on the next episode of Aerospace Unplugged.