Negative: Autopilot

By “Coach Vance” Trefethen

***Resolved: The United States federal government substantially reform the use of Artificial Intelligence technology***

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Negative: Autopilot

TOPICALITY

1. Nothing reformed

Link: Definition of reform

Merriam Webster Online Dictionary copyright 2021 <https://www.merriam-webster.com/dictionary/reform> (accessed 28 May 2021)

**:**to put or change into an improved form or condition

AI is already being phased in to the aircraft industry

Alyson Behr 2018 (aviation journalist) 5 Dec 2018 “More than an auto-pilot, AI charts its course in aviation” <https://arstechnica.com/information-technology/2018/12/unite-day1-1/> (accessed 20 Nov 2021)

Major aircraft manufacturers such as [Airbus](https://www.airbus.com/) are already phasing in AI. According to Airbus Vice President for AI Adam Bonnifield, the company has been working on these technologies for a long time. "Airbus is not that unfamiliar with these technologies because of our background in aviation and building systems that essentially solve some problems in autonomy," he told Ars.

Violation: Doing more of the same isn’t reform

If the Affirmative claims to be doing more of what the Status Quo is already doing (or, heaven forbid, rolling it out BEFORE it’s ready), then nothing is reformed.

Impact: No Affirmative team in the round warrants a Negative ballot

Both sides are advocating for the Status Quo, so there is no one advocating the substantial reform required by the resolution. No matter who wins, if no one is affirming the resolution, you should write Negative on the ballot.

INHERENCY – Status Quo will solve

1. Industry already working on it

Aviation industry is already working on AI autopilot and will adopt it as soon as it’s ready

Haitham Baomar and Peter Bentley 2021 (Both are with: Department of Computer Science, University College London) “Autonomous fliht cycles and extreme landings of airliners beyond the current limits and capabilities using artificial neural networks” 15 Feb 2021 <https://link.springer.com/article/10.1007/s10489-021-02202-y> (accessed 30 Nov 2021)

The aviation industry is currently working on solutions which would lead to decreasing the dependence on human pilots. The reason behind this is to lower the workload, human error, stress, and handle the pilots’ shortage problem compared to the high demand for new airplanes, by developing autopilots capable of performing complete flights without human intervention. We anticipate that future autopilot systems which make of methods proposed here could improve safety and handle the challenges faced by the industry.

“Significant resources” being invested by airlines in AI already in Status Quo

Alyson Behr 2018 (aviation journalist) 5 Dec 2018 “More than an auto-pilot, AI charts its course in aviation” <https://arstechnica.com/information-technology/2018/12/unite-day1-1/> (accessed 20 Nov 2021)

Ask anyone what they think of when the words "artificial intelligence" and aviation are combined, and it's likely the first things they'll mention are drones. But autonomous aircraft are only a fraction of the impact that advances in machine learning and other artificial intelligence (AI) technologies will have in aviation—the technologies' reach could encompass nearly every aspect of the industry. Aircraft manufacturers and airlines are investing significant resources in AI technologies in applications that span from the flight deck to the customer's experience.

2. Federal government is already working on it

NASA is researching AI for commercial aviation

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Perhaps one of the most important uses of AI-based analytics, however, may be in identifying risks to the safety of aircraft before a disaster—such as the crash of Lion Air Flight 610, when a failure of the automated control system on a prior flight may have signaled a major safety issue. [NASA Ames Research Center](https://www.nasa.gov/ames) in Silicon Valley is heavily involved in aviation-related AI, and one of NASA's projects there is focused on identifying "anomalous operations" within data from commercial aviation—events that could be precursors to potentially bigger problems.

3. Status Quo is the best policy for safety

AI + Humans is the best policy for saving lives, rather than replacing humans with AI

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The hope for the analytics being developed at Ames is that the AI can discover patterns of anomalies in flight data that could be indicative of a systematic problem with aircraft. "You'd like to find that as soon as possible and come up with some kind of a mitigation to prevent it happening again," [NASA researcher Nikunj] Oza explained. He said that, so far, rather than AI replacing humans outright in aviation, AI and human experts have proven to be complementary—a partnership that can save human lives.

HARMS / SIGNIFICANCE

1. Not much improvement possible – no harm in Status Quo

Commercial aviation is so safe already that it’s difficult to find ways AI could make it any safer

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[NASA Ames Research Center](https://www.nasa.gov/ames) in Silicon Valley is heavily involved in aviation-related AI, and one of NASA's projects there is focused on identifying "anomalous operations" within data from commercial aviation—events that could be precursors to potentially bigger problems. This is a primary area of research for Nikunj Oza, a computer scientist and leader of the data sciences group within NASA Ames' intelligent systems division known as Code TI. Because commercial aviation's safety record is so good—much better than driving, for example—it's much more difficult to identify those few cases where there's an anomaly that might represent a safety issue.

SOLVENCY

1. No reform of Air Traffic Control (ATC) in AFF Plan

Can’t implement AI planes without also complete update of the entire ATC system

Sani Theo 2021 ( **Head – Technical** in the **EFY Group,**  technology-oriented publishing organisation) 8 Jan 2021 “AI In Aviation: Are You Ready To Fly Without A Human Pilot?” <https://www.electronicsforu.com/technology-trends/tech-focus/ai-aviation-fly-without-human-pilot> (accessed 29 Nov 2021)

Autonomous commercial aircraft would also require updating entire ATC systems. If an ATC needs to reroute the plane, or issue a change in course, currently it is handled via person-to-person communication. Some kind of command to the plane via data link would be needed to do it via an automated system. Thus, automation will be needed both in aircraft and the ATC system.

Must have ATC speech recognition to get AI to work. Status Quo is working on it

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Air Traffic Control (ATC) communications is a critical aspect of all flights. In the European airspace, much conversation happens in heavily accented English, making it difficult for pilots and controllers to understand each other. Pilots need to listen for their tail/flight number to be called for clearances, directional instructions, and traffic alerts, often under challenging instrument meteorological conditions (IMC) when they can't see out of the cockpit. Airbus directed AI at this problem as part of [a public contest](https://aigym-v.airbus.com/contest/5bc8313f58907f002785515d) in the company's [AI Gym](https://aigym-v.airbus.com/about)—a program in which Airbus seeks outside partners to assist in developing breakthrough AI systems. Cleaning up air traffic conversations is difficult for machine-learning algorithms to parse, because ATC audio is noisy, and the conversation is rapid-fire and full of what Airbus described as "domain-specific vocabulary." The goal of AI Gym was to provide full transcription of ATC audio, as well as extract aircraft call signs from audio for conversation tracking and alerting. "We opened it up to a broad community of different businesses, consulting firms, startups, and research groups to collaborate with us," said Bonnifield. The competition closed in October 2018, and Airbus has already begun work to convert the results into a product.

2. Too expensive

Airlines can’t afford the new AI expensive technology

Sani Theo 2021 ( **Head – Technical** in the **EFY Group,**  technology-oriented publishing organisation) 8 Jan 2021 “AI In Aviation: Are You Ready To Fly Without A Human Pilot?” <https://www.electronicsforu.com/technology-trends/tech-focus/ai-aviation-fly-without-human-pilot> (accessed 29 Nov 2021)

While AI is promising for the future of the aviation industry, it has some pitfalls as well. First, AI is quite expensive. All airlines might not be able to afford or invest in such new and expensive technology.

3. Technology at least a decade away (More Study Needed)

Airplanes are way more complicated than drones (UCAVs). AI won’t be feasible in the next decade or so

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A UCAV has some intelligence along with the capability of flying to a pre-determined location. Dropping some mines and then returning to a base location might be militarily cost-effective. But we cannot compare auto-pilot features in commercial planes with UCAVs, because UCAVs have limited features and control functions. There are many risks involved with pilot-less commercial planes. Therefore experts feel that fully-functional commercial planes without human pilots may not be feasible in the next decade or so.

Solvency: Lots of complex technology problems still have to be resolved for AI planes to work + Inherency: Airline industry will adopt it when it’s ready. Be patient.

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Like any other industry, the aviation industry will embrace cost-cutting using robots. With advanced AI technology, more and more aircraft controls are being entrusted to AI systems. Robots and cognitive machines are already more advanced than humans at most jobs. But replacing human pilots by AI is a complex mission, and would involve technical, legal and political aspects. Auto-pilot feature to an extent can fly a plane but it generally involves some human interaction. Complete automation without human intervention is not an easy task.

A lot more study needed to make AI aircraft feasible

Erin I. Rivera and Anna Dietrich 2020 (Rivera is an aviation attorney with Fox Rothschild LLP and a former combat search and rescue flight engineer in the U.S. Air Force. Dietrich is co-executive director of the Community Air Mobility Initiative) 16 Oct 2020 “Moving from automation to autonomy in aviation”   <https://evtol.com/opinions/moving-automation-autonomy-aviation/> (accessed 29 Nov 2021)

For most of the aviation era and arguably still today, the most advanced equipment onboard the aircraft has been the pilot. Advancements in autonomous aircraft may one day render the human pilot obsolete, but that day is still quite a ways off. The introduction of autonomy systems promises tremendous improvements in safety over the current pilot-and-automation setup, but the transitioning years must be approached with a careful understanding of the capabilities, limitations, strengths, and weaknesses of available AI systems and humans alike.

A/T “IAS (Intelligent Autopilot System)” – It’s a “proof of concept,” not a ready working system

Haitham Baomar and Peter Bentley 2021 (Both are with: Department of Computer Science, University College London) “Autonomous flight cycles and extreme landings of airliners beyond the current limits and capabilities using artificial neural networks” 15 Feb 2021 <https://link.springer.com/article/10.1007/s10489-021-02202-y> (accessed 30 Nov 2021)

Zhai et al. emphasizes the need for assuring that the intelligent control system must not behave unexpectedly and must have a certain level of situational awareness where the behaviour is altered to handle an emergency for example. Although the IAS is a proof-of-concept designed to prove the possibility of introducing intelligent autonomy to the cockpit, not a fully developed mature autopilot, we have already paid attention to the assurance points by making sure the training datasets contain specific patterns that guarantee the elimination of unexpected behaviour.

A/T “IAS (Intelligent Autopilot System)” – Great potential but needs more study

Haitham Baomar and Peter Bentley 2021 (Both are with: Department of Computer Science, University College London) “Autonomous flight cycles and extreme landings of airliners beyond the current limits and capabilities using artificial neural networks” 15 Feb 2021 <https://link.springer.com/article/10.1007/s10489-021-02202-y> (accessed 30 Nov 2021)

To involve the aviation industry in evaluating the performance of the IAS, and in addition to providing training data for the IAS, the experienced pilot provided his feedback after being presented with complete (airport to airport) flight demonstrations of the IAS, and landings in calm and extreme weather conditions as the experiments above show. We asked him the following questions, and he answered as follows:  
1. Compared to the standard modern autopilot, what is your impression of the performance of the IAS when executing complete flights in calm and severe weather conditions? “*Good. I Wish we can try the IAS in a 6-axis full motion flight simulator to evaluate it further.*”  
2. Although flying in such conditions is probably against regulations, but for testing purposes, is the IAS capable of preforming crosswind landings beyond the current limits and capabilities of modern autopilots? What about experienced human pilots? “*Yes. It is always a challenge, human pilots are allowed to land in crosswind conditions up to the demonstrated limit such as 38 knots, whereas the autopilots limit is less. I Hope that the IAS can help in increasing the crosswind limit which is sometimes limited due to flight controllability rather than pure capability.*”

3. Is the current performance of the IAS in general comparable with human pilots? If yes, as an experienced captain and instructor, how would you rate its performance if it were human? novice, intermediate, or experienced? “*Yes, I would say intermediate although I suggest comparing it more with other autopilot.*”

4. Do you agree that the IAS has the potential to introduce new advantages to the aviation industry such as enhancing safety as a dependable autopilot compared to the modern ones? “*Yes, it does. It just needs to be trained more on scenarios and various conditions and malfunctions.*”

DISADVANTAGES

1. Crisis handling

Link: Sure, you can do AI autopilots tomorrow… if you don’t care about what happens in a crisis situation

Keith Button 2019 (journalist) Jan 2019 “A.I. in the cockpit” <https://aerospaceamerica.aiaa.org/features/a-i-in-the-cockpit/> (accessed 29 Nov 2021) (brackets added)

“We can automate it tomorrow,” he [chair of the FAA Research Engineering and Development Advisory Committee, John Hansman] says. “In an airplane like an A320 or a 787, the pilot taxis it out, gets to the end of the runway, and as long as you want the airplane to fly the trajectory you’ve predefined, you can press a button and the pilot won’t touch the control until the airplane rolls out on landing and they put the brakes on and taxi it in.” The question is what happens in a crisis.

Link & Brink: Must validate crisis situation handling before AI takeover of autopilot. Even if they’re rare.

Keith Button 2019 (journalist) Jan 2019 “A.I. in the cockpit” <https://aerospaceamerica.aiaa.org/features/a-i-in-the-cockpit/> (accessed 29 Nov 2021)

Computer scientists point to in-flight emergencies as examples of edge cases, rare scenarios that can be too complex and uncertain to be resolved by today’s combination of automation and human pilots. Validating performance in these edge cases remains arguably the largest stumbling block toward the goal of assigning complete control of a passenger plane to AI.

Impact: CRASH!

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Recently, Boeing was under intense scrutiny after its 737 Max Jet was involved in two deadly crashes. In March, Ethiopian Airlines Flight 302, a Boeing 737 series crashed minutes after it took off, and all 157 people onboard died. The first such crash took place in October 2018 in Indonesia. Lion Air Flight 610 crashed just minutes after taking off from Jakarta, killing 189 people. MCAS software installed in jets was the key reason behind the fatal accidents. These incidents are an eye-opener for the use of AI technology in the aviation sector.

Lion Air Flight 610 crash in Oct 2018 shows why AI software needs more study

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But machine-learning systems are only as good as the data they get. There is inherent risk in handing off more of what humans do in a high-risk environment to ML or AI that few people understand. While the final investigation of the [recent crash of Lion Air 610](https://arstechnica.com/information-technology/2018/11/black-box-data-shows-pilot-fought-control-system-in-indonesia-crash/) is still underway, the details revealed so far are a strong warning of the risks of handing off too much control to autonomous systems. While catastrophic aviation accidents seldom happen as a result of a single mistake (and this was no exception), the MCAS sensors failed, maintenance failed to fully correct the issue, and the pilots had not been fully trained and informed on the function and use of the MCAS. The lesson, reinforced at a tragic cost of 189 lives, is that the aviation industry will have to fold data quality and the care and feeding of ML and AI systems into the safety culture that commercial aviation is already renowned for. As machine learning and AI transform the role of pilots, those technologies need to be as thoroughly tested as their human counterparts and deemed at least as competent.