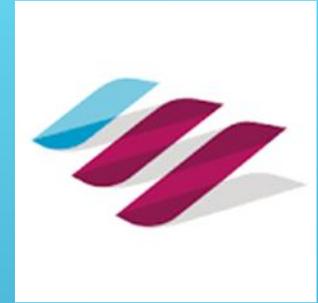


# CHANGE IS IN THE AIR

A discussion around un-manned commercial flight.

- ▶ co-pilot crashed a Germanwings plane into a French mountain
- ▶ prompted a global debate about how to better screen crewmembers for mental illness
- ▶ How many human pilots, some wonder, are really necessary aboard commercial planes?



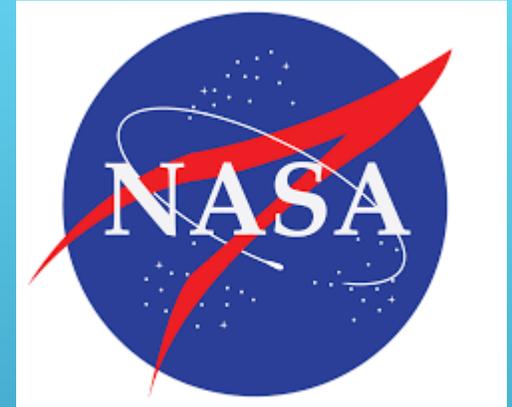
# GERMAN WINGS CRASH

- ▶ In 2014, airlines carried 838.4 million passengers on more than 8.5 million flights.
- ▶ Approx. 80% of all accidents are attributed to Human Error. 70% of which is based on in flight decisions.
  
- ▶ Commercial aviation is already heavily automated.
  - ▶ flown by a computer autopilot that tracks its position using motion sensors and dead reckoning, corrected as necessary by GPS. Software systems are also used to land commercial aircraft.
- ▶ survey of airline pilots,
  - ▶ Boeing 777s reported that they spent just seven minutes manually piloting their planes in a typical flight.
  - ▶ Airbus planes spent half that time.

## CURRENT LANDSCAPE

- ▶ Such a system could take over, if permitted. Already, the Pentagon has deployed automated piloting software in F-16 fighter jets. The Auto Collision Ground Avoidance System reportedly saved a plane and pilot in November during a combat mission against Islamic State forces.
- ▶ The Pentagon has invested heavily in robot aircraft. As of 2013, there were more than 11,000 drones in the military arsenal. But drones are almost always remotely piloted, rather than autonomous. Indeed, more than 150 humans are involved in the average combat mission flown by a drone.

## CURRENT ACTIVITY



- ▶ Ames Research Center - NASA's center in Silicon Valley, California  
- contributes to virtually every major NASA mission and initiative

NASA AMES RESEARCH CENTER

- ▶ NASA is exploring a related possibility: moving the co-pilot out of the cockpit on commercial flights, and instead using a single remote operator to serve as co-pilot for multiple aircraft.
- ▶ In this scenario, a ground controller might operate as a dispatcher managing a dozen or more flights simultaneously. It would be possible for the ground controller to “beam” into individual planes when needed and to land a plane remotely in the event that the pilot became incapacitated — or worse.



## THE FUTURE – SEMI MANNED



- ▶ The Defense Advanced Research Projects Agency, the Pentagon research organization, will take the next step in plane automation with the Aircrew Labor In-Cockpit Automation System, or Alias. Sometime this year, the agency will begin flight testing a robot that can be quickly installed in the right seat of military aircraft to act as the co-pilot. The portable onboard robot will be able to speak, listen, manipulate flight controls and read instruments.

DARPA

- ▶ The machine will have many of the skills of a human pilot, including the ability to land the plane and to take off. It will assist the human pilot on routine flights and be able to take over the flight in emergency situations.
- ▶ A number of aerospace companies and universities, in three competing teams, are working with Darpa to develop the robot. The agency plans for the robot co-pilot to be “visually aware” in the cockpit and to be able to control the aircraft by manipulating equipment built for human hands, such as the pilot’s yoke and pedals, as well as the various knobs, toggles and buttons.
- ▶ “This is really about how we can foster a new kind of automation structured around augmenting the human,” said Daniel Patt, a program manager in Darpa’s Tactical Technology Office.



## THE FUTURE - UNMANNED

- ▶ NASA would like to see fewer humans guiding planes on the ground, too.
- ▶ agency officials ran a simulation of new software intended to bring more automation to the nation's air traffic control system, specifically to help with congestion and spacing of aircraft.
- ▶ Last month at the NASA Ames facility, retired air traffic controllers and commercial pilots sat at air traffic control terminals and helped scientists test the system as it simulated air traffic arriving in Phoenix.
- ▶ The software, known as Terminal Sequencing and Spacing, can coordinate the speed and separation of hundreds of aircraft simultaneously to improve the flow of planes landing at airports. Ultimately, NASA says, it may be able to increase the density of air traffic in the nation's skies by as much as 20 percent — with fewer human controllers.
- ▶ Indeed, the potential savings from the move to more autonomous aircraft and air traffic control systems is enormous. In 2007, a research report for NASA estimated that the labor costs related to the co-pilot position alone in the world's passenger aircraft amounted to billions of dollars annually.



## OTHER SYSTEMS OF AUTOMATION

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# SAVINGS

- ▶ What the Germanwings crash has elevated the question of should there or not be ways to externally control commercial aircraft?
- ▶ Could we have a single-pilot aircraft with the ability to remotely control the aircraft from the ground that is safer than today's systems?



ONE SIDE OF THE COIN

- ▶ Automating that job may save money. But will passengers ever set foot on plane piloted by robots, or humans thousands of miles from the cockpit?



THE HUMAN CONDITION

- ▶ “You need humans where you have humans, If you have a bunch of humans on an aircraft, you’re going to need a Captain Kirk on the plane. I don’t ever see commercial transportation going over to drones.” - Mary Cummings, the director of the Humans and Autonomy Laboratory at Duke University



FINAL THOUGHT