Even the best pilots have physical & mental limits

how could an ALIAS assistant extend these?

As aircraft pulls out of bank, pilot suggests that they could ditch in Hudson river

While still theoretically feasible to land, piloted simulations show that workload begins to rise dramatically

First minute after diagnosing issue was critical to outcome. Workload driven by assessing & maintaining state, finding procedures in binders

→ Additional automation and situation awareness (trajectory computation) tools could have assisted

heroic piloting saved 155 passengers
The objective of the ALIAS program is to develop and insert new automation into existing aircraft to enable operation with reduced onboard crew.
Dangerous trends in aircraft complexity and automation

Automation and MFDs have reduced number of direct controls for a pilot\(^1\)

Procedural complexity continues to increase across aircraft

Part-time automation is creating a crisis in the cockpit\(^2\)

ALIAS could provide a full-time hierarchical abstraction to manage cockpit workload

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1. DARPA analysis; 2. K. Abbott et al., Operational use of flight path management systems, 5 Sep 2013, FAA
Downward trend in transport operating aircrew

Theoretic advantages of increased automation in aircraft
- Better abilities for some operations
- Reduced pilot workload
- New capabilities and missions

ALIAS would provide a path to addressing challenges of safety, trust, and cost

Image source: propspistonsandoldairliners.blogspot.com
What is ALIAS?

ALIAS would be an automation kit; a toolbox

that enables operation with variable onboard crew on a variety of existing aircraft

installed in a portable, reversible manner

controlled at a “mission commander” level from a latency tolerant, low-workload user interface

Image sources: wikimedia commons, CCA2.1 license, user:Mizunoryu, www.af.mil
Technology framework: three key technical thrusts

(1) ALIAS-aircraft interface
[aircrew motor functions]
- Operation and automation of aircraft functions without extensive aircraft modifications

metrics
- installation time of 1 day
- automatic flight operability from takeoff-to-landing flight via installable in-cockpit system

(2) Knowledge acquisition
[aircrew training]
- Adaptable core flight controller and machine-assisted assimilation of procedural knowledge

metrics
- time-to-adapt in <1 month

(3) Human-machine interface
[capture & inform operator intent]
- High-level mission direction
- Condensed display of expert system logic and system status

metrics
- control of flight via a single-screen and/or voice
Current Platforms
ALIAS extensibility to future applications

- ALIAS could provide a simpler way to interface with complex machines
- ALIAS could provide low cost means to bridge between automation and autonomy in field of aerospace, burdened with high capital costs
- Defies current platform-centric model for advances

Architecture supposes the future, at low cost: trusted, reliable system at the heart of mission capability, human provides high level guidance.

ALIAS architecture advances technology

capability development
freed from dependence on
platform development

Breaks expensive platform-dependence in autonomy development

onboard or offboard operator
“The objective of the ALIAS program is to develop and insert new automation into existing aircraft to enable operation with reduced onboard crew”