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Designing a virtual cognitive assistant for pilots: a user-centered approach



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EXECUTIVE FUNCTIONS AND FLYING

Piloting an aircraft takes place in a complex, changing and dynamic environment. It requires **fast decision-making process** and **high level cognitive abilities**, including executive functions.

For instance, pilots need to **process a lot of information**, store data in short term memory, plan actions or regulate their own behavior in case of a stressful event.

In addition, an important **perceptual activity** is necessary to integrate all various information displayed on the cockpit instruments or coming from the outside world.

COGNITIVE AGING AND AVIATION

The effects of cognitive aging are now well known and documented in the literature.

Some executive functions, like working memory, begin to decline from the age of 55 (Causse, 2010).

There is **no age limit for flying in general aviation** and many private pilots are 65 years old or above.

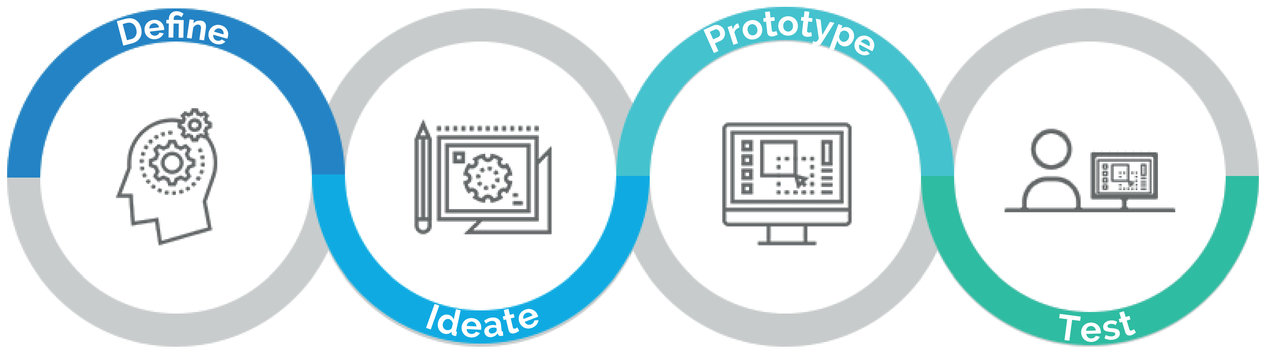
For those older pilots, **alteration of executive functions due to age can lead to human error or increased workload**, thus compromising flight safety.

Yet, very few studies investigate how technological developments could be used to mitigate those effects on piloting performance.

USER CENTERED DESIGN

→ **Iterative design process** that focuses on the users and their needs in **each phase** of the design process

→ **Involve users** throughout the **whole design process** via a variety of research and design techniques



We first conducted semi-structured interviews (contextual inquiry) to get insights from pilots and clearly identify their needs in terms of assistance.

We first met 8 pilots (5 from general aviation, 3 from commercial aviation), all males, aged from 34 to 52 years old.

KEY FINDINGS

The results of our semi-structured interviews show that all pilots from general aviation (all single-pilot aircrafts) **are in favor of being assisted**.

The users ideal assistant :

→ Is a **supervisor** of the systems

→ **Alerts** the pilot in case of an abnormal situation

→ Is **not intrusive**

→ Can be controlled by **voice command** (but not only)

→ Does **not use vocal feedback**

FUTURE WORK

→ **New interviews**, with older pilots (55+ years old) focusing more specifically on the effects of age

→ **Brainstorming** sessions with pilots, using our first findings as insights

→ **Prototyping** a functional representation of an on-board cognitive assistant aiming at reducing cognitive workload of elderly pilots

→ **Testing** the prototypes with pilots in a flight simulator

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