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Integration of Unmanned Aircraft to the National Airspace System: Challenges and Opportunities

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The United States Federal Aviation Administration has set a goal of initial integration of Unmanned Aircraft Systems (UAS) into the National Airspace System (NAS) by 2015, with additional, related goals stretching to 2025. Currently, UAS are only authorized to fly in restricted airspace. In some instances, on a case-by-case basis, with strictly reviewed and regulated procedures, UAS can operate just beyond restricted airspace when necessary.

There is a lot of work to be done to realize the goal of integration into the NAS. It may be overgeneralizing to suggest that the many thousands of unique types of UAS can be said to have common characteristics. However, some general issues appear to be shared by many UAS types. For instance, Unmanned Aircraft have traditionally been designed either for use in theater, a scenario that does not involve interacting with the large volume of U.S. domestic air traffic, or for limited range use, such as surveillance or photography of remote areas. Thus, there is a large range of the level of sophistication and comparability to manned aircraft of the instrumentation on UAS. Most UAS were not designed to use domestic navigational aids or infrastructure, and some do not yet have the level of specificity in flying or even inputting given headings or altitudes as their manned counterparts.

Another aspect of UAS flight which would benefit from analysis is the issue of a loss of command and control link. When the ground control station loses its signal link with the aircraft, the typical aircraft executes a previously programmed (often updatable while the link is maintained) mission or flight plan. This flight plan could have a goal of transiting the aircraft to a "safe" place to ditch, or to a place to try to re-establish the link. In either case, many potential human-system interactions can be explored in the effort to identify a best practice.

These issues, of course, could potentially be overcome with evolution of their control interface. Further mitigation of these issues could be accomplished with careful adaptation of air traffic regulations of any sort that might ensure safety. Regardless of the myriad technological and policy changes that may occur to help integrate UAS into the NAS, a wealth of research to investigate the most effective, most safe, and least likely to fail solutions is prudent and inevitable.

Some, but not all UAS pilots (or operators) are certified manned aircraft pilots of various types. However, some have experience only with UAS. The potential control interface and policy adaptations described above will need to assume a novice user (i.e., one not necessarily familiar with traditional, manned aircraft controls and information displays). This is at once a challenge and an opportunity. UAS pilots (who are not also manned aircraft pilots) could potentially be trained more effectively to use novel control interfaces and new types scan information displays. From a design, training, and human factors standpoint, there is potential for a great deal of intriguing development and study.

I believe research involving the ergonomic and cognitive-ergonomic aspects of these solutions will continue to be an area of growth not only in our field, but in many fields. Researchers who feel their expertise is applicable to the safe integration of Unmanned Aircraft into the National Airspace System would do well to take note.

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