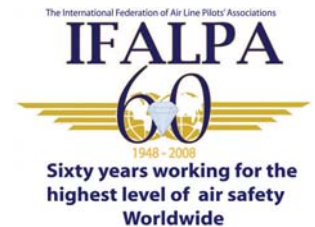


International Federation of Airline Pilot Associations

By Capt Thomas Milderberger & Gideon Ewers



UAS & Responsibility

There is no doubt that the capabilities of unmanned aircraft and their systems have progressed to an impressive extent, but have they progressed to enough to be permitted open access to unsegregated airspace? Do they indeed fulfil the necessary prerequisites?

The International Federation of Airline Pilots Associations, which represents more than 100,000 airline pilots in 104 countries, argues that if these aircraft are to be allowed into unsegregated airspace then they and all aspects of their operations must be subject to the same regulation as a similarly sized manned aircraft. We have concerns that the complexity of such compliance is not fully understood. This may, on first view, seem to be an arrogant statement tinged with Luddite tendencies but allow us to justify the remark. The fact is that unmanned flying does not remove the human from the control loop. In reality he is just removed from the aircraft and placed in a remote location. It is our contention that this removal has implications which leave important questions still unanswered.

One of them is about responsibility for the operation of an UAS. In every area of aviation there is a person who is responsible for the safe operation of the aircraft - this falls to the pilot in command and is also combined with certain powers (and this applies from paragliders to A380s). These principle is enshrined inter alia in ICAO Document 9376 which states in chapter 6 (6.2.1):»The Pilot in Command is responsible for operating an aeroplane in accordance with rules of the air, and has final authority as to the disposition of the aeroplane while in command.« EU-OPS, the European law regulating aviation, extends these powers and responsibilities inline with ICAO further (stating in para 1.085g) «The commander shall, in an emergency situation that requires immediate decision and action, take any action he/she considers necessary under the circumstances. In such cases he/she may deviate from rules, operational procedures and methods in the interest of safety.»

It may seem a straightforward solution to nominate the UAS pilot as the commander. However, it is simply not enough to make this nomination and continue to automate, send a unmanned aircraft down route 'autonomously'. In order for him to 'live' his responsibility and 'exercise' his authority, there must be a proper real time flight data feedback to the UAS commander together with a possibility of low-level-control intervention by the commander. The argument that automation of the UAS' systems will allow the aircraft to remain in stable flight for a period of time even when communications with the control station has been lost will not stand up against the requirement for the aircraft commander to make immediate decisions and actions in the interest of the safety of the flight as required by ICAO and other regulations.

The UAS commander has to make decisions connected to the safe conduct of the flight because it is he who is responsible not the automatic systems. As such, in order to make informed decisions about the flight he must be supplied with enough information and of course, in addition, there must be a means for him to manipulate the unmanned aircraft in a way which, in his opinion, will be the safest. Even this basic concept has multiple repercussions since much of today's UAS concepts, including

some of its flagships, are incompatible with these prerequisites for non-segregated airspace integration.

Much of the present generation of UAS are designed for fully automatic flight with the aircraft following a trajectory pre-programmed into navigation and control systems. Accordingly, designers did not see a need to provide for 'low-level' information like airspeed, attitude or altitude in the Ground Control Station in a professional man-machine-interface - like a flight deck! It is maybe the reasoning of the designers, that the UAS commander doesn't need the means, except perhaps some 'on the fly' reprogramming, to react directly to deviations from the expected flight plan/trajectory. It's hard to see how the UAS commander could exercise the «emergency authority» as described in EU-OPS if you cannot manipulate the trajectory of your aircraft directly by at least having the option to select heading or vertical speed, if not attitude or power!

Can a UAS, which denies its UAS-pilot in command the means to exercise his authority and responsibilities to the fullest extent, be certified to fly in non-segregated airspace? We think not.

One important aspect of the See&Avoid-discussion centres around avoidance of traffic/weather/terrain. It is in the nature of this avoidance, that the process of detection of the threat, decision to and how to avoid and execution of an evasive manoeuvre is time-critical. Complex reprogramming-procedures after difficult situation-gathering in a poor ground-station-environment is no way of fulfilling this task. Neither is it viable to automate the manoeuvre on a regular basis, since this separates the vehicles behaviour from the UAS-commanders responsibility.

Earlier we claimed that the IFALPA position regarding the introduction of UAS to unsegregated airspace was not reactionary or Luddite and we stand by that assertion. It is also true that it is a position that is based on the 106 years of cumulative experience in heavier than air operations.

In flying, young pilots are often advised that to enjoy a long life they must «fill the cup of experience before they finish drinking the cup of luck» and as pilots we are able to draw on the cumulative experience of the profession which has been hard won over the last 106 years. Together with engineers, scientists and the aviation authorities we have been able to apply this experience to create an environment where we are able to perform an activity with potentially lethal hazards (as aviation unquestionably is) to an enviably high standard of safety. We would like to see the unmanned sector taking advantage of these millions of man-years of experience to fill its own cup of experience without draining that vital cup of luck.

How then can unmanned operations be integrated with manned flight? In our view when the aircraft and their operation comply with the regulation applied in the manned arena; including, but by no means limited to, the UAS pilot-in-command being able exercise to the authority and responsibility they hold for the aircraft's operation by the reliable feed of real time information from the aircraft which enables them to build an informed picture of the state of the aircraft and its immediate environment. They must also be able to take immediate and overriding corrective action to the trajectory of the aircraft and its systems.