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THE NEW SIMULATION REALISM?

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Realism has gone far enough, and simulation technology should now be devoted to reducing costs and improving general aviation training. This is the personal view of ROBIN ABLETT of the UK Civil Aviation Authority.

Simulation is an essential element of modern aviation science. Apart from the significant cost benefits, it is possible to practise many emergency procedures without threatening the aircraft, the instructor or the trainee. Indeed it can be argued that some exercises could not be practised sensibly other than in a simulator. I would like to suggest that for the large jet transport aircraft we should step back and take a careful look at the benefits of further technical advance. In the case of smaller aircraft, perhaps there are opportunities for development of devices of much lower cost.

The fidelity of simulators representing the large jet-transport aircraft has advanced to the stage where the CAA has begun to approve devices on which pilots can convert to type without flying the real aircraft, provided they are converting from an aircraft of a similar class. The FAA have taken this process even further.

There are still some minor criticisms of the fidelity of some parts of the flight envelope. Deficiencies when making the transition to and from ground effect and the ATC environment are sometimes not represented as realistically as possible. However, the question must be asked whether significant improvements in present technology may be beset by the law of diminishing returns both in terms of cost and total realism.

Despite the present state of technology, a simulator is still a simulator and not a real aeroplane. The pilot knows he is in a simulator although for short periods he may forget. The reaction to emergency situations will, in psychological terms, be totally different. Not many people are killed in simulators. Any form of panic or apprehension is limited to the way in which the training captain may view performance.

Furthermore the environment surrounding the operation of an aircraft full of real passengers is never simulated. There is no problem achieving an ATC slot, no need to achieve a quick turn-round to get back to Gatwick before night restrictions apply.

Attempts to simulate panic among passengers in order to assess optimum cabin configurations and exit procedures have proved successful to some extent in trials conducted at Cranfield, but I do not feel the methods used are suitable for aircrew. Perhaps there are human factors specialists who feel that there are techniques available to create the "atmosphere" surrounding aircraft operations to complement the technical fidelity now possible. But, it is open to debate whether improved realism of this sort would produce crews who would operate more efficiently or safely. I think the CAA would regard such embellishments as not relevant to the object of the exercise, i.e. to train crews to fly and operate the aircraft safely. It is for operators to decide if it is worth embarking on these concepts, or rely on "on-the-job" training in the problems associated with modern civil aviation operations, outside those which directly affect safety.

In a simulator exercise, some abnormal situation or situations are to be expected. This is essentially different from a real flight where, although all contingencies are the subject of pre-planned actions, there is an expectation that all will go to plan, at least as far as the aircraft and its systems are con- cerned. The crew is prepared for the abnormal situation in a simulator exercise and can be said to be in a different frame of mind to that when conducting a real flight.

Perhaps the time has come for simulator manufacturers and operators to pause and assess the future. Further advances in technology could be focussed on achieving the current technical ability at reduced costs. It would then be possible for smaller operators to possess their own simulators and not be con- strained by the necessity to hire from others with the resultant lack of flexibility in planning their own training programme and inefficient use of crews travelling from their base to use facilities some distance away from base, often outside their own country.

In general aviation, simulator technology is thought to be less advanced compared with large jet transport. There is no reason, in principle, why simulators representing the smaller turboprop or jet aircraft should not have the technical capabilities of their large counterparts. The technology is there, assuming that manufacturers can produce the appropriate performance and handling characteristics. However, the cost of simulators with a high level of fidelity, coupled with the prospect of very limited utilisation for all but the big-fleet operators, precludes the development of type specific GA simulators in commercial terms.

Generic simulators

There may, however, be a case for producing generic simulators for GA aircraft. The current pilot shortage is likely to last some time and there will be a continual need for pilots to move up from small piston aircraft via turboprop com- muters to jets. The transition from propeller aircraft to jets may be aided significantly by the use of generic simulators. The basic cockpit layout will need to be fixed in hardware terms, but some variation in performance and handling qualities could be possible by the use of different software. In this way the implications of large speed ranges, the ability to think more quickly and the very different handling qualities at high altitudes and lower speeds can be taught and demonstrated cost-effectively.

Such a simulator would need a suitable shell, a simple motion system, and software based on the performance and handling characteristics of a typical type.

The product would then be assessed as to whether or not it behaved like an aeroplane of the class it is aimed to represent. It would be used to teach basic skills and could, to some extent, relate to the aircraft type which the trainee intends to fly, by the use of suitable instruments e.g. an appropriate flight director.

It is highly unlikely that regulatory authorities would give any credit whatsoever for the issue of an individual aircraft type rating. The use of such simulators would be a commercial decision by the operator. It could reduce the training required, over and above that laid down by the regulatory authority, to convert to a new aircraft type. A generic simulator could also be used by employers to assess applicants for aircrew posts.

To make generic simulators attractive, the price needs to make their purchase and use viable both for operators and perhaps even for private individuals who are following the "self-improver" route. It has been suggested that the target price should be around £200,000. This may raise a few eyebrows amongst manufacturers but it should be remembered that the device will be very much less complex than its larger counterpart (with no visuals) and potential volume sales should be greater.

To summarise, the technical fidelity of simulators for large transport aircraft has in general gone as far as is necessary. The task for manufacturers now is to produce the same product at reduced cost.

There is a gap in simulator technology for the smaller general aviation aircraft which could be filled by generic devices which, whilst not accruing benefit for the purposes of type rating, may aid in the transition from one aircraft class to another.

Finally, there will be an increasing role for simulation in the development of future transport aircraft, especially in defining the nature of the interface between the crew and the ever-more-automated aircraft. With

the aircraft becoming an element of a highly interactive air traffic management system comprising many other aircraft and several ground agencies, it is necessary to use simulation to optimise the design of that system.

Cost and Sticktime

	Air	Simulator (4,600 h/y)
747-200	$16,560/h, 2h	$478/h, 16h
747-400	$17,160/h, 2h	$758/h, 16h

A reminder that realism pays came from Lufthansa's W.-D. Hass, who gave these 1989 figures to the Royal Aeronautical Society's simulation conference in his paper "Economy of Simulation for Flight Crew Training".