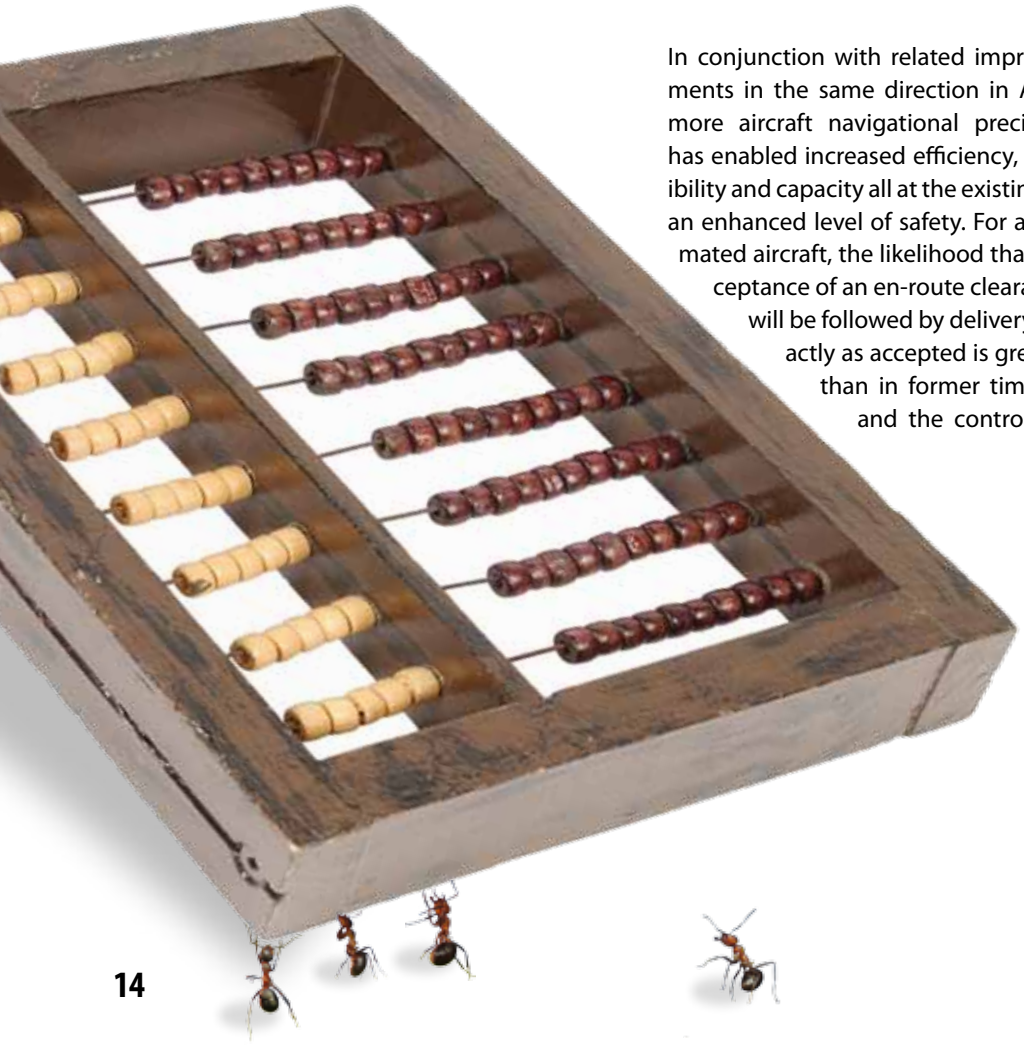
REVERSION – the other side of automation

by Captain Ed Pooley

Most of us recognise that the arrival of high levels of commercial aircraft automation and their major effects on the precision with which aircraft performance can be delivered has had a huge impact on the ATM world.



In conjunction with related improvements in the same direction in ATM, more aircraft navigational precision has enabled increased efficiency, flexibility and capacity all at the existing or an enhanced level of safety. For automated aircraft, the likelihood that acceptance of an en-route clearance will be followed by delivery exactly as accepted is greater than in former times – and the controller's scope for clearance issue is also greater. But poor pilot use of automation in a fast-moving aircraft can quickly lead to problems exacerbated by the expectation of usually more reliable outcomes that have allowed more aeroplanes to use the same skies. And anyway, the skies are full of a complex mix of aircraft with a range of performance capabilities even before you add in the pilot factor!

Of course, apart from such occasional misuse of automation, the everyday issue if it is functioning properly – and it is very reliable – is twofold. Firstly, how well do pilots understand its capabilities? and secondly, if it or the inputs on which it depends malfunction, how well do pilots cope with reversion to 'less automation'?

Quite some years ago, but a long time after flight with auto pilots and auto throttles became routine even for approaches, almost all the simulator

Joe... does the emergency
NAV kit work or should I call MAYDAY?

time spent on training and checking pilots on their task competence was conducted without the use of the autopilot. The 'excuse' was that to allow it to be used reduced the workload which could be imposed upon pilots to see if they could 'survive' under high pressure. Such pressure was equated at that time with the pressure that might arise if unspecified abnormalities arose. Eventually, as this early level of automation moved into the era of the Flight Management System, directives changed to a requirement to use the autopilot most of the time. However, since the required minimum simulator time stayed the same, operating the aircraft with autopilot out became something to do in the aircraft on a nice day line flying. Back in the simulator, with the exception of a few key (memorised) emergency task competencies[1], the focus in the era of increasingly complex (but also increasingly reliable) automation moved to a combination of the everyday and the **anticipated** departures from it. Because there were now so many SOPs for loss of automation scenarios, it was tacitly assumed that there would be one for most situations provided that (when using a QRH in book form in pre ECAM/EICAS days) you could correctly identify it!

But this understandable focus on mitigating the 'regular' causes of accidents led to far less attention being paid to the wide range of infrequently encountered (for any particular pilot) abnormal events, for which a procedural response was (entirely understandably) not specified or only partially specified. What seems to have been overlooked is that what used to be called 'thinking on your feet', an essential process for situations where no specific procedural response exists, often demands rapid recall of acquired and retained technical knowledge, both generic to all aircraft flight and specific to the aircraft type involved. Such a background goes well beyond how to get the best out of the SMS and how to optimise aircraft performance in 'normal' operations. But how widespread is this 'competency' nowadays?

Could there be a parallel in ATM as systems are increasingly automated to make sure that ATM performance continues to match modern aircraft performance? I think so. Performance of any system which depends on high levels of automation to deliver efficiency, flexibility and capacity with no reduction in safety also demands an ability to cope with reversion to a lower level of system performance. Crucially, just as for pilots, this includes both reversion to expected or anticipated conditions, which can be addressed by prescribed responses and the infrequent, perhaps very infrequent, unexpected and unanticipated conditions. Here again, the ability to respond effectively is, as for pilots, is likely to be dependent on acquired and retained knowledge which will only very rarely be needed.

These 'reversions' may be internal to the ATM system or a consequence of changes to the automation status of an aircraft being handled. Has ATM training risen to this challenge? I suspect that, just as in pilot training, in the areas of background knowledge it has not yet caught up with the rapid arrival of reliable automation in both ATM systems and on the flight deck. If I am right, it is time to ensure that expensive recurrency simulator time for controllers is preceded by classroom preparation for infrequent reversions of all sorts which goes beyond 'learned responses' for the expected and presents 'unpredictable' or 'unexpected' scenarios. For such scenarios, there will not be just one particular and prescribed correct response but several equally acceptable ones. Of course, such background training for the unexpected will undoubtedly also provide a deeper understanding of performance issues in the everyday world.

Captain Ed Pooley is an experienced airline pilot who for many years also held the post of Head of Safety for a large short haul airline operation. He now works as an independent air safety adviser for a range of clients and is currently acting as Validation Manager for SKYbrary.

1- Such as engine failure on take-off, emergency descents and responses to activation of the Stall Protection System, the TAWS and the TCAS