IMAGINE REALITY

Sometimes, we imagine that we are capable of more than we can really are. When this happens, more often than not, it is the routine rather than the exceptional that fools us. Because something is so routine and ordinary, we tend not to pay much attention to it. But perhaps we should. In this article, **Wolfgang Starke** invites us to 'imagine reality'. How can procedures be better designed for human use?

KEY POINTS

1. **We tend to ignore how we work when faced with routine, boring tasks. We also naturally tend to reduce workload wherever possible.**
2. **We sometimes see a difference between the underlying idea of a procedure and the way the work is actually done.**
3. **Procedure designers need to respect human capabilities as well as limitations, and how we think and work in reality.**
4. **When designing procedures, the operational staff should always be consulted.**

"A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools." (Douglas Adams)

I would not say that professionals in aviation could be called "complete fools". Still, some parallels can be observed, not because of foolishness but because we are fooled by routine and occasionally our natural desire to reduce effort.

One of the common mistakes that we make repeatedly is ignoring how we work when faced with routine, boring tasks. One of these examples is the problem that pilots occasionally tend to extend flaps at too high a speed when they are high or fast on approach. A typical idea of fleet chiefs is to introduce a 'speed checked' call-out of the monitoring pilot. With this procedure, it is imagined that the monitoring pilot is first observing the speed, confirming it is below maximum extension speed of the flaps, then saying "speed checked" and moving the flap lever.

What is happening in reality? As the speed is usually below the maximum permissible speed for flap extension, the monitoring pilots simply always responds "speed checked", regardless of the actual speed.

In most of the cases the speed is checked after moving the lever, which routinely leads to some degree of chaos and bustle after recognising the mistake. Still, the imagined protection failed.

We see a difference between the underlying idea of the procedure and the way it is done in reality.

Something comparable is the altitude select function of the autopilot installed in the Bombardier Dash8-Q400. The Q400 is one of the very few aircraft that will, flown by the autopilot, not automatically level off at the selected altitude. If you want it to level off, you need to press the ALT SEL switch after selecting the desired altitude.

As this design of the autopilot is rather predestined to produce level busts, a procedure was put in place always to call out the flight level and altitude select armed after selecting a new altitude. The pilot flying should always verify (read!) the selected flight level and the armed altitude select mode from the flight mode annunciation panel (FMA) and then call out "flight level 240, ALT SEL". In theory, this would eliminate all the possible level busts as there is no way altitude select can not be armed when it is read aloud from the FMA by the pilot flying, and confirmed silently by the monitoring pilot.

Again, if we look at work-as-done we see some degree of difference. Of course, some will always perform this procedure as it was designed. But the majority of pilots tend to occasionally call out something they could never have read because either the correct altitude or the indication of altitude select armed was never displayed. Pilots tend to do this because in many, many cases it is displayed and therefore they do the callout as they always do it.

Part of the problem in the two cases is a lack of understanding of the human brain. The brain tends to reduce effort as much as possible. This is why we still can read words even if half of the characters are missing or if the middle characters are scrambled. Our brain recognises the word without reading all the characters. In the two cases above, this means that the brain is not really looking at the FMA as it is always displayed there. However, if we do not turn in the correct altitude, mistune it or forget the altitude select mode, our brain will forget to recognise this for the very same reasons.

Another reason for not complying with procedures is when procedures are designed in a way that cannot be complied with in most cases. My company for instance has designed a decelerated approach that requires pilots to fly 140 knots at four miles from threshold. This approach technique was designed to reduce unstabilised approaches and reduce the likelihood of missed approaches following these unstabilised approaches.

This was a worthy goal that was never met. Usually this technique is not used. But why? The simple answer is that every air traffic controller on a busy airport will request that aircraft keep 160 knots to four miles final. This is not a problem in itself, but it requires pilots to deviate from standard operating procedures during every second approach. That in turn lowers the threshold for SOP-deviation significantly, even if that is not instructed by the controller.

Another problem is habituation. Usually there is distance measuring equipment (DME) at every major airport. As this is a fact, pilots tend to use the DME-distance as distance to the airport, which works out well in most cases.

Flying into a smaller airport recently, my first officer duteously tried to fly the prescribed decelerated approach. Unluckily, the DME was not located at the airport but rather about two miles behind the landing runway, which made its reading distance to threshold plus three miles. He was then instructed to keep 150 knots to four miles. He ended up totally astonished, two miles on final, gear up, without landing flaps and 150 knots on the airspeed indicator. The mandatory missed approach followed.

He simply made the mistake doing what he always did on all the other approaches, using the DME as distance to the runway. But in a world that requires less and less thinking while we are supposed to stick to our procedures as close as possible, we are still not released from thinking.

Designing procedures: Some advice

All of this shows two basic requirements for designing procedures.

First, designers of procedures need to consider the peculiarities of how we think and work. Simply adding a callout usually works in the short term at best but never in mid- to long-term. It should further be understood that the human brain will, to a certain degree, reward the operator for non-compliance if the non-compliant way is easier and usually leads to a comparable and safe outcome. If that is the case, operators will – sooner or later – take the easier way, perhaps disobeying the procedures.

This is a common reason why the overwhelming majority of unstable approaches are completed to landing instead of ending up in a mandatory missed approach at the stabilisation height. Completing the landing is simpler and usually leads to a safe outcome.

Second, while designing procedures the operational staff should always be consulted. There is no sense in procedures that seem perfect in theory but will not and cannot be adhered to in reality.

When the Russian engineers for spacecraft did not know how to proceed because a problem seemed to be without solution, they occasionally described the problem to young pupils and then listened carefully.

Of course, we do not fly to the moon but maybe it is wise to ask people that do not sit in offices all day thinking about theory. Maybe asking pilots, controllers or all the other operational staff will sometimes highlight issues that do not exist in theory but can cause problems in reality. This is why ICAO described committees like the Runway Safety Teams, where all the operational parties can give their opinion and search for possible mitigations to safety issues.

As a conclusion, we have to say that our procedures eventually need to respect the capabilities as well as the limitations of a human brain. Furthermore, these procedures need to be compatible with what we can expect in reality – our day-to-day business.

If procedures are not designed according to these two basic requirements, as simple as they might seem, these procedures will never work as they are imagined.

"In theory, there is no difference between theory and reality." (Unknown)

Captain Wolfgang Starke is a Bombardier Dash8-Q400 check captain and type-rating instructor with the Air Berlin group. He chairs the Air Traffic Management and Aerodromes Working Group of European Cockpit Association (ECA) and serves on committees for the Vereinigung Cockpit (German Air Line Pilots' Association) and for IFALPA (International Federation of Air Line Pilots' Associations). He is an IFALPA representative member of ICAO's Surveillance Panel.