UNDERSTANDING OF RUNWAY SAFETY, YOU MUST:

BY DR ANNE ISSAC

OUR UNDERSTANDING OF INCIDENT INVESTIGATION AND THE ASSESSMENT OF ASSOCIATED CAUSAL FACTORS, PARTICULARLY IN THE AERODROME ENVIRONMENT HAS HAD MANY DEVELOPMENTS. RATHER LIKE THE STAR WARS FILMS, WHICH APPEAR IN NO PARTICULAR ORDER, RUNWAY SAFETY EVENTS ALSO OCCUR IN RANDOM SEQUENCE...

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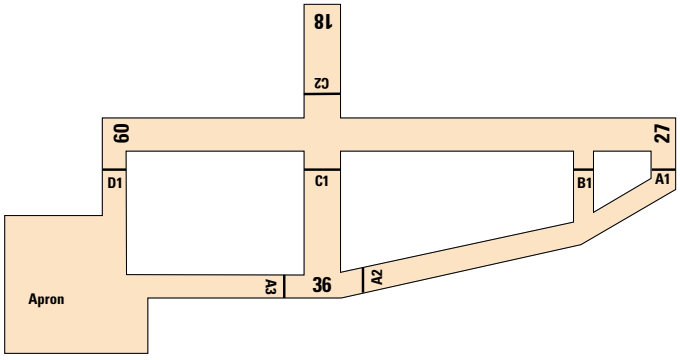
One way of attempting to understand how the complexities occur is to unpick the event in chronological order. The Joint Error Development of Incidents [JEDI] methodology was initially developed in Europe and has been refined within NATS to broaden the skills of incident investigators and enhance the depth of understanding of the causal factors associated with ATS incidents. This is achieved by looking closely at the context within which the assessed causal factors occur. Put simply, rather than a collection of causal factors, the JEDI methodology works through the timeline of an incident, identifying the 'pivotal' moments at which an incident may have been either prevented completely or the severity of the event reduced.

One thing this work has highlighted is that, although there is immense value in the capture and analysis of causal factors, it can be difficult to provide an in-depth of understanding of these factors without providing greater context. To demonstrate how, in the future, a deeper level of understanding of incident causation can be achieved, a runway safety incident has been analysed using the JEDI methodology. This incident is based upon an actual event, but some of the details have been altered in order to protect the identity of the airport and personnel involved.

The incident is first described and then analysed by a flow chart which shows the time-line of the event, from initial decision to final outcome. It shows how the incident progressed and, from this, it is possible to see where safety was first breached, where opportunities to prevent or resolve the incident may have been missed and the associated severity of the final outcome. On the right hand side of the flow chart, the final safety severity score has been entered [Safety Significant Event – SSE – 1 very significant to 4 – of least significance]. Additionally, the likely severity scores have been added to show the pivotal moments at which severity could have been reduced. Using this method it is possible to provide greater context to each causal factor and provide an enhanced level of understanding of how these events could be prevented in the future.

Event Example : An aircraft started to cross the main runway, without clearance, whilst another aircraft was cleared to land.

Severity Level - 1



This incident occurred at a medium complexity airport, during daylight hours, in good visibility conditions. A basic representation of the layout is shown above.

Runway 27 was the main runway in use for the majority of traffic. The crossing runway, Runway 36 was available for use for light, non-jet aircraft.

A locally based light, twin-engine, propeller aircraft had landed on Runway 36. The aircraft had crossed the runway intersection during the landing run and, after slowing to taxiing speed, had been instructed by the aerodrome controller [ADC] to perform a 180 degree turn and hold at holding point C2. This clearance was read back correctly and completely. A further aircraft was then cleared for take-off from Runway 27. After this aircraft had departed, an Airbus A320 on final approach to Runway 27 was cleared to land.

ADC then issued a series of conditional clearances involving permission to enter the runway, all subject to the same landing aircraft. These clearances were all fully compliant with the rules as described in the Manual of Air Traffic Services. They were all delivered clearly and correctly and all read-backs were complete and correct. However, the aircraft holding at C2 started to cross Runway 27 before the A320 had actually landed. Upon entering runway 27, the pilot of the light aircraft realised that the A320 had not yet landed, and was at that moment crossing the Runway 36 threshold. Fortunately, the pilot managed to 'power back' and reverse the aircraft away from runway 27, shortly before the landing A320 crossed the runway intersection.

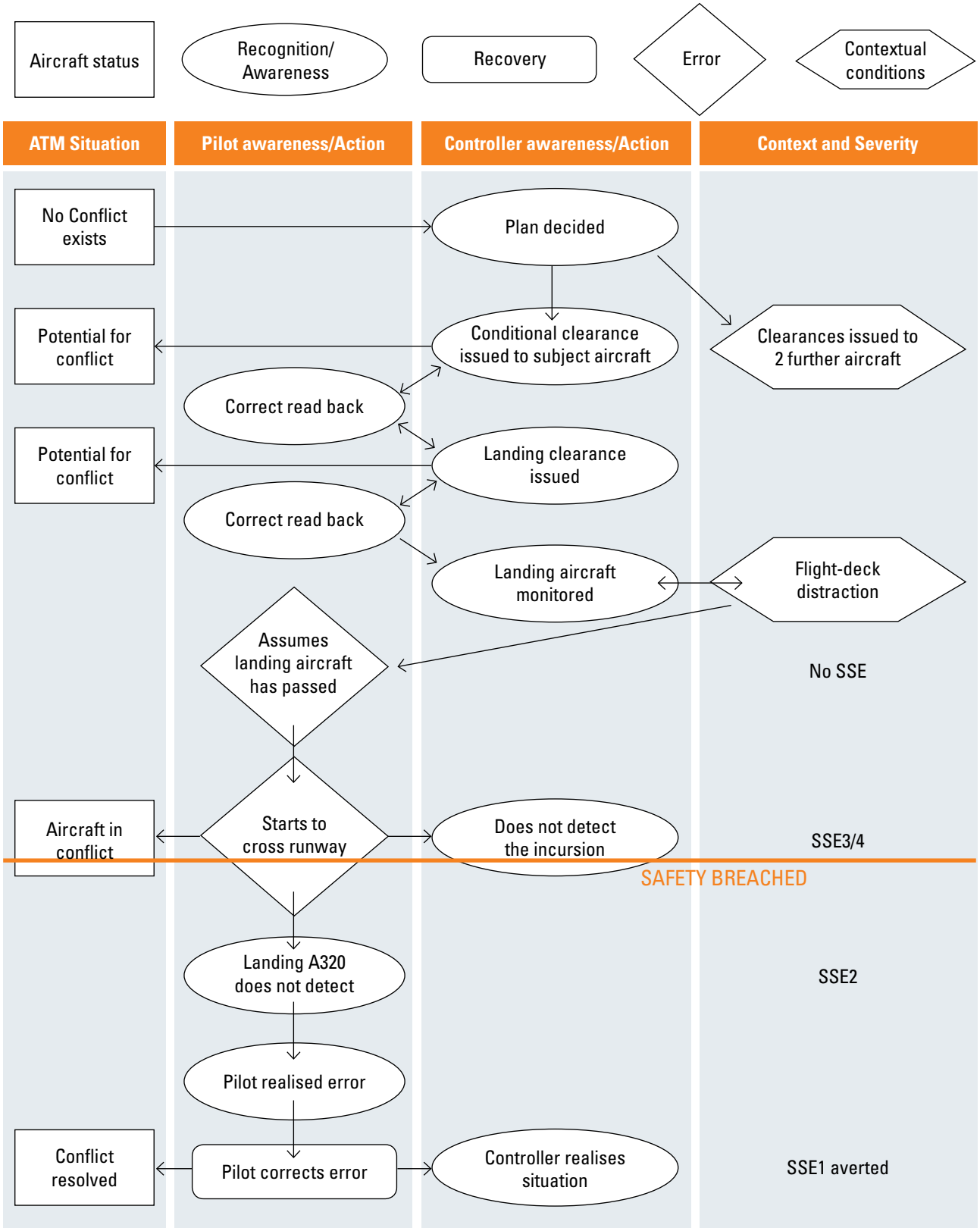
The course of events was as follows:

1. Light, propeller aircraft lands on Runway 36, crosses intersection with Runway 27 and is instructed to hold position at C2.
2. Aircraft departs runway 27.
3. A320 cleared to land on Runway 27
4. ADC issues the following instructions:
   a. Light aircraft holding at C2 instructed "after the landing A320, to cross Runway 27 at the intersection".
   b. Saab aircraft holding at B1 instructed "after the landing A320, to line-up on Runway 27" and warned that there will be traffic crossing ahead.
   c. A further A320 holding at A1 is instructed "after the landing A320, to line-up on Runway 27" and warned that there will be an aircraft departing ahead from B1.
5. The attention of the pilot is distracted by a conversation in the cockpit. The pilot then assumes that the aircraft has already landed and commences crossing 27. Upon realising that the A320 is actually still in the process of landing, they power back and reverse back towards C2.
6. The controller had been monitoring the landing aircraft and did not see the light aircraft cross holding point at C2.

A number of causal factors were assigned to this incident, the primary causal factor being 'Pilot failed to follow ATC instruction'. The use of conditional clearances is also assigned as 'contributory'; as, although there was no fault on the part of the ADC controller, it is clear that had the clearance not been issued then the incident would have been less likely to happen.

However, using the JEDI methodology gives a much more structured framework to this process. It also enables the investigator to clearly identify those 'pivotal' moments during the incident where the event outcome increased in severity. This process begins to add context to the causal factors, rather than simply provide a two-dimensional list. The following diagram is a simplified version, intended to show how the process works.

The meaning of the symbols represented on the flowcharts are as follows:



The JEDI approach has now been used to analyse many aerodrome and airborne events and it has proven to assist, not only in the understanding of the causal factors present, but also the contextual complexities and individual contribution of the teams and crews involved.

Let's hope we don't have to wait for more classical Yoda predictions before we start to learn the lessons from this JEDI.