SERIOUS INCIDENT

Aircraft Type and Registration:	Airbus A321, YL-LCQ
No & Type of Engines:	2 International Aero Engine V2533-A5 turbofan engines
Year of Manufacture:	2004 (serial number 2211)
Date & Time (UTC):	22 July 2019 at 2319 hrs
Location:	On approach to London Stansted Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 8 Passengers - 211
Injuries:	Crew - None Passengers - None
Nature of Damage:	None reported
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	13,468 hours (of which 3,095 were on type) Last 90 days - 222 hours Last 28 days - 74 hours
Information sources:	Aircraft Accident Report Form submitted by the pilot, Mandatory Occurrence Report submitted by ATC and further enquiries by the AAIB

Synopsis

London Stansted Airport (STN) was operating with a displaced threshold on Runway 22 (RW22) while repairs were carried out at the normal threshold. RW22 ILS was unavailable during the works period. A revised RNAV approach (RNAV22C), which was steeper and based on the displaced threshold, had been promulgated for RW22. YL-LCQ was observed to be lower than expected during its approach and over the works area.

The pilots of YL-LCQ had not realised that a revised approach was required and flew the standard RNAV arrival. Radar data indicated that the aircraft was low over the works area and touched down close to the displaced threshold. Temporary approach plates were available to the pilots in their electronic flight bags (EFB), but the stated work-in-progress (WIP) active periods on the temporary airfield chart were incorrect. ATC had made repeated references to the displaced threshold and the RNAV22C arrival during the period when YL-LCQ was on the terminal controller's frequency.

After the incident, the operator highlighted the WIP implications to all their pilots operating from STN. The chart manufacturer reviewed their processes to address the issues which had resulted in incomplete information being presented on the temporary airfield chart.

History of the flight

STN had begun a works programme to carry out repairs to the runway near the eastern threshold (THR 22). To facilitate continued flight operations the work was to be carried out only at night and employed a displaced maintenance threshold to permit safe overflight of the works area. The works rendered the ILS unusable but a revised RNAV approach to the displaced threshold was published for use when reduced runway length operations were in force.

YL-LCQ was the first aircraft to make an approach to the airfield after the displaced threshold had been established on the evening of Monday 22 July 2019. The pilots did not realise that they were required to follow the RNAV22C procedure and flew the standard RNAV arrival anchored at THR 22. The Aerodrome Tower Controller thought that the aircraft looked "slightly lower than the traffic on final approach during the previous night's reduced distance operation", but they were "not sure". As the aircraft approached 4 miles the controller issued landing clearance and added "CAUTION, DISPLACED THRESHOLD AND REDUCED LANDING DISTANCE AVAILABLE…DO NOT FLY BELOW PAPI INDICATIONS". The airline reported that their pilots had misinterpreted the controller's instruction to "not fly below the PAPIs" as "do not follow the PAPIs".

The aircraft was seen to be lower than expected over the works area.

The crew did not see any obstructions on the runway and did not notice anything untoward during their approach and landing.

Airfield information

UK AIP Supplement 24/2019 (SUP 024/2019), published 6 June 2019, provided details of the intended works and the associated displaced maintenance threshold (THR 22C). The works were planned for two blocks of four consecutive nights between Sunday 21 July and Thursday 1 August. On nights when works were scheduled the runway was to be closed for 15 minutes from 2300 hrs to allow time for airfield ground lighting changes to be made and to establish the displaced threshold (Figures 1 and 2). As part of the lighting changes, temporary PAPIs were deployed; these were set to indicate a 3.5° approach angle. The normal approach to RW22 is flown with PAPIs set at 3.0°.

2.1 **Timetable for 2019 Works**

TIMINGS (All times ZULU)						OPERATIONAL IMPACT		
Date	Runway Closure Time	Runway Closed for Lighting Changeo-ver	Runway Open With Reduced Distances Available	Runway Closed for Lighting Changeover	Runway Open Full Length	Runway Configura-tion During Reduced Distances	TORA	LDA
Sunday – Thursday	2259	2300-2315	2315-0445	0445-0500	0500	Phase 3	2200 M	1900 M

PHASE 3: Displaced Threshold 22C – Sunday to Thursday Nights 21 July until 1 August 2019

CIVIL AVIATION AUTHORITY SUP 024/2019-1

Figure 1

SUP 024/2019 works timetable and operational impact

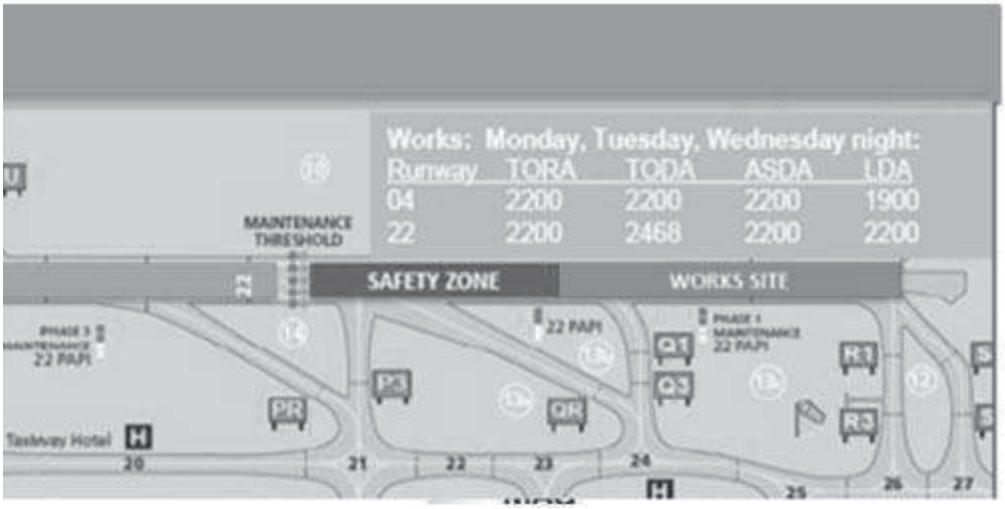

Figure 2

SUP 024/2019 overview of runway works plan showing displaced maintenance threshold

With vehicles planned to be operating in its normal beam path, the ILS was unavailable during the works period. An alternative RNAV procedure, designated RNAV22C and generating increased flightpath clearance above the works area, was promulgated in SUP 024/2019. Notable differences between the RNAV22 and RNAV22C procedures were the following:

- RNAV22 began at waypoint TOTVO while RNAV22C began at UPGIR.
- The RNAV22 approach angle was 3.0°, but the RNAV22C final approach was 3.5°.
- RNAV22 targeted a threshold crossing height (TCH) of 49 ft over THR 22 while RNAV22C targeted a TCH of 50 ft over THR 22C.

Meteorology

At the time of the incident STN was reporting good visibility with a gentle westerly breeze. The final approach was flown clear of cloud.

Personnel

Neither pilot was a native English speaker. The aircraft commander's flight crew licence was issued by the Irish Aviation Authority and contained a valid English Language Proficiency Level 5 endorsement.

Recorded information

Transcript from Essex Radar

YL-LCQ was initially instructed to hold at reporting point ABBOT while the runway was closed for the WIP lighting changeover. During the time that YL-LCQ was holding ATC gave another aircraft on the same radio frequency details about the runway opening time

and the reduced runway operations. They then checked that the pilots of YL-LCQ had heard the information:

ATC: "[YL-LCQ] I TAKE IT YOU COPIED THAT THE RUNWAY IS DUE TO OPEN AT 2315. VECTORS FOR RNAV APPROACH RW22C DISPLACED THRESHOLD."

YL-LCQ: "COPIED OPEN AT 15, RNAV APPROACH."

YL-LCQ: "JUST CONFIRM RNAV APPROACH RW22."

To which ATC responded:

ATC: "AFFIRM, VECTORS FOR RNAV APPROACH RW22C IT WILL BE A DISPLACED THRESHOLD WHEN THE RUNWAY OPENS."

This was acknowledged by the flight crew. After initial vectoring from the ABBOT hold, YL-LCQ was cleared direct to UPGIR, the start of the RNAV22C approach:

ATC: "[YL-LCQ] ROUTE DIRECT UPGIR DESCEND ALTITUDE 2,500 FT CLEARED RNAV APPROACH RW22C."

Based on their planned RNAV22 arrival, the pilots should have expected to route via TOTVO; UPGIR was not in their active flight plan. They did not query the routing and replied:

"[CALLSIGN] DESCEND 2500 CLEARED FOR ILS, SORRY, RNAV APPROACH RW22C"

ATC did not ask the flight crew to confirm the routing to UPGIR. Shortly afterwards YL-LCQ was transferred to Stansted Tower frequency. The pilot of YL-LCQ spoke with a thick accent which may have contributed to a slight lack of clarity in transmissions from the aircraft.

The Air Traffic Service provider conducted an internal Unit Investigation into the occurrence. Their report concluded that the most likely explanation for the incident was that the pilots flew the RNAV22 rather than RNAV22C procedure. It also highlighted that incomplete readbacks by the pilots of YL-LCQ were not challenged by the Terminal Control (TC) controller. The Unit's TC airports interface manager was tasked to '*raise the issue of incorrect or incomplete readbacks with TC controllers, ensuring that TC controllers are robust in challenging these types of events*'. The report noted that some operators at STN questioned '*the need to use phraseology such as "do not fly below PAPI indications" as they believed this could be distracting in the latter stages of an approach*'. The airport's user safety group was tasked to conduct a full review of the phraseology used for the reduced runway operations.

ATC radar

Radar data for the incident aircraft and the two aircraft that landed after it revealed that YL-LCQ was consistently lower during the approach than the following aircraft which had both flown the RNAV22C procedure (Figure 3).

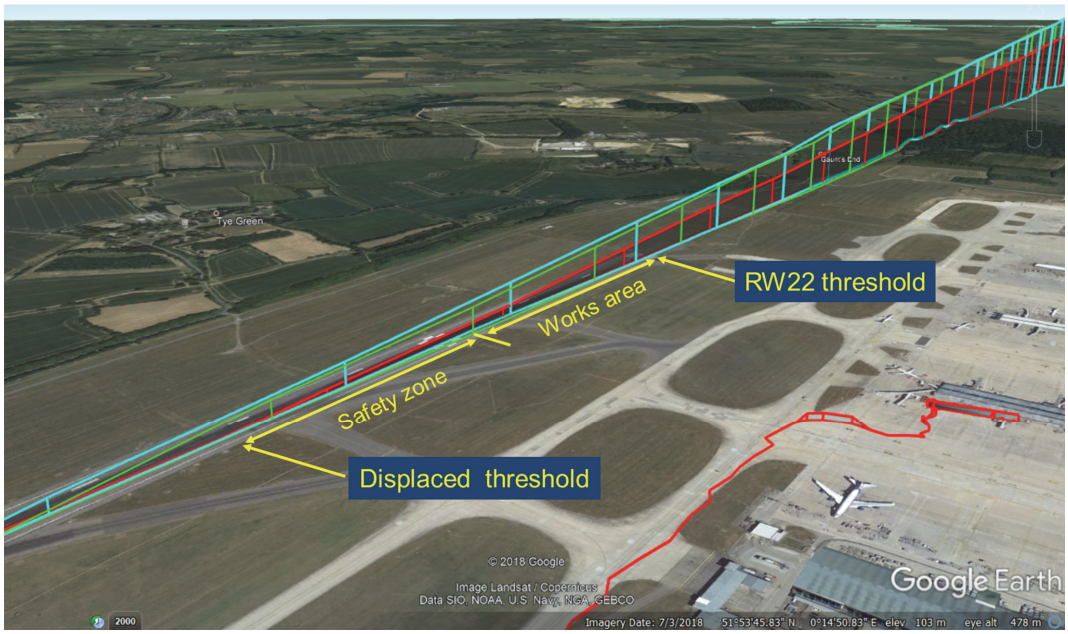

Figure 3

Comparative radar traces (YL-LCQ trace in red)

Other information

NOTAMS

The flight documentation pack issued to the pilots contained two NOTAMs relating to the runway works at STN (Figure 4). While the second NOTAM referenced Sup 024/2019, the pilots did not have access to that document.

Destination airport EGSS - STN - LONDON/STANSTED RWY 04 04C 22 22C [rwy | NEW TODAY]
A2293/19 NOTAMN
Q) EGTT/QMRLC/IV/NBO/A/000/999/5153N00014E005
A) EGSS B) 1907212300 C) 1907312315 D) SUN-WED 2300-2315
E) RWY 04/22 CLSD TO PREPARE FOR REDUCED DISTANCE OPERATIONS [rwy | 1]

A1701/19 NOTAMN
Q) EGTT/QMRTT/IV/BO/A/0/999/5153N00014E5
A) EGSS B) 1907210000 C) 1908012359
E) TRIGGER NOTAM - REDUCED RUNWAY OPERATIONS. SUP 024/2019 REFERS [rwy | 2]

Figure 4

NOTAMs relating to STN runway repair works, as issued to pilots of YL-LCQ

Airfield charts

The pilots had up-to-date airfield databases on their EFBs, a recent update to which had introduced temporary charts issued to reflect pertinent information from SUP 024/2019. Included in the database was a chart for the RNAV22C procedure as well as a temporary '*Reduced Rwy Operations*' airfield chart (Figure 5).

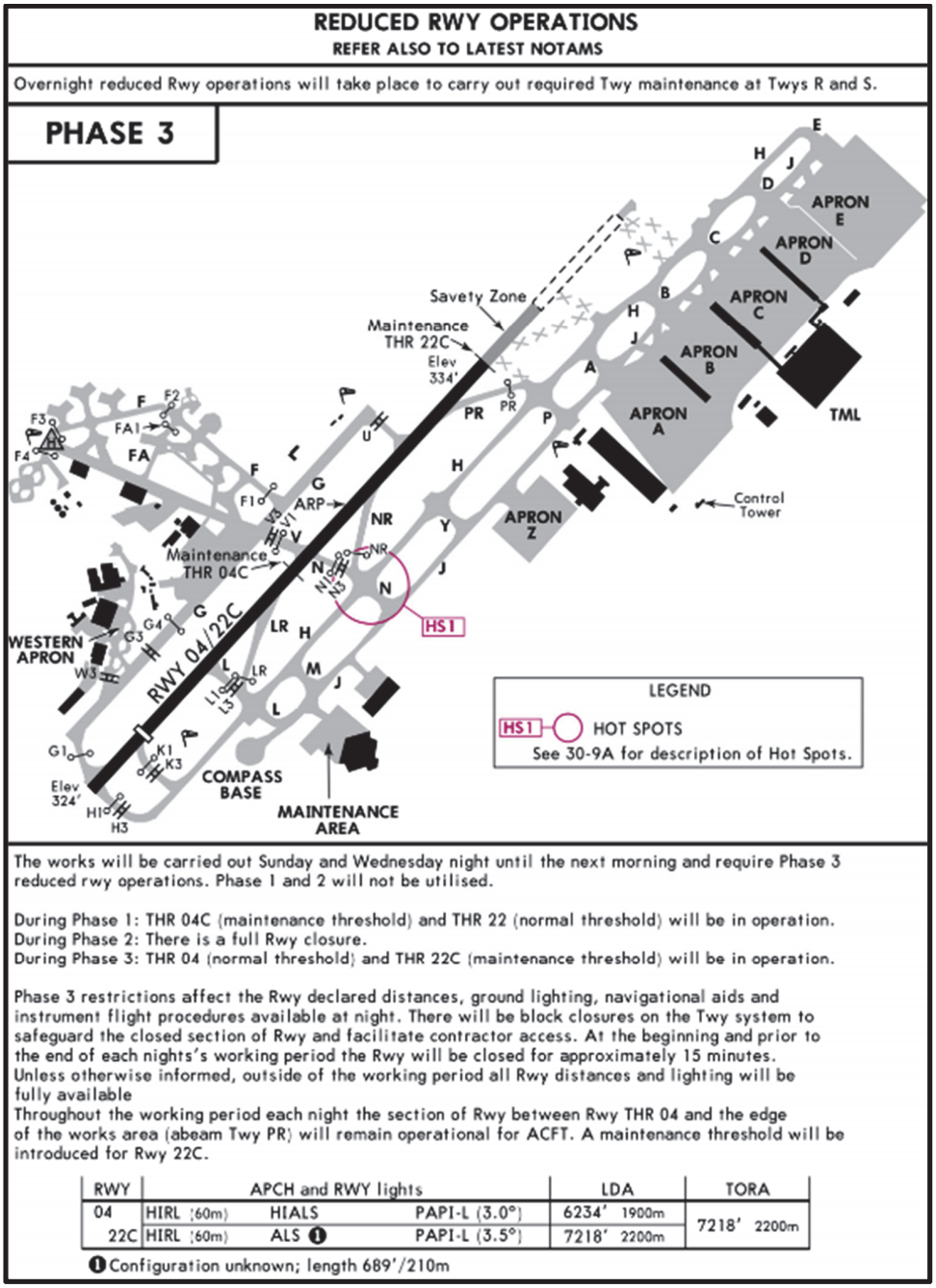

Figure 5

Temporary airfield chart available to the pilots

The wording on the temporary airfield chart stated that works would be carried out on '*Sunday and Wednesday night*' rather than Sunday through to Thursday night. Having been made aware of the incorrect data after the incident, the chart manufacturer conducted an internal investigation. They identified how the error in data transposition had occurred and took steps to prevent similar slips in the future.

Human factors

The pilots had reviewed the NOTAMs and airfield charts, the wording of which led them to believe that the STN runway works would not affect them on a Monday night. While ATC referred several times to RNAV22C and the displaced threshold, this did not alert YL-LCQ's flight crew to the requirement to fly the revised approach.

Analysis

Radar data and eye witness testimony confirmed that YL-LCQ was lower than expected over the THR 22 works area at STN. The aircraft appeared to have touched down close to the displaced threshold. Flying the RNAV22C procedure would have placed YL-LCQ 50 ft higher over THR 22C and thus greater clearance over the works area would have been achieved.

An error in the temporary airfield chart available to them misled the pilots into thinking that the runway works were not active on the night of the incident. They planned for and flew a standard RNAV22 approach. Neither holding during the temporary runway closure nor ATC's repeated references to reduced runway operations and the displaced threshold triggered a realisation that the works were taking place. The crew appeared to have exhibited a degree of confirmation bias; they were expecting a standard RNAV arrival and did not perceive the cues directing them to fly the alternative procedure.

While the controller consistently referred to the RNAV22C approach, the pilots of YL-LCQ replied with "RNAV APPROACH" to all bar the final approach clearance readback. The flight crew did not query or repeat the clearance to proceed direct to UPGIR, and ATC did not challenge their incomplete clearance readbacks. The pilot's thick accent may have contributed to a slight lack of clarity in radio transmissions from the aircraft. Confirmation bias may also have influenced the terminal controller's understanding of the flight crew's intentions.

The tower controller advised the pilots to avoid flying below PAPI indications because the aircraft was low on the approach. The pilots were unaware that they were lower than anticipated, hence did not expect to be reminded to maintain the correct glidepath. They misinterpreted the controller and believed that they were to ignore PAPI indications.

Conclusion

Having read the relevant flight documentation paperwork, the pilots' mindset was that the runway works at STN were not active during their approach. Confirmation bias appears to have played a part in the pilots' selection of the wrong approach procedure and may have contributed to ATC not detecting the error. The reminder to follow PAPI indications was misinterpreted as an instruction to ignore them. The incident highlighted the importance of correct and complete radio transmission phraseology.

Safety actions

Following this serious incident, the following safety actions were taken:

- The aircraft operator alerted their crews to the error in the temporary airfield chart and the requirement to fly the revised RNAV procedure when the THR 22 works were active.
- The Stansted Airport air traffic services unit terminal control interface manager was tasked to raise the issue of incorrect or incomplete readbacks with the terminal control unit; the aim being to ensure that future poor radio phraseology would be robustly challenged.
- The airport's user safety group was tasked to conduct a full review of the phraseology used for the reduced runway operations.
- The chart manufacturer undertook an investigation into how the works scheduling had been incorrectly represented on the temporary airfield chart and took remedial action to prevent similar data transposition errors in the future.