FINAL REPORT

RUNWAY INCURSION IN SELETAR BY VEHICLE

7 APRIL 2018

AIB/AAI/CAS.162

Transport Safety Investigation Bureau
Ministry of Transport
Singapore

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The Transport Safety Investigation Bureau of Singapore

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SYNOPSIS

Runway 03/21 in Seletar Airport was closed at 2331 local time (LT) on 6 April 2018 for runway maintenance and scheduled to be reopened by 0700LT on 7 April 2018. The maintenance work was completed by about 0500LT. Following an inspection of the runway, the runway was reopened at 0540LT.

At 0542LT, there was an unauthorised entry into the runway by one of the vehicles involved in the runway maintenance. There was no aircraft departure and arrival at that time.

The Transport Safety Investigation Bureau classified this occurrence as an incident.

1 FACTUAL INFORMATION

All times used in this report are Singapore Local Time (LT) unless otherwise stated. Singapore Local Time is eight hours ahead of Coordinated Universal Time (UTC).

1.1 Sequence of events

1.1.1 Runway 03/21 in Seletar Airport was closed from 2331LT on 6 April 2018 for runway maintenance and scheduled to be reopened by 0700LT on 7 April 2018. The maintenance works involved four contractors engaged by the aerodrome operator: Contractor A for works involving airfield lightings and Contractor B for works involving painting of runway markings. The other two contractors were for grass-cutting, and mechanical and electrical works.

1.1.2 Before the commencement of the maintenance works, the contractors' workers and vehicles were required to gather at the Assembly Point (AP) on the ground floor of the building housing the Seletar Air Traffic Control Tower (hereinafter referred to as Tower) for the necessary briefing by the aerodrome operator. They could only enter and exit the airside of the airport[1] through the gate near Tower. Also, they could only enter and exit the runway via Taxiway E3 (hereinafter referred to as E3) which was designated as the Runway Entry/Exit Point (REP). **Figure 1** shows the layout of the Seletar Airport.

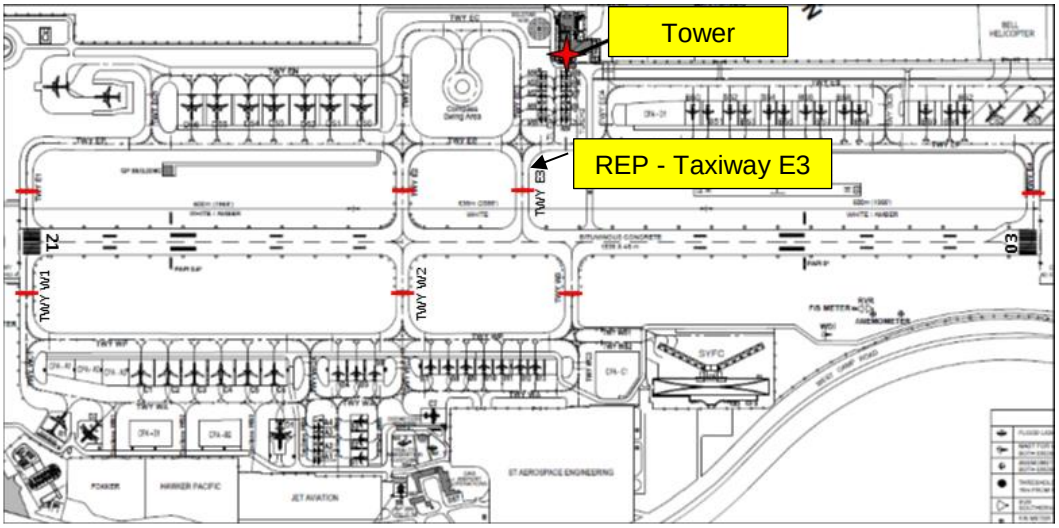

Figure 1: Seletar Aerodrome Layout

[1] Airside means the movement area (i.e. runway, taxiways and parking apron) of the airport and the adjacent terrain and buildings or parts thereof, the access of which is controlled.

1.1.3 The aerodrome operator appointed one of its officers as the Runway Entry/ Exit Point Officer (REPO) to be the overall-in-charge of the runway maintenance operation that night. The REPO was required to communicate with Tower although the duties of the REPO were not clearly documented[2] by the aerodrome operator. For the purpose of communicating with Tower, the aerodrome operator required a person to have a Category One (CAT 1) Airfield Driving Permit (ADP). The REPO on duty during the event did not have a CAT 1 ADP.

1.1.4 Contractor A was the lead contractor for the runway maintenance works, as required by its contract with the aerodrome operator. The lead contractor's responsibilities included the following:

- Assigning one of its personnel (hereinafter referred to as the REP Assistant) to assist the REPO;
- Conducting safety briefing to all contractors' workers involved before the start of the works;
- Checking that all personnel involved in the runway maintenance works had donned the proper personal protective equipment before entering the airside; and
- Placement and removal of cones and lighted cross markers before and after runway maintenance.

Although the lead contractor was provided with a checklist of the tasks to be completed during runway maintenance, the duties of a lead contractor were not clearly documented by the aerodrome operator.

1.1.5 Contractor A was to assign a CAT 1 ADP holder from its personnel to be the REP Assistant and to conduct the safety briefing to all contractors' workers. The REP Assistant was also to help the REPO allocate vehicle number tags[3]. The REPO, herself without a CAT 1 ADP, also tasked the REP Assistant to

[2] The aerodrome operator's checklist for a REPO included a phraseology for requesting Tower for runway closure and for informing Tower that the maintenance parties had all cleared from the runway. This implies that the duties of a REPO entailed communicating with Tower via radio communication and ensuring that all contractors' vehicles and workers were accounted for and were clear from the runway before the runway was returned to Tower for operation.

[3] The allocation of number tags to each vehicle was a system developed by the aerodrome operator as a means for accounting for the vehicles entering and exiting the airside. The vehicles involved in the runway maintenance were to return the vehicle number tags to the REP Assistant after the maintenance works had been completed and the workers and vehicles had returned to the AP. The REP Assistant would check that every vehicle had returned the number tag and inform the REPO accordingly before runway opening.

communicate with Tower via radio communication on her behalf. However, the duties of the REP Assistant were not clearly documented by the aerodrome operator and made known to Contractor A.

1.1.6 The REP Assistant had successfully passed the necessary tests required by the aerodrome operator to qualify for a CAT 1 ADP but had yet to be issued with a CAT 1 ADP by the aerodrome operator. Contractor A had assigned him to assist the REPO, not knowing that the REPO would be asking him to communicate with Tower. On realising that the REPO wanted him to communicate with Tower on her behalf, Contractor A objected to the arrangement, believing that, without a formal CAT 1 ADP, it was inappropriate for the REP Assistant to be tasked to communicate with Tower. The REPO did not require Contractor A to provide a replacement as REP Assistant, but instead tasked the driver of Mobile 36[4] (hereinafter referred to as Mobile 36), also from Contractor A and who had a CAT 1 ADP, to communicate with Tower on her behalf and to use the callsign Mobile 3, which was the callsign reserved for the REPO, when communicating on her behalf[5]. The aerodrome operator had no operating procedure on whether a REPO had the authority to task a contractor's driver to transmit on behalf of the REPO.

1.1.7 At about 2300LT and under the supervision of the REPO, the REP Assistant conducted the safety briefing at the AP to all the workers from the four contractors. The briefing included the safety procedures while carrying out maintenance works on the runway and the dos and don'ts while working on the airside. In particular, the REP Assistant reminded the workers that they were to only enter and exit the runway via the REP, i.e. E3 and that they were not allowed to go beyond the traffic cones that would be placed to mark the runway holding positions (other than that of E3).

1.1.8 After the briefing, the REPO and the REP Assistant allocated the vehicle number tags to the contractors' vehicles. The number tags were to be displayed on the vehicles' dashboard. The REP Assistant recorded the allocation of the vehicle number tags in a form.

1.1.9 At about 2330LT, the REPO made a call to Tower through her mobile phone to ask for Tower's confirmation that the last aircraft movement had taken place. After receiving Tower's confirmation, the REPO instructed Mobile 36, who was then at the AP with the REPO, to make a request to Tower over the radio to

[4] Mobile 36 was not stationary at the AP. Mobile 36's main task was to be in charge of inspecting the airfield lightings system and escorting two other vehicles from Contractor A which were not equipped with the radio communication set. This would require him to travel away from the AP and onto the runway.

[5] This was the first time Contractor A worked with a REPO who did not have a CAT 1 ADP since being assigned in December 2017 by the aerodrome operator to be the lead contractor for runway maintenance work.

enter the runway to carry out maintenance works. Mobile 36 made the request as Mobile 3. Tower approved the request and closed the runway subsequently.

1.1.10 Runway maintenance works began following the runway closure. Mobile 36 and two other vehicles from Contractor A entered the runway via E3 to position a cone at each runway holding point, and a lighted cross marker at each runway threshold. At the same time, the driver of Mobile 75 (hereinafter referred to as Mobile 75) and two other vehicles from Contractor B entered the runway via E3 to place a white cross marker at each runway threshold.

1.1.11 After the crosses and cones were deployed, the rest of the workers and vehicles entered the runway via E3 to begin their respective maintenance works on the runway. At the AP, the REPO ensured that all workers and vehicles proceeding to the runway were accounted for. She then proceeded to her office (located above the AP) and monitored the radio communications with Tower with a receive-only radio set.

1.1.12 The runway maintenance was completed at about 0500LT on 7 April 2018 and all the contractors' vehicles and workers returned to the AP. According to Mobile 36, while at the AP, he overheard the REPO telling the REP Assistant to the effect that they could inform Tower once all the vehicles had exited the runway and when the runway had been inspected to be clear of foreign object debris (FOD). He took this conversation as a clearance for him to inform Tower after all the cones and cross markers were collected and the final inspection was completed. However, according to the REPO and the REP Assistant, they did not recall having this conversation.

1.1.13 At about 0510LT, Mobile 36 and his two other vehicles, as well as Mobile 75 and his two other vehicles, entered the runway via E3. Mobile 36's team was to remove the cones and lighted cross markers and Mobile 75's team the white cross markers.

1.1.14 After collecting all the cones and lighted cross markers, Mobile 36 carried out an inspection of the runway and his two other vehicles returned to the AP. While he was travelling from Runway 03 threshold towards E3, he noticed flashing yellow lights in the direction of Runway 21 threshold. He believed the lights were from one of Mobile 75's team of vehicles and so he stopped at E3 to wait for the vehicle to come to him with a view to exiting the runway together. Mobile 36 waited for about two minutes. However, the lights did not approach E3 but instead disappeared from his view.

1.1.15 Mobile 36 tried three times to contact Mobile 75 on his mobile phone but the calls were not answered. Mobile 36 then drove to Runway 21 threshold in an attempt to confirm the source of the flashing lights, but he did not find any vehicle there.

1.1.16 At about the same time, Mobile 75's team of three vehicles, after having collected the white cross markers at Runway 21 threshold, exited the runway via Taxiway W1, instead of via E3 as they had been briefed. They were proceeding to the store, which was located to the west of the runway, to return their equipment[6] (see **Figure 2**). Mobile 75 chose to exit via W1 because it was the shortest route to the store. However, Mobile 75 did not inform anybody that his team was proceeding to the store to return their equipment.

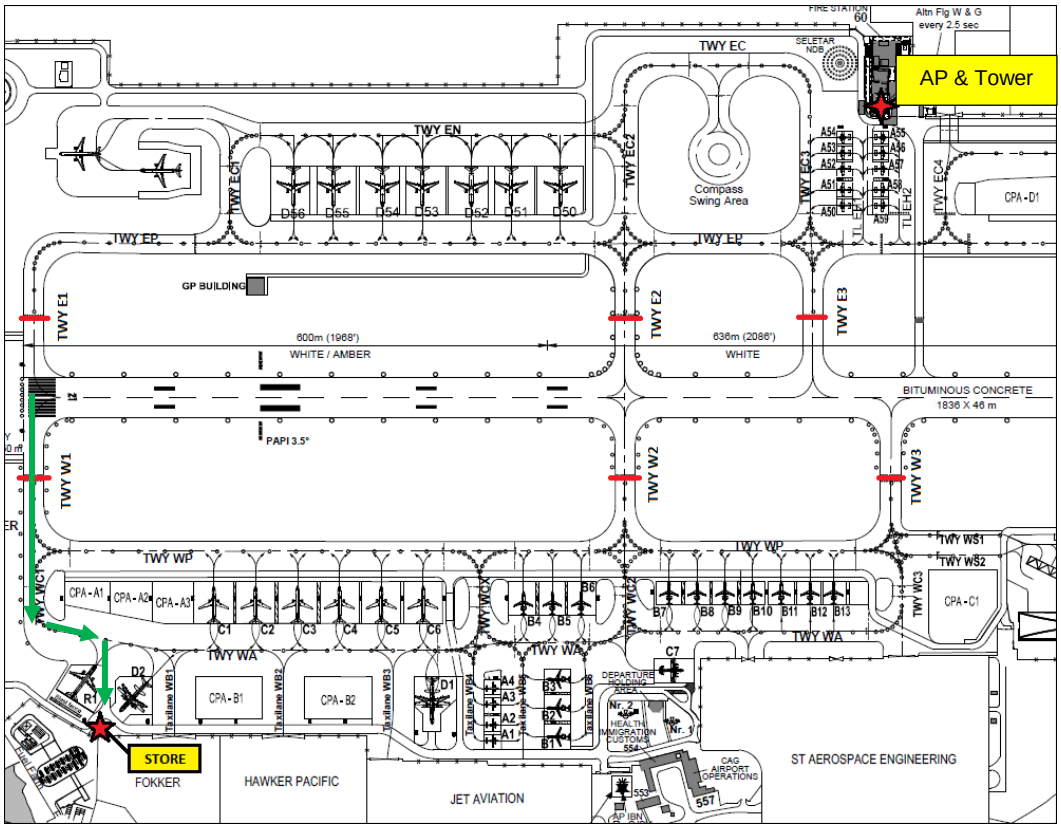

Figure 2: Route taken by Mobile 75's team of vehicles (indicated in green)

1.1.17 Meanwhile, the REPO returned to the AP from her office. The REP Assistant informed her that the runway maintenance works had been completed and that Mobile 36 and Mobile 75's teams were collecting the cones and crosses from the runway and had yet to return to the AP to hand in their vehicle number tags.

1.1.18 While Mobile 36 was returning to E3 from Runway 21 threshold, he visually scanned the runway and the parallel Taxiways EP and WP but saw no other vehicles nor any flashing yellow lights. Mobile 36 then exited the runway via

[6] The Mobile 75 team drew the equipment from the store before the runway closure. They used the aerodrome's perimeter road to reach the store.

E3 at 0538LT.

1.1.19 As mentioned in 1.1.12, Mobile 36 assumed that he had the clearance to inform Tower when the final inspection was completed and that he did not need to ask the REPO for her go-ahead to inform Tower. Thus, on his way back to the AP, he contacted Tower at 0540LT via radio communication using the callsign Mobile 3 to inform Tower that "… *runway closure is completed … machineries, personnel and vehicles accounted (for)*". Tower acknowledged Mobile 36's input and reopened the runway subsequently. However, neither the REPO nor Mobile 75 was aware of this exchange between Mobile 36 and Tower.

1.1.20 When Mobile 36 returned to the AP, the REPO noticed that Mobile 75's team of three vehicles had not returned to the AP. She queried the REP Assistant their whereabouts. The supervisor of Mobile 75, who was present at the AP, contacted Mobile 75 on his mobile phone and was told that he was on his way back to the AP from the store. However, Mobile 75 did not mention whether he would be crossing the runway or travelling via the perimeter road. The supervisor then informed the REPO and the REP Assistant that Mobile 75 was returning to the AP.

1.1.21 As Mobile 36 came down from his vehicle, he told the REPO that he had completed the final inspection of the runway and that he had informed Tower that the maintenance parties had all cleared from the runway. However, neither did Mobile 36 indicate to the REPO, nor did the REPO ask exactly when he informed Tower.

1.1.22 As mentioned in paragraph 1.1.16, Mobile 75's team of three vehicles were proceeding to the store to return their equipment. After returning his equipment, and while his colleagues on the other two vehicles were still in the process of returning their equipment, Mobile 75 decided that he should return to the AP without them. He collected the vehicle number tags from them so that he could return the number tags to the REPO on their behalf. He reminded them to exit the airside via the perimeter road after they had returned their equipment[7], while he himself would return to the AP by crossing the runway from Taxiway W2 (hereinafter referred to as W2) to E3 as it was a shorter route[8] as compared to using the perimeter road.

1.1.23 At 0542LT, Tower noticed a vehicle approaching W2 and made a general radio

[7] These other vehicles in Mobile 75's team were not equipped with radio set and thus were not allowed to travel into the runway area without an escort.

[8] Mobile 75 was not aware that the runway had been reopened. He was aware that the REPO would only inform Tower that the maintenance parties had all cleared from the runway after all vehicle number tags had been returned to the AP and that all vehicles were accounted for. Since he still was holding onto three vehicle number tags, he had no reason to doubt that the runway was still closed.

broadcast in an attempt to contact the unknown vehicle. This was to no avail. Tower saw the vehicle entering the runway via W2[9], travelling on the runway, vacating the runway via E3, and proceeding to the AP. The vehicle was subsequently identified to be Mobile 75.

1.1.24 Shortly after Mobile 36 had told the REPO that he had informed Tower (see paragraph 1.1.21), Mobile 75 arrived back at the AP. He signed for the return of his team's three vehicle number tags. The REPO did not see the other two vehicles in his team leaving the airside. No one asked for the whereabouts of these two vehicles. With the vehicle number tags all accounted for, the REPO released the entire maintenance works party.

1.1.25 The two other vehicles in Mobile 75's team took the perimeter road and exited the airside via gate VG3 (see **Figure 3**) located on the western side of the airport.

1.2 Injuries to persons

1.2.1 There was no injury to any person.

1.3 Personnel information

1.3.1 REPO (Aerodrome operator)

Working experience	• 1 year 3 months with aerodrome operator working in Seletar Airport • Two on-the-job training sessions on REPO duty • Two solo sessions as REPO prior to the incident
Seletar CAT 1 ADP	None

1.3.2 REP Assistant (Contractor A)

Experience working	• 5 months working in Seletar Aerodrome • First time as REP Assistant at the time of incident
Seletar CAT 1 ADP	None[10]

1.3.3 Mobile 36 (Contractor A)

Experience working	• 5 months working in Seletar Aerodrome • First time as Mobile 36 at the time of incident

[9] This entry into the runway was also detected by the Microwave Barrier Detection (MBD) system (see paragraph 1.6.2.1).

[10] REP Assistant had been holding a Changi Airport CAT 1 ADP since 2010.

Seletar CAT 1 ADP	Yes

1.3.4 Mobile 75 (Contractor B)

Experience working	• 4 months working in Seletar Aerodrome (he had worked in a similar capacity for more than 10 years in Seletar Aerodrome with another company before working for Contractor B)
Seletar CAT 1 ADP	Yes

1.4 Meteorological information

1.4.1 The incident occurred in hours of darkness and there was no precipitation.

1.5 Communications

1.5.1. All communications between Tower and the vehicles involved in the runway maintenance works were conducted over the radio frequency of 122.9 MHz.

1.6 Aerodrome information

1.6.1 Runway holding position stop bar lights

1.6.1.1 During normal runway operations, the red runway holding position stop bar lights (hereinafter referred to as stop bar lights) would remain ON to remind pilots and vehicle drivers not to enter the runway even if clearance had been given by Tower. After issuing a clearance, Tower would turn off the appropriate stop bar lights to allow the aircraft or vehicle to enter the runway. The stop bar lights would come ON again automatically after 40 seconds. **Figure 3** shows the stop bar lights at a runway holding position.

1.6.1.2 During scheduled runway maintenance, as in this incident, the stop bar lights at all the runway holding positions, including E3, would remain ON. Nevertheless, vehicles were allowed to enter the runway via E3 while the stop bar lights remained ON.

Figure 3: Stop bar lights at runway holding position

1.6.2 Microwave Barrier Detection System

1.6.2.1 Although a Microwave Barrier Detection (MBD) system was not required by the aerodrome regulator, the aerodrome operator had nevertheless installed such a system. The system would give a visual and aural alert to Tower when there was an unauthorised entry of aircraft or vehicles into the runway during runway operation. During runway maintenance works, the MBD visual and aural alert would be disabled while the stop bar lights remained ON.

1.7 Recorded data

1.7.1 The following recorded data were made available to the investigation team:

a. In-vehicle video recording of Mobile 36;

b. Tower's voice recording of radio communications between Tower and the vehicles operating in the aerodrome; and

c. CCTV footages from cameras installed in the aerodrome.

2 ANALYSIS

The investigation looked into the following:

(a) Runway incursion by Mobile 75

(b) Operation of runway holding position stop bar lights

(c) Access to the equipment store

(d) Reopening of runway before all maintenance vehicles and personnel were accounted for

(e) Aerodrome operator's procedures and requirements for runway closure for maintenance works

2.1 Runway incursion by Mobile 75

2.1.1 The runway incursion arose because:

(a) The runway had been reopened but Mobile 75 was not aware of the reopening; and

(b) Mobile 75 chose to return to the AP via the runway through W2.

2.1.2 Mobile 75 did not hear Mobile 36 informing Tower that the maintenance parties had all cleared from the runway, probably because he was not in his vehicle at that time as he was returning his equipment to the store. Mobile 75 knew that the REPO had to account for all the vehicle number tags before informing Tower that the maintenance parties had all cleared from the runway. As he was having his own vehicle number tag with him as well as those of the other two vehicles in his team, it never occurred to him that the runway could have been reopened.

2.1.3 Mobile 75 returned to the AP via the runway, entering via W2 and exiting via E3, instead of using the perimeter road. He chose to do so because this was a shorter route and he believed that the runway was still closed.

2.2 Operation of runway holding position stop bar lights

2.2.1 On the one hand, the aerodrome operator had been promoting a safety consciousness whereby, when a runway was in operation, a waiting aircraft or vehicle was never to enter a runway when the stop bar lights at a runway holding position were ON, even when Tower had given a clearance to enter the runway. Tower would need to take an extra step of turning OFF the stop bar lights concerned to allow the aircraft or vehicle to proceed to enter the runway.

2.2.2 On the other hand, Tower would leave the stop bar lights ON during runway closure for maintenance works but would allow the vehicles and personnel involved in the runway maintenance works to nevertheless enter the runway via E3. While this practice of leaving the stop bar lights ON could be an expedient measure (as otherwise Tower would have to turn the lights OFF every time a vehicle driver requested Tower for permission to enter the runway even when the runway had been closed for maintenance works), it was not congruous with the safety consciousness that the aerodrome operator had been promoting.

2.2.3 Had Tower been adopting consistently the "red stop bar lights ON means no crossing under any circumstances" approach, it was likely that Mobile 75 would have stopped at the runway holding position at W2 to await Tower's clearance to cross the runway.

2.3 Access to the equipment store

2.3.1 For the returning of their equipment to the store, Mobile 75's team exited the runway via W1. The safety briefing prior to the commencement of the runway maintenance work had emphasised that entrance to and exit from the runway had to be via the REP, i.e. E3. The Mobile 75 team ought to exit the runway via E3 and used the perimeter road to reach the store, but they chose to exit via W1 to go to the store as this was a shorter route[11].

2.4 Reopening of runway before all maintenance vehicles and personnel were accounted for

2.4.1 Mobile 75 returned to the AP to return his team's vehicle number tags. This practice of returning vehicle number tags on behalf of others defeated the purpose of issuing vehicle number tags which was to ensure that all the vehicles that had entered the airside had exited the airside. Allowing such practice may result in a potential hazard of vehicles remaining in the airside even after the vehicle number tags have been returned to the REPO.

2.4.2 The REPO accounted for the tags but did not see the two other vehicles from Mobile 75's team. It was a safety concern that she did not take any action to ascertain their whereabouts. She should have taken action to ensure all vehicles and personnel were accounted for, even if taking action could entail closing the runway again.

[11] Mobile 75's team were aware of this perimeter road access to the store. Before the runway closure, they went via the perimeter road to go to the store to draw their equipment.

2.4.3 It may be desirable for the aerodrome operator to have a system whereby the REPO could know the whereabouts of all the vehicles involved in the runway maintenance works.

2.5 Aerodrome operator's procedures and requirements for runway closure for maintenance works.

2.5.1 There were instances where the aerodrome operator's personnel deviated from the aerodrome operator's procedures or requirements. It was not clear whether the aerodrome operator meant for these procedures and requirements to be strictly adhered to, or whether it allowed its personnel the flexibility to deviate from the procedures or requirements as necessary. Such instances include the following:

(a) On the one hand, the REPO was supposed to be the authority for communicating with Tower on the closure and reopening of the runway and the aerodrome operator required a person to have a CAT 1 ADP in order to be qualified to communicate with Tower. On the other hand, the aerodrome operator did not ensure that a person to be appointed as REPO had a CAT 1 ADP.

(b) The aerodrome operator did not clearly define the responsibilities of a REPO and of a lead contractor.

(c) Contractor A was required by the aerodrome operator to provide a person with a CAT 1 ADP to assist the REPO as the REP Assistant. The aerodrome operator did not clearly define the duties of the REP Assistant and did not ensure that the REP Assistant had a CAT 1 ADP.

(d) When it was discovered that the REP Assistant did not have a formal CAT 1 ADP, the REPO did not ask Contractor A to find a replacement but instead tasked Mobile 36 to communicate with Tower on her behalf. It was not clear whether the REPO had the authority to task Mobile 36 to communicate with Tower as Mobile 3.

(e) It was not clear whether the aerodrome operator's procedures allowed Mobile 36 to communicate with Tower on behalf of the REPO.

3 CONCLUSION

From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

3.1 Despite having been briefed to use only E3 for entering and exiting the runway during runway closure for maintenance works, Mobile 75 took a shortcut from the runway via W1 to go to the equipment store. Later, without knowing that the runway had been reopened, he returned to the AP by re-entering the runway via W2, travelling on the runway, and exiting via E3. This resulted in the runway incursion.

3.2 The aerodrome operator did not adopt the "red stop bar lights ON means no crossing under any circumstances" approach (as practised when the runway was in operation). Had this approach been adopted for runway closure, it was likely Mobile 75 would not have entered the runway without clearance from Tower.

3.3 Mobile 36, without having sought REPO's permission, informed Tower that the maintenance parties had all cleared from the runway.

3.4 The REPO did not take action to ascertain the whereabouts of the two vehicles in Mobile 75's team even when she did not have evidence that the two vehicles had exited the airside via the AP after the reopening of the runway.

3.5 There were instances where the aerodrome operator's personnel deviated from the aerodrome operator's procedures or requirements. It was not clear whether the aerodrome operator meant for these procedures and requirements to be strictly adhered to or whether it allowed its personnel, e.g. REPO, the flexibility to deviate from the procedures or requirements as necessary.

3.6 The duties and responsibilities of REPO, REP Assistant, lead contractor, and any person serving as proxy for the REPO were not clearly documented.

4 SAFETY ACTIONS

Arising from discussions with the investigation team, the aerodrome operator initiated a number of safety actions.

4.1 Tower has reviewed its procedures and adopted in August 2018 the “red stop bar lights ON means no crossing under any circumstances” approach when the runway is closed for maintenance works. Even when a clearance has been given, maintenance vehicles will have to wait for Tower to turn off the stop bar lights before entering the runway.

4.2 The aerodrome operator has reviewed its procedures and will henceforth ensure that that only personnel with CAT 1 ADP can be appointed as REPOs and that personnel to be considered for REPO appointment will be trained and assessed on REPO’s tasks.

4.3 The aerodrome operator has reviewed its procedures and made the following changes:

(a) Documented the roles and responsibilities of the personnel involved in runway maintenance works, including those of the REPO.

(b) Documented the experiences and competency pre-requisites for the personnel involved in runway maintenance works, including those of REPOs.

(c) Enhanced the contents of the safety briefing for personnel involved in runway maintenance works prior to the start of the works.

(d) Developed a new (single) master list to aid the REPO to effectively account for all vehicles and personnel. In the master list, the REPO would record each entry and exit of every vehicle via the AP. Prior to informing Tower that the maintenance parties had all cleared from the runway, the REPO would verify with the aid of the master list that all vehicles had exited the runway. In accordance with the aerodrome operator’s safety management system, the master list document will be reviewed as and when necessary and at least annually.

(e) The aerodrome operator has shifted the REP for the maintenance parties to a point north of Runway 21 threshold on 4 May 2018 and designated perimeter road PE3, shown in **Figure 4**, as the only route to access the AP during runway maintenance works. There should henceforth be no occasions for vehicles to need to enter the runway via Taxiways E1-E4 and W1-W3 where they would have to pass through runway holding positions.

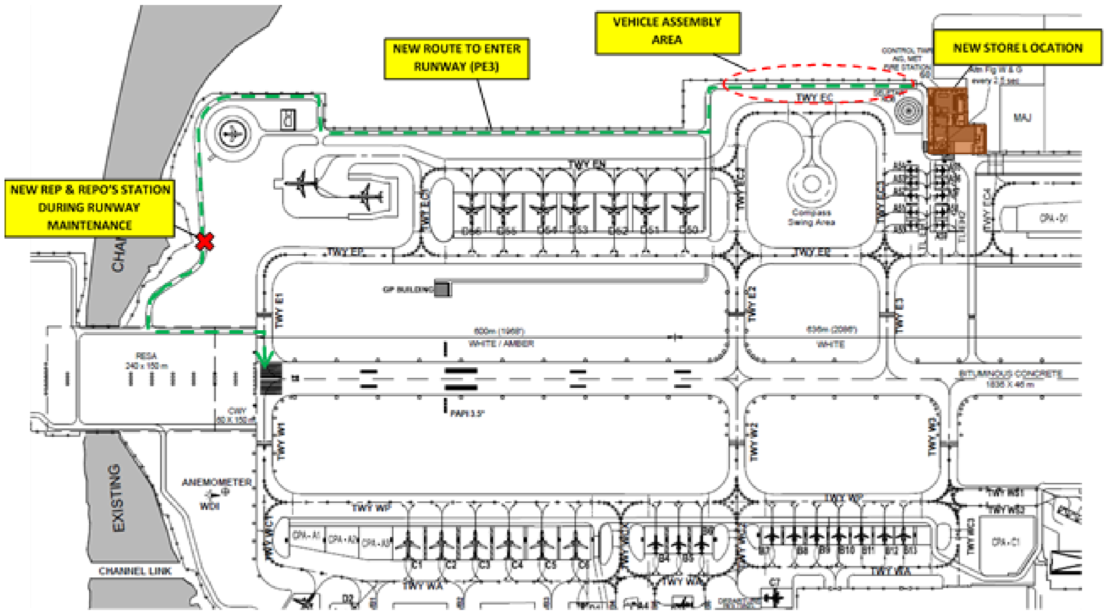

Figure 4: New route for entering and exiting the runway (indicated in green) and the new location of the store

(f) The aerodrome operator has relocated the store to the eastern side of the aerodrome as shown in **Figure 4**. This eliminated the risk that a vehicle would enter the runway after returning the equipment to the store.

4.4 The aerodrome operator has implemented the following tracking system in December 2018 to enable the REPO to know the whereabouts of all the vehicles involved in the runway maintenance works:

(a) Vehicles that may enter the runway and taxiways, and installed with radio communication equipment (hereinafter referred to as CAT 1 vehicles) will have to carry a mobile tracking device that enables the REPO to know at any moment their whereabouts during the runway maintenance works.

(b) Non-CAT 1 vehicles will have to be escorted by CAT 1 vehicles that carry the mobile tracking devices.

(c) The REPO will verify that each CAT 1 vehicle involved in the runway maintenance works carries a functioning mobile tracking device before the start of the maintenance works.

(d) At the end of the maintenance works, the REPO will verify that all CAT

1 vehicles involved in the runway maintenance works have exited the runway and that the non-CAT 1 vehicles that have been escorted by CAT 1 vehicles are accounted for.

5 SAFETY RECOMMENDATION

In view of the safety actions taken by the operator, no safety recommendation is proposed.