

NEAR-COLLISION AT LOS ANGELES

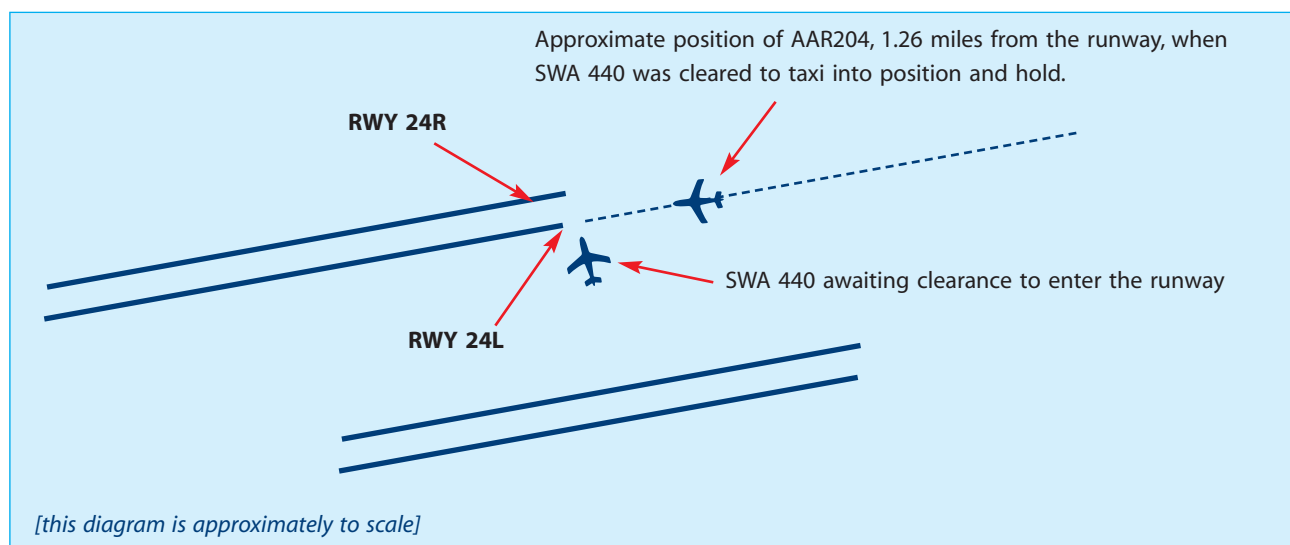
Asiana Airlines AAR204, a Boeing 747-400 that had been cleared to land on runway 24L [at Los Angeles International Airport (LAX)], initiated a go-around and overflew Southwest Airlines flight SWA440, a Boeing 737 which had been cleared into position and hold for takeoff on runway 24L. Radar reconstruction of the event found that AAR204 passed over SWA440 at 200 feet during the go-around. At the time of the incident, a controller change for the LC2 position had just occurred and the relief controller was responsible for the air traffic control handling of both AAR204 and SWA440.

At 2151:21, the LC2 controller who was being relieved cleared flight 204 to land runway 24L. At this point, the Boeing 747 was 9.3 miles from the runway. About 2 minutes later, while AAR204 proceeded inbound on the approach, the LC2 controller provided a relief briefing to the LC2 relief controller and advised him that AAR204 was landing on runway 24L, which the relief controller acknowledged. After

assuming responsibility for the position, the first transmission from the LC2 relief controller was to SWA440, instructing the flight crew to taxi into position and hold on runway 24L. AAR204 was 1.81 miles from the runway at 700 feet. According to the SWA440 captain's statement, he saw the Asiana Boeing 747 on final approach but believed that the aircraft was landing on runway 24R. Twelve seconds later, the relief controller cleared SWA440 for takeoff. Radar data indicated AAR204 was 1.26 miles from the runway and about 35 seconds from reaching the landing threshold. Data retrieved from the SWA440's flight data recorder indicated the airplane was on taxiway V approaching runway 24L when given the takeoff clearance. This meant that the flight crew had less than 35 seconds to taxi on to runway 24L, begin a departure roll, and travel 6,000 feet before AAR204 crossed the landing threshold, which would be impossible. According to the Asiana captain's statement, he observed the Southwest Boeing 737 approaching runway 24L but believed the airplane

would hold short of the runway. Once he realised the aircraft was entering the runway, he initiated a go-around and estimated it was about the time his airplane was passing through 400 feet approaching the runway.

The relief controller said that contrary to the recorded relief briefing where he clearly acknowledged that AAR204 was cleared for the left runway, he fully believed AAR204 was landing runway 24R, and was therefore unaware of the conflict. He first became aware of the problem when the Airport Movement Area Safety System (AMASS) generated an alarm. At this point, AAR440 was only about 12 seconds from colliding with SWA440. Without the prompt action of the Asiana flight crew a collision would in all likelihood have occurred. When the relief controller recognized the problem, he cancelled SWA440's takeoff clearance and AAR204's landing clearance. However, AAR204 had already overflown SWA440 on the go-around, clearing the aircraft by about 200 feet. Although the relief controller believed AAR204 was



landing runway 24R, this did not alleviate his responsibility to properly monitor the operation and ensure separation was maintained.

Recorded voice communications of the position relief briefing indicated the LC2 controller informed the relief controller that the inboard runway (RWY 24L) was in use for landings, and that AAR204 was cleared to land on runway 24L. There was no indication from the relief controller that he did not understand or needed clarification from the relieving controller. The LC2 controller addressed all major areas on the LAX position relief checklist, and conveyed information accurately during the position relief briefing. About 30 seconds after the LC2 controller completed the briefing, he remembered additional information about helicopter operations and began relating that to the relief controller; however, this conversation was interrupted by another radio transmission, which effectively distracted both the LC2 controller and relief controller and probably exacerbated the difficulty the relief controller had in converting the briefing information in his short term memory to working memory. Immediately following the relief briefing, the LC2 controller left the position.

Based on what is known about the volatility of information held in short term memory, and the speed of decay in short term memory without rehearsal of the information, it is not surprising that the relief controller failed to recall every detail of the LC2 controller's position relief briefing with complete accuracy. The relief controller was briefed on the location and clearances for seven aircraft (seven pieces of

information is about the limit that can be effectively retained in short term memory), but was not given sufficient opportunity to rehearse this information in working memory until 13 seconds after the briefing was completed. The format and timing of the position relief briefing and its interruption by routine radio transmissions contributed to the relief controller's memory error.

LAX tower controllers interviewed during the investigation stated that, because of the location of the tower, it was difficult to determine visually whether a single approaching aircraft was lined up for runway 24R or runway 24L. Controllers stated that destination runways were most difficult to determine visually for large aircraft, such as the Boeing 747. The LC2 relief controller believed this was the reason he did not recognize the conflict between AAR204 and SWA440. Although this may be true, it does not alleviate the controller of his responsibility to monitor the operation. In addition, the relief controller was aware the inboard runways were in use for landings and should have been alert to the possibility of aircraft arriving on runway 24L.

To assist the controllers with visual observations, the LAX tower is equipped with Digital Bright Radar Indicator Terminal Equipment (DBRITE) displays. The relief controller stated that he saw AAR204's radar target on the DBRITE display during the position relief briefing, but that he did not specifically recall seeing AAR204's data block. A review of the radar replay indicated AAR204's data block displayed two sets of alternating aircraft information: runway assignment and aircraft

type were presented for 5 seconds; followed by a 15-second presentation of altitude and ground speed data. The relief controller stated that he glanced at his DBRITE display before the runway incursion. However, he clearly did not perceive the critical information that AAR204 was assigned to land on runway 24L, and he therefore did not take action to eliminate the conflict. Time-sharing of runway assignment information on the aircraft data tag increased the likelihood that critical information would not be perceived when parallel approaches were being conducted on the north side of the LAX tower.

LAX is equipped with Airport Movement Area Safety System (AMASS), which is a computer software enhancement to the airport surface detection equipment. The LAX AMASS at the LC2 position generated an aural and visual alert only 12 seconds before a collision would have occurred, warning the controller of the impending conflict; however, the flight crew of AAR204 had observed the Southwest Boeing 737 taxiing towards the runway and, believing the aircraft was not going to stop, initiated a go-around before the AMASS alert activated. A collision was avoided, not by AMASS, but by the actions of the flight crew of AAR204.

At the time of the incursion, five certified professional controllers and one operations supervisor were working in the tower cab. According to facility personnel, there would normally be 10 people available to work on this shift but injuries and illness had reduced the available shift staff to five. It is common for ATC to combine positions to accom-

moderate facility and/or operational needs. Controllers routinely work combined positions and are specifically trained to do so. However, in this situation, the absence of a local assist controller eliminated an additional safety net established to assist local controllers. The staffing decisions made by the Federal Aviation Administration supervisor on duty at the time of the incursion decreased the likelihood that the relief controller's error would be detected and corrected prior to the runway incursion.

In its evaluation of fatigue, the investigation determined that the relief controller had only 8 hours off between

the end of his August 18 evening shift at 2330, and the beginning of his morning shift at 0730 on the day of the incident. As a result, the relief controller reported sleeping just "5 or 6 hours" the night before the incursion, and described his shift leading up to the incursion as a "hard day." This acute sleep loss resulted in a slight decrease in cognitive performance on tasks involving working memory and reaction time.

The National Transportation Safety Board determines the probable cause(s) of this incident as follows:

- a loss of separation between Southwest flight 440 and Asiana

flight 204 due to the LC2 relief controller's failure to appropriately monitor the operation and recognize a developing traffic conflict. Contributing factors included the FAA's position-relief briefing procedures, the formatting of the DBRITE radar displays in the LAX tower, controller fatigue, and the tower supervisor's staffing decisions on the day of the incident.

The full narrative of the NTSB report may be viewed at

www.nts.gov/ntsb/brief2.asp?ev_id=20040830X01323&ntsbno=LAX04IA302&akey=1



LESSONS LEARNED

The following recommendations are taken from Safety Reminder Message - HAND-OVER/ TAKE-OVER OF OPERATIONAL POSITIONS distributed by EUROCONTROL on 15/10/2004 which may be viewed at :

www.eurocontrol.int/safety/public/standard_page/safety_alert_board.html

Before hand-over:

- A hand-over produces a workload of its own. Careful consideration should be given to the timing;
- If it is likely that the sector will be split shortly after the hand-over - consider splitting it before the hand-over;
- Simultaneous take-over of all the sector positions (for example both radar and planner) should be avoided;
- Do not short cut the existing good practice during low vigilance periods;

- The handing-over controller should tidy up the working position prior to the hand-over;
- A hand-over should be commenced only after all the initiated actions for resolving the potential conflicts or recovering from actual conflicts are accomplished

During hand-over:

- Avoid distracting controllers during hand-over;
- Use checklists with the sequence of actions to be performed by both handing-over and taking-over controllers;
- The taking-over controller should ensure that he/she has been able to assimilate all information relevant to a safe hand-over and should accept responsibility only after he/she is completely satisfied that he/she has a total awareness of the situation;

- Use mnemonic reminders within the checklist like “check REST before going to rest”. (See table below.)

After a hand-over:

- It is specifically important that the handing-over controller should remain available for a few minutes following the hand-over, particularly in dynamic traffic situations, to provide clarification/assistance on any points which may subsequently arise;
- Other controllers on the sector should impart additional information only after a hand-over has been completed.

R	Restrictions	Examples: flow restrictions, TSA, danger, prohibited and other special status airspace.
E	Equipment	Examples: status, maintenance, ground-ground communications, air-ground communications, navigation, surveillance, radar filters, radar source, type of surveillance, source integration if multiple, strip printers, workstations, information systems.
S	Situation	Examples: weather (fog, snow, hail, visibility, low/high pressure, CB, turbulence, CAT, winds etc.), staffing, configurations (sectors, runways, taxiways, adjacent sectors etc.), strips, holding.
T	Traffic	Examples: all under control, expected, military, VIP, aerial activity, non compliant with ATM regulations (RVSM, RNAV, 8.33, ACAS etc.), VFR flights, clearances and instructions given.

Please, note that there is an important logic behind the REST sequence, building consecutively the situational awareness for (1) environment framework (2) environment of operations (3) operations.