NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

October 5, 2005

AIR TRAFFIC CONTROL GROUP FACTUAL REPORT
NYC05IA095AB

A. AIRCRAFT ACCIDENT

Location: Boston, Massachusetts

Date: June 9, 2005

Time: 1940 Eastern Daylight Time / 2340 Coordinated Universal Time[1]

Aircraft: Aer Lingus Flight 132, A333 and US Airways Flight 1170, B737

B. AIR TRAFFIC CONTROL GROUP

Chairman: Ms. Sandy Rowlett
National Transportation Safety Board
Washington, D.C.

Mr. John Haley
National Air Traffic Controllers Association (NATCA)
Merrimack, NH

Mr. Eric West
Federal Aviation Administration (FAA)
Washington, D.C.

C. SUMMARY

On June 9, 2005, at approximately 2340 UTC, Aer Lingus flight 132 (EIN132) and US Airways flight 1170 (USA1170) were involved in a runway incursion at General Edward Lawrence Logan International Airport (BOS), Boston, Massachusetts. Both aircraft were under control of the Boston Air Traffic Control Tower; the Local Control West (LCW) controller was responsible for EIN132 and Local Control East (LCE) was responsible for USA1170. At 2339:10, the LCW cleared EIN132 for takeoff from runway 15R. Five seconds later, the LCE cleared USA1170 for

[1]All radar and radio transmission times are expressed in Coordinated Universal Time (UTC) unless otherwise noted.

departure from runway 9. The Federal Aviation Administration's (FAA) Runway Safety Office classified this runway incursion as a Category A[2].

D. DETAILS OF THE INVESTIGATION

At the time of the accident, EIN132 and USA1170 were under control of the BOS Air Traffic Control Tower (ATCT). The air traffic control (ATC) group convened at BOS on June 16, 2005 and met with Bob Sgroi, Patty Pilanen, Gary Hufnagle, BOS Support Staff; Toni Dusseault, BOS Support Manager; Bettina Peronti, BOS Air Traffic Manager, and Harry West, Manager, Runway Safety Program for the New England Region who provided a brief synopsis of the event. The group collected initial data on the sequence of events, reviewed training folders for the controllers, listened to recorded voice communications, and reviewed a replay of recorded Airport Movement Area Safety System (AMASS) data related to the incident. On June 17, 2005, the group interviewed 2 local controllers, the cab coordinator, and the tower supervisor and concluded the field phase of the investigation.

1. History of Flight

At the time of the incident, aircraft operating at BOS were landing on runways 4R and 4L and departing from runways 15R and 9. The BOS Local East controller (LCE) was responsible for aircraft operating on runways 4R and 9 and the BOS Local West controller (LCW) was responsible for aircraft operating on runways 15R and 4L. Runway 15R intersected 3 active runways: 4L, 4R, and 9. Because runways 4R and 9 belong to the LCE controller, the LCW must obtain a release from LCE before authorizing departures from runway 15R. BOS procedures required that any airplane crossing an active runway must be on the appropriate local controller's frequency. All arrival aircraft on runway 4R must cross runway 4L as they taxi to their gates and most of the departing jet aircraft must cross runway 4L as they taxi to the departure runway. Both LCE and LCW were holding airplanes between the runways that were either waiting for a departure time or for a gate.

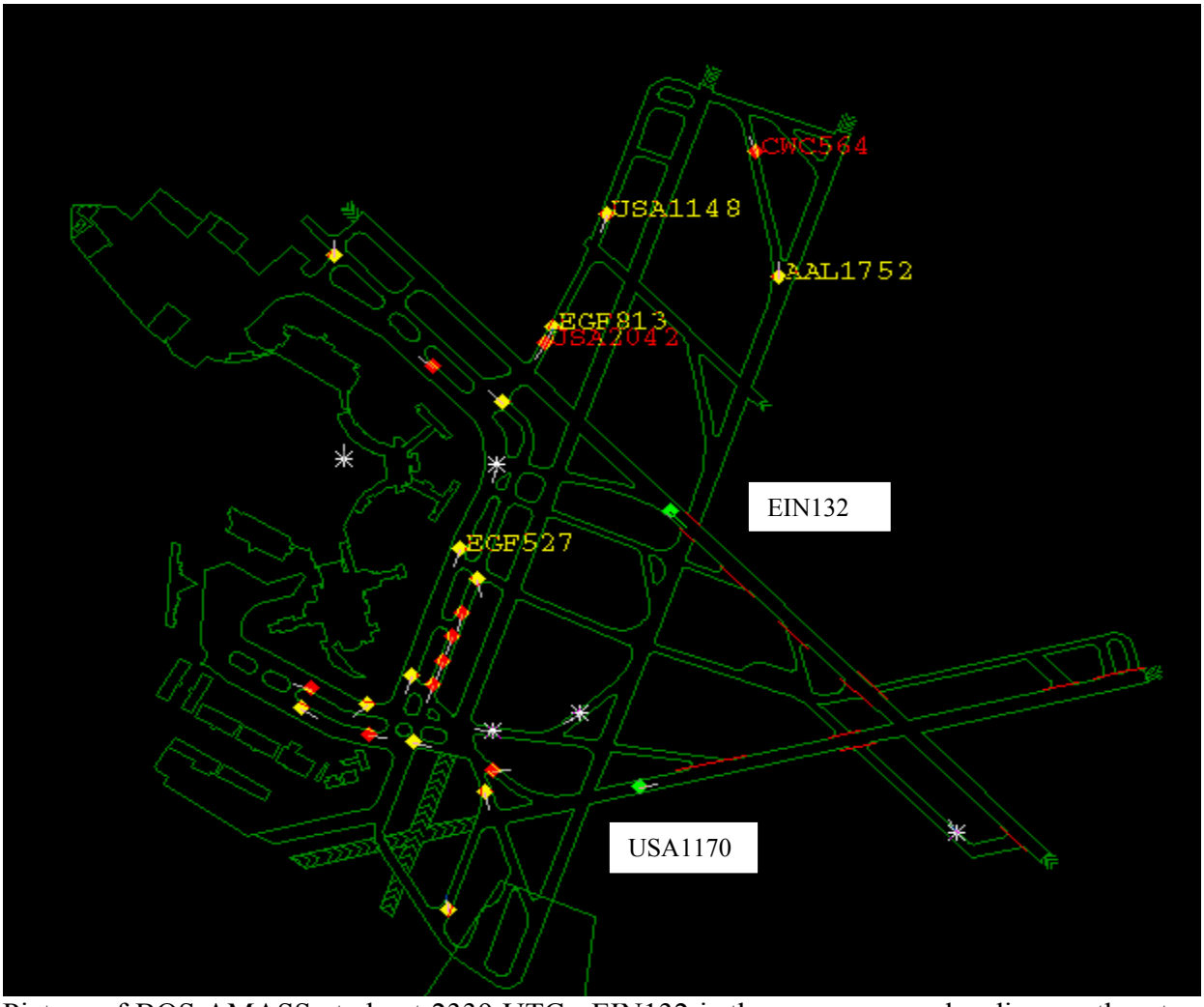
The facility's Standard Operating Procedures (SOP) stated that the LCW will use the interphone to coordinate the release with the LCE. The directive indicated that the LCW will say: "Request release runway 15R, (call sign)." The LCE should respond: "(Call sign) observed and released runway 15R." Once the aircraft departed runway 15R, the LCE can resume normal operations without further coordination.

At 2327:51, LCE instructed EIN132 to taxi into position and hold on runway 15R.

[2] According to the Runway Safety Office, "AER Lingus was on the ground approximately 500 feet prior to the intersection and at an altitude of 300 feet approximately 500 feet after the intersection. With that information, the assessment team felt that AER Lingus was lower than the 300 feet in the preliminary report when it crossed the runway intersection. Also according to the radar data, US AIR rotated after the intersection, leading the team to believe that the crew held the aircraft on the ground. The team also took into account the high speeds of the aircraft as they approached the intersection. Based upon the preceding information, the assessment team categorized the incursion as an 'A.'"

At 2338:24, almost 11 minutes later, the LCE contacted LCW and said, "Observed and released fifteen right, Shamrock, heavy, KI[3]." The LCW responded with her initials, "RL". The LCW transmitted to the EIN132 crew, "Shamrock 132 heavy I've got one crossing and I have got one arrival to the crossing runway it'll be an American seven five seven, you'll see him shortly, be ready." The pilot responded, "we're ready, Shamrock 132." At 2339:10, the LCW said, "Shamrock 132 heavy start bringing your power up traffic is on a three mile final to the crossing runway wind zero eight zero at four runway one five right cleared for takeoff." The pilot of EIN132 responded, "Cleared for takeoff one thirty two heavy."

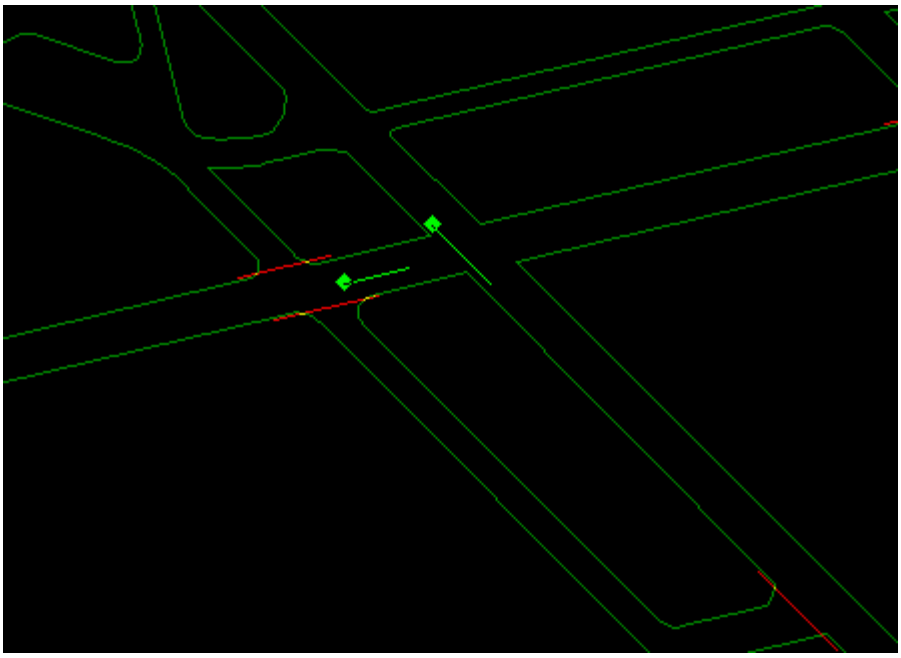
At 2339:15, the LCE said, "USAir eleven seventy runway niner cleared for takeoff traffic two miles out for the crossing." The crew of USAir1170 acknowledged.



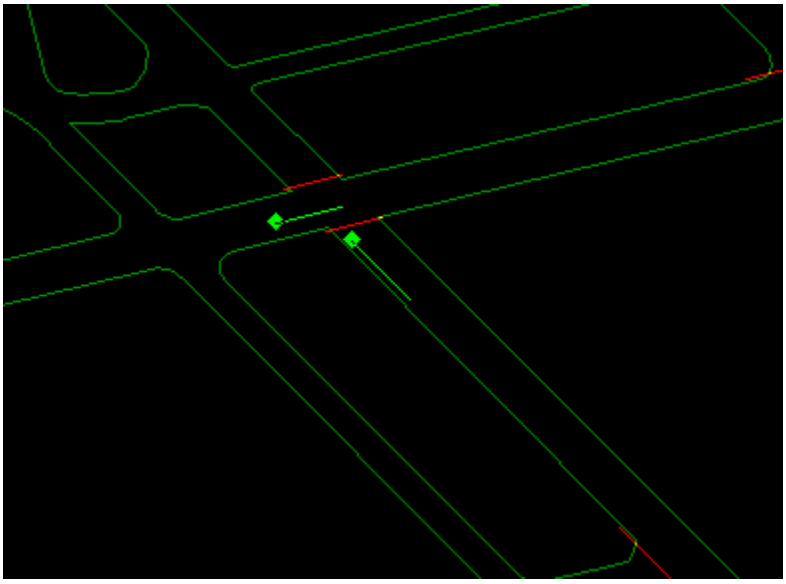
Picture of BOS AMASS at about 2339 UTC. EIN132 is the green square heading southeast on runway 15R. USA1170 is the green square heading east on runway 9.

At 2340:03, the LCE said, "whoa, whoa" and an unidentified voice reported, "That was close".

[3] "KI" are the LCE's operating initials.



At 23:41:39, USA1170 had a velocity of 238 ft/s with an acceleration of 6 ft/s^2. EIN132 had a velocity of 293 ft/s with an acceleration of 3 ft/s^2, it was about 415 feet from the intersection of the two runways.



At 23:41:40, USA1170 had a velocity of 245 ft/s with an acceleration of 6 ft/s^2. EIN132 had a velocity of 291 ft/s with an acceleration of 1 ft/s^2, and was about 171 feet from the intersection of the two runways.

2. Facility Information

BOS was an ATC level 11 facility that operated 24 hours per day, 365 days per year. There were 11 tower positions in the cab: flight data (FD), clearance delivery (CD), gate control (GH), ground control 1 and ground control 2 (GC1, GC2), LCE, LCW, local helicopter, cab coordinator (CC), traffic management coordinator (TMC), and supervisor (OSC). On the evening of the incident, there were 8 controllers and 1 supervisor on duty. The gate control and TMC positions were not staffed. There were 2 airport surveillance detection equipment (ASDE)

displays in the tower cab, one located above the LCE position and one located above the LCW position. There were also 2 digital bright radar tower equipment (D-BRITE) displays next to the ASDE displays.

3. ATIS[4] Information

Boston Logan Airport information Quebec, two two five four zulu. Wind zero niner zero at six, visibility niner, few clouds at one five thousand. Temperature one eight, dew point one five, altimeter three zero one zero. ILS runway four right approach, and visual approach to runway four left in use. Departing runway niner. All aircraft read back all hold short instructions. Heavy bird activity in all areas. Taxiway Victor closed. Advise on initial contact you have information Quebec.

4. Airport Information

In the summer, BOS has an average daily traffic count of approximately 1350 aircraft. Approximately 90 percent are jet aircraft. Runways 4R/22L and 4L/22R are separated by 1500 feet. Runway 4R is the primary arrival runway. Runway 4L is the secondary arrival runway. All jet departures are initially assigned runway 9. If they cannot accept runway 9, they are then usually assigned runway 4R. If runway 4R is not acceptable, runway 15R is then assigned.

[4] Automatic Terminal Information Service is the continuous broadcast of recorded noncontrol information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information

Runway 9 approach end, view from the tower catwalk

Runway 15R approach end, view from the tower catwalk

The far intersection is the intersection of runways 15R/9 as seen from the tower catwalk

5. Letter from NTSB ATC Group Chairman to BOS Facility Manager[5]

On June 30, 2005, the ATC Group Chairman sent a letter to facility management describing issues noted and suggested changes to current procedures that may assist in preventing runway incursions at BOS.

6. BOS Tower Order 7110.11J, Standard Operating Procedures

Paragraph 3-6, Tower Airspace Coordination, states in part:

a. General. Release of aircraft on non-standard runways or crossing active runway swill often affect the operation of another controller's position of operation. These releases shall be accomplished according to the procedures in this paragraph.

b. Procedures.

…(4) Release requests shall include the Runway and the ACID, e.g., "Request release runway 15R, DAL210."

(5) Release approvals shall include the runway, the term "Observed and released", and the ACID, e.g., "DAL219 observed and released runway

[5] See appendix 1.

15R."

NOTE: The "observed" portion of the release is required to allow the responding controller to continue operations once the aircraft has been released and is no longer a factor.

7. Procedural Changes

On June 29, 2005, Boston Tower Notice 7110.6, "Aircraft Releases on Non-Standard Runways" was implemented for "Non-Standard" or "Off-Runway" departures.[6] This Notice:

A. Reiterated timely release coordination for non-standard runway departures. It prohibits the use of any other intersecting runway until the departure from the non-standard runway is no longer a factor.
B. Required that once a release has been authorized, the departure strip(s) of the number one/first aircraft to depart on any intersection runway shall be flipped over and placed upside down in the strip bay until the departure from the non standard runway is no longer a factor, and
C. Required a recorded "Rolling Report" on the aircraft departing on the non-standard runway.

As of July 29, 2005, the Operations Manager was in the process of briefing all supervisors/CIC's and TMC's on the importance of recognizing the direct impact that imposed TMI's have on the airport's acceptance rate and movement area congestion. This activity is ongoing. Expected completion is mid August.

Additionally, a facility workgroup will be established to explore potential changes to control position jurisdiction to minimize/eliminate distractions caused by multiple aircraft on the movement areas waiting for release times.

[6] See appendix 2.

8. Personnel Interviews

Ayaz Gulal Kagzi **Local Controller East (LCE)**

Training Records:

Entered on duty (EOD) FAA: 1/22/95
EOD ZNY: 1/23/95
EOD BDL: 12/6/98
EOD BOS: 10-6-02
CPC BOS: 2/18/2004
RI Prevention: 4/21/04
CBI AT Memory Guide: 4/21/04
Situational Awareness: 9/15/04
Runway Incursion Prevention: Safety Bulletin 14: 10/15/04
Runway Safety Bulletin #14: 11/17/04
Runway Safety – It Is Your Business: 1/19/05
Runway Incursion/ Safety Program: 3/16/05
Runway Incursion Prevention/ Airport Signage/Flash Card: 4/13/05
Runway Incursion prevention/Video/Never Happen to Me: 8/29/04

Interview:

Mr. Kagzi was interviewed by the ATC Group on June 17, 2005. During the interview, his representative was Tom Coronite, NATCA. In response to questions, Mr. Kagzi provided the following information:

His operating initials were "KI". He began his FAA career on January 22, 1995 at the Mid-Atlantic Consortium (MAC) for radar training. He was then assigned to New York Center's Oceanic area, and later transferred to Bradley Tower. He does not have any military ATC experience. He is a private pilot. He has no collateral duties at the facility. He had not had any operational errors or operational deviations in the last 2.5 years. His medical certificate was current and he wears contact lenses for near vision. His regular days off were Monday and Tuesday. The Wednesday prior to the incident he worked 0600-1400 local time and on the day of the incident he worked 1330–2130 local time.

Mr. Kagzi has a wife and infant child (6.5 months). Before his shift, he did nothing outside of his normal duties of taking care of the house and child. He said he felt rested when arriving for work. He went to bed around 2100 on Wednesday night, got up at 0345, and did not take a nap prior to the shift. There were no significant changes to his health in the last year. He does not drink alcohol.

Mr. Kagzi described the sequence of events that lead to the incident. There was a tremendous amount of thunderstorm activity, and a lot of traffic management initiatives associated with the weather were in effect. Not many areas of the airport were benign, everything was "hot." There was nowhere to stage aircraft at BOS so the controllers had to hold aircraft in the areas between the runways. These aircraft must be repositioned continuously and there were delays "in the hours" that day. During this evening, Mr.Kagzi was at the LCE position controlling runways 4R and 9. LCW had 4L and 15R. Aircraft were being staged on taxiway C between the parallels

and, because aircraft cannot execute a 180 degree turn on taxiway "C", to move to other locations on the airport aircraft had to follow a "Z" shaped track that crossed runways 22L and 22R using several taxiways. Taxiway V was closed and aircraft were being staged on taxiway U as well. It was a steady flow of traffic but with the holds and the releases coordinated with the arrivals, he had to reposition an aircraft on taxiway C near runway 22L. He said that aircraft holding on taxiway P or E had to move to enable aircraft on taxiway C to get out in a timely manner or released aircraft would encounter another extended delay. He spoke about an aircraft that had just been issued a delay: the pilot was pretty upset about it. There was a Delta shuttle to LGA holding on taxiway C. After being notified of a departure delay for LGA, Mr. Kagzi moved the shuttle aircraft from taxiway C to runway 22L, taxiway P, to hold short of taxiway E in front of an arrival airplane. Mr. Kagzi also had to move someone else on taxiway E that was holding for CLT. Numerous aircraft had turned off their engines on taxiway U. "We were also completely ground stopped for IAD and I had 2 or 3 of them stacked up." Then there was a VIP movement that was 4th in line and he had to move other airplanes to get it out[7]. He stated that he had to jockey aircraft from both sides of his area of responsibility. Some airplanes were already there when he took the position. He stated that the flight data controller (FD) and cab coordinator (CC) were managing the delay information.

Mr. Kagzi could visually see all the aircraft as it was still light outside. He used the airport surface detection equipment (ASDE) for position verification. He was crosschecking the ASDE with his flight progress strips to confirm what he saw out the window. He was also very busy coordinating verbally with other controllers.

There were multiple aircraft ready for departure at runway 15R. "LCW and I were trying to coordinate the departures on 15R." Regarding EIN132, "LCW and I were talking off-line and I was so busy that it was difficult to get in a word edgewise." Mr. Kagzi knows the LCW controller well, and they work together often.

Mr. Kagzi noticed there were multiple 15R departures pending. He explained that "if you don't relieve the pressure" on runway 15R, general aviation (the Signature terminal) gets shut down. They needed to develop a game plan to get the runway 15R departures out. Ground control (GC) was also quite busy. Typically LCW will call LCE to obtain releases but because of the communications load caused by all the ground movement, she couldn't get in. When he had "down time," he called LCW and released EIN132, then "ceased his operation". Mr. Kagzi said he told LCW "runway 15 observed and released". There was about a minute of delay before the runway 15R departure began to roll. At the same time, he received a release for the Delta (DAL) shuttle, but USA1170 was in front of the Delta shuttle and needed to depart first in order for the shuttle flight to get to the runway. Mr. Kagzi stated that he cleared USA1170 for takeoff in order to get the Delta shuttle into position for departure. He stated that he simply forgot that he gave LCW the release on EIN132 and rolled USA1170 to get DAL out.

After he stated "observed and released" he stated that it was his personal technique to "turn the next runway 9 departures' strip upside down. However, during this session there were so many aircraft with amended times, amended clearances, and amended delays that he had to constantly

[7] The VIP movement occurred approximately 45 minutes before the incident.

update information on the strips, so there was a lot of strip management and movement." He was uncertain if he turned over the USA1170 flight progress strip as he would typically do.

Runway 9 is a departure-only runway. After clearing an aircraft for take-off, he would put a hash mark through the strip and then conduct a clockwise scan. This includes the adjoining runways and the ASDE, other control positions, and the runways. He said that "typically I look at 15R but there was a person next to me, on both sides and 15R was not in the sightline because of people next to me." He could see targets sitting or creeping forward on ASDE.

Asked about using different control techniques to minimize hold times on runways, Mr. Kagzi stated that "pre-loading" departure airplanes is necessary because intervals are so time critical that "I have to lock and load as quickly as possible." Not putting aircraft on the runway would tend to slow down traffic. There are procedures in place but they broke down. "Unless the aircraft is cleared for takeoff, it's not a player." He doesn't know if it would enhance safety to not pre-load an airplane. Much of the problems occurred due to the changing traffic management initiatives and the position of the aircraft in their staging areas. On this particular day, the functions that he had to perform were non-standard with a lot of heads down time and strip management along with a lot of data source inputs. We did not have a traffic management coordinator that evening, so the cab coordinator was performing extra duties. Controllers were constantly moving, changing, and amending strips and there was a lot of communications involved with that. Mr. Kagzi had minimal contact with the supervisor, and doesn't know if the gate hold position (GH) was open.

After clearing USA1170 for takeoff, Mr. Kagzi went back to moving aircraft and getting others ready for departure. He stated that he saw the incident after the airplanes were past the intersection and he said, "Whoa, Whoa" on the frequency. There was just so much going on at the time with noise and conversation that he was not sure why the system broke down. He believes he did his scan and believed that he flipped the strip but he wasn't sure.

The wake separation requirement is 2 minutes from the time the aircraft begins its roll. This is typically done using the UTC clock located in front of the position. He stated that the departure time is filled in the strip and they look at the departure. He typically sees the departure airplane roll because it is based on other traffic.

AMASS does not presently detect conflicts between aircraft operating on intersecting runways. There are occasional false alarms because of erroneous data. For example, Mr. Kagzi recalled holding a DHL flight short of runway 22L, but the target appeared to have entered the runway. Sometimes helicopters operating on the taxiways cause alerts with aircraft holding in position on runway 15R.

He stated that he can generally maintain situational awareness of LCW traffic while at the LCE position.

He has worked previous emergencies but they landed without incident.

What does "observed and released" mean? Before LCW clears an aircraft to depart runway 15R,

LCE needs to observe the traffic and release it. "I have to see the traffic, identify it and release it before it can depart." He initiated the release for EIN132. In this particular case, he then forgot about EIN132 and released USA1170.

What is your cut-off for departing an aircraft when another is on final to the same runway? Usually 1.5 miles but it depends upon other things, but it has to do with the separation requirements.

He was monitoring frequency 132.22 in the headset and frequency 121.5 was on speaker.

When asked about other distractions Mr. Kagzi explained that there were many, many inputs going on that evening. He believed that the traffic situation was extremely complex that night. The VIP release "didn't help."

When asked what suggestions he had to prevent another incident, he stated that they should hold aircraft at the gates until they can go, or have larger parking areas to stage aircraft that are delayed.

Rebecca Dawn Larson **Local Controller West (LCW)**
Training Records:
EOD FAA: 10/10/91
EOD SFB: 3/1/92
EOD ADQ: 4/3/94
EOD BED: 8/31/97
EOD BOS: 1-13-02

Ms. Larson was interviewed by the ATC Group on June 17, 2005. During the interview, her representative was Tom Coronite, NATCA. In response to questions, Ms. Larson provided the following information:

Her operating initials were "RL", and she was a CPC. She was hired by the FAA in 1991 and came to BOS on January 13, 2002. She previously worked at Sanford, FL; Kodiak, AK; and BED. She had no ATC experience in the military and she was not a pilot. In addition to being a controller, she was in charge of maintaining headsets and assisted in creating lesson plans. Her medical certificate was current with a requirement to wear glasses for distant vision. She was wearing them the day of the incident.

He regular days off were Monday and Tuesday. On Wednesday she worked the morning shift 0600-1400 local time and on Thursday she worked 1345 –2145 (1/2 hour flex time) local time.

Ms. Larson stated that on the evening of the incident they were short staffed in controllers and TMC, and it was "crazy busy," with the most delays in a long time. She also stated that the noise level in the tower cab was the highest she has ever experienced. She hadn't been on position long before the incident occurred. When she plugged into LCW, there were a lot of communications and delays. There were a couple of aircraft on taxiway E, one on taxiway C and another on taxiway W, which gave no outs to runway 9. Taxiway B was closed: normally the

tower can hold aircraft on it, but not at that time. At the time of the incident, there were a lot of "international" departures that like to use runway 15R. There were several people coordinating tower operations and the people were working well as a team. Ms. Larson was working well with the LCE. There was a lot of talking and coordination going on between the controllers which was not on the interphone system and therefore not on the ATC voice tape. Everyone was extremely busy. Once GC gave up runway 15R, he had limited taxi routes. Ground was gridlocked at the time, so Ms. Larson had to hold aircraft on the other side of runway 15R. She was aware of what GC and LCE were doing with their traffic. She indicated that she couldn't cross runway 15R with too many aircraft because it would cause gridlock. Several people were coordinating and getting (departure) times - they were a "phenomenal team." There was a lot of discussion of where to put airplanes. She noticed the second airplane on taxiway E was released so she had to move the one ahead of him out of the way because the second aircraft needed to get to the runway and couldn't do a 180 degree turn on the taxiway. She recalled moving the first aircraft. Then taxiway B opened and she changed the aircraft's taxi route twice more. Ms. Larson finally put the aircraft on taxiways B/U and got an earlier release time. One Delta flight didn't pull up far enough so the American Eagle behind it couldn't clear the runway. Ms. Larson stated that whenever she finished a radio transmission, someone in the cab would be talking to her, pointing to various airplanes saying "he can go, he can't go." Told LCE that she had several runway 15R departures to get out, but he had aircraft with traffic management assigned departure times and those had higher priority than the runway 15R international departures. She said she saw a hole and asked LCE to let her aircraft go "after the American." She was departing aircraft from runway 4L and holding on the other side of runway 15R to use taxiway Q instead of F so as to not interfere with GC. She advised EIN132 that he would depart after American. LCE told her that he was going to call her early because he had a lot to do and other aircraft to talk to. LCE subsequently called her and gave her a release; she then told EIN132 "to be ready." She waited for American to land and cross the 15R intersection before she released EIN132.

Ms. Larson's technique before clearing someone for takeoff is to scan the runway—from the departure end to the approach end--and also the crossing runways. She looks at the next arrival and back at her own final and departure end before she says "clear for takeoff." The key was to ensure that EIN132 was rolling. Once EIN132 passed runway 4R, she looked at taxiway N to ensure that when she crossed an airplane, she wouldn't hurt GC. Ms. Larson then crossed an American Eagle and put the strip in the appropriate controller's in-box. She then heard someone saying "whoa, whoa, whoa" inside the cab.

She couldn't recall when taxiway B was closed, but it had been closed the entire session. She could not recall how long she was on position, but said, "It seemed like it was long."

When asked about her first statement about being short-staffed she explained that the TMC was gone and they needed GH open; FD and CD were too busy to handle the GH duties as well as their own. FD would normally pick up the slack but it was too busy. CC is a "time getter," meaning he does what is needed such as getting new strips or departure times.

Ms. Larson explained about the noise level in the cab. "There was a great deal of coordination needed and there was a lot of talking going on, which meant there was a lot of noise." The FDIO printed flight progress strips at CD that needed a new route or a new time, and there was a lot of

talking back and forth. "Non-stop talking on position." There was no radio or TV on, only work related discussions.

Asked if she maintains situational awareness of what LCE is doing while she is working LCW, Ms. Larson stated, "Yes…you need to be aware of all the positions because when I do something it affects all the other positions." Ms. Larson stated that she couldn't see LCE's bay and could not hear his conversations with the planes, but she does try to pay attention to what is going on with LCE. I wear my earphone on my right ear (where the LCE position is). It is very important that the LCE and I talk and coordinate at all times.

When you are working LCE do you know what is going on with LCW? Yes, you develop a technique and your attention should be to your operations. Each person has their own way of doing their job and the SOP tells you to support the other people in the cab.

Asked how runway 15R fits into the scan, Ms. Larson stated that her primary responsibility is for the runways that she owns. If she is working runways 9 and 4R and there is no activity on runway 15R, then she doesn't have to look there. She also uses the ASDE to monitor surface traffic.

When LCW has a pending departure on runway 15R, LCW is required to notify and coordinate with LCE. There is a strip marking for 15R. There is constant adapting and changing going on in the cab:it is part of your job. The use of 15R depends on factors such as the wind, weight of the aircraft, and international departure demand, and it changes from day to day. Runway 15R departures are not unusual – it is a frequent operation.

Interphone communication is through the headset and she is not sure if it blocks out the frequency. She knows that when she talks to the TMC, the frequency does come over the speaker.

Once the runway 15R departure release is obtained from the LCE controller, what do you do next? She says "Roll 15R" to the LCE controller. She remembers that at one of the other facilities she worked at, it was a requirement to speak out that an aircraft was rolling and it helped as a memory jogger. Ms. Larson stated that is was a good technique, and she did make a "rolling" announcement when EIN132 was cleared for take-off. She does this off the intercom and says it loudly. No one responds, and there is no requirement to respond. She doesn't believe anyone would have heard her because of the noise level, and did it out of habit. Ms. Larson didn't think anything of it when no one responded. This is a personal technique and she seems to recall that a lot of other people do use it also, but there is no BOS requirement to advise the other LC that the airplane is departing.

How do you ensure wake turbulence requirements are met between 15R departures and traffic on the runway 9? It is part of the observe and release procedure that the owner of runway 9 must acknowledge that there is a departure on runway 15R. When you are working LCE, you look at the time the runway 15R airplane departs and add 2 minutes. If you don't observe the airplane rolling, you should use 2 minutes after the time you see.

Asked about the reliability of AMASS, Ms. Larson said that it appears to go off when it is supposed to. Sometimes it generates false alarms when there is an aircraft holding on a runway and a nearby aircraft is taxiing quickly.

In general, the view from the cab is good. There are poles in the way that sometime block aircraft out. There is a need to constantly move around, and because I am so short, this is a necessity.

What does "observed and released" mean? She explained that it meant, "you observe the aircraft and release the runway for an aircraft to take off. You watch for the departing aircraft to go through the intersection and you can then go back to normal operations on your runway. There is no need to communicate anything."

When asked how she prepares to depart an aircraft from runway 15R, Ms. Larson stated that "Request release off 15R" must be followed by "Observed and released" from LCE, otherwise that aircraft cannot be cleared for take-off. There are no time parameters. Timing of the coordination call is a matter of technique: some people like to do it early. There is discussion between LCE and LCW offline regarding "when" the aircraft is likely to be released before the conversation takes place on the intercom.

When you have an arriving aircraft, how do you determine when to roll a departure from the same runway? She indicated that she typically uses "a mile and a half in general, but it depends on the speed of the aircraft. It is a situational decision."

Ms. Larson indicated that the closure of taxiway B impacted the flow of taxing traffic to runway 4R. Ground control more often will release airplanes from a gate even when they cannot depart because of flow times but the crew needs to be off the gate either because of an inbound flight or because they want to be to be close to the runway.

Would having the gate hold position open have helped? Yes, we had a lot of volume, and they could have asked more questions regarding the need for the aircraft to move from the gate. It would have helped with frequency and aircraft congestion. On that day, taxiway victor was closed and bravo was also closed for vehicle traffic, so this was a relatively unusual configuration for the airport.

Shuffling the aircraft is becoming the norm - do you know if anything being done to alleviate this congestion problem? Ms. Larson replied, "You are not talking to the right person."

She stated that if runway 15R hasn't been used in 2 hours, the supervisor has to advise MASSPORT so they can do a runway check before any landings or takeoffs.

She stated that her traffic was "moderate". GC and LCW traffic was extremely high. Because of the TMI, the complexity was high. At the time of the incident her position was combined with helicopters but she doesn't recall having any.

She indicated that CPCs are not trained to work the TMC position. She stated that it "makes a

world of difference when that person is here - it is like having 2 supervisors up there."

Since the incident, controllers are now required to "flip the strip over which indicates that the airplane cannot go for some reason." She said this technique is "OK for some people, but may not work for all."

She stated that FD handles the job of the TMC.

Ms. Larson stated that had she heard LCE clear USA1170 for takeoff, she may have been able to prevent the incident. However, she explained that she wears the earpiece on the right side and could not hear LCE all the time.

Chris Stephen Quigly **BOS Tower Supervisor**
Training Records:
EOD FAA: 9/5/89
EOD ZBW: 9/5/89
Control Tower Operator certificate: 9/10/91
EOD BAF: 10-13-91
EOD BOS: 10-30-94
CPC BOS: 8/29/95

Mr. Quigly was interviewed by the ATC Group on June 17, 2005. His representative was Mark Olsen, FAA. In response to questions, he provided the following information:

Mr. Quigly's operating initials were "CQ". His date of hire with the FAA was September 5, 1989 and went to BOS on October 30, 1994. Prior to BOS, he worked for 2 years as a co-op at BOS Center, 3 years at BAF. He stated that he became a supervisor about 6 months prior to the incident. He had no military ATC and he was not a pilot. He had no collateral duties at BOS. His medical certificate was current and contained the restriction to wear contacts for near and far distances. He stated that he was wearing them the night of the incident. His regular days off are Saturday and Sunday. The week of the incident he worked the night shift, 1400-2200 local time. He has 8 employees assigned but is not assigned to their shifts. His duties include general supervision of the tower cab, regardless of who is assigned to work in the cab.

He stated that he works about 1/3 of his shifts with the LCE and this is divided evenly among the other employees. Mr. Quigly stated that he became a supervisor about 6 months ago, and did not train the LCE controller.

Mr. Quigly stated that the LCE controller is of average ability and needs more experience to become more efficient and expeditious. He is a good, conscientious employee. Mr. Quigly made a similar assessment of the LCW controller's performance, stating that she was also about average. The LCW controller is not on Mr. Quigly's team, and he is not aware of any specific needs for improvement. She is a motivated, conscientious, hard-working employee.

The evening of the incident was a typical summer shift with "popcorn" thunderstorms stretching

from New England to Florida. He explained that this is not unusual during this time of year.

There were an above average number of traffic management initiatives in effect, mainly due to the storms in the area, but Mr. Quigly did not remember any specific ones. Before becoming a supervisor, Mr. Quigly had been a traffic management specialist at BOS for 5 years.

Ground traffic flow was slightly heavy with a higher complexity, partly due to the traffic management initiatives.

Volume of aircraft was moderate to heavy, complexity was higher because of the traffic management initiatives. The tower operation was at the mercy of Boston Center and whatever restrictions "they want us to abide by." Arriving traffic flow was moderate at the time, about 44 arrivals per hour (capable of doing 68 under this configuration). Mr. Quigly asked for no restrictions, and he did not believe that the ground traffic warranted a restriction. No controller asked him to request any flow restrictions. When asked if any controllers ask for help, he said that they generally complain when there are heavy traffic restrictions but do not seek help. They make statements such as, "We're bending over backward - what are they doing?" When the airport approaches gridlock, Mr. Quigly coordinates with Boston Center and the Air Traffic Control System Command Center. These centers are normally accommodating when negotiating traffic restrictions. It's a negotiating process that involves Boston TRACON. When asked about meetings with upper management, he said that there is a group that deals with many issues, however, he has only been a supervisor for 6 months and is not on this particular group.

Mr. Quigly first became aware of EIN132 when the aircraft was ready to depart on runway 15R.

He stated that he becomes aware of runway 15R departures when GC announces when an aircraft is pushing back, and when the airplane is taxiing to runway 15R. At the time of the incident, he said there were 3 departures. There are no specific actions that he needs to take when this happens. He pays more attention when runway 15R is in use for departures because of an incident that happened several years ago. He explained that an aircraft taxied on 15R when it was closed.

Mr. Quigly saw the event right before it happened (he called it the point of no return). He was standing at the podium behind LCE's shoulder doing something with delay strips. He did not recall hearing any coordination with either controller regarding this event, however, this was a fairly standard operation and did not require special attention. The ground movement was typical for bad weather nights with traffic management restrictions in effect.

Mr. Quigly thought that there was adequate staffing in the tower that night. "Not short, not over, just right." He explained that he was a TMC prior to this and said that he was confident that all that was required was being done. He didn't call in a TMC for overtime because it "wouldn't go over well"; he didn't believe he needed one anyway.

Clearance delivery and gate hold were combined at that time. The noise level was typical for that scenario; louder than when there are no thunderstorms. He has worked in that environment for a long time: "That's the way it is." It was typical to hear an occasional shout from time to

time, like "Roll him".

He explained the phrase "Observed and released": "You have observed that the aircraft on runway 15R that is ready for departure and you may continue operations once the other runway is clear. There is no need to 'close the loop'." When asked if he believed whether or not it was a good operation, he indicated "It's all I've ever known. It's worked for 11 years." His experience has been with intersection departures at BAF, but there was only one local controller at BAF. Typically there is a lot of conversation between the controllers when they are coordinating the departure of aircraft on runway 15R. He feels that in this case LCE and LCW coordinated a little early.

Mr. Quigly stated that the tower has a good view of both runways, and he spends most of his time looking out the window. He can monitor frequencies from the supervisor position by picking up the telephone and selecting the position he wants to hear. At the time of the incident, he was doing traffic management duties and not wearing a headset.

Mr. Quigly said that he has talked to the LCE since the incident and discussed lessons learned. The LCE admitted to making a mistake. The LCE believes he normally flips the departure strip when the aircraft is being held but he couldn't recall if he had.

The LCE did not appear fatigued around the time of the incident, and Mr. Quigly stated that the LCE would have told him if that were the case. The LCE was about 2 minutes from being relieved (there is a 2 hour maximum on position) prior to the incident.

It is the primary responsibility of the TMC to count departure delay strips. This responsibility transfers to the supervisor when there is no TMC. There were about 88 delays during the entire evening shift. Normally on a nice VFR day there would be none.

Mr. Quigly explained how the wake turbulence separation is ensured between the two aircraft departing from the intersecting runways. He stated that LCE checks the LCW departure strip and sees the departure time that is written there.

Boston operations have become more complex since Mr. Quigly started at the facility 11 years ago. There seem to be more traffic management initiatives in effect, but he doesn't know if it's attributable to increased volume. Since 9/11 traffic has rocketed up, but he doesn't believe it will climb to pre-9/11 numbers again.

He said that either BG or CD can hold aircraft on the gate, but usually another aircraft needs the gate space so either the arriving or departing airplane will have to wait somewhere else on the airport.

Is there anything that could improve the information the controllers have available to them that could have prevented this incident? There were 7 people in the tower that evening: they all work as a team and all have a part in the "safety net."

Have you recently experienced an emergency situation? Yes, a COMAIR flight crossed an

active runway without a clearance and I had to file a pilot deviation.

AMASS is reliable, but occasionally will generate a false alert. Once, AMASS activated because there was heavy rain on one half of a runway. There have also been a couple of helicopter-induced AMASS alerts. When a helicopter lands at Signature and runway 15R is closed, AMASS thinks it's an arrival.

When asked if it is it a hindrance to hold departing aircraft on the runway, Mr. Quigly responded, "no, it is what needs to be done."

Bryan Leonard Bourgoin **Cab Coordinator**
Training Records:
EOD FAA: 10/23/85
EOD Bridgeport ATCT (BDR): 2/23/86
EOD BOS ATCT: 3/28/88
EOD A90 (Boston TRACON): 10/7/90
EOD BOS: 5/10/98

Mr. Bourgoin was interviewed by the ATC Group on June 17, 2005. His representative was Tom Coronite, NATCA. In response to questions, he provided the following information:

He was employed by the FAA on October 23, 1985 and was assigned to Bridgeport ATCT before being transferred to BOS on March 28, 1988. He transferred to BOS TRACON where he worked as a traffic management coordinator and plans and procedures specialist before transferring back to BOS in 1999. His operating initials were "BL". He had no collateral duties at BOS. His medical certificate was current with no waivers or restrictions. He had no military ATC experience. He was a pilot but was not current. He has a SEL, SMEL, and CFISE licenses. His regular days off were Monday and Tuesday. On Wednesday he was assigned a 1400-2200 local time shift and Thursday, the day of the incident, he was assigned to work 1400-2200 local time.

Mr. Bourgoin had been in the cab about 1 to 1 ½ hours before the incident, first as CIC and then for about 30 minutes as cab coordinator. The cab coordinator performs duties as assigned by the supervisor. The supervisor requested him to coordinate numerous restrictions and to coordinate between LC or GC to remove or adjust any restrictions. He was to release or hold aircraft as appropriate and advise the controller.

Mr. Bourgoin received the necessary information either via phone from Boston Center or via the strip printer. He was not wearing a headset nor monitoring any frequencies at the time.

He stated that traffic flow that evening was chaotic and complex, mostly because of the number of traffic-management related communications rather than the traffic itself. The local controller had to park aircraft in movement areas and subsequently had to move them around constantly as holds were put on aircraft because of weather. They were also utilizing runway 15R for departures to ease the minimum spacing required to depart all the aircraft on runway 4R. He indicated that it was more efficient to depart runway 15R than to try and land and depart on

runway 4R.

Mr. Bourgoin stated that he requested relief from local flow restrictions from the BOSOX sector but he was given none. No explanation. He did not expect to get a relief from either 6 MIT for departures but was given none. He stated that 10 percent of the time he gets relief, may not get what they ask for but he takes what he can get.

Mr. Bourgoin stated that he does not coordinate between LCE and LCW they coordinate between themselves.

The noise level was high and was typical for that type of night. It centered mostly around the traffic management restrictions. Everyone was very focused on the job at hand. He didn't know if a radio was on in the back of the cab, but if it were it was not loud enough to be a distraction.

He explained the term "Observed and Released": The LCE controller would advise the LCW that he observed the aircraft on runway 15R and he would keep his runway sterile so the 15R departure could occur. The LCW would clear the aircraft for take-off. Coordination is usually done in a timely manner, when the arriving aircraft on runway 4R is crossing taxiway C. When asked if 45 seconds was long for a departure to roll after receiving a release, he stated that it "depends on the rest of the traffic, however, this amount of time does seem excessive but my job was to focus on the delays and releases." Some people give a "rolling call", but it's not in the SOP. When working LCW, Mr. Bourgoin does not always use the "rolling" procedure.

Non-standard departures: "If aircraft are going to a non-standard runway, as CC I would be aware of this situation but have no responsibilities for this situation." The cues are: looking at the strip, seeing an aircraft on the runway, and GC advising of the non-standard operation.

He noticed the incident just as USA1170 was between taxiways E and C and EIN132 was just rotating between taxiways F and G on runway 15R. He said it looked like USA1170 made an effort to remain on the ground. He was just an observer; there was nothing that could be done at the point where he saw what was happening.

Mr. Bourgoin stated that AMASS was reliable but sometimes the tower gets nuisance alarms as a result of helicopters at the general aviation terminal and the Port Authority.

He stated this incident occurred because the LCE was distracted and forgot that he gave the release to LCW, and then he cleared USA1170 for take-off.

Asked how he would solve the problem, Mr. Bourgoin stated that he 1) Would not allow aircraft with delays into the movement area, and 2) Would inform the pilots not to get into long-winded discussions with controllers responsible for the movement area.

We were short a traffic management coordinator who would have been responsible for the traffic management initiatives. It would have been nice to have a gate control position and Cab Coordinator. In the 4 years that I was a supervisor, the Operations Manager would not allow supervisors to call in a TMC for overtime (to replace one who is sick). The TMC would have

been doing the paperwork and since he was not there, the supervisor had to do the paperwork.

Appendix 1: Letter from the ATC Group Chairman to the BOS Facility Manager

National Transportation Safety Board
Washington, D.C. 20594

June 30, 2005

Ms. Bettina Peronti
Air Traffic Manager
Boston Airport Traffic Control Tower
Logan International Airport
600 Control Tower, 19th Floor
East Boston, Massachusetts 02128

Dear Ms. Peronti:

On June 9, 2005, about 1940 eastern daylight time, Aer Lingus flight 132 (EIN132), an Airbus A330, and US Airways flight 1170 (USA1170), a Boeing 737, were involved in a runway incursion/near midair collision at General Edward Lawrence Logan International Airport (BOS).

At the time of the incident, airplanes were landing on runways 4R and 4L and departing from runways 15R and 9. The Local Control East (LCE) controller was responsible for airplanes operating on runways 4R and 9 and the Local Control West (LCW) controller was responsible for airplanes operating on runways 15R and 4L.

According to BOS air traffic control tower (ATCT) order 7110.11J, Standard Operating Procedures (SOP), under this airport configuration the LCW was required to coordinate runway 15R departures with LCE. This order stated that LCW would use the interphone to coordinate a release with LCE. The specified LCW phraseology for this coordination was "Request release runway 15R, (call sign)." The order indicated that the LCE should respond, "(Call sign) observed and released runway 15R." There were no other coordination requirements or facility-mandated usage of memory aids applicable to this situation.

In this case, in a variation from the standard procedures, the LCE initiated the coordination call for EIN132 (which was holding in position on runway 15R), advising the LCW, "Observed and released fifteen right, Shamrock, heavy." The LCW responded with her initials. The LCW then advised the EIN132 crew, "Shamrock 132 heavy I've got one crossing and I have got one arrival to the crossing runway it'll be an American seven five seven, you'll see him shortly, be ready." The pilot responded, "we're ready,

Shamrock 132." A few seconds later, the LCW said, "Shamrock 132 heavy start bringing your power up traffic is on a three mile final to the crossing runway wind zero eight zero at four runway one five right cleared for takeoff." The pilot of EIN132 acknowledged.

After the LCE released EIN132 for departure on runway 15R, American Airlines flight 1752 (AAL1752), a Boeing 757, landed on runway 4R, and the LCE cleared USA1170 for takeoff on runway 9. On the basis of the advisory to the EIN132 flightcrew about the landing American Airlines 757, it would appear that the LCW was aware of the potential conflict between AAL1752 and EIN132 and withheld EIN132's takeoff clearance to resolve it. However, no evidence was recorded of any coordination between the LCW and the LCE regarding a potential conflict between these two airplanes. Further, there is no evidence that the LCW was aware that USA1170, another potential conflict, was preparing to depart from runway 9. Under these circumstances, it would appear that separation between USA1170 and EIN132 was completely dependent on the actions and awareness of a single controller, the LCE.

When interviewed about operating procedures following this incident, the LCE stated that after he approved a departure release from runway 15R, he would turn over the flight progress strip for the next aircraft to depart runway 9 to remind himself not to authorize departures from that runway until the airplane departing runway 15R was clear of the area. He couldn't recall if he used this memory aid on the night of the incident. Although this technique assists in preventing conflicts between runway 9 departures and runway 15R departures, there is no analogous procedure for focusing attention on potential conflicts between runway 15R departures and runway 4R arrivals.

All systems involving human-machine interfaces are threatened by the potential for human error. In air traffic control, pilots, controllers, and automated systems must all function optimally to maximize controller/pilot situational awareness, to minimize the occurrence of controller/pilot errors, and to minimize the chances that controller/pilot errors will result in accidents. Recognizing the limitations of human performance, such as the volatility of controller memory, is a first step toward achieving these objectives. Development of redundant layers of protection designed to prevent controller errors and limit their impact is also important. Safety Board investigators are concerned that several aspects of BOS ATCT procedures do not provide redundant layers of protection against human error, and may some day permit a single controller error to develop into a serious accident.

In the airport configuration in use at the time of the incident, flight crews using runways 15R and runway 4L were on a different local control frequency than those crews using runways 4R and 9. Because two local control frequencies were in use, pilots could not directly monitor activities that were occurring around them; specifically, the pilots of USA1170 could not hear that the LCW had cleared the pilots of EIN132 for takeoff from runway 15R. In addition, the airport layout made it difficult for flight crews to see airplanes operating on intersecting runways. As a result, the pilots of USA1170 had no opportunity to detect the controller's error and were not prompted to confirm or question their own clearance to take off on a converging runway.

While BOS is equipped with the Airport Movement Area Safety System (AMASS), the current version of AMASS tracking software does not detect conflicts between aircraft operating on converging runways. Therefore, the two local controllers did not have automation backup for the type of incident under examination here.

Finally, BOS ATCT procedures require that the LCE and the LCW coordinate a release for airplanes operating from runways "that are not normally active in the runway configuration in use," which in this case applied to runway 15R. When interviewed, the LCE stated that he advised the LCW that EIN132 was "observed and released" and then, he believes he followed his usual technique and turned over the flight strip for USA1170 (the next runway 9 departure) before ceasing operations pending departure of EIN132. However, a review of recorded AMASS data and voice communications indicated that, after the LCE gave the LCW the release, AAL1752 landed on runway 4R. Airplanes using runway 4R conflict with traffic using runway 15R. As noted above, although there was no recording of any coordination between the LCE and the LCW about AAL1752, the LCW did ensure *adequate* separation between EIN132 and AAL1752. It is therefore possible that the LCE forgot about AAL1752 when issuing the release, and that the LCW detected the conflict on her own. The LCE also cleared USA1170 for takeoff from runway 9 without resolving that airplane's potential conflict with EIN132, indicating that he had likely forgotten about the airplanes' relative positions and casting doubt on the effectiveness of his memory aid technique.

To maintain awareness of developing situations, controllers scan runways and listen to transmissions made by other controllers. Controllers interviewed during this investigation stated that the noise level in the tower cab was quite high around the time of the incident. Although they were standing next to each other, neither the LCE nor the LCW heard the other controller issue takeoff clearances to their respective flights. BOS ATCT procedures do not mandate that an ATCT cab coordinator or supervisor monitor the local control positions, nor does the facility assign another controller, such as a local assist, to help the local controllers monitor traffic and provide redundancy in identifying errors and potential conflicts.

On the basis of observations made during the investigation of this incident, Safety Board investigators offer the following suggestions that may assist in preventing runway incursions at BOS.

1. Require the LCW to advise the LCE on the interphone "runway XXX, rolling, (initials)" when an aircraft is departing from a runway not normally active in the runway configuration in use. The receiving controller should respond with his/her initials. This coordination would provide the receiving controller with a timely reminder that the runway was in use and, if a conflicting clearance had just been issued, prompt that controller to immediately resolve the conflict.

2. Require either the supervisor or cab coordinator to monitor either the LCE or the LCW position, as appropriate, when they are using a runway not normally active

in the runway configuration in use. The additional personnel would be able to monitor the traffic situation and provide redundancy in the detection of any developing conflicts.

3. Do not permit controllers to place an airplane on an active runway unless that airplane is expected to depart in an appropriately short time. The presence of an airplane holding on a runway should serve as a warning to ATCT observers that a departure is imminent. Frequent use of extended "position and hold" procedures increases the likelihood of runway conflicts and may cause controllers to become desensitized to the significance of an airplane occupying a runway. (In this case, EIN132 was held in position on runway 15R for more than 11 minutes before the LCW issued a takeoff clearance.)

4. Facility management should evaluate the feasibility of incorporating a local assist position to be used when an aircraft is departing from a runway not normally active in the runway configuration in use. The intent of this position would be to monitor the position and coordinate with other positions/facilities, as appropriate.

I appreciate the help and support you provided to the team during this investigation and I look forward to hearing from you.

Sincerely,

Sandra Rowlett
Deputy Chief, Operational Factors Division

Appendix 2: Boston Tower Notice 7110.6

NOTICE

U.S. Department of Transportation
Federal Aviation Administration

Boston Consolidated Terminal

Radar Approach Control

BOS TWR N7110.6

7/1/05
Cancellation
Date: 7/1/06

SUBJ: **AIRCRAFT RELEASES ON NON-STANDARD RUNWAYS**

1. PURPOSE. This directive has been formulated to help prevent a recurrence of an Operational Error (OE) that involved two departing aircraft.

2. DISTRIBUTION. This Notice is distributed to the Notice and OPS Immediate Binders and the Support and Operations Managers.

3. CANCELLATION. Boston Tower Notice 7110.5, Off-Runway/Non-Standard Departures, dated June 15, 2005, is cancelled.

4. EFFECTIVE DATE: July 1, 2005.

5. BACKGROUND: This directive has been formulated to help prevent a recurrence of the Operational Error (OE) that took place on June 9, 2005. This OE resulted in the loss of separation between an aircraft departing on the primary departure runway and an aircraft departing on a runway that is not normally active in the runway configuration that was in use.

6. SCOPE: The contents of this directive apply to situations where an aircraft release is required on a runway that is not normally active in the runway configuration that is in use.

7. PROCEDURES.

a. The authorization for the release shall be made in a timely fashion and not provided/issued until all conflicts with other arriving/departing aircraft have been resolved.

b. When a release has been authorized, the departure strip(s) of the number one/first aircraft to depart on any crossing runway, of the position that authorized the 'Release', shall be flipped over and placed upside-down in the strip bay.

c. The departure strip(s) referenced above shall remain upside down in the strip bay until the departing aircraft (that the release was given to) is no longer a factor.

d. Just prior to, or as, the released aircraft starts takeoff roll, the local controller that was given the release shall advise the other local controller that the aircraft is rolling. This advisory shall be accomplished via the ETVS. Examples: 'Rolling Runway 15R', 'Rolling Runway 33L'. The receiving controller shall acknowledge the 'Rolling Report' with their operating initials.

Distribution: Notice Binder, Ops. Immediate Binder, OM, and SM

Initiated By: BOS-4

Bettina M. Peronti
Air Traffic Manager
Boston ATCT