STATEMENT OF

CAPTAIN JOHN PRATER

PRESIDENT

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL

BEFORE THE

SUBCOMMITTEE ON AVIATION

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

UNITED STATES HOUSE OF REPRESENTATIVES

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RUNWAY SAFETY

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Good afternoon, Mr. Chairman and members of the Subcommittee. I am Captain John Prater, President of the Air Line Pilots Association, International (ALPA). ALPA represents 60,000 professional pilots who fly for 43 passenger and all-cargo airlines in the United States and Canada. On behalf of our members, I want to thank you for the opportunity to testify today about the need for enhanced runway safety.

ALPA is a world-renowned aviation safety advocate, dedicated to protecting the interests of passengers, crew members and cargo. Many in the industry, including a former Federal Aviation Administration (FAA) Administrator, refer to us as "the conscience of the industry." Today, I would like to address three runway safety topics: runway incursions; runway excursions; and runway confusion.

Runway Incursions

We need to remember that it was a runway incursion over 30 years ago that still stands as the most deadly accident in the history of airline flying. On March 27, 1977, two Boeing 747s collided on an airport runway in Tenerife, Canary Islands while operating in very poor visibility conditions. In that single accident, 583 lives were lost. Although Tenerife was a landmark event in aviation history and much has been done to mitigate the risk of incursions since then, the potential for another runway incursion which could kill hundreds of people in a single accident is real and growing in view of current and forecast increases of traffic within the National Airspace System (NAS).

U.S. airlines safely completed 19.4 million flights in 2007. Of these, only a few hundred experienced a runway incursion and most of those were not "close calls." But despite this relatively low number, when considering the consequences of a high-speed collision, the potential for catastrophe is high.

The problem of runway incursions has been exhaustively studied by dozens of aviation experts and numerous, effective mitigation solutions have been devised that can greatly lessen the inherent risk associated with airport ground operations. The question that

remains to be answered is whether government and industry are truly committed and willing to invest in the resources that are required to eradicate this problem.

Demanding schedules, inadequate rest periods and insufficient or inaccurate information related to weather or airport conditions can degrade the performance of even the most seasoned and dedicated pilot. While the Federal Aviation Administration (FAA) has made efforts to address a number of these issues by emphasizing improvements to crew operating procedures and training, the number of runway incursions has increased, not decreased, over the past few years. Although it may be easy to say that nearly all runway incursions are caused by human error, it is more important to look for the root causes of those errors and develop strategies to eliminate them. Clearly, the focus on human factors should continue, but there is also a need to invest in available technological improvements, system design enhancements and procedural changes to reduce pilot and air traffic controller errors, all of which contribute to the problem of runway incursions.

ALPA's safety volunteers have assisted a number of airline managements in determining the causes of runway incursions which have identified a variety of contributing factors. One airline found the following contributing factors to runway incursions from data that it collected over a year: runway and taxiway marking confusion; airport configuration/layout issues; runway change impact on performance parameters; crewmember/ATC verification; implied runway crossing clearance; and "follow" clearances. Another airline found this list of contributing factors from 2006-2007 for Level D (i.e., the most dangerous type) incursions: distractions; runway and taxiway markings and signs; misunderstood ATC clearances; taxi speed; and closely spaced parallel runways.

Ingenious technology, combined with political will and monetary resources, have virtually thwarted two of the deadliest types of accidents: midair collisions and controlled flight into terrain (CFIT). Numerous midair collisions, resulting in hundreds of deaths over several decades, occurred when air traffic controllers and pilots relied solely on basic ground-based radar and see-and-avoid techniques to maintain required separation between aircraft. The development of the traffic alert and collision avoidance system (TCAS) equipped pilots with an invaluable tool that warns them of an impending collision and gives instructions on how to avoid it. Since the introduction of TCAS, many midair collisions have been averted, and many lives have been saved.

CFIT accidents have been similarly catastrophic and caused perhaps thousands of casualties during the era when controllers and pilots relied solely on radar coverage, charts, and ground visual references to maintain adequate clearance from the ground in low visibility conditions and periods of darkness. The invention, development, and implementation of the ground proximity warning system (GPWS), and its newer supplement, the enhanced GPWS, or EGPWS/TAWS, has had the same powerful effect on reducing the number of CFIT accidents that TCAS has had on reducing the number of midair collisions. In both instances, existing technologies, training, and procedures were insufficient to satisfactorily meet the challenge of preventing incidents and accidents. In both instances, enhanced situational awareness and conflict alerting capability were

combined for a powerful one-two punch to the heart of the problem. In both instances, recommendations for great risk mitigations were ignored until several high-profile accidents occurred.

So it is with runway incursions. The risk posed by runway incursions can be significantly reduced—by as much as 95 percent according to the U.S. Commercial Aviation Safety Team (CAST)—with a combination of technologies which greatly improve the flight crew's situational awareness and provide conflict-alerting capability during ground operations.

We must not wait for another Tenerife accident before we get serious about solving the problem of runway incursions. Aviation stakeholders must make a commitment as an industry to field effective mitigations, whether they are low-tech solutions, such as painting runways and taxiways with enhanced markings, improving airport signage and lighting, or more sophisticated, such as providing Automatic Dependent Surveillance Broadcast (ADS-B) technology in the cockpit. We need to provide the best equipment in control towers and cockpits that will improve situational awareness at both ends of the radio. Installing systems like runway status lights (RWSL) that have already been proven to reduce or eliminate runway incursions in real operations will have a great effect on improving safety.

Following is a list of expanded action items which will substantially reduce the potential for a runway incursion accident:

Implement CAST Recommendations

In ALPA's white paper on Runway Incursions, published in March 2007, we recommended that the U.S. government and aviation industry fulfill the commitments that were made to implement the recommendations of the Commercial Aviation Safety Team (CAST) Runway Incursion Joint Safety Implementation Team (R-I JSIT). Unfortunately, government and industry have yet to act on many of those proposals.

CAST determined that 95 percent of all runway incursions could be prevented by having (1) a cockpit moving map display with own-ship position for improved situational awareness, (2) integration of ADS-B to enable pilots and controllers to see all aircraft and vehicles on the surface and aircraft up to 1,000 feet above ground level, (3) automatic runway occupancy alerting, and, (4) digital data-linked clearances that are displayed on the moving map. Electronic flight bags, which provide computer-generated displays of aircraft and flight information, can be used to display moving maps and own-ship position. Last year, the FAA announced its intention to amend its policies on the use of EFBs with moving maps and own-ship position to give airline pilots the safety benefits from these EFBs as soon as possible. Only a very few airliners have EFBs with moving maps and own-ship position installed, but it is widely used on general aviation and corporate aircraft. Installation of this vital equipment on airliners should become a national aviation safety priority. The FAA recently lowered the certification requirements for EFBs with aircraft moving maps which should result in a reduced cost

to implement this technology on U.S. airliners. However, the equipment manufacturers and airlines have yet to collaborate on installing this technology in our cockpits.

Improve Air Traffic Controller Training

In 2000, CAST made recommendations to improve air traffic controller training. Subsequently, the FAA issued guidance for the development of a curriculum which has been incorporated into initial and recurrent controller training programs. ALPA is alarmed that despite this increased emphasis on training and procedural best practices, the number of incursions has not diminished.

In order to rectify this situation, ALPA recommends that the FAA develop a Controller Resource Management (CRM) training curriculum for tower cab controllers that mirrors similar programs currently in place for flight crews and aircraft dispatchers. Particular emphasis should be placed on effective coordination techniques during high workload conditions.

On February 6, 2008, the FAA announced that over the next 18 months, it will deploy new air traffic tower simulators to a number of domestic airports to assist in the training of thousands of new air traffic controllers. The Tower Simulation Systems (TSS) will provide more realistic depictions of an airfield and its surrounding areas and are programmable to replicate varying traffic, weather, lighting and visibility conditions. ALPA applauds the FAA for this effort and encourages it to continue to supply the most realistic training available to its air traffic control work force. This recent development is clearly a positive step toward solving the problem of runway incursions.

Airport Design and Enhanced Airport Signage and Markings

The FAA's action to require all commercial airports to implement enhanced taxiway markings is another positive step toward assisting pilots in maintaining awareness that a runway intersection is being approached. In the population of airports with more than 1.5 million annual passenger enplanements, 71 have accomplished this goal, 62 other airports have voluntarily made the improvements, with 121 more airports planning to finish the task by the end of the year.

ALPA recommends that all FAR Part 139 airports with commercial (Part 121) air carrier operations install enhanced taxiway markings, to include a red runway identifier that is not part of FAA's required improvements.

Implementing enhanced surface markings will clearly assist pilots in identifying approaching runway intersections, but their usefulness is limited when an airport surface is obscured by snow or other forms of precipitation or contaminants. Because surface markings have limited application, a number of other technologies have been developed which are intended to improve the situational awareness of pilots traversing an airport's surface. Use of these directional aids takes on added meaning when pilots are navigating

airfields with which they have little familiarity (not an uncommon occurrence), or are operating in adverse meteorological or high traffic conditions.

The following recommendations on available technologies are contained in the CAST 2002 RI-JSIT report wherein it is noted that substantially improved ground movement navigation guidance is needed to prevent runway incursion accidents and incidents.

- Variable electronic message boards which display critical clearance related instructions such as "hold," "cross," or "takeoff."
- Provision of runway occupancy information to pilots on final approach to prevent "land over" accidents and incidents in which an arriving aircraft jeopardizes, or collides with, an aircraft positioned on a runway awaiting takeoff clearance.
- "Smart" ground movement lighting that indicates the cleared taxi route, substantially reducing runway incursions which result from pilots taking an incorrect path and proceeding onto a runway or taxiway without a clearance.

In addition to these technologies, there are a multitude of less sophisticated solutions for improving airport surface safety, many of which are similar to aids provided to motorists to assist in navigation and warn of impending hazards. We urge the FAA to exercise its authority and responsibility to support research and installation of improved signage systems in the airport ground environment.

End-Around and Center Taxiways

ALPA supports the installation of perimeter (i.e., end-around) taxiways as they enhance both safety and capacity; perimeter taxiways drastically reduce opportunities for runway incursions. Atlanta Hartsfield (ATL) airport has already completed construction of an end-around taxiway that allows traffic to proceed from arrival runways to terminal gates without crossing other arrival or departure runways. Dallas-Ft. Worth (DFW) is in the process of constructing several of these taxiways. Atlanta's airport experiences 500–600 fewer runway crossings daily due to its end-around taxiway; that's 500-600 fewer opportunities for a runway incursion. Additionally, operational data has demonstrated that perimeter taxiways can actually increase airport efficiency.

The record of runway incursions includes numerous cases involving parallel runways, where a landing aircraft exited the runway via a high-speed taxiway onto an occupied parallel runway causing a runway incursion in the process. This is a very high-risk accident scenario, but one which can be mitigated by implementing a center taxiway between parallel runways. ALPA is urging the Los Angeles World Airport authority to include a center taxiway between parallel runways at LAX during their modernization program so as to enhance both safety and efficiency.

Airport Surface Detection Equipment Model X (ASDE-X)

ASDE-X, which operates on the principle of multi-lateration, provides tower controllers with increased situational awareness of the airport surface by displaying a wide variety of

targets, including aircraft and ground vehicles. Currently, only 11 airports in the U.S. have ASDE-X installed. ALPA supports an accelerated plan to implement ASDE-X at all OEP airports. While there are still issues associated with its operational use, we believe that this technology offers controllers a high fidelity presentation of the airport surface movement area so as to provide reliable data via which yields better quality decisions. One manufacturer has demonstrated a runway occupancy alerting capability for the flight crew which obtains its signals from ASDE-X. As was noted previously, a runway occupancy alerting capability combined with other technologies aimed at increased situational awareness could reduce incursions by 95%.

Runway Status Lights (RWSL)

Runway Status Lights work in conjunction with an airport's ASDE-X radar system. These lights provide pilots with a direct indication of runway status, a recommendation endorsed by the NTSB. In a recent operational evaluation conducted by MIT's Lincoln Laboratory at Dallas-Fort Worth International Airport (DFW), runway incursions on the test runway decreased by 70 percent. Recently, San Diego's Limburgh Field (SAN) installed a RWSL system. We are encouraged that both Los Angeles (LAX) and Chicago O'Hare (ORD) airports are also considering these installations as part of their airport modernization efforts.

ALPA has recommended that the RWSL system become a standard technology upgrade for all large air carrier hub airports. We believe that Airport Improvement Plan (AIP) funds should be allocated to expedite implementation for all candidate airports. As part of this effort, it is important that clear and definitive action is taken to ensure the incorporation of RWSL in the proposed ORD modernization plan.

Automatic Dependent Surveillance – Broadcast (ADS-B)

ADS-B, unlike radar, does not rely on a ground-based surveillance system. Three-dimensional, Global Positioning Satellite (GPS)-derived aircraft positioning reports will provide air traffic controllers with greatly enhanced air traffic surveillance capabilities. Additionally, the use of ADS-B will enable pilots and controllers to see all aircraft and vehicles on the airport surface and aircraft up to 1,000 feet above ground level.

A recently issued FAA Notice of Proposed Rulemaking (NPRM) requires mandatory ADS-B equipage for National Airspace (NAS) operations after the year 2020. ALPA believes that this mandate for ADS-B OUT should be accelerated and that it is imperative that increased emphasis should be placed on the development of technology and procedures for display of traffic information on the flight deck, via ADS-B IN. The current NPRM mandates ADS-B OUT by 2020. This improves controller surveillance, but would provide pilots no additional information. Operational safety enhancement will only be gained with equipage of aircraft with ADS-B IN and Cockpit Display of Traffic Information (CDTI). Once the safety and efficiency gains for this technology are analyzed, it is our expectation that there will be compelling data to suggest a mandate for ADS-B technology in an accelerated timeframe.

Non-Standard Air Traffic Phraseology

ALPA believes the U.S. should align itself with ICAO guidance for air traffic controllers and pilots regarding airport surface operations and runway holding instructions. The U.S. is one of just a few countries that does not comply with certain ICAO standards for phraseology or taxi instructions. The ICAO guidance is more succinct than the FAA's and requires a specific affirmation of a clearance to cross all active runways that cross their assigned taxi route. It also provides standardized phraseology when instructing a flight to enter the runway and hold its position until a takeoff clearance can be issued.

On any given day there are hundreds of internationally based flight crews operating at our nation's busiest airports. With multiple accents on busy radio frequencies and the lack of a common understanding as to what is expected of everyone, we fear that safety is being compromised.

Standard Operating Procedures (SOPs)

ALPA recommends improved standard operating procedures (SOPs) and improved training for aircraft ground operations throughout the aviation industry. One prudent SOP is to complete as much "heads down" activity as possible prior to departing the gate. To accomplish this goal, ALPA recommends that all airlines standardize their procedures and implement the guidance contained in FAA Advisory Circular (AC) 120-74A, *SOPs for Ground Operations*. Completing all pre-departure checklists and briefings before leaving the gate will significantly reduce crew distractions during the taxi phase. Similarly, executing post-landing checklists after safely clearing the active runway, but before initiating taxi to the gate, will ensure that both crewmembers are focused on taxi clearance instructions and the safe transiting of the prescribed route.

One major airline has noted that complex taxi routes and pilots' misunderstanding of taxi instructions account for over 90% of their runway incursions. This miscommunication is due in part to the necessity for aircrews to complete complicated checklists as they taxi their aircraft. Frequently, flight crews must process changes to navigation routings given by air traffic controllers (ATC), or prepare the aircraft for flight as they determine correct aircraft trim settings based on actual weight and balance factors of the plane. Such information is often known only minutes before leaving the gate.

We know of at least two airlines that have changed their taxi procedures to facilitate the completion of all checklists items that can be accomplished prior to departing the gate area. Particularly in the event of a short taxi route, this practice will prevent crews from rushing completion of their checklist items while navigating their aircraft on the airport surface.

Runway Excursions

Rejected takeoffs and poor landings are high-risk maneuvers which may lead to a runway excursion. Recent data shows that over 28% of accidents from 1995 to 2007 involved runway excursions. Three quarters (75%) of those were on landing, and 25% were on takeoff. Fifty-one percent (51%) of landing accidents occurred on a runway contaminated with snow, rain or ice, while only 10% of usual aircraft movements are on wet or contaminated runways.

Aircraft flight manuals do not contain actual flight-test determined data for takeoff or landing performance under wet or slippery runway conditions. Flight crews are also not provided reliable data on the effect of a contaminated runway on aircraft braking, and stopping information is vague and subjective. Although provision of such information is mandated in Europe, it is not required in the U.S. ALPA believes that in the interest of safety, manufacturers must be required to provide flight crew with takeoff and landing performance data for all runway conditions expected to be encountered in service.

Pressure on flight crews to complete scheduled operations can play a role in runway excursions as well. We have seen instances of "pilot pushing," wherein a company dispatcher insists that a landing is legal when it may not be, due to ambiguity in aircraft performance data in unfavorable conditions. This dynamic potentially puts pilots, passengers and cargo in harm's way.

This issue could be resolved if pilots were provided aircraft takeoff and landing performance data as a function of existing runway conditions. For in-flight computation, pilots should be provided data in the form of required landing distances, rather than in terms of weight limits. When in flight, the weight factor is unchangeable, and the runway length is the controlling factor.

In the event that an aircraft is unable to stop before reaching the end of the runway due to mechanical, weather, or other operational problems, a runway safety area (RSA) is intended to ensure that an incident does not become an accident. ICAO recommends that runways have a defined runway safety area free of obstacles and extending well past the end of the actual runway. In the U.S., FAA Advisory Circular 150/5300-13, *Airport Design*, provides the criteria for an acceptable RSA.

Unfortunately, hundreds of airports in the U.S. that serve both domestic and international air carrier operations do not meet U.S. or international standards in this regard. According to recent FAA statistics, 45% or 460 of the 1,024 certificated airport runways in the U.S. must be improved with regard to RSAs.

Three solution methodologies exist for those US airports that do not meet current RSA standards:

1. Airport authorities should remove obstacles, fill ravines or level ground to create adequate RSAs. This option may not be possible for urban airports or others in a confined geographic area.
2. Airports can decrease the effective runway length of certain runways to create adequate runway safety areas. This option may not be attractive because it could potentially mean reducing the size and weight of aircraft that use the airport.
3. If the physical space simply does not exist to create the recommended runway safety area, an Engineered Materials Arresting System (EMAS) could be installed. This system uses aerated, frangible concrete to bring an aircraft to a quick but controlled stop, much like runaway truck ramps on steep mountain highways. EMAS is a solution that has proven successful in actual operation. It is worth noting that EMAS has the advantage of being generally unaffected by snow and/or ice contamination and functions to the same level of arresting capability as if it is bare and dry.

Runway Confusion

Although this issue has rarely been the cause of a catastrophic accident, it has been identified as a definite weakness in our nation's runway safety system. The regional jet accident in Lexington, Kentucky in 2006 and the Singapore Airlines 747-400 which crashed during takeoff from Taiwan in 2000 represent the real risks of this scenario. Other runway confusion-related incidents have occurred, but in those cases, safety was not compromised to the point of causing an accident.

Known causes of runway confusion include one or more of the following factors: mistaken situational awareness; crew in "heads down" operations; lack of advisory information on airfield configuration changes; obscuration of markings and signs; inaccurate charting when construction is occurring; and, poor quality automated terminal information service (ATIS) broadcasts.

Solutions for preventing runway confusion can be found in many of the systems offered for mitigating runway incursions, but challenges remain in eradicating this safety problem. Technology for crew alerting and awareness systems such as the runway alerting awareness system (RAAS) appears very promising, but it is only being purchased by a small number of airlines. Electronic Flight Bag (EFB) with Aircraft Moving Map Displays (AMMD) offers great potential, but is not planned for retrofit except at a few progressive airlines. Requisite operational information frequently is not provided to flight crews prior to departing the gate, necessitating crew attention and action during taxi. However, few airlines provide crews with training scenarios involving taxi challenges.

Recommendations

We urge Congress to assist the industry in its efforts to mitigate the risks of runway incursions, runway excursions, and runway confusion. Following are our recommendations in this regard.

Runway Incursions

- Provide improved ground movement training for air traffic controllers, particularly with the use of high-fidelity visual tower simulators, which are similar in quality to aircraft flight simulators routinely used for pilot training.
- Require that all airports with commercial air carrier operations have the enhanced taxiway markings, including the red runway identifier that is not yet part of FAA's required improvements.
- Direct the FAA to exercise its authority to support research to improve signage systems around the airport.
- Support the expenditure of funds to install perimeter taxiways, which enhance both safety and capacity.
- Airlines should work with equipment manufacturers to install Electronic Flight Bags (EFBs) with Aircraft Moving Map Displays in our cockpits. The FAA has lowered the certification requirements for them thereby reducing the cost to implement EFBs.
- FAA is scheduled to implement ASDE-X at 7 airports in 2008; this schedule should be accelerated.
- Include Runway Status Lights (RWSLs) as a standard technological upgrade for large hub airports and support Airport Improvement Plan (AIP) funding to quickly implement RWSLs at the nation's busiest airports. It is important that there be clear and definitive action taken immediately to ensure that the Chicago O'Hare, Los Angeles International, and other hub airport modernization plans incorporate RWSLs.
- Aircraft must be adequately equipped, and regulators must develop and implement procedures, for ADS-B technology. The government and industry should push for the development of air-to-air ADS-B applications that benefit the users.
- All airlines should standardize their procedures and implement the guidance contained in the FAA Advisory Circular (AC) 120-74A, SOPs for Ground Operations.
- Change procedures to require crews to complete all pre-departure checklists and briefings before leaving the gate to significantly reduce distractions to the crew during the taxi process.
- Change procedures to require crews to complete after landing checklists and briefings before taxiing begins from the landing runway.
- Airlines should be encouraged to conduct thorough root cause analysis of all runway incursion events that involve their flight crews to ensure a complete understanding of why the event took place and implement strategies to eliminate them.

Runway Excursions

- Manufacturers must be required to provide flight crew with performance data for takeoff and landing for all runway conditions expected in service. Pilots should be

provided data in the form of required landing distances, rather than in terms of weight limits.

- Airport runways with runway safety areas less than 1,000 feet in length should be improved to provide at least this size. If the physical space simply does not exist to create the recommended runway safety area, an Engineered Materials Arresting System (EMAS) should be installed.

Runway Confusion

- All airlines should standardize their procedures and implement the guidance contained in the FAA Advisory Circular (AC) 120-74A, SOPs for Ground Operations.
- Change procedures to require crews to complete all pre-departure checklists and briefings before leaving the gate will significantly reduce distractions to the crew during the taxi process.
- Provide improved ground movement training for air traffic controllers, particularly with the use of high-fidelity visual tower simulators, which are similar in quality to aircraft flight simulators routinely used for pilot training.
- Require that all airports with commercial air carrier operations have the enhanced taxiway markings, including the red runway identifier that is not part of FAA's required improvements.
- Direct the FAA to exercise its authority to support research to improve signage systems around the airport.

Thank you for the opportunity to testify today. I would be pleased to address any questions that you may have.

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