



# National Blueprint

for



# Runway Safety

October 2000





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# National Blueprint for Runway Safety

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# Executive Summary

The Federal Aviation Administration is pleased to present the National Blueprint for Runway Safety, the guide by which the Runway Safety Program (RSP) will achieve a measurably safer runway environment.

Simply stated, a runway incursion occurs when an aircraft, vehicle, or pedestrian transgresses on an active runway while it is being used by another aircraft to land or take off. Incursions are a growing threat to safety and, unless concerted action is taken across a full spectrum of potential causative factors, they are likely to continue to increase as a result of the 3% predicted annualized growth of air travel. Runway incursions are a high-profile problem recognized by the FAA and the aviation community as a primary threat to safety. The FAA Administrator has responded by including runway incursions in the Safer Skies initiative and creating a new organization dedicated solely to reducing incursions. The goal of the RSP is to design and execute a coherent, corporate action plan that will effectively reduce the number of incursions at our nation's airports.

Though it is incumbent upon the FAA to lead the struggle against runway incursions, no single entity "owns" runway incursions and no single entity owns the cure. Incursions happen because a variety of people (pilots, controllers, and vehicle drivers) occasionally makes mistakes. For this reason incursions are everyone's problem and everyone, at every level the problem touches, must participate in forming the solution.

The RSP has reached out to the aviation community to improve runway safety in a systematic and strategic manner. A series of nine Regional Workshops were held across the country during the Spring of 2000. These meetings, under the auspices of the FAA, brought together all of the stakeholders in runway safety to develop additional ways to reduce runway incursions.

The workshops were followed by a Human Factors and Runway Safety Symposium and a Runway Safety National Summit. Through these and other sources nearly 1,000 detailed and specific recommendations were received. These recommendations were then condensed into approximately 60 major initiatives by combining similar proposals and eliminating duplication. These 60 potential initiatives are grouped into seven major categories called *thrusts*, described in detail in the Blueprint. These thrusts are: Training; Technology; Communications; Procedures; Signs/Markings/Lighting; Data, Analysis, and Metrics; and Local Solutions.

The Blueprint outlines a structured, iterative process designed to understand the problem, decide upon solutions, plan actions, implement initiatives, evaluate progress, and improve performance. Initiatives which offer clear benefits and which can be rapidly implemented will be accelerated. Detailed milestones are established by which progress may be evaluated.

Specific factors have been identified as critical to success. These are: leadership support across all segments of the aviation community; consistent stakeholder involvement in developing and implementing solutions; communication and coordination among all stakeholders; funding and resource availability; the prompt implementation of promising interventions; adherence to milestones; and complete and accurate reporting of surface incident data.

At the heart of the matter we recognize that an open and honest partnership between the Runway Safety Program and the aviation community is central to achieving our shared vision of safer runways. Correspondingly, the RSP has created an Aviation Community Liaison Plan to help support extensive participation on the part of diverse elements of the aviation community across the spectrum of RSP activity.

## I. BLUEPRINT PURPOSE AND OVERVIEW

Preventing runway incursions and surface incidents is the responsibility of everyone whose actions impact the safety of runway operations. This responsibility extends beyond pilots and controllers to airline operators, airport managers, ground vehicle operators and pedestrians, special interest organizations, unions, flight instructors, rule-makers, regulators, and all who touch, or influence those who touch, the airport surface.

For this reason, the Blueprint is designed to reach out to the aviation community and engage all in the common cause of preventing incidents and accidents. Affirming the inherent responsibility of the FAA to guide, facilitate, and support efforts to improve runway safety, the Blueprint recognizes the importance of all stakeholders, defines appropriate roles, and challenges them to participate in the successful execution of the program.

The Blueprint describes the processes employed to measurably reduce the risks associated with runway incursions and surface incidents. It sets expectations, establishes accountability, communicates information, and defines new and improved ways of working together. It takes advantage of existing relationships and establishes new ones, enabling organizations that already work together to collaborate in new and more efficient ways. Finally, it establishes an integrated organization with a coherent approach for managing initiatives and measuring progress.

The Blueprint also communicates our vision for a safer runway environment. As this vision unfolds, it may be necessary to adjust strategies to meet the inevitability of change and respond to an evolving environment. Thus, the Blueprint is a living document. It starts with what is under way now, while detailing the next sequence of recommended initiatives to be pursued this year. Comprehensive annual assessments will be conducted, and future iterations of the Blueprint will be refined and published annually in light of experience gained.

The Blueprint consists of the following sections:

- Section I presents the purpose and overview of the Blueprint.
- Section II discusses the challenges in creating a safer runway environment.
- Section III describes the vision for runway safety and improvement initiatives to achieve this vision. These initiatives incorporate both current initiatives, including 10 near-term initiatives launched on August 1, 2000, and more than 50 recommended initiatives under consideration.
- Section IV outlines the RSP Office goals, milestones, critical success factors, approach plans, and organization. Most importantly, the program approach establishes a controlled process to better understand causes, identify and implement effective solutions, and measure success. Finally, it describes the organizational relationships that will enable the FAA and the aviation community to work together in addressing runway safety.

To better understand the problem of runway incursions, it is important to be familiar with the various terms used to describe runway surface events. This terminology includes the

FAA definitions used to describe specific aspects of runway safety. (See definitions in Box 1.)

## Box 1 Terminology

A **surface incident** is an event during which authorized or unauthorized/unapproved movement occurs within the movement area or an occurrence in the movement area associated with the operation of an aircraft that affects or could affect the safety of flight.

A **runway incursion** is any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of separation with an aircraft that is taking off, intending to take off, landing, or intending to land.

A **collision hazard** is any condition, event, or circumstance that could induce an occurrence of a collision or surface accident or incident (for example, a pilot takes an unplanned or evasive action to avoid an aircraft, vehicle, object, or person on the runway).

A **loss of separation** is an occurrence or operation that results in less than the prescribed separation between aircraft, or between an aircraft and a vehicle, pedestrian, or object.

All runway incursions are surface incidents, but not all surface incidents are runway incursions. To qualify as a runway incursion, an aircraft that is taking off, intending to take off, landing, or intending to land must encounter both of the following conditions:

- At least one aircraft, vehicle, pedestrian, or object must be on the runway.
- A collision hazard or a loss of separation must occur.

Runway incursions are classified into the following four categories.

1. **Operational Error.** A failure of the air traffic control system that results in a loss of separation as defined in Federal Aviation Administration Order 7210.56A.
2. **Pilot Deviation.** The action of a pilot that results in violation of Title 14 of the Code of Federal Regulations or a Federal Aviation Regulation.
3. **Vehicle/Pedestrian Deviation.** Any entry or movement on the movement area by a vehicle (including aircraft operated by non-pilots) or pedestrian that has not been authorized by air traffic control.
4. **Miscellaneous.** A situation that occurs that cannot be attributed to any of the three categories above (for example, equipment failure).



## II. THE CHALLENGE OF CREATING A SAFER RUNWAY ENVIRONMENT

The United States has the largest, most complex, and busiest air transportation system in the world. It is also the safest system in the world. The National Airspace System is a highly evolved system of humans, procedures, and technologies that has been tested hundreds of millions of times. On any given day the National Airspace System safely handles more than 175,000 takeoffs and landings. The driving force behind this enviable record is the absolute priority placed upon safety by the FAA and the aviation community.

Though the system is quite safe, mounting evidence indicates that safety may be jeopardized by events on the airport surface known as runway incursions. A runway incursion is defined as an occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard with an aircraft taking off, intending to take off, landing, or intending to land.

The worst aviation disaster on record worldwide occurred as a result of a runway incursion. In 1977, two B747s collided on Tenerife Airport in the Spanish Canary Islands resulting in the loss of 583 lives. Since 1990, there have been five fatal runway incursion accidents involving commercial airline aircraft. Each of these events received extensive media coverage and generated public debate about the safety of aviation. One of the Federal Aviation Administration's "top five" priorities is mitigating the threat presented by runway incursions and surface incidents. Runway incursion prevention has been on the National

Transportation Safety Board's list of "Most Wanted Transportation Safety Improvements" for the last decade.

### The Airport Surface Environment

The airport surface environment is a complex and dynamic place the dimensions of which are bounded, not only by physical pavement and its attendant marking, lighting, and signage, but also by the capabilities of the many people who must carry out their separate roles on its surface and the equipment and procedures they use to coordinate their actions. Some of the factors that contribute to complexity are large numbers of aircraft moving in close proximity to one another; differing aircraft types and capabilities; weather changes that impact visibility and conceal normal visual cues; darkness when arrays of airport lights converge against a busy background of city lights; cryptic signs and surface markings; unfamiliar/inexperienced pilots; complex and

"RUNWAY SAFETY IS ONE OF THE FEDERAL AVIATION ADMINISTRATION'S 'TOP FIVE' SAFETY PRIORITIES."

"WE CAN ONLY IMPROVE RUNWAY SAFETY THROUGH THE CONSTRUCTIVE COLLABORATION OF THE ENTIRE AVIATION COMMUNITY."

Jane F. Garvey, Administrator  
Federal Aviation Administration

infinitely varying airport geometry; ground vehicles such as maintenance trucks, security cars, operations vehicles, refueling trucks; pilots, controllers, and vehicle drivers with differing levels of experience, training, and language proficiency concentrating on their tasks against a background of heavy radio communications traffic. These, and other factors as well, play a role in the problem. All of them interact to create an ever-changing stage where the single thread common to all runway incursions can fail—the human operator.

Runway incursions present a thorny problem because there is no single cause to target. In fact, there isn't even a handful of causes to target; there are myriad causes. From an analytical perspective, incursions can be considered to be almost random events—a product of the continuing interaction of numerous factors and thus essentially immune to single solutions.

The only thing all incursions have in common is the fact that they are the end product of human error. Humans make the mistakes that lead to incursions, but we cannot simply “fix” the human. (See Box 2.) People, even when superbly trained and motivated, remain vulnerable to error, especially when confronted with unexpected circumstances. To fix the incursion problem we must look not just at humans, but at the entire system in which they must function. The airport surface environment is a complex and dynamic amalgam of dissimilar people, systems, and equipment, each with a unique role to play. If we are to succeed in reducing incursions we must account for this interaction.

Reducing human error associated with airport surface operations is a daunting task because so many people are involved. In the United States alone there are more than 600,000 certificated pilots, 8,000 airport tower controllers staffing more than 460 towered airports, and literally hundreds of thousands of airport personnel. To adequately address the problem of runway incursions, the interconnected roles and requirements of all of these stakeholders must be understood and accounted for.

#### Other Challenges

Other factors also enter into the runway safety equation. Central among these is the impact of predicted traffic growth in an already constrained infrastructure environment. Further complicating the problem is uncertainty surrounding the quantity and quality of the incursion data collected so far, the nature of the widely diverse aviation community itself, and the urgent need for action.

Historically, the number of reported runway incursions has increased by 73% from 1993 to 1999, and the rate (number per 100,000 operations) has increased by 56% during that same time period. While the number of incursions in 1999 was approximately the same as in 1998, there was an increase of 28% in the period from January through August 2000 as compared to the same period the year before. This rise may be partially attributable to an increase in reporting due to heightened awareness; however, the fact that increased traffic also creates more opportunities for incursions to occur cannot be overlooked.



## Box 2 Humans in the Airport Surface Environment

Many people have both a direct and an indirect role in runway safety. Understanding who the people are and how they do their jobs is helpful to illustrate those human elements that can lead to errors. Controllers, pilots, and airport personnel directly manage, operate on, and monitor conditions of runways. Vehicle operators and pedestrians manage baggage, fuel, catering, and other ground handling functions; use taxiways and apron areas; and in some circumstances may be required to cross runways.

Controllers issue clearances, instructions, and advisories to pilots who operate their aircraft on the aprons, taxiways, and runways. Pilots navigate using paper charts of the airport layout; they look out of the cockpit window for surface taxiway/runway signs, markings, and lighting to provide orientation and situational awareness in order to follow the route issued by the controller.

Controllers monitor surface traffic primarily by looking out of the tower window to determine the identity, location, and movement of aircraft on the taxiways and runways. For pilots and controllers, human vision provides the principle means of maintaining situational awareness and separation.

Just as controllers issue instructions to pilots, they instruct vehicle operators, who then maneuver their vehicles on the airport movement area in compliance with the instructions. Types of vehicles required to operate on the airport surface and the operations they perform include the following:

- Fuel trucks refuel aircraft in preparation for their next flight.
- Maintenance vehicles perform maintenance tasks.
- Baggage, catering, and utility trucks service many flights.
- Airport authority vehicles check for foreign objects and monitor runway conditions.
- Federal Aviation Administration vehicles monitor and maintain navigation equipment, radars, visibility measuring equipment, and certain lighting systems.
- Emergency vehicles respond to emergency situations.
- Snowplows and mowers maintain runways and surrounding areas.
- Construction and other vehicles maintain the airport surface, add new taxiways and runways, and support other airport expansion plans.

Air traffic is expected to continue to grow at an annualized rate of 3%, representing a total increase of 26% over the next 10 years. Such a pace will certainly surpass planned capacity improvements. Even if the statistical probability of incidents and accidents is reduced, the absolute number of these events may grow over time. Data indicates that without significant action by the aviation community, as traffic grows, the risk of runway accidents will grow. Consequently, the airport surface environment must not just be made safer, it must be made significantly safer to succeed in reducing the risk to the traveling public.

The FAA needs to understand the root causes of surface incidents even if they do not qualify as incursions. Though any individual incident may not pose a hazard at the time, its occurrence is significant and indicates a point of failure in the system.

The FAA and the aviation community are working together to both promote runway safety and increase awareness of the importance of complete and accurate incident reporting. As awareness increases, the incident reporting rate is anticipated to increase as well, thus providing more data for analysis. This improved data stream will enable the FAA and the aviation community to target specific causal factors and develop more effective remedies.

Throughout the aviation community there are multiple stakeholders that, together, share a deep and vested interest in safety. They are active participants in direct contact with the issues surrounding the problem. Other stakeholders include organizations whose functions are to regulate, influence, and support the safety of the air transportation system. These include airport authorities; local, regional, and national FAA organizations; aviation special interest groups; airline operators; general aviation operators; labor organizations; and governmental entities such as Congress, the National Transportation Safety Board, and the Department of Transportation-Office of the Inspector General. In order to achieve the vision of safer runways, the knowledge, expertise, needs, and opinions of all stakeholders must be considered and balanced.

“RUNWAY COLLISIONS COULD CAUSE MORE U.S. DOMESTIC JET DEATHS OVER THE NEXT TWO DECADES THAN ALL OTHER CAUSES COMBINED.”

Dr. Arnold Barnett, Ph.D.  
Massachusetts Institute of Technology (MIT)

### III. RUNWAY SAFETY VISION AND IMPROVEMENT INITIATIVES

#### Runway Safety Program Vision

*To collaborate with the entire aviation community to achieve a safer runway environment, through targeted improvements to training, surface infrastructure, procedures, and technology.*

The RSP envisions a future where the flying public will enjoy an even higher level of safety than ever before. As the vision becomes reality, runways will be safer because the entire airfield environment will be safer. The situational awareness of all individuals involved in runway operations will be dramatically improved. Communication among operational personnel will be enhanced. Refined, standardized operational procedures will be developed through collaboration with all stakeholders in runway safety. Implementation of these procedures will promote an environment where all users operate in a predictable manner with a shared understanding of the roles of others. Technology designed to enhance the performance of the human operator will enable people to safely and efficiently execute their various tasks. Across the board improvements will make it less likely for people to make mistakes. And if they do, an error-tolerant environment will mitigate the potential consequences of those mistakes.

#### Goals

Our goals are calculated to set in motion those actions that will bring immediate (and long-term) improvements to the airport surface environment. The ultimate goal of the program is to increase runway safety by implementing improvements, evaluating results, and making adjustments as needed. To reach this aim, intermediate goals will be set on an annual basis. The specific goals for fiscal year 2001 include the following:

- Increase awareness and enhance communication throughout the aviation community;
- Improve the understanding of runway incursion and surface incident causal factors;
- Identify and design initiatives to address causal factors and reduce risk;
- Ensure that all participants in the airfield environment are educated and trained adequately to reduce the potential for error;
- Improve airfield infrastructure (signs, markings, and lighting) and procedures, as appropriate, to reduce the potential for error;
- Deploy technology to support human operators in the execution of their responsibilities;
- Define measurements to assess the efficacy of specific initiatives and the value of the overall program in reducing risk; and
- Establish a mechanism for capturing lessons learned to continuously improve initiatives and overall program effectiveness.

The fundamental commitment to the belief that every life is valued drives all Runway Safety Program actions. Runway incursions and surface incidents must be understood in terms of their potential risk for loss of life. Initiatives must be identified, prioritized, and implemented effectively to address the most serious risks. Specific initiatives already under way and under consideration are described below.

### Runway Safety Initiatives

The issue of runway incursions is not new. Since 1990 the FAA has initiated a series of action plans and initiatives to address the problem. Multidisciplinary groups representing the major stakeholders in the FAA identified and implemented specific initiatives to address runway incursions. Action plans were written and subsequently updated in 1991, 1995, and 1998. Throughout this period more than 261 different initiatives were established.

During this timeframe the congressionally mandated Research, Engineering, and Development Advisory Committee developed a list of 13 non-technical and 10 technical initiatives to address runway incursions. The 10 technical initiatives were assigned to the Communications, Navigation, and Surveillance Directorate to form the Runway Incursion Reduction Program. This program is currently under way.

The Office of the Inspector General has audited the Federal Aviation Administration's performance on runway safety on an annual

basis for the last 3 years and has offered 19 additional recommendations to improve runway safety.

In 1999, the Federal Aviation Administration Administrator determined that the agency's runway safety activities must be redirected and escalated. To succeed, the effort required greater innovation, a more effective, agency-wide approach, with a higher profile, more funding, greater reach, and executive commitment and oversight. The process was begun to create what would become the Runway Safety Program. At that time, the Administrator appointed a Director of Runway Safety to serve as the focal point for all runway safety activities across the agency. In September 1999, a program charter and mission statement were established. Shortly thereafter, knowledgeable representatives from the Air Traffic, Airway Facilities, Flight Standards, Airports, Research and Acquisitions, System Safety, and Human Factors organizations of the FAA were assembled to form the Integrated Team for Runway Safety (ITRS).

Meanwhile, leaders from government and industry collaborated to form the Commercial Aviation Safety Team (CAST) to develop and implement data-driven safety initiatives. Correspondingly, the General Aviation Joint Steering Committee was formed to address general aviation issues. These organizations, in turn, combined their efforts to establish the Runway Incursion Joint Safety Analysis Team (JSAT). In May 2000, the JSAT completed 114

recommendations. These have been forwarded to a Joint Safety Implementation Team (JSIT) that has the responsibility for developing detailed implementation plans.

The JSIT is tri-chaired by members from the Air Line Pilots Association, the Aircraft Owners and Pilots Association, and the FAA Runway Safety Program. JSIT members include representatives from government and industry, including representatives from the Runway Safety Program. The Joint Safety Implementation Team and the Commercial Aviation Safety Team are integral components of the Runway Safety Program.

### *Current Initiatives*

Identifying resources and developing and implementing safety initiatives are the core activities of the Runway Safety Program. As indicated previously, many initiatives have been under way for more than a decade and some are still in the implementation process. Current active initiatives associated with the FAA's 1998 Airport Surface Safety Action Plan, the Associate's Commitments, and the Now Strategies, are incorporated into this Blueprint.

Some of these current initiatives have specific products with identified end dates. Other initiatives, such as Runway Incursion Action Team (RIAT) site visits, have benefits that will be realized over a longer period of time. These teams are an important local, regional, and national safety activity because they focus

expert attention on identifying and solving runway safety issues at the local level. They will continue to be a key part of the RSP. During this fiscal year, the Runway Incursion Action Team process will be thoroughly reviewed with emphasis on expansion of this program.

Some significant current initiatives include the following:

1. Establish Regional Runway Safety Program Manager positions for each FAA region.
2. Develop and implement a new, multifaceted 'back to basics' refresher training program for all tower controllers. This training addresses all aspects of tower operations relating to preventing runway incursions, including but not limited to the following: scanning techniques; best practices to optimize the effectiveness of radio communications, including read back and hear back; the most effective and safest way to employ procedures such as taxi into position and hold, intersection takeoffs, and land-and-hold-short operations; strip/hold pad marking and using memory aids; issues inherent in vehicle operations on the airport surface; closed runway situations and the use of closed runways for taxi operations; and the appropriate use of techniques such as anticipated separation. Training also emphasizes vigilance and the need to recognize situations in which flight crews need help orienting themselves on the airport surface.

3. Develop and promote a runway incursion educational awareness program for Federal Aviation Regulation part 129 foreign air carriers to promote enhanced awareness of runway safety and incursion prevention throughout the international air carrier community.
4. Develop and publish Advisory Circulars that establish national standard operating procedures for airport surface operations. These Advisory Circulars will address cockpit tasks such as planning, situational awareness, techniques for moving across complex intersections and runways, intracockpit verbal coordination and air traffic control/pilot communication. It will provide guidelines for developing and implementing standard pilot procedures for conducting safe aircraft operations on the airport surface. The Advisory Circular is intended for use by Federal Aviation Regulation parts 91, 121, 129, and 135 small and large aircraft operators. It is anticipated that these guidelines will become an integral part of all surface movement operating procedures.
5. Increase the visibility of runway hold line markings to improve the flight crew/vehicular operator recognition. Change Standards for Airport Markings Advisory Circular (AC150/5340-1H) to prescribe standards for double-sized markings containing glass beads and outlined in black on all runway hold lines at certified and towered airports.
6. Establish a process for sustaining, controlling, and enhancing the collaboratively developed government, industry, academia, and military education, training, and awareness resources library. This library would be advertised and made widely available in a variety of media to enable individuals and organizations to obtain materials about runway safety and programs.
7. Develop a training course for air traffic controllers on the limitations of human memory and potential techniques to help them optimize their memory capacity.
8. Review Air Traffic Controller phraseology, as included in FAA Order 7110.65 (Air Traffic Control) and the Airman's Information Manual, to determine the advisability of reducing unnecessary or redundant verbiage wherever possible. Evaluate the overall effectiveness of current phraseology in pilot/controller communication.
9. Require all pilot checks, certifications, and biannual flight reviews to incorporate evaluations of ground operations performance and tests of knowledge of airport signs, markings, and lighting. Develop standardized training materials and training programs.
10. Offer the existing Air Traffic Teamwork Enhancement course at facilities that have the highest number of operational errors that result in runway incursions.



11. Issue a Broad Agency Announcement to solicit proposals from private enterprise on potential applications of new and emerging surface technologies to promote runway safety.
12. Form partnerships with air traffic and pilot groups to jointly develop training. Ensure that all perspectives are incorporated. Encourage airlines to share data relevant to incursions and incidents.
13. Develop generic and specific training in the areas of crew resource management and situational awareness for controllers.
14. Enhance remedial training for airmen involved in runway incursions.
15. Focus more attention on the needs of the general aviation community. Emphasize training, marking, and signage. Provide user-friendly runway safety information.
16. Continue aviation community outreach programs and wider promotion of runway safety training programs. Increase time and energy allocated to user education. Increase funding for runway safety literature.
17. Increase opportunities for the aviation community to provide input regarding issues and potential solutions associated with runway safety through a variety of means, including Web site feedback, telephone, and fax.
18. Disseminate runway safety information through the Wings and Pilot Continuing Education Programs.
19. Encourage airport operators to use distribution channels such as the Internet to widely disseminate runway safety information specific to their airfield.
20. Create a runway safety technology roadmap to identify the process for assessing technology requirements and outline the broad technology concepts required to address the systems and products necessary to improve runway safety. Coordinate and obtain consensus for the technology roadmap with government and the aviation community.

### *Recommended Initiatives*

Starting in March 2000, the RSP began an activity to identify new recommended initiatives. What made this process different from past approaches was that the Program Office reached out to the aviation community and accumulated nearly 1,000 individual recommendations for actions to improve runway safety. The sources of these recommendations include nine regional workshops, a Human Factors Runway Safety Symposium, and the Runway Safety National Summit. Additional recommendations came from sources such as the National Transportation Safety Board; the Joint Safety Analysis Team; the Research, Engineering, and Development Advisory Committee; and other members of the aviation community. These meetings and workshops are the first in a continuing series that will continue to gather

ideas from local, regional, and national sources. (See Box 3.)

The RSP, with valuable input from a wide cross section of the aviation community, identified 10 initiatives from the collection of 1,000 that offered the highest potential to add immediate value and benefit toward reducing runway incursions. These "Ten Near-Term Initiatives," with goals, milestones, and resources, are not listed here separately but are instead included in the FAA's current initiatives.

The remaining recommendations were reviewed and consolidated into a set of more than 50 initiatives. These initiatives embody the spirit and intent of all the recommendations identified during the 4-month, nationwide outreach effort. This group is referred to as 'recommended' initiatives. They are being assessed for potential impact and prioritized based on the process described in Section IV.

### Major Thrusts

To provide structure for the program, and to better organize all initiatives, the Runway Safety Office identified seven major emphasis areas or 'thrusts.' Each thrust includes initiatives that may be implemented individually or integrated with other initiatives to provide an effective, comprehensive solution. The seven thrusts are as follows:

1. Training
2. Technology
3. Communications
4. Procedures

5. Airport Signs/Markings/Lighting
6. Data, Analysis, and Metrics
7. Local Solutions

The following sections describe recommended initiatives within each of these thrusts.

### *Training Thrust*

Training initiatives are designed to enhance the knowledge, skills, and overall performance of pilots, controllers, vehicle operators, and other personnel who interact on the airport surface. Specific training initiatives include the following:

1. Review written exams for initial pilot certification to determine if more emphasis needs to be placed on airport signs, markings, and lighting.
2. Develop Practical Test Standards to be administered during certification of Flight Instructors/Designated Pilot Examiners and establish recurring training requirements.
3. Modify existing on-the-job training courses for air traffic controllers to emphasize the importance of maintaining situational awareness and the appropriate prioritization of tasks, particularly during operations in which anticipated separation is incorporated.
4. Develop runway incursion training to be administered before local control certification and establish requirements for recurrent training.
5. Require all tower facilities to provide crew briefings on 'lessons learned' from runway incursions that have occurred at their (and other) towers.

### Box 3 What Happened to My Recommendation?

Over the last six months, the Federal Aviation Administration has accumulated from industry, government, and academia nearly 1,000 local, regional, and national recommendations that address runway safety. From the beginning, the Runway Safety Program committed to a vigorous Program to reach out to the aviation community for input.

Starting in March 2000, a series of runway safety workshops were hosted by the nine Federal Aviation Administration regions across the nation. Through these workshops new working relationships were created, strengthening ties between Federal Aviation Administration headquarters, regional offices, and the aviation community. The Runway Safety Program supported the regions by providing funding, expertise, and other needed resources while the regions directed the activities—creating an effective partnership. Each of the regions opened its doors to any and all members of the aviation community to participate. More than 1,750 participants attended, representing airlines, airports, general aviation organizations, pilots, air traffic controllers, academia, and other aviation interest groups, where together, they identified ways to reduce runway incursions at airports in the regions. Through these workshops, local, regional, and national recommendations were identified.

In June 2000, the Runway Safety Program hosted a Human Factors Runway Safety Symposium attended by more than 80 accomplished human factors scientists and distinguished professionals from the aviation industry, academia, and the Federal Aviation Administration. The objective of the symposium was to apply the science of human factors to the complex problem of runway incursions to better understand

why humans make mistakes and what can be done to mitigate the consequences of human error. At the close of the symposium, 30 additional recommendations were added to the list of potential actions.

During the last week of June 2000, the Federal Aviation Administration convened a Runway Safety National Summit attended by more than 600 participants, including aviation safety experts, airline representatives, pilot and air traffic controller unions, general aviation groups, and airports. The 3-day meeting focused on recommendations, actions, and results from the nine regional workshops, the Human Factors Runway Safety Symposium, and other industry-wide activities to improve runway safety. Through these activities and other sources, such as the Joint Safety Analysis Team, nearly 1,000 detailed and specific recommendations have been accumulated to date.

To appropriately consider each recommendation, a process was devised to categorize, prioritize, document, and refine multiple recommendations into more than 50 different candidate initiatives. While the original recommendations are traceable to each initiative, this broader categorization allows for similar recommendations to be rolled up within the context of larger solutions.

As each of the 50+ initiatives is further analyzed, some initiatives have been fast-tracked and implemented immediately. Other recommendations warrant additional analysis and are being reviewed and evaluated as to their potential feasibility, suitability, and risk-reduction potential. Acting on some recommendations, while conducting additional analyses of others, creates a flexible process to ensure timely and full consideration of all recommendations.

6. Improve controller team performance by developing an advanced air traffic controller resource management training course similar to that provided to air carrier flight crew members and administer this training to all controllers. Emphasize techniques and procedures designed to improve understanding of individual and team roles and responsibilities, coordination, communication, task and resource management, decision-making, and leadership within and among air traffic controller teams.
7. Plan, budget for, and procure state-of-the-art, high-fidelity, and out-the-window visual tower simulators for use in tower controller training.
8. Heighten aviation community awareness by developing a spectrum of innovative educational materials, training and awareness aids, information resources, etc., on subject matter central to the problem of runway incursions. These materials should target the specific needs of all stakeholders whether they be pilots, controllers, vehicle operators, mechanics, or Fixed Base Operators (FBOs), and be available in a range of formats such as computer, video tape, brochures, paper copies, news articles, or other formats appropriate to the target audience. Distribution strategy should involve a variety of techniques including, but not limited to, mass mailings, a central runway safety information Web site (www.faa.gov/runwaysafety), personal presentations and handouts for use at aviation forums, safety briefings, and outreach programs directed at special interest groups in the aviation community. These materials should not only be developed but a process should be put in place to update and maintain the program as needed on a continuing basis. Develop or promote the use of existing programs that provide cross-familiarization training or experience for pilots, controllers, and vehicle operators.
9. Provide materials focused on runway incursion prevention for all pilots (general aviation and commercial). These materials should emphasize good operating techniques and specific pilot actions that can reduce the potential for runway incursions. Such materials should include, but not be limited to, topics such as low visibility taxiing (using cockpit simulators whenever appropriate); communication; crew resource management; standard operating procedures; airport surface signs, markings, and lighting; pavement configuration; closely spaced parallel runways; holding position visual aids; and procedures.
10. Provide guidance to airlines/operators for the development of surface movement training to address factors contributing to runway incursions (for example, pavement configuration, closely spaced parallel runways, holding position visual aids, procedures, and communications).

11. Review Federal Aviation Regulation parts 61, 121, 129, 135, and 139 to determine if existing requirements for training and currency adequately address all factors that can contribute to surface errors. Amend as necessary.
12. Modify Fixed Base Operator and air carrier training manuals to include specific site training for personnel moving aircraft on the airport operations area.
13. Develop and publish an Advisory Circular that outlines national standard operating procedures for vehicle operations on the airport movement area. These standard operating procedures (SOPs) should detail the roles and responsibilities of airport and vehicle operations and provide standards and guidelines for operating procedures, communications equipment, vehicle markings to enhance conspicuity, standardized air traffic control phraseology, and driver training.
14. Establish national standards to guide airports in developing, implementing, and administering formal programs to regulate the operation of vehicles and aircraft maintenance on the airport operations area (in accordance with the standards to be developed under item #13 above). These programs should include provisions for training (initial, recurrent, and remedial), testing (initial and periodic), and certifying drivers and mechanics with a requirement to operate vehicles or aircraft on the airport operations area.
15. Foster the development of a culture that emphasizes safety in daily operations (a safety culture). Such an effort would be enhanced by steps such as considering studies of safety versus capacity issues at high-volume airports, sharing of data among airline operators and regulators, and conducting risk analyses of procedures that may affect safety.
16. Establish and execute a coordinated Flight Standards, Airports, and Air Traffic Lines of Business (Airports, Air Traffic Services, System Safety, Regulation and Certification, and Research and Acquisitions) effort tasked to create an airport-specific familiarization training program for pilots and air traffic controllers at selected airports.
17. Require an Airport Construction Safety Plan, including a Runway Incursion Prevention Plan, be developed, published, and executed before commencing airport construction projects.

### *Technology Thrust*

The primary role of technology is to augment and amplify the human operator's skills and abilities as well as compensate for human vulnerabilities. Technology can create a 'safety net' that supports the differing roles of the individuals who operate in the airfield environment to do their jobs more efficiently and accurately. However, technology can in some cases make the situation worse if introduced without due consideration to its

potential impact upon the human operator and the complex web of interconnected elements composing the system in which it will operate.

1. Establish a Runway Incursion Technical Evaluation Team to conduct comprehensive assessments of all potential technologies and products to enhance airport surface safety and efficiency. The technologies identified by the Broad Agency Announcement along with technology demonstrations currently under consideration will be examined. Examples of such technologies include, but are not limited to, the following: Surface Movement Guidance and Control System; Airport Surface Detection Equipment; ground loops; laser-illuminated hold bars; smart lighting systems; runway-occupied indicators; Global Positioning System moving maps in the cockpit; data tags for Airport Surface Detection Equipment; heads-up guidance system for aircraft; graphical recreations of surface incidents; rumble strips; pulsating fiber optic in-pavement lights; radio antiblocking equipment; Automatic Dependent Surveillance Broadcast equipment or transponders to track ground vehicles; command lighting systems to control runway access; and innovative schemes to enhance aircraft conspicuity.
2. Complete implementation of existing technology, such as Airport Surface Detection Equipment - Model 3 and

Airport Movement Safety System, and acquisition of new technology such as Airport Surface Detection Equipment - Model X.

3. Coordinate the runway safety technology initiatives with the National Aeronautics and Space Administration and all elements of the user community to ensure common understanding and consensus.
4. Develop innovative implementation strategies to ensure promising runway safety technologies are made available for different size airports and aircraft types. These scalable technological solutions must address runway incursion risk and causal factor analysis and result in measurable improvements to surface safety.

### *Communications Thrust*

The communications thrust contains initiatives to simplify and standardize radio communications within the community of people involved in surface operations. It includes recommendations to employ existing technology to reduce the incidence of blocked transmissions and also covers the broader concept of communication and coordination among stakeholders in the aviation community itself.

1. Solicit comments on a requirement that all ground radios and radios of aircraft that operate in the National Airspace System be retrofitted with antiblocking and antistuck microphone radio technology.



2. Accelerate implementation of standard taxi routes at selected major airports to reduce frequency congestion and improve pilot/controller communication.
3. Expand the use of data links to issue certain messages (for example, assigned runway and taxi routes) between air traffic controllers and pilots during surface operations.
4. In concert with ICAO, develop metrics to determine the level of English language proficiency needed for safe operation for domestic and foreign national pilots.
5. Harmonize Federal Aviation Administration and International Civil Aviation Organization phraseology.
6. Prepare and distribute material informing pilots and vehicle operators of which surface movement control instructions require a read back.
7. Assess the timeliness, accuracy, and dissemination of the current Notices to Airmen System, and develop and implement improvements to make the system more effective for users. Such assessment should include an examination of the issues surrounding the role of flight service stations.

### *Procedures Thrust*

Operational procedures are in place to manage the actions of pilots, controllers, and vehicle operators. Changes to procedures must be assessed, using an integrated approach, to

determine the impact on the entire community of people who have safety-related responsibilities. Procedural initiatives under consideration include the following:

1. Segregate ground vehicles from the airport operations area whenever possible. Emphasize the use of Airport Improvement Program funds to construct perimeter roads and other projects to control access to the airport operations area.
2. Initiate a study to determine the effect of amending 14 Code of Federal Regulations Section 91.129(i) to require a specific clearance to cross any runway. In the absence of a specific clearance to cross a runway, the procedure should be that the aircraft must hold short of the runway.
3. Develop and employ short-term memory aids to help tower controllers to remember that an aircraft is holding in position on the runway. Establish and disseminate a list of best practices for memory management and for dealing with distractions.
4. Develop and implement national standard operating procedures for tower air traffic controllers designed to help them maintain situational awareness through the use of uniform and effective operating practices.
5. Review and approve flight crew training programs to ensure appropriate emphasis is placed on 'best cockpit practices' for airport surface operations.
6. Revise Federal Aviation Regulation parts 121 and 135 to ensure that requirements

for training/currency adequately address surface operations.

7. Encourage parts 121 and 135 commercial operators to develop SOPs for airport surface operations.
8. Review procedures that permit reduced separation on final and simultaneous operations on intersecting runways. The review should include critical analyses of risk, methods of air traffic control technique training, and local implementation to determine the effect on surface movements and runway safety.
9. Conduct an analysis to determine the operational issues surrounding the practice of clearing multiple aircraft to land in sequence on the same runway. Consider the effect of discontinuing or revising this practice. Any revisions should be consistent with International Civil Aviation Organization Document 4444-RAC/501, Part V, Paragraph 15.2, "Procedures for Air Navigation Services-Rules of the Air and Air Traffic Services," Part V, "Aerodrome Control Service."
10. Conduct an analysis to determine the risk involved in using "taxi into position and hold on the runway" procedures. Consider the effect on both safety and efficiency. Develop recommendations regarding the continued use, discontinuance, or modification of this procedure.
11. Align FAA Orders 7110.65 (Air Traffic Control), 8400.10 and 8700.1 (Flight Standards Operations Inspectors

Handbooks), and 5280.5 (Airport Certification Program Handbook) with respect to allowing vehicles and equipment in a runway safety area during aircraft operations. Order 7110.65 should also be reconciled with 14 CFR part 139 regarding the presence of objects not fixed by function in the Runway Safety Area. Allow enforcement of ground vehicular procedures at all towered airports.

### *Airport Signs/Markings/Lighting Thrust*

This thrust encompasses initiatives to improve the physical nature of the airport environment, increase visibility, enhance the safe and efficient movement of aircraft, and test pilot knowledge of airport signs, markings, and lighting. The following are specific initiatives under consideration:

1. Conduct a comprehensive review of airport signs, markings, and lighting requirements and standards to determine if they should be revised. Consider all airport conditions, including wet surfaces and reduced visibility. Develop an easy-to-use, objective method for airport operators to determine when airport surface markings need repainting as a result of rubber obscuration, normal wear, fading, lack of contrast with the pavement, or other reasons.
2. Train airspace system inspection pilots to identify conditions that have a bearing on runway safety and report them to the appropriate Airports Regional Office. Examples of such conditions would include,

but not be limited to, runway/taxiway signs, markings, and lighting; comparison of the airport diagram with the actual layout; frequency congestion; "Land and Hold Short Operations"; and ground vehicle operations. Make allowance for airport inspectors to join flight inspection teams as crew members for inspections at airports with significant increases or constant high numbers of surface incidents and runway incursions.

3. Encourage the use of Airport Improvement Program funds for the procurement, installation, and maintenance of security fencing and of signs, markings, and lighting at all airports.
4. Work with Fixed Base Operators to promote and expand the use of accurate airport taxi charts.

### *Data, Analysis, and Metrics Thrust*

The data, analysis, and metrics thrust contains several initiatives planned to enhance understanding of the causes of runway incursions and accidents and enable the Program Office to better measure how well initiatives are performing. They are as follows:

1. Develop and institute a standard method of investigating and analyzing the human factors aspects of aviation incidents and accidents, including runway incursions, to identify the underlying causes of human error. Establish and maintain a universal database available to all researchers.
2. Develop software tools to convert accident and incident narratives into coded fields to facilitate their inclusion into the national database.
3. Make FAA policy changes to enhance the quality and quantity of data collected for the analysis of runway incursions. Develop and publish a Notice of Proposed Rule Making, soliciting comments to establish a standardized, nonpunitive data collection program for application within and across all FAA operational organizations having a role in airport surface safety. Emphasize reaching the widest audience possible, protecting the identity of participants, establishing an easy-to-use mechanism, and identifying a neutral and credible focal point for data collection.
4. Conduct an evaluation to identify potential commonalities among airports with frequent runway incursion problems and compare these with airports that have relatively few runway incursions.
5. Perform a study to determine if efforts intended to increase airport capacity and acceptance rates can have the potential to increase the risk of runway incursions. Analyze the top 20 runway incursion airports and determine if airport acceptance rates and surface traffic density, especially at peak periods of traffic activity, have an adverse effect on frequency congestion and controller workload, or directly or indirectly increase the risk of runway incursions.

6. Make organizational changes to reassign the responsibility for investigating runway incursions to an organization that is independent of the operation.
  7. Respond to National Transportation Safety Board recommendations regarding policies relative to collecting, retaining, and formatting air traffic control data germane to runway incursions.
2. Maintain and periodically update a 'local solutions' central information source to report on the status of newly implemented corrective actions and their effectiveness in preventing runway incursions.

### *Local Solutions Thrust*

Broad participation in the development of runway safety initiatives at the local level is needed to address problems that may be unique to a particular locality. Likewise, participation on the regional, national, and global levels is required to ensure that successes and lessons learned in one locale are shared, adapted as needed, and leveraged as broadly as possible.

1. Encourage, support, and coordinate the development and implementation of local programs (facility and regional) to reduce runway incursions. Examples of these actions should include, but not be limited to, identifying and publicizing airport 'hot spots,' conducting Runway Incursion Action Team evaluations, developing Surface Incident Prevention Plans, conducting user safety meetings/seminars, and collaborating with all airport safety stakeholders on addressing local issues, outreach programs, etc. Local remedies and their results should

be shared with other facilities and regions via a centrally established and readily accessible information source so that all may benefit from the experiences of others.

### Human Factors

There is a single thread connecting the different operational elements that make up the airport surface environment. That thread, of course, is the human being. The airport surface is inherently safe—proven by the exceptional safety record of civil aviation. However, statistics predict that airport surface safety must be improved. We need to do better merely to stay in the same place. We must do much better if we are to reverse the trend that statistics foresee.

When improvements are made they will come from careful attention to the margins of the system—the isolated, overlooked places where human error occurs. Finding these places is the last incremental step toward the realization of our vision. In recognition of the crosscutting nature of human factors, it is therefore considered an integral part of every thrust. The systematic application of human factors will be included in all proposed actions to reduce runway incursions.

## IV. THE RUNWAY SAFETY PROGRAM

Over the past 12 months, the Runway Safety Program has taken a leadership role in energizing the aviation community around the issue of runway safety. Government, organizations, and individuals alike are putting safety initiatives into practice. However, simply changing the way we do things will not be effective unless it is accomplished in an organized manner. The Runway Safety Program Office, though inherently responsible to provide leadership and structure, recognizes the need to cooperate with the aviation community to resolve the shared problem of incursions. Clear objectives are established and accepted by all stakeholders and a robust process is being put in place to coordinate activities.

The RSP has a simple objective—to improve runway safety through the reduction of runway incursions and surface incidents. The following section describes the approach, milestones, and critical success factors the Program Office has established to reach that objective.

### [Runway Safety Program Office](#)

The Runway Safety Program Office serves as the focal point for all runway safety activities inside and outside the FAA. Created to reflect the priority, commitment, and urgency the FAA

places upon the challenge of improving runway safety, the RSP Office is designed to address runway safety issues across organizational boundaries by providing executive direction, leadership, and focus for all related activities.

Within the FAA, the RSP Office integrates and coordinates all work associated with runway safety and supporting research and development activities. Outside the FAA, the RSP Office is establishing and maintaining relationships with industry partners to leverage their knowledge and experience, to keep them informed, to encourage their participation, and to facilitate communication.

As the single point of contact for all runway safety activities, the RSP Office provides direction for the development and implementation of specific initiatives for improving runway safety. More specifically, the RSP Office will do the following:

- Drive the processes within the FAA and the aviation community to understand the problem and promote initiatives that work toward enhancing runway safety.
- Mobilize and leverage FAA and aviation community resources to ensure actions are taken.
- Monitor and evaluate program activities, establish metrics, and track progress for individual initiatives. Monitor the suitability, performance, and effectiveness of all initiatives.

- Manage the FAA RSP budget and resources.
- Evaluate runway incursions and surface incident mitigation activities, including educational, procedural, surface environment, and technology-related solutions.
- Collect, analyze, and report on data related to runway safety.
- Disseminate system wide the results of activities undertaken.
- Create a process and forum for continuing dialogue and communication of results.

#### [Federal Aviation Administration and Aviation Community Relationships, Roles, and Responsibilities](#)

The relationships among FAA organizations, as well as between the FAA and the aviation community, are best described as constituting an integrated team dedicated to runway safety. The Runway Safety Office is at the center, guiding the team toward action at the national, regional, and local levels by coordinating with FAA Lines of Business, regional and local authorities, and the aviation community.

#### *Relationships within the Federal Aviation Administration*

The Runway Safety Program Office is linked with various other FAA organizations, including the Associate and Assistant Administrators, Regional Administrators, Regional RSP Managers, Public Affairs, and

labor organizations. The RSP Office coordinates and communicates with each of these organizations. Assisting in this effort is the Integrated Team for Runway Safety (ITRS) with its complement of representatives from many elements of the FAA. This structure allows the ITRS to stay focused while accurately representing the viewpoints of the other involved organizations.

Regional RSP Managers report directly to the Regional Administrators and keep the RSP Office apprised of all regional runway incursion and surface-related activities. They participate in investigative activities, encourage runway safety initiatives, disseminate information, promote local awareness, and coordinate with key stakeholders.

Two other specialized teams composed of FAA and industry experts were formed as well.

- The Runway Incursion Action Team (RIAT) conducts onsite evaluations at airports with an unusually high incidence or risk of runway incursions or related surface incidents. The RIAT also evaluates current activities targeted at surface safety and makes recommendations.
- The Surface Incident Prevention Team (SIPT) is a local, airport-specific team responsible for creating a Surface Incident Prevention Plan (SIPP) for their airport. Each SIPP identifies safety-related actions to be taken annually at an identified airport.



Both teams participate in the identification and development of solutions and the establishment of program requirements and milestones.

### *Relationships between the Federal Aviation Administration and the Aviation Community*

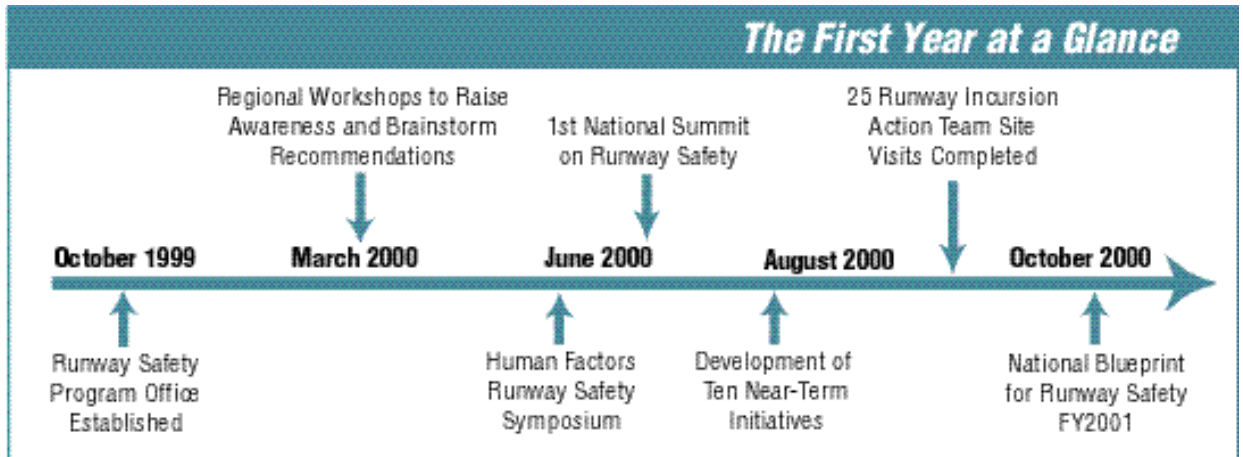
The FAA will continue to work closely with the aviation community to develop and implement runway safety improvement initiatives.

Organizations and individuals other than the RSP Office who can help improve runway safety include, but are not limited to, the following:

- Industry and Government Organizations, Unions, and Associations. These groups, which employ and represent the key individuals and organizations responsible for ensuring runway safety, include as members pilots, air traffic control specialists, vehicle drivers, airport management, airline management, and others.
- Training Providers. Key training institutions and individual instructors are fundamental to runway incursion risk reduction.
- Academia and Research and Development Laboratories. These individuals and institutions contribute significantly to providing a better understanding of the growing risks and fundamental causes of runway incursions and surface incidents.
- Technology Manufacturers and Aerospace Corporations. All manufacturers and other businesses involved in creating high- and low-technology solutions to be applied toward reducing the risks of runway incursions and other surface incidents are partners.
- Oversight Organizations. The National Transportation Safety Board, the Department of Transportation Inspector General, Congress, and others provide resources, direction, recommendations, and feedback.
- The Media. Working with the aviation-specific and general media is very important to communicating successes and challenges. The media play a strong role in influencing public officials, commercial aviation, and the general public toward finding solutions to the challenges before us.
- International Organizations. The International Civil Aviation Organization, the International Air Transport Association, the International Federation of Air Line Pilots Association, and other civil aviation authorities over time may increase their participation as causes and corrective solutions are identified in the integrated global aviation system.

## Milestones

Milestones assist the FAA, the aviation community, and the general public in measuring progress. As indicated, the RSP has completed several significant milestones during the first year of its existence.



Some milestones have also been planned for fiscal year 2001. For each future milestone, the RSP Office is defining detailed activities along with specific implementation plans, resource requirements, budgets, and checkpoints. A comprehensive list of the milestones appears in Table 1: Key Runway Safety Program Milestones, Fiscal Year 00, and Table 2: Key Runway Safety Program Milestones, Fiscal Year 01.

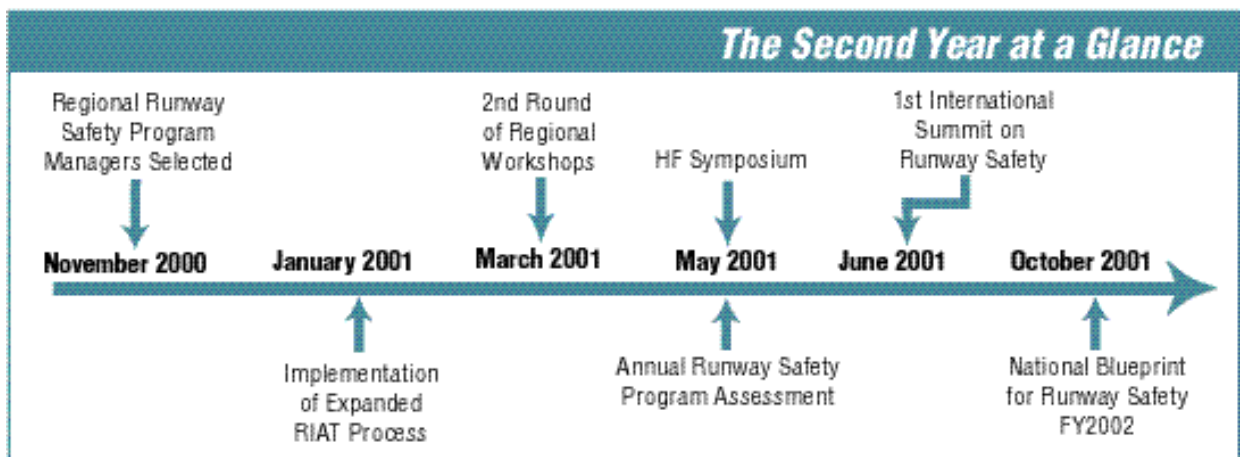


Table 1: Key Runway Safety Program Milestones  
FISCAL YEAR 00

TARGETED DATE	MILESTONE DESCRIPTION AND ACTIVITIES
10/1999	<p>Establish the Runway Safety Program Office to serve as a single focal point for runway safety issues, providing direction, leadership, and focus to all runway safety activities in the FAA.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Establish the Program Office and Charter</li> <li>• Identify the RSP mission, vision, goals, and objectives for fiscal year 2000 and beyond</li> <li>• Communicate with the aviation community</li> </ul>
5/2000	<p>Establish the Runway Safety Web site to share information and broaden lines of communication with the field and the aviation community (<a href="http://www.faa.gov/runwaysafety">www.faa.gov/runwaysafety</a>).</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Establish technical capability within the RSP Office to support the Web site</li> <li>• Update the Web site regularly with information and statistics</li> <li>• Generate informational materials and data to keep the Web site robust</li> </ul>
6/2000	<p>Complete regional workshops and a Human Factors Runway Safety Symposium to raise awareness, engage stakeholders, and brainstorm recommendations on runway safety.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Plan and convene nine regional workshops and a Human Factors Runway Safety Symposium</li> <li>• Gather recommendations</li> </ul>
6/2000	<p>Convene a National Summit for Runway Safety to focus the aviation community on findings, recommendations, actions, and results from the regional workshops, Human Factors Runway Safety Symposium, and other industry-wide activities under way.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Plan and conduct National Summit</li> <li>• Communicate with aviation community</li> <li>• Consolidate recommendations into initiatives</li> </ul>

Table 1: Key Runway Safety Program Milestones (continued)  
FISCAL YEAR 00

TARGETED DATE	MILESTONE DESCRIPTION AND ACTIVITIES
8/2000	<p>Develop 10 near-term initiatives that can have an immediate effect on reducing runway incursions and the risk of fatalities.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Develop implementation plans, budgets, and reporting requirements</li> <li>• Implement 10 near-term initiatives</li> </ul>
9/2000	<p>Complete major technology milestones that contribute to improving runway safety.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Reach Airport Movement Area Safety System Initial Operational Capability at San Francisco, CA</li> <li>• Begin Airport Movement Area Safety System Independent Operational Test and Evaluation at San Francisco, CA</li> <li>• Complete delivery of 40th and last Airport Surface Detection Equipment-3 radar at Charlotte, NC</li> </ul>

Table 2: Key Runway Safety Program Milestones  
FISCAL YEAR 01

TARGETED DATE	MILESTONE DESCRIPTION AND ACTIVITIES
10/2000	<p>Publish and distribute the National Blueprint for Runway Safety identifying program vision, goals, objectives, processes, relationships, and initiatives.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Develop and distribute the National Blueprint</li> <li>• Coordinate with FAA organizations and the aviation community at large</li> <li>• Implement the Blueprint</li> </ul>

Table 2: Key Runway Safety Program Milestones (continued)  
FISCAL YEAR 01

TARGETED DATE	MILESTONE DESCRIPTION AND ACTIVITIES
10/2000	<p>Begin implementation of selected recommended initiatives with detailed implementation plans, including work breakdown structures, resource commitments, and funding.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Complete assessment of recommended initiatives</li> <li>• Prioritize initiatives</li> <li>• Obtain approvals</li> <li>• Develop detailed implementation plans</li> <li>• Obtain commitment for resources</li> <li>• Commit funding</li> </ul>
11/2000	<p>Select Regional Runway Safety Program Managers to provide more local and regional focus on runway safety.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Develop position descriptions, roles, and responsibilities</li> <li>• Recruit, interview, and make selection decisions</li> <li>• Train new hires and begin expanded regional RSP actions</li> </ul>
12/2000	<p>Establish a centralized education, training, and awareness resource library to share and exchange materials on runway safety.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Meet with the aviation community to discuss objectives</li> <li>• Identify available materials, courses, systems, and products</li> <li>• Create and maintain knowledge repository</li> </ul>

Table 2: Key Runway Safety Program Milestones (continued)  
FISCAL YEAR 01

TARGETED DATE	MILESTONE DESCRIPTION AND ACTIVITIES
1/2001	<p>Improve and expand the Runway Incursion Action Team process to include a regional focus, to be conducted with greater frequency and applied 'best practices' investigative techniques.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Assess current processes</li> <li>• Coordinate with regional and local facilities</li> <li>• Coordinate with industry</li> <li>• Obtain 'best practices' from air traffic, flight standards, airports, National Transportation Safety Board, Office of the Inspector General, and Department of Defense</li> <li>• Develop new procedures and roles and responsibilities</li> <li>• Communicate changes</li> <li>• Provide training</li> </ul>
2/2001	<p>Begin execution of Broad Agency Announcement contracts for evaluating emerging technologies.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Publish the announcement</li> <li>• Establish evaluation team, process, and criteria</li> <li>• Receive and evaluate vendor responses</li> <li>• Select technology and award contracts based on specific criteria</li> </ul>
3/2001	<p>Begin a second round of regional workshops and symposia designed to raise awareness, report on progress, and solicit additional recommendations on runway safety.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Plan and convene regional workshops</li> <li>• Provide status of activities and share lessons learned</li> <li>• Identify additional activities</li> </ul>

Table 2: Key Runway Safety Program Milestones (continued)  
FISCAL YEAR 01

TARGETED DATE	MILESTONE DESCRIPTION AND ACTIVITIES
5/2001	<p>Conduct an annual assessment of the RSP.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Conduct review</li> <li>• Communicate results</li> </ul>
5/2001	<p>Complete and distribute a history of activities and lessons learned.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Assess and measure activities</li> <li>• Document and distribute lessons learned</li> </ul>
6/2001	<p>Conduct the 1st International Symposium on Runway Safety designed to share lessons learned and identify recommendations to reduce runway incursions.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Plan and prepare for International Symposium</li> <li>• Communicate with aviation community</li> </ul>
10/2001	<p>Publish and distribute the fiscal year 2002 National Blueprint for Runway Safety Program.</p> <p><i>Key Activities:</i></p> <ul style="list-style-type: none"> <li>• Revise and finalize the National Blueprint</li> <li>• Publish and distribute the Blueprint</li> </ul>



### *Critical Success Factors*

Certain elements are fundamental to the attainment of program goals and ultimately the vision itself. For the Runway Safety Program to succeed, the following elements must be in place:

1. **Leadership Support.** Leaders in all segments of the aviation community with an ability to improve runway safety must make a commitment to fulfill their runway safety responsibilities.
2. **Stakeholder Engagement.** All entities with a stake in reducing the risk presented by runway incursions and surface incidents must provide the leadership and support necessary to identify, develop, and implement the solutions.
3. **Communication and Coordination of Effort.** Leaders in the aviation community must continue to increase awareness and learn from one another. All participants must engage in routine, open, and candid communication about their activities, best practices, and experiences—both positive and negative.
4. **Funding and Resource Availability.** Aviation community leaders must ensure they have procedures in place to determine, obtain, and mobilize the funding and other resources required to achieve success.
5. **Expedited Implementation Processes.** When highly effective solutions are identified, they must be placed on a ‘fast track’ toward implementation. Because of the unacceptable risk posed by runway incursions, inefficiencies within the process must be eliminated.

6. **Adherence to Milestones.** Milestones and schedules are only effective if they are adhered to.
7. **Complete and Accurate Reporting.** It is not possible to understand the problem nor determine the effectiveness of our interventions without accurate data.

### Approach

The Runway Safety Program will employ a structured, iterative, yet flexible process for improving runway safety. (See Figure 1.) A scientific approach will be applied to *understand* the problem, *decide* upon solutions, *plan* actions, *implement* initiatives, *evaluate* progress, and continuously *improve* performance. This process has at its core the capability to *fast-track* initiatives that are perceived to offer clear benefits for immediate implementation. Thus, analysis, decision-making, planning, and evaluation take place while select initiatives are being implemented.

The Federal Aviation Administration and the aviation community need a more precise understanding of why runway incursions occur. A disciplined approach to understanding the causes of runway incursions will yield insights that translate directly into more effective solutions. The RSP will employ the following analytical steps:

1. **Collect Data.** Data and information will be collected from various sources, including historical sources, current investigations, ongoing research, current initiatives, and community experiences. Data collection will occur on a continuing basis, with the community-at-large providing information and experiences to further refine the analysis.

2. **Analyze Causes.** Causes will be analyzed with respect to their impact on fatalities, loss of property, and operational effects.
3. **Identify Risks.** Identify the degree of risk associated with such causes according to impact and probability of occurrence.
4. **Analyze Actions.** Potential interventions will be analyzed in detail to determine their predicted effectiveness.
5. **Define Measures.** Specific measures of suitability, performance, and effectiveness will be developed for each intervention adopted.

Criteria

New recommendations will be evaluated against the following criteria:

- Its anticipated effect on what are considered high-risk and extremely high-risk runway incursions;
- The ability of the aviation community to implement it; and
- Available resources and funding.

Upon adopting each initiative, the RSP Office will identify the implementing organization. The responsible organization will, in turn, inform the RSP of the resources required, launch the initiative, and establish a tracking and reporting mechanism.

Metrics

Measurement is an essential part of the process. Accurate feedback regarding the effectiveness of interventions will allow the

Runway Safety Program to modify its actions to achieve the greatest benefit. Three types of metrics will be employed to evaluate initiatives. These are measures of suitability, performance, and effectiveness.

1. *Measures of suitability* reflect the degree to which an initiative can be satisfactorily put in place. Consideration will be given to operational feasibility, human factors acceptability, compatibility and interoperability with existing elements of the runway environment, availability of resources, maintainability, logistics supportability, natural environmental effects, documentation requirements, and training requirements.
2. *Measures of performance* provide an indication of the progress being made toward deploying an initiative by measuring how much activity has occurred.



**Figure 1: The Runway Safety Program Process**

3. *Measures of effectiveness* capture the overall degree to which any particular initiative achieves its desired effect.

Prior to its implementation, one or more specifically tailored measures of suitability,

performance, or effectiveness will be developed for each initiative. Selecting metrics appropriate to a specific initiative is important if we are to meaningfully assess its effect on incursions. (See Box 4.)

#### Box 4 Measuring Success

In the past, runway safety activities have been tracked in terms of the number of reported incursions and surface incidents at tower-controlled airports and the number of individual Program initiatives completed. For example, 292 incidents were reported in 1997, 325 were reported in 1998, and 321 were reported in 1999. Likewise, previous Program status reports included statements such as "75 percent of the 186 actions and initiatives identified in the 1998 Runway Safety Action Plan have been completed."

Numbers like these are useful for tracking activity. They do not, however, directly measure the risk in the airfield environment or the effectiveness of initiatives in reducing risk. It is important to be able to measure and track the effectiveness and answer the question, "Have efforts made runways safer and, if so, by how much?"

This Blueprint relates a new philosophy in the manner by which we collect data, analyze it, and use the results. We will strive to measure the effectiveness of individual runway safety initiatives and estimate their contribution to the effectiveness of the overall Program.

Measures of suitability, performance, and effectiveness allow for accurate reporting on actions taken. An example of how each of these three types of metrics might be used is instructive. One of the initiatives under consideration is to enhance communication by developing standards, training, and measurable tests to determine English language proficiency. This initiative would be applicable to both domestic and foreign national pilots.

Measures of suitability would include the availability of required trainers. Are sufficient numbers available to support training program deployment? Are adequate training facilities available?

Measures of performance would monitor the number of pilots trained and tested to the required level of proficiency.

Measures of effectiveness would articulate the intended effect of the initiative, which in this example is to decrease the rate of pilot deviations attributed to language misunderstanding. As this initiative is fielded, the effectiveness of the training would be measured by observing the decrease in the rate of pilot deviations attributable to language misinterpretations.

### Aviation Community Liaison Plan

The Runway Safety Program is committed to open, honest, and responsive communication with all parties, including the news media. The FAA and the RSP will continually strive to keep the public and the aviation community informed through the news and aviation feature media about initiatives and resulting impacts on runway safety.

The RSP is implementing a formal aviation community liaison plan designed to support the extensive aviation community involvement required for success. Timely, credible, and well-coordinated communication by and among the aviation community, and supported by the RSP Office, is essential if we are to achieve the vision of safer runways.

The liaison plan will adopt a two-pronged approach aimed at the primary target audiences that directly affect runway safety as well as those entities that influence the primary audiences. It assumes interactive communication and participation, and support for effective communication through a knowledge management system. Knowledge management means getting the right information within the right context to the right person at the right time for the right purpose.

In order to achieve and maintain effective liaison, communication activities must start with an active, current, and easily accessed base of knowledge. The Runway Safety Program will develop a base of knowledge that will help stimulate innovation from all

participants. Knowledge management enables the sharing of best practices and expertise with individuals, groups, or organizations in ways that directly and positively impact the problem of runway incursions.

Specific communication and liaison activities underway include the following:

- Incorporate two-way communication utilizing the Runway Safety Web and local and wide area networks.
- Organize an aviation community liaison steering committee to identify and refine objectives, activities, and resources. Members of the committee will enable discussion and decision.
- Utilize communication vehicles, including existing and new media and forums such as direct mail; formal aviation organization meetings, such as the Joint Safety Implementation Team meetings; aviation community 'town hall' meetings; FAA leadership team meetings and management level meetings; aviation media roundtable discussions; and media releases.
- Announce public meetings, dates, and locations.
- Acknowledge and communicate achievement of significant milestones throughout the process (that is, vision, goals, successes, setbacks).
- Communicate detailed information on the Blueprint, vision, goals, and achievements with customers and partners.
- Allow the completed aviation community liaison plan to be used as a tool for group

presentations, discussion starters, town meetings, etc.

- Assist Regional RSP Managers in tailoring the national aviation community liaison plan for local use.

### Budget Plan

The Runway Safety Program Office will follow the FAA's formal budget process for formulating, justifying, and executing its budget. The purpose of the FAA budgeting system is to estimate, justify, and obtain the necessary funds to carry out its missions, including the mission of the RSP.

The FAA Administrator has directed that the formulation, justification, and execution of all operations and research, engineering, and development-funded runway safety initiatives come under the supervision of the RSP Office. The RSP Office will seek input from each Line of Business during the budget formulation process, distribute appropriated funding, and track all obligations. In addition, all expenditure plans will be coordinated with the RSP Office.

Each Line of Business will be responsible for formulating, justifying, and executing its facilities and equipment (F&E) budgets associated with runway safety initiatives. For reporting purposes, the RSP Office will roll up and track all funding (including F&E).

### Summation

Runway safety is a shared commitment. An alliance between the FAA and the aviation community at large is fundamental to success. Many organizations and individuals that have the ability to effect positive change will be relied upon for their knowledge and experience throughout the program process.

Preventing incursions is the responsibility of everyone whose actions impact the safety of runway operations. This responsibility extends beyond pilots and controllers to encompass everyone who touches, or influences those who touch, the runway surface.

Aircraft operators, airport management, vehicle operators, special interest organizations, unions, flight instructors, rule-makers, and regulators all share responsibility because all play a role in the complex problem. For this reason, the Blueprint reaches out to all stakeholders in the aviation community and engages them in the common cause of preventing runway incursions. While it affirms the inherent responsibility of the FAA to guide, facilitate, and support efforts to reduce incursions, the Blueprint recognizes the importance of all stakeholders, defines appropriate roles, and challenges them to participate in the successful execution of the program.



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