Runway Excursion Risk Reduction Toolkit
2nd Edition

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Regional Runway Safety Summit
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Runway Safety
Operator-related runway safety issues

- Takeoffs, Approach and Landings, in which the risk of a catastrophic accident is particularly high, are considered the most critical phases of flight.

- In fact 68% of the accidents are attributed to these phases of flight. (Reference 2010-IATA Safety Report)

- 23% of total accidents in 2010 is attributed to Runway Excursion (Reference 2010-IATA Safety Report)

- Airport facilities were cited as a factor in 50% of runway or taxiway excursion accidents. (Reference 2010-IATA Safety Report)

- 2% of accidents are attributed to Wildlife/Birds and Foreign Objects (Reference 2008-IATA Safety Report)
Runway Safety:
Operator-related runway safety issues

- Take-off and landing phase of flight places the greatest demands on the captain and on the aircraft while operating within the most unforgiving environment

- Runway safety can be improved
  - Sharing experiences
  - Lessons learned
  - Education

- Working together will expedite the journey to a more safe, efficient and reliable aviation industry
Runway Excursion
Runway Excursion Risk Reduction (RERR) Toolkit – 2nd Edition

- RERR 2nd edition is available for public on GSIC Website
- The link to download Free of Charge is http://gsic.iata.org
Contributors

[List of logos from various organizations]

CEO and COO Brief

RERR 2nd Edition
Runway Excursion Risk Reduction (RERR) Toolkit – 2nd Edition
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## Runway Excursion Risk Reduction (RERR) Toolkit – 2nd Edition: Contents

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Industry Safety Records for Runway Excursion

- IATA-GSIC Data Source
Commercial Transport Accident History
IATA Safety Data 2004 – 2009

There were 594 total commercial accidents during this period:

- 164 of these accidents were runway excursions
- 20 runway excursion accidents involved fatalities
- This resulted over 483 passenger and crew fatalities
Runway Excursions 2004 – 2009

The % is relative to the total number of accidents during that year.
Runway Excursion Rates
2004 – 2009 per million sectors

Based on region of operator
Runway Excursions – Regional Occurrences

Industry vs. IATA Member airlines
Runway Excursions – Regional Occurrences
2004 – 2009 accident count
Runway Excursions – Regional Occurrences
Region of operator vs. occurrence
Runway Excursions – Human Factors
Distribution of the human factors

![Bar chart showing the distribution of human factors across different regions.

- Loss of Control
- Flight Crew Procedures
- Aircraft Handling
- Embedded Pilot Skills

The chart displays bars for each region (NASIA, ASPAC, AFI, MENA, EUR, CIS, NAM, LATAM), indicating the number of occurrences for each factor.}
Runway Excursions – Technical Factors
Distribution of the technical factors

<table>
<thead>
<tr>
<th>Region</th>
<th>Gear/Tire</th>
<th>Engine Malfunction</th>
<th>Gear Collapse</th>
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<tr>
<td>NASIA</td>
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<td>3</td>
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<tr>
<td>ASPAC</td>
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<td>6</td>
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<td>AFI</td>
<td>2</td>
<td>5</td>
<td>7</td>
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<tr>
<td>MENA</td>
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<td>4</td>
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<td>NAM</td>
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<tr>
<td>LATAM</td>
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<td>4</td>
<td>5</td>
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</table>
Runway Excursions – Weather Factors

Distribution of the weather factors

![Bar chart showing the distribution of weather factors for different regions.

- ASPAC: Poor Visibility = 1, Ice/Slush = 2, Contaminated Runways = 1, Windsheer = 2, Rain = 1.
- AFI: Poor Visibility = 6, Ice/Slush = 6, Contaminated Runways = 3, Windsheer = 3, Rain = 1.
- MENA: Poor Visibility = 10, Ice/Slush = 6, Contaminated Runways = 6, Windsheer = 2, Rain = 2.
- NAM: Poor Visibility = 4, Ice/Slush = 4, Contaminated Runways = 8, Windsheer = 1, Rain = 4.
- LATAM: Poor Visibility = 9, Ice/Slush = 9, Contaminated Runways = 6, Windsheer = 2, Rain = 6.]
2010 Runway Excursions

Reported Incidents | Accidents
2011 Runway Excursions (as at Sep 16, 2011)
EMAS arrests vs. overrun accidents
2004 – 2010 accident data

- There have been five incidents where the technology has worked successfully to arrest aircraft which overrun the runway and in several cases has prevented injury to passengers and damage to the aircraft.

- During 2004 – 2010, a total of 3 commercial air transport aircraft were arrested by EMAS.
History proves: EMAS Successes:

- May 1999 – JFK 4R
  SAAB 340 @ 70+

- January 2005 – JFK 4R
  747 @ 70 Knots

- May 2003 – JFK 4R
  MD11 @ 30+ Knots

- July 2006 – GMU 01
  Falcon 900 @ 30+ Knots

- July 2008 – ORD 22
  LA321 @ 35 Knots

- CRJ 200 @ + Knots

- January 2010 – CRW 23
  CRJ-200 @ + Knots
### Runway Excursions - Top Contributing Factors

<table>
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<tr>
<th>Latent Conditions (Deficiencies in...)</th>
<th>Threats</th>
<th>Flight Crew Errors (relating to...)</th>
<th>Undesired Aircraft States (UAS)</th>
<th>End State</th>
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<tr>
<td>Flight Crew Training</td>
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<td>Manual Handling</td>
<td>Vertical, lateral or speed deviations</td>
<td>Runway Excursion</td>
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<tr>
<td>Flight Ops SOPs</td>
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<td>Flight Controls</td>
<td>Long, forced, bounded, firm or off-centerline landing</td>
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<td>Ops Pressure</td>
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<td>SOP adherence / Procedural</td>
<td>Unstable Approach</td>
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<td>Safety Management</td>
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<td>Communication</td>
<td>Continued Landing</td>
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<td>after unstable approach</td>
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<td>Communication</td>
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<td>Failure to go-around after destabiliation</td>
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- Vertical, lateral or speed deviations
- Long, forced, bounded, firm or off-centerline landing
- Unstable Approach
- Continued Landing after unstable approach
Flight Operation

- These accidents can be prevented through training, awareness of the threats, and in applying good judgment to reduce the risk
The runway condition is very important for a safe landing.
Runway Condition Reporting

A common factor in most of the wet runway overrun and excursion accidents is the fact that the actual condition of the runway is not reported to the pilots.
Role of ANSPs in Preventing Runway Excursions

- Aircraft Energy Management
  - Stabilized approaches
- Infrastructure enhancement
Aircraft Energy Management

- Runway excursions result from a failure to properly manage or control the energy of the aircraft.

- Proper energy management starts at top of descent, and should lead to a stable approach and a safe landing.

- Airspace flow management affects aircraft energy management.
Challenges to Energy Management

- Weather
- ATC Restrictions
- Traffic
- Navaids Inop
- Terrain
- Runway Changes

- 1995-2008: 40% of all runway excursions were preceded by an unstable approach

ATC: “Maintain 170Kts until the FAF”

Today’s std practice 6~10 step downs
Infrastructure Enhancement

- PBN / APV implementation
- Continuous Descent Operations
- Trajectory- Based Operations
Stabilized Approaches- ANSP Role

- Controllers and pilots have a shared responsibility for safety
- The requirement to position aircraft so that a safe approach and landing is possible is overriding
- Understand the pilots' working environments and constraints
- Pass the pilots timely and accurate information that will help them to make the correct landing decision
- Altitude and/or speed restrictions should be limited
Safety benefits of PBN

- Vertically Guided Final Approaches
  - Stabilized approaches
- Laterally Guided Missed Approaches
- Increased Situational Awareness for flight crews
- CFIT Reduction
  - More precise course guidance for terrain-impacted terminal areas
- PBN promises to increase capacity / enhance safety

- IATA / ICAO Global PBN Task Force Created
  - Provide tools and enablers to enhance regional efforts
  - Accelerate and harmonize global implementation
Continuous Descent Operations

Comparison between a CDO and a conventional descent.
Trajectory-Based Operations

- Four-dimensional trajectory (4DT)
- "Open-ended" flight maneuvers (vectoring) reduce predictability
- "Closed" trajectory-based maneuvers improve predictability
- Key element for the USA’s NEXGEN and Europe’s SESAR
Role of Airports in Preventing Runway Excursions

- Runway Surface Design
- Runway Condition Reporting
- Post Accident Survivability
  - Arresting Systems
Reported Air Traffic Services Threats
From Landing Accident/Incident Reports

- Lack of knowledge on stabilized approach criteria
  - Delays and/or intermediate level-offs during descent
  - Failure to allow aircraft to reduce speed on the approach
  - Vectoring the aircraft to final approach high of glide path
  - Failure to descend aircraft appropriately for the approach

Avoid the Slam Dunk!
Reported Air Traffic Services Threats
From Landing Accident/Incident Reports

- Clearance to the ILS with no glide slope available
- Inaccurate meteorological information
- Changing the runway late on approach
- Failure to select appropriate runway based on the wind
- Misinterpretation of the runway condition reports

IATA STEADES Analysis 2005-2008
- 239 Long and/or Off-Centerline Landing Safety Reports
  - 31% noted a threat from Air Traffic Services
Increase awareness and support for airport safety improvements

- Runway Surface Design
- Runway Condition Reporting
- Post Accident Survivability
  - Engineered Materials Arresting Systems (EMAS)
http://gsic.iata.org

to represent, lead and serve the airline industry