



African Regional Runway Safety Seminar

10-12 April 2013, Agadir, Morocco



In cooperation with: **المكتب الوطني للمطارات**
Office National Des Aéroports

Session 2 *Hazards and Mitigation Strategies for Excursions*

11:00	13:00	30 mins Pilot/Air Operator Perspective of Excursion Hazards and Proposed Mitigation Strategies	Nacer Marrakshi, Royal Air Maroc
		30 mins Airport Operator perspective of Excursion Hazards and Proposed Mitigation Strategies	Peter O. Onyeri, Safety Manager, Federal Airports Authority Nigeria
		30 mins Air Traffic Controller/ATC perspective of Excursion Hazards and Proposed Mitigation Strategies	Djamel Ait Abdelmalek, IFATCA - ENNA, ATC Supervisor
		30 min Panel	David Gamper, ACI World
13:00	14:30	Lunch	

Communication hazards and mitigation

- The failure to provide timely, accurate and relevant information between:

- *ATC and crew*

→ *Educate ATC on crew needs and priorities*

1. *wind infos*
2. *Type of contamination*
3. *Braking action*

(To calculate Take-off performance and landing distance)



Communication hazards and mitigation

- ATC and crew

The misinterpretation of the given message:

- Use standard phraseology
- Listen before speaking
- Speak slowly
- When in doubt, seek clarification



Communication hazards and mitigation

2 JANUARY 2008 : OVERRUN EVENT IN FREEZING RAIN – DEAUVILLE RWY 30

ATC to the crew : « there is ice on the runway »



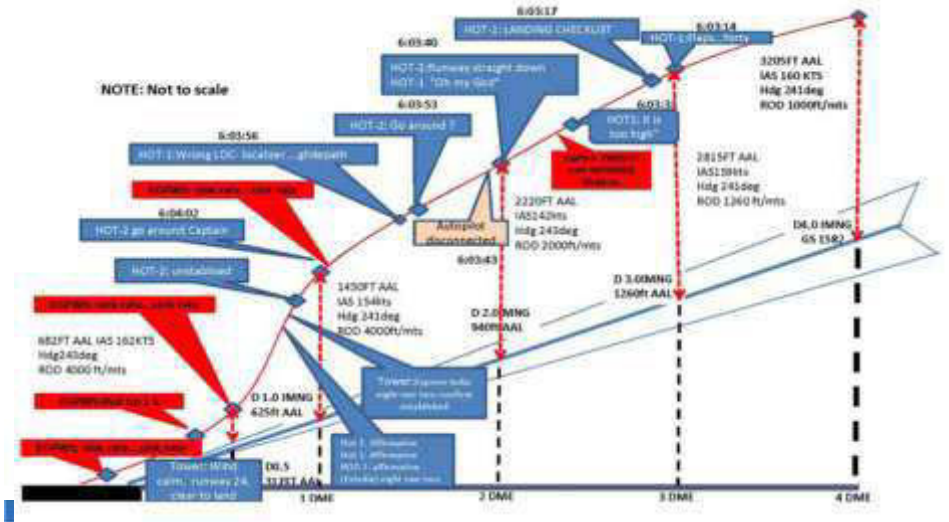
Communication hazards and mitigation

- *Crew members*
 - ***Implement effective crew resource management***
- Non essential communication
 - ***Adopt sterile cockpit concept***
- Communication impediments in multi-crew cockpit
 - ***Define the role of each pilot***
 - ***CRM training on communication techniques***
 - ***Manage the cockpit workload***



Communication hazards and mitigation

22 MAY 2012 B 737 – 800 MANGALORE CRASH



Communication hazards and mitigation

22 MAY 2012 B 737 – 800 MANGALORE CRASH



Photo 9: Broken ILS Mounting Structure Due to Impact of Wing



Photo 10: Broken Wing of Aircraft after Impacting the ILS Mounting Structure

Operational hazards and mitigations

OPERATIONS

- Flight Operations
- Environment – visibility + runway contamination
- Infrastructure



Operational hazards and mitigations

Flight Operation Threats

- **Human Error**
 - **Un-stablized Approaches**
 - **Fatigue: performance decrease – Loss of situational awareness**
 - **Inaccurate performance calculations**
 - **Ineffective braking**
 - **Non-compliance with SOP**
 - **Pilot training and techniques**
- **Mechanical Malfunction**
 - **Engine malfunction recognition**
 - **Other malfunction : reversers, spoilers fail to deploy etc...**

Operational hazards and mitigations

Fatigue: performance decrease – Loss of situational awareness

- *Establish an effective CRM system / module on fatigue mitigation strategies*
- *Establish SOPs that*
 - *define operating parameters*
 - *incorporate FRMS options / Controlled rest on seat*

Management of fatigue is a shared responsibility:

The employees responsibility is first, to obtain sufficient sleep; second, to report when they have been unable to do so or feel at risk of making a fatigue-related error; and finally, to report any situation observed that may present fatigue-related risk.

The company has the responsibility of providing adequate sleep opportunity, mitigating fatigue related risk, and taking action if an employee is not fit for work.



Operational hazards and mitigations

Flight Operations Landing Threats

- **Inaccurate landing performance calculations**
- **Un-stabilized approaches**
- **Failure to make a go-around decision**
- **Abnormal touchdowns and pilot technique**
 - **Ineffective braking**
 - **Approach long and fast**
- **Contaminated runways and meteorological factors (aerological phenomenon in convective weather)**
- **Mechanical malfunctions during landing**
- **Non-compliance with CRM and SOP**



Operational hazards and mitigations

Flight Operations Landing Threats

A stabilized approach is important for a safe landing

→ *Establish FDA Program*

→ *Establish SOPs*

- *No fault go around policy*
- *Use precision approaches / visual approaches / circling approaches*
- *Select the most operationally suitable runway*
- *Establish stable approach criteria*
- *Establish missed approach criteria*
- *Establish criteria for reduced flap settings and idle reverse thrust on landing*
- *Cross-check significant actions*
- *Non-grooved runway operations*
- *Operations in topical weather environments*
- *Operations in winter conditions*
- *Landing distance requirements calculations*
- *SOPs to avoid runway confusions and for last minute runway changes*

Operational hazards and mitigations

Flight Operations Landing Threats

➤ **Abnormal touchdowns and pilot technique**

27 JULY 2010 – RUH : RWY VEER OFF AFTER HARD LANDING

The MD-11F freighter bounced twice on landing, and on the third touchdown, the aft fuselage ruptured and the nose landing gear collapsed. The aircraft came to a stop off the left side of the runway and was destroyed by fire. The first officer was seriously injured, and the captain sustained minor injuries.



S: Fire Damage – Main Cargo Compartment

Operational hazards and mitigations

Flight Operations Landing Threats

Mechanical Malfunctions: (Engine Reverser, Brakes)

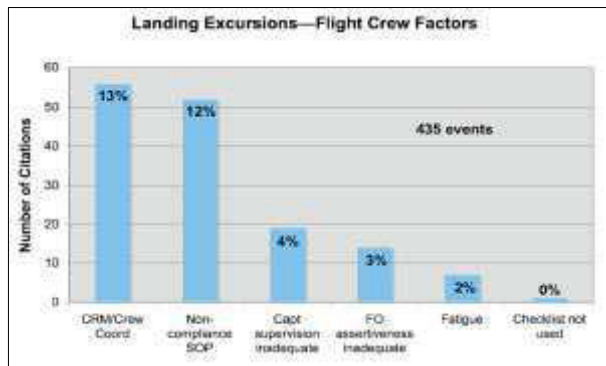
- Flight crew needs to be ready and trained for malfunctions
- Landing performance calculations should consider the loss of engine reverse during landing (especially on contaminated runways)
- During contaminated runway landings, use maximum reverse thrust, combined with wheel brakes, until at a safe taxi speed. A contaminated runway may result in the same effect as a wheel brake mechanical failure.



Operational hazards and mitigations

Flight Operations Landing Threats

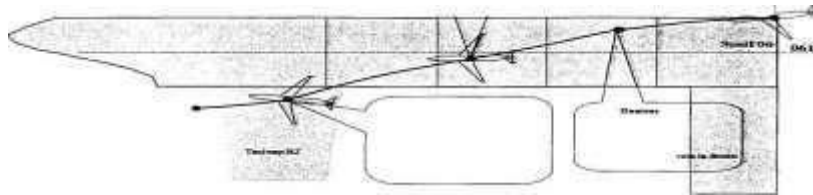
Non-Compliance with CRM and SOP is a significant factor in excursion accidents



Operational hazards and mitigations

Flight Operations Landing Threats

26 MARCH 2003 OUD : RUNWAY VEER OFF EVENT LDG : Crew interrupted a go-around at 142 ft AGL to press on the approach in poor visibility.



Operational hazards and mitigations

Flight Operations Landing Threats

Preventing Runway Excursions – Best practices

- Select the best runway for the existing conditions
- Consider autoland when in convective weather
- Optimize the use of aircraft stopping capabilities (i.e., auto brakes, maximum flap settings, auto ground spoilers, etc) Do not delay deceleration on contaminated runways
- Implement an effective incident reporting system
- Be aware of all factors used in calculating landing performance (i.e, whether reverse thrust is used, etc)
- Brief the threats; in adverse weather or runway conditions, be ready and prepared to make a go-around
- A go-around should be conducted at any time significant deviations are recognized during the flare and touchdown
- Go around or bulked landing. Training on bulked landing

Operational hazards and mitigations

Flight Operations Take-off Excursion Threats

Human Error

- Inaccurate take-off performance calculations
- Aircraft not configured properly (trim, flaps, V_{speeds})
- Aircraft not loaded properly
- Runway selection error
- Line up from wrong intersection
- Improper Rejected Take-off (RTO) accomplishment.
 - Improper V_1 decision
 - Go, No/Go Decisions
- Inadequate directional control
- Non-compliance with SOP
- Pilot training and techniques



Operational hazards and mitigations

Flight Operations Take-off Excursion Threats

THESE ERRORS CAN RESULT IN:

- Tail strikes
- An inability to rotate
- Insufficient runway to take-off, or perform an RTO
- Other unsafe conditions

MITIGATION STRATEGIES

- Implement an effective incident reporting system
- Always perform a reasonableness check (regardless of the source of the takeoff data)
- Check the Take-off speeds, runway length, thrust setting
- Independently verify the other crew member's actions
- Always follow SOP
- SOPs to check aircraft is on the correct runway before takeoff maneuver

Operational hazards and mitigations

Flight Operations Take-off Excursion Threats

RUNWAY OVERUN EVENT 30 APRIL 2007 – BAMAKO – RTO > V1 AFTER LOUD BANG AFTER ENGINE # 1 ANOMALY (HPT BLADE RUPTURE).



Operational hazards and mitigations

Environment: Visibility Hazards

Reduced visibility increases potential for loss of situational awareness

- Not only due to fog or other “low visibility” phenomena as it may be an issue in clear weather due to glare or reflection (surface contamination)
- **Conséquences**
 - Not knowing the remaining landing distance available
 - Loss of direction control due to a decrease of external cues (Sudden unexpected loss of adequate visual reference on short final or during the take-off run due to showers of rain can have an impact on the aircraft control.)

Operational hazards and mitigations

Environment: Visibility Hazards

MITIGATION STRATEGIES

- Establish procedures
- Provide realistic training
- Adhere to take-off/landing minima
- Use all available technologies to maintain situational awareness on the runway
- Realistic training for all low visibility operations

Operational hazards and mitigations

Environment: Contaminated RWY

- Runway surface condition is a critical safety concern
 - Snow, icy or water on runways can have an impact on aircraft performance
- Wind (crosswind, tailwind) can affect both directional control of the aircraft and deceleration performance



Operational hazards and mitigations

Signage and markings

- Standard markings and signs are important, as designation markings, touchdown zone, aiming point and side strip marking should be maintained in good condition (not faded)
- The correct application of ICAO ANNEX 14 is essential to improve safety during ground operations.



MITIGATION STRATEGIES

- Report signs that are not usable
- Report unserviceable markings
- Report lighting not in accordance with ICAO standards



Operational hazards and mitigations

Airport Design Hazards

Weather conditions, lights, markings and signage as well as the infrastructure layout can cause confusion among pilots and lead to a runway confusion.

A 320 takes off from taxiway M with 1620m of Taxiway available in OSLO



Operational hazards and mitigations

Airport Design Hazards

Weather conditions, lights, markings and signage as well as the infrastructure layout can cause confusion among pilots and lead to a runway confusion.

B 737 takes off from runway 35R instead of 35L in CASABLANCA with 200m

Visibility



Operational hazards and mitigations

Airport Design Hazards

MITIGATION STRATEGIES

- Conduct an airport briefing before every operation using aerodrome Charts, need to highlight Hot Spots, RESA information
- Procedure to verify takeoff and landing runway
- Use all available navigation aids to confirm position
- Use aircraft technology to verify taxiways and runways (RAAS)
- Incorporate threat and error management procedure



THANK YOU



RUNWAY EXCURSION HAZARDS AND MITIGATION OPTIONS

-an airport operator perspective

By
Peter O. Onyeri
General Manager (ARFFS)
Federal Airports Authority of Nigeria (FAAN)

RUNWAY EXCURSION



- Any occurrence at an aerodrome, of an aircraft leaving the surface designated for landing or takeoff at an incorrect or unauthorized position
- Management a convergence of stakeholder groups especially of ICAO Annexes 3,6,11,14 and 15

CONTRIBUTORY HAZARDS

- DESIGN FACTORS
- PROCEDURES AND OPERATING PRACTICES
- COMMUNICATION
- WORK/AIRPORT RUNWAY ENVIRONMENT
- ORGANISATIONAL FACTORS

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DESIGN FACTORS AND MITIGATION OPTIONS

- Inappropriate slopes, Low surface friction
 - Compliance with ICAO Annex 14 Vol 1
- Degraded visual aids
 - Removal of rubber deposits/contaminants, effective grass management
- Compromised LDAs and TORA
 - Effective communication management, NOTAMs
- Obstacles above limitation surfaces
 - Mapping, controlled development, adoption of GNSS

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PROCEDURES/PRACTICES AND MITIGATING OPTIONS

- ❑ Weak regulations and regulatory oversight, Poor runway risk management regime, Poor maintenance practices, inspections/audits
- Improvements, standardization and adoption of industry best practices, check lists and maintenance programs
- ❑ Absence/defective procedures and operating practices
- Availability and training for knowledge & human factors
- ❑ Inadequate training
- Structured and needs-focused trainings

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COMMUNICATION HAZARDS AND MITIGATION OPTIONS

- ❑ Poor relay of runway conditions (wind, wetness, birds activity, runway closure etc)
- Use of SOPs for reporting and update criteria, method of reporting and observing
- ❑ Wrong application/complete absence of information
- Adoption of Airport SMS with a strong reporting culture
- ❑ Poor communications management skills
- Trainings

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WORK ENVIRONMENT FACTORS AND MITIGATING OPTIONS

- ❑ Low visibility, AFL glares, Torrential rain, Wind turbulence around landing zone, Rubber deposits/FODs
- Right application of technology
- Adoption of work best practices
- Use of SOPs
- Use of modern metrology and forecast information
- Training

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ORGANISATIONAL FACTORS AND MITIGATION OPTIONS

- ❑ Policy issues, Planning, Training
- ❑ Communications
- ❑ Resource (men, materials and funds) allocation
- ❑ Supervision
- A safety-driven management methodology

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CHALLENGES

- ❑ Our culture, our attitude
 - Erosion of age old habits by strange and alien cultural patterns leading to confusion and mental disengagement.
 - Modern risk management tendencies, reporting, documentation and accident investigation not in our character
 - Silos work habits and individualism
- ❑ Poverty, corruption and indiscipline

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RECOMMENDATIONS

- ❑ A carefully designed and managed culture change process in a controlled airport system
- ❑ Compliance of airport systems with regulatory requirements
- ❑ Autonomy for CAAs for effective regulatory oversight
- ❑ Support and buy-in for state, regional and international collaborative safety initiatives- LRSTs, Airport Certification, APEX, BAGASSO, EASA etc
- ❑ Create funding schemes as in the CapeTown Convention, for airports
- ❑ Encourage donor agencies and the private sector for aggressive support to airports on safety

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Thank you for your attention

The air traffic controller's perspective on runway excursion hazards and mitigation options

Session 2 Presentation 3



About CANSO



- Civil Air Navigation Services Organisation
- Global Trade Association for ANS providers, Voice of ANSP's
- Open to all aviation industry players
- Founded 1997, H.Q. based in Amsterdam
- Worldwide 73 Full & 65 Associate Members & we control 85% of the World Air Space

Runway excursion hazards associated with ATC are generally related to:

1. Unstable approaches
2. Inaccurate surface/meteorological information
3. ATC knowledge of prevailing conditions and ability to update the pilot
4. Runway state reporting

Local Runway Safety Teams will help

Communication Hazards & Mitigation

- Inaccurate/Out of date Information on Surface Conditions and Wind
- Unstable approaches
- Cockpit workload
- - **Knowing each others roles**
- - **Local Runway Safety Teams are critical**

Operational Hazards & Mitigations

- Unstable approach
- Balancing efficiency with safety
 - Pressure to meet performance targets – i.e. reduce delays, increase capacity
 - Cost: reduced resources available for maintenance of equipment and training of personnel
- ATC Ineffective Traffic Flow Management leading to...
 - Unpredictability in traffic management expectations
 - Last-minute approach and/or runway changes
 - Vectoring into short final
 - Speed control to avoid compression on final
 - Intercepting glide path from above
 - Unstable approach
- Inadequate Training
- Failure of approach aids

Operational Hazards and mitigations (cont)

- Not using actual winds on the ATIS
 - **Update manual to require use of actual winds**
- Lack of procedures for operations on complex runways
 - **Identify hazards**
 - **Establish mitigation options**

Operational Hazards (cont.)

- Runway selection
 - Incompatible aircraft type
 - **Establish a procedure for runway selection based on aircraft type**
 - Late changes
 - **Establish runway change cut-off points**
 - Runway selection based on ATC preferences or noise abatement requirements.
 - **Base runway selection on technical best practices**

Construction Hazards and mitigations

- Airports are constantly being upgraded, repaired, maintained
- AIP documentation on status of airport may differ from current airport works
- NOTAM and ATC advice very important
- Procedures to keep pilot up to date e.g. operations on shortened runways

Local Runway Safety Teams are critical

Airport Design Hazards

- Tower location that prevents the monitoring of multiple runway operations
 - Inability to detect confusion events
- **Additional runway/taxiway signage**
- **Utilize technology such as**
 - Airport Surface Detection Equipment (ASDE-X)
 - Precision Radar Monitoring (PRM)
- **Specific procedures to address the blind spots**
- Tower location that prevents the monitoring of multiple runway operations
- Inability to detect confusion events
- Complex taxiway configuration
- Itinerant pilots – local knowledge gaps
- Off airport development
- Local Runway Safety Teams are critical
- – Training
- – Signage



THANK YOU

