



Agenda Item 2: Air Navigation Matters
2.3 Other Specific Air Navigation Developments
2.3.1 Aerodromes and Ground Aids (AGA)
• Runway Safety

RUNWAY SAFETY

(Presented by the Secretariat)

SUMMARY

It is recognized that runway safety is a collective responsibility. This responsibility extends to organizations (aerodrome operators, the air navigation service provider, and the aircraft operator) as well as to individuals (e.g. controller, pilot, vehicle operator).

While there are several incidents due to runway incursions and excursions that may have catastrophic consequences, these events continue to happen and airport authorities need to maintain their efforts to reduce the occurrence.

A wide range of factors contribute to runway incursions, including less-than-perfect aerodrome design, technology, procedures, training, regulations and human error.

This working paper addresses the best practices for airfield safety and several factors to consider in managing runway safety as an on-going effort.

References:

- Doc 9830 - *Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual*
- Doc 9870 - *Manual on the Prevention of Runway Incursions*
- Known “Best Practices” for Airfield Safety – FAA
- Aviation Safety Letter, Transport Canada, Issue 3/2009
- EUROCONTROL, Airport safety, preventing runway incursions European Action Plan for the prevention of runway incursions
- Report of the Seventh Meeting of the GREPECAS Aerodromes and Ground Aids/Aerodrome Operational Planning Subgroup (AGA/AOP/SG/7), Buenos Aires, Argentina, 9 to 13 November 2009

Strategic Objectives

This working paper is related to Strategic Objectives A and D.

1. Introduction

1.1 The issue of runway incursions has been identified as a serious threat to aviation safety and several initiatives from States, mainly in Europe and North America, include the implementation of action plans for the prevention of runway incursions in order to enhance runway safety. These action plans contain a number of recommendations designed to reduce runway accidents and incidents and improve safety. Canada and United States have advanced programmes for runway incursion prevention.

1.2 With respect to the ICAO Runway Safety Programme, this has evolved to include the prevention and mitigation of Runway Incursions (RI), Runway Excursions (RE) and other occurrences related to runway safety. ICAO has developed SARPs, guidance material and toolkits to address various aspects of runway safety and has held a series of seminars to raise situational awareness. Historically, these runway safety efforts have been made within individual operational specialties. However, the increasingly interconnected nature of specialties in addressing modern aviation issues requires a more holistic approach. The ICAO Runway Safety Programme is envisioned to provide a forum including regulators, aircraft operators, air traffic management, aerodromes and aircraft manufacturers to holistically address runway safety issues across operational specialties.

1.3 The ICAO Accident/Incident Data Reporting (ADREP) system indicates that REs are the highest single occurrence category of all accidents over the last 10 years for all commercial and general aviation operations of fixed-wing aircraft above 5 700 kg certified maximum take-off mass.

1.4 Potential prevention strategies for REs and RIs must include five areas, i.e. regulators, aircraft operators, air traffic management, aerodromes and aircraft manufacturers. These areas should be included in the ICAO Runway Safety Programme.

1.5 This working paper describes one of the tasks related to the Regional Performance objective number 10. *Enhance Capacity and Efficiency of Aerodrome Operations* of the NAM/CAR RPBANIP.

2. ICAO Runway Safety Programme

2.1 ICAO's dedicated focus on runway safety efforts began in 2002 with an education and awareness campaign that consisted of a series of seminars in ICAO Regions to disseminate information on the prevention of RIs. As the frequency and severity of RE became more apparent, it was considered appropriate to address all runway safety issues in a comprehensive manner. Therefore, the ICAO Runway Safety Programme has been expanded to cover both REs and RIs, as well as other occurrences and activities related to runway safety.

Runway excursion (REs)

2.2 ICAO's runway safety efforts currently underway in regard to RE mainly include:

- a) provisions for runway end safety areas (RESA) and associated mitigating measures;
- b) provisions for runway friction measurement and surface condition assessment and reporting, and development of a circular providing runway friction-related information and guidance;
- c) development of the performance-based navigation (PBN) concept to provide for better stabilized approaches;
- d) provisions for standardized visual aids providing consistent situational awareness for flight crews; and
- e) development of a joint ICAO/IATA Runway Excursion Risk Reduction Toolkit providing a multi-disciplinary perspective.

Runway incursion (RIs)

2.3 ICAO's runway safety efforts currently underway in regard to RI mainly include:

- a) SARPs and guidance material for the integrated use of visual aids to help prevent RI;
- b) provisions for the use of aerodrome ground radar systems and standardized controller-pilot-driver communications;
- c) standardization of RI terminology and improvements in the collection of RI data; and
- d) human factors considerations of clearance compliance.

Other Occurrences and Activities related to Runway Safety

2.4. ICAO's runway safety efforts currently underway in regard to other occurrences and activities mainly related to runway safety include:

- a) provisions concerning the regular inspection, monitoring and maintenance of movement areas, including runways, so that runway pavements are kept clear of foreign object debris (FOD);
- b) expansion of bird strike hazard reduction provisions to include all wildlife; and
- c) provisions concerning the use of the new performance level "C" foam for aircraft rescue and fire fighting.

3. Discussion

3.1 A number of recommendations are directed at aerodrome operators, air navigation service providers, aircraft operators and regulators among others. The best practices for preventing runway incursions are:

- a) aircrew requires the consistency and predictability that the harmonized application of ICAO provisions can provide;
- b) at the aerodrome level, runway safety can only truly be enhanced by local joint action because local differences in the layout of the infrastructure and the mixture of traffic, etc. must be taken into account;
- c) airport operators should provide comprehensive radiotelephony training to vehicle drivers;
- d) to have a policy preventing aircraft from crossing illuminated red stop bars;
- e) current efforts are focused on two main areas, specifically devices that provide positional awareness to pilots and systems that provide air traffic controllers with a warning whenever a runway incursion is under way;
- f) implement an Action Plan for the Prevention of Runway Incursions; and
- g) implement Advanced Surface Movement Guidance and Control System (A-SMGCS). The implementation of A-SMGCS Level 1 gives an accurate surveillance picture of the traffic on and adjacent to the runway, including the position and identity of all known traffic. It will also indicate unknown traffic (or intruders).

3.2 A-SMGCS Level 2 will further enhance Level 1 by giving the controller warnings of potentially hazardous situations associated with runway incursions.

3.3 Specific uses of A-SMGCS include:

- a) detection of intruders;
- b) monitoring compliance with ATC instructions;
- c) detection of hazardous situations on the runways;
- d) emphasizing the protection of active runways, and to enhance the prevention of runway incursions, pilots are asked to acknowledge taxi authorizations that contain the instructions “hold” or “hold short” by providing a complete read back or repeating the hold point. With the increased simultaneous use of more than one runway, instructions to enter, cross, backtrack or line up on any runway should also be acknowledged by a read back; and
- e) installing airport surface detection equipment. This equipment enables controllers to detect potential runway conflicts by providing the controller with a radar picture of movement on runways and taxiways.

3.4 The establishment of runway incursions and excursions prevention programmes according to Doc. 9870, Chapter 3 is highly recommended, as well as creating national runway safety teams by States. To support this effort, ICAO has produced a Runway Safety Toolkit which is available on the website specified in Appendix J of Doc 9870. (Refer to the **Appendix** to this paper).

4. Suggested Action

4.1 The Meeting is invited to:

- a) analyze the best practices detailed in paragraph 3.1, which can be considered for preventing runway incursions/excursions and enhance runway safety;
- b) make use of the ICAO Runway Safety Toolkit referred to in paragraph 3.4, and
- c) based on the information provided in item a) and the use of the ICAO Toolkit described in item b), urge the E/CAR States/Territories to inform the ICAO NACC Regional Office the best practices implemented for preventing runway incursions by **25 February 2011**.

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AN/463**



Manual on the Prevention of Runway Incursions

**Approved by the Secretary General
and published under his authority**

First Edition — 2007

International Civil Aviation Organization

Chapter 3

ESTABLISHING A RUNWAY INCURSION PREVENTION PROGRAMME

3.1 RUNWAY SAFETY TEAMS

3.1.1 A runway incursion prevention programme should start with the establishment of runway safety teams at individual aerodromes. The primary role of a local runway safety team, which may be coordinated by a central authority, should be to develop an action plan for runway safety, advise management as appropriate on potential runway incursion issues and recommend strategies for hazard removal and mitigation of the residual risk. These strategies may be developed based on local occurrences or combined with information collected elsewhere.

3.1.2 The team should comprise representatives from aerodrome operations, air traffic service providers, airlines or aircraft operators, pilot and air traffic controller associations and any other groups with a direct involvement in runway operations. The team should meet on a regular basis. Frequency of meetings should be determined by the individual groups. At some aerodromes, other groups may already exist that could carry out the functions of a runway safety team.

3.2 OBJECTIVES

Once the overall number, type and severity of runway incursions have been determined, the team should establish goals that will improve the safety of runway operations. Examples of possible goals are:

- a) to improve runway safety data collection, analysis and dissemination;
- b) to check that signage and markings are ICAO-compliant and visible to pilots and drivers;
- c) to develop initiatives for improving the standard of communications;
- d) to identify potential new technologies that may reduce the possibility of a runway incursion;
- e) to ensure that procedures are compliant with ICAO Standards and Recommended Practices (SARPs); and
- f) to initiate local awareness by developing and distributing runway safety education and training material to controllers, pilots and personnel driving vehicles on the aerodrome.

3.3 GENERIC TERMS OF REFERENCE

Suggested generic terms of reference for a runway safety team are to assist in enhancing runway safety by:

- a) determining the number, type and, if available, the severity of runway incursions;
- b) considering the outcome of investigation reports in order to establish local hot spots or problem areas at the aerodrome;
- c) working as a cohesive team to better understand the operating difficulties of personnel working in other areas and recommending areas for improvement;
- d) ensuring that the recommendations contained in the *Manual on the Prevention of Runway Incursions* (Doc 9870) are implemented;
- e) identifying any local problem areas and suggesting improvements;
- f) conducting a runway safety awareness campaign that focuses on local issues, for example, producing and distributing local hot spot maps or other guidance material as considered necessary; and
- g) regularly reviewing the airfield to ensure its adequacy and compliance with ICAO SARPs.

3.4 HOT SPOTS

3.4.1 The ICAO definition of a hot spot is:

“A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.”

Note 1.— The criteria used to establish and chart a hot spot are contained in the PANS-ATM (Chapter 7) and Annex 4 — Aeronautical Charts (Chapters 13, 14 and 15).

Note 2.— Hazards associated with hot spots should be mitigated as soon as possible and so far as is reasonably practicable.

Examples of how hot spots are shown on charts are provided in Figures 3-1, 3-2 and 3-3.

3.4.2 Aerodrome charts showing hot spots should be produced locally, checked regularly for accuracy, revised as needed, distributed locally, and published in the Aeronautical Information Publication (AIP).

3.4.3 Once hot spots have been identified, suitable strategies should be implemented to remove the hazard and, when this is not immediately possible, to manage and mitigate the risk. These strategies may include:

- a) awareness campaigns;
- b) additional visual aids (signs, markings and lighting);
- c) use of alternative routings;
- d) construction of new taxiways; and
- e) the mitigation of blind spots in the aerodrome control tower.

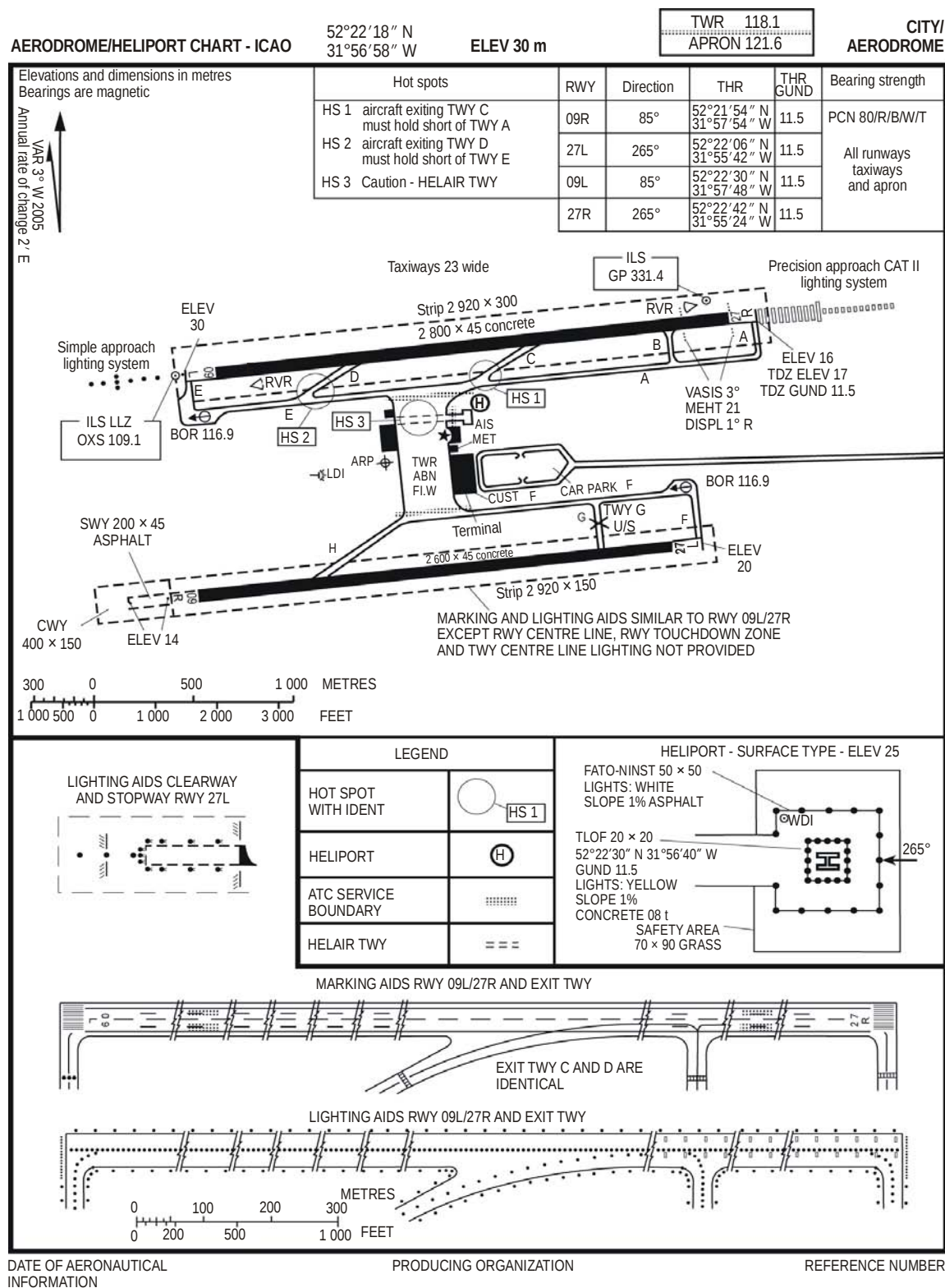


Figure 3-1. Sample Aerodrome/Heliport Chart — ICAO
showing ICAO charting method for depiction of hot spots

(Associated provisions in Annex 4 and the PANS-ATM will become applicable on 22 November 2007)

Figure 3-2. Example of hot spot information

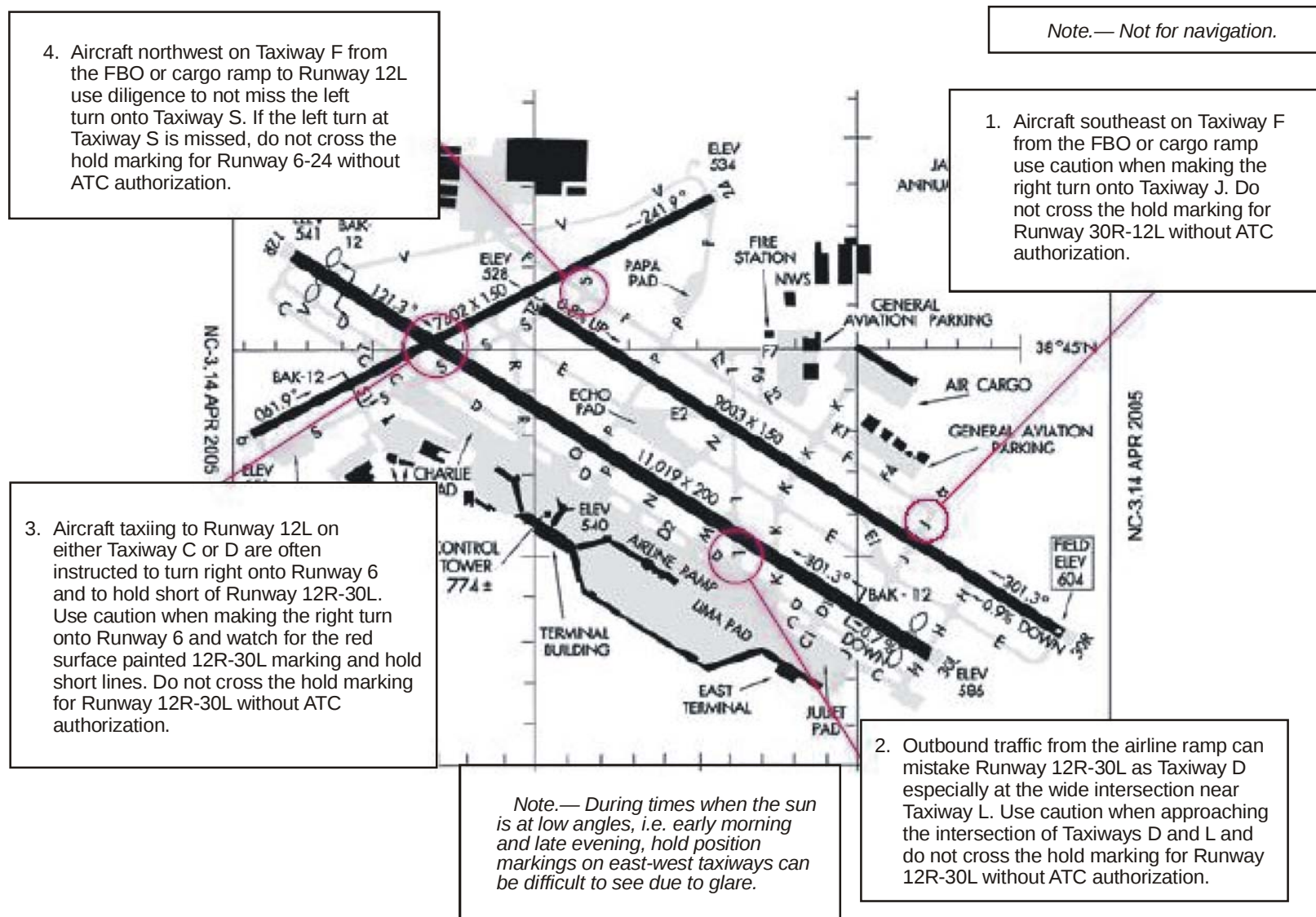
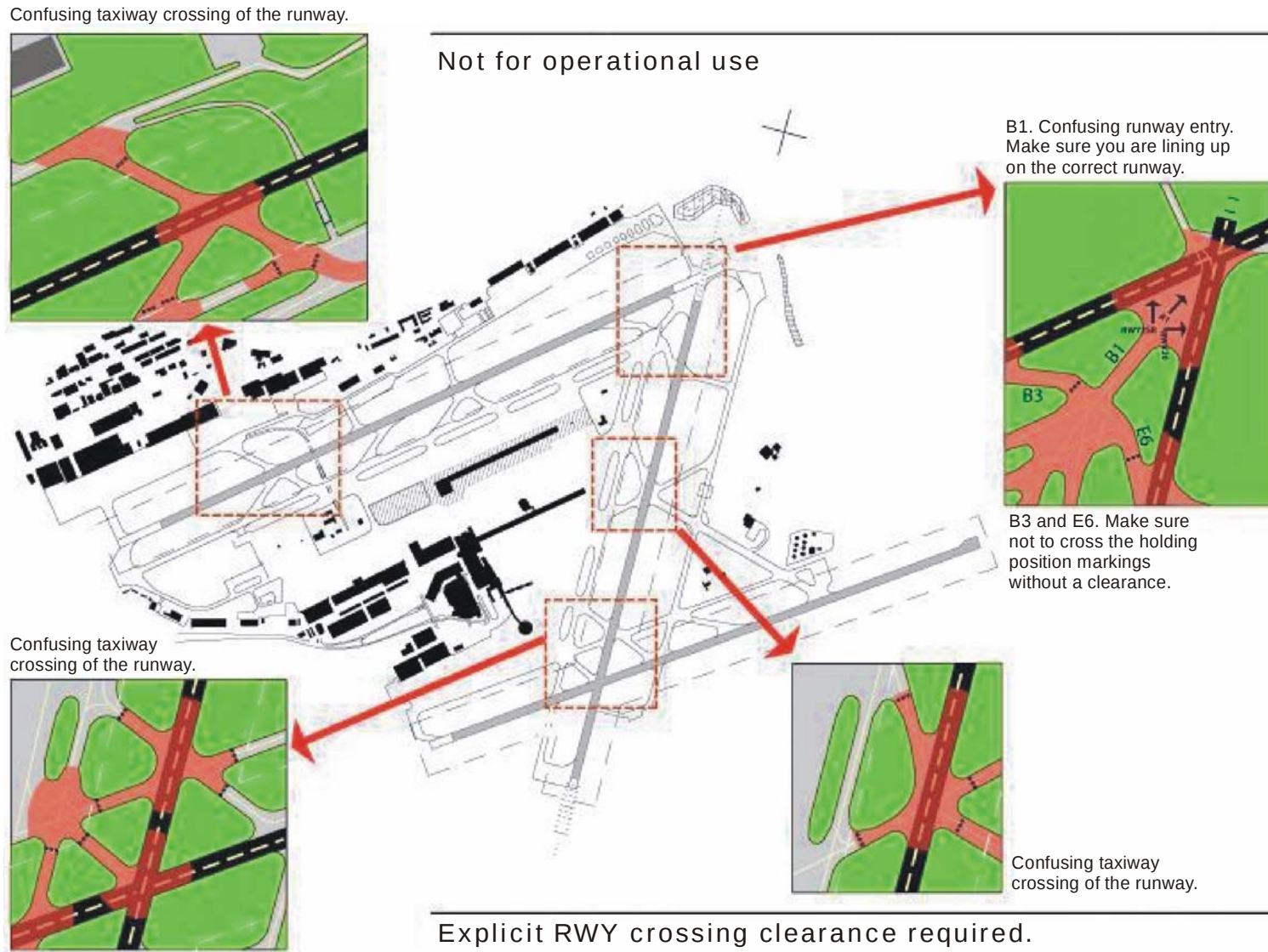


Figure 3-3. Example of hot spot detail



3.5 ACTION ITEMS

A plan containing action items for mitigating runway safety deficiencies should be developed. Action items should be aerodrome specific and linked to a runway safety concern, issue or problem at that aerodrome. Action items may include suggested changes to the physical features of, or facilities at, the aerodrome; air traffic control procedures; airfield access requirements; pilot and vehicle operator awareness; and production of hot spot maps.

3.6 RESPONSIBILITY FOR TASKS ASSOCIATED WITH ACTION ITEMS

Each action item should have a designated person or organization which is responsible for completing the relevant tasks. There may be more than one person or organization affected by an action item; however, one person or organization should take the lead and be responsible for the completion of all the tasks associated with the action item. A realistic time frame to accomplish the work should also be associated with each action item.

3.7 EFFECTIVENESS OF COMPLETED ACTION ITEMS

Periodically the effectiveness of implemented and/or completed action items should be assessed. This can be accomplished by comparing the results of the initial analysis and the current runway incursion status. For example, if an action item was to provide training for controllers, pilots or vehicle drivers, the effectiveness of such training should be evaluated by the team. If the analysis shows little or no improvement in the number, type or severity of runway incursions, the team should re-evaluate the implementation of that action item.

3.8 EDUCATION AND AWARENESS

3.8.1 Education and awareness material such as newsletters, posters, stickers and other educational information are invaluable tools for reducing the risk of runway incursions. The ICAO runway safety toolkit, discussed in Appendix J, provides a wealth of information for educational and awareness programmes.

3.8.2 Other awareness material that may be helpful to local runway safety teams is available from:

Airports Council International (ACI)
www.airports.org

Air Services Australia
www.airservicesaustralia.com

European Organisation for the Safety of Air Navigation (EUROCONTROL)
www.eurocontrol.int/runwaysafety/public/subsite_homepage/homepage.html

Federal Aviation Administration (FAA)
www.faa.gov/runwaysafety

International Air Transport Association (IATA)
www.iata.org

International Civil Aviation Organization (ICAO)
www.icao.int/fsix/res_ans.cfm

International Federation of Airline Pilots' Associations (IFALPA)
www.ifalpa.org

Transport Canada
www.tc.gc.ca/civilaviation/systemsafety/posters/tools.htm

United Kingdom Safety Regulation Group
<http://www.caa.co.uk>

Appendix J

ICAO RUNWAY SAFETY TOOLKIT

1. The ICAO runway safety toolkit on CD-ROM was produced by the International Civil Aviation Organization (ICAO) and Embry Riddle Aeronautical University, Florida, United States, as part of a continuing effort to assist States in the implementation of runway incursion prevention programmes. This interactive toolkit is a compilation of the best educational material available, obtained over a period of several years, and draws on information and knowledge obtained during a series of ICAO seminars on the subject of runway safety held between October 2002 and October 2004. The toolkit is meant to be used with other runway safety tools such as the *Manual on the Prevention of Runway Incursions* (Doc 9870) and to support other runway incursion prevention programme initiatives.
 2. The CD-ROM contains:
 - a) an opening statement by the President of the ICAO Council;
 - b) introduction to all users;
 - c) modules for air traffic control, flight operations, aerodrome and management responsibilities; and
 - d) supplemental material including a glossary of terms related to runway safety, an appendix containing ICAO provisions on runway safety, references and links to runway safety websites, posters, videos, and presentations given during the ICAO runway safety awareness and education campaign.
 3. The CD-ROM can be obtained from the ICAO website at:

www.icao.int/fsix/res_ans.cfm.
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