

# INTERNATIONAL FEDERATION OF AIR TRAFFIC CONTROLLERS' ASSOCIATIONS

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## Emergency Descent Procedures Presented by TOC

### Executive Summary

*Existing ICAO recommended practices concerning emergency descent procedures provide guidance to pilots and ATS units in the event of an emergency descent. However, these provisions are outdated. Updates are needed to handle modern scenarios.*

## 1. Introduction

- 1.1 Recent publications by Eurocontrol<sup>1</sup> and the International Federation of Airline Pilots' Associations<sup>2</sup> (IFALPA) address the need for a more detailed approach to emergency descent procedures than currently exists in ICAO documents. Specifically, the Eurocontrol document advises that several Air Navigation Service Providers (ANSPs) in the European region have published procedures that are expected to be more effective in high density traffic environments. Additionally, an IFALPA policy statement proposes that more detailed instructions be issued to pilots in assisting them to "clear the area" of the emergency descent. The recent efforts of Eurocontrol and IFALPA highlight the need to adopt a somewhat more modern approach to developing emergency descent procedures.
- 1.2 ICAO has added the issue of Emergency Descent procedures to the work programme of the Operations Panel (OPSP). The Panel will be forwarding recommendations for amendments to PANS-ATM to the Air Navigation Commission for approval this year. Following this, the proposal will be distributed for consultation through the State Letter process and then depending on the State Letter feedback it may be ready for adoption in the next PANS amendment cycle or it may be returned for further work.

## 2. Discussion

- 2.1 ICAO publications contain the following references relevant to emergency descent:
  - Doc 8168<sup>4</sup> – guidance for pilots in emergency situations
  - PANS-ATM<sup>3</sup> 15.1.4 – guidance for pilots and controllers
  - PANS-ATM 12.3.2.5 – phraseology
  - Doc 7030 – regional supplements
- 2.2 Doc 8168 makes numerous references to emergency procedures similar to this one:

[Introduction] 1.5 (...) It is the responsibility of the operator to provide contingency procedures for abnormal and emergency operations.

When a pilot is faced with a situation requiring an emergency descent, there is likely to be catastrophic potential. The pilot must juggle competing priorities and instantly determine the best course of action. One of those priorities must be the potential for interaction with aircraft below. In the event that the pilot does not or cannot coordinate with air traffic control prior to descent, the pilot should understand that there is now a risk of collision that may be avoided by one of the following means:

- Use of TCAS by the descending aircraft
- Use of visual methods by the descending aircraft
- Direct control of the aircraft below by the controller
- Use of advisories, TCAS and/or visual methods by the aircraft below.

2.3 The situation is somewhat analogous to a Resolution Advisory (RA), in that the descending aircraft is not following a clearance and the pilot knows first what that aircraft is about to do. In this case, a pilot may be following guidance or executing maneuvers in direct conflict with the ATC clearance. This is anathema to a core principle of air traffic control, a singular point of control.

2.4 In an RA, ACAS takes action to provide collision avoidance. The controller does not resume the responsibility for separation until certain criteria are met (the subject of another TOC paper this year). Both parties understand this explicitly. Emergency descent procedures are not as clear. Here are the citations from PANS-ATM:

#### **15.1.4 Emergency descent**

##### **15.1.4.1 GENERAL**

Upon receipt of advice that an aircraft is making an emergency descent through other traffic, all possible action shall be taken immediately to safeguard all aircraft concerned. When deemed necessary, air traffic control units shall immediately broadcast by means of the appropriate radio aids, or if not possible, request the appropriate communications stations immediately to broadcast an emergency message.

##### **15.1.4.2 ACTION BY THE PILOT-IN-COMMAND**

It is expected that aircraft receiving such a broadcast will clear the specified areas and stand by on the appropriate radio frequency for further clearances from the air traffic control unit.

##### **15.1.4.3 SUBSEQUENT ACTION BY THE AIR TRAFFIC CONTROL UNIT**

Immediately after such an emergency broadcast has been made the ACC, the approach control unit, or the aerodrome control tower concerned shall forward further clearances to all aircraft involved as to additional procedures to be followed during and subsequent

to the emergency descent. The ATS unit concerned shall additionally inform any other ATS units and control sectors which may be affected.

#### 12.3.2.5 EMERGENCY DESCENT

\*a) EMERGENCY DESCENT (intentions);

b) ATTENTION ALL AIRCRAFT IN THE VICINITY OF [or AT] (significant point or location) EMERGENCY DESCENT IN PROGRESS FROM (level) (followed as necessary by specific instructions, clearances, traffic information, etc.).

\* Denotes pilot transmission.

- 2.5 In most of today's environments, the requirement for pilots receiving an emergency broadcast to "clear the specified areas" is vague and completely impractical. As stated by Eurocontrol, "unless the emergency broadcast is appropriately targeted and contains unambiguous instructions, there is the possibility of aircraft unexpectedly deviating from their track to 'clear the specified area' which, in areas of high traffic density, has the potential to create additional hazardous situations"<sup>1</sup>. The term "targeted" here is used to mean clearances given to individual aircraft, not clearances preceded by the term "ALL AIRCRAFT" as prescribed in 12.3.2.5 b.
- 2.6 Similarly, IFALPA states "There is no direction as to how aircraft are to achieve the aim to 'clear the specified areas,' i.e. which kind of turn, or other action, is expected from them"<sup>2</sup>. Such generic and open-ended directions are far more likely to create new conflicts than to resolve any conflict associated with the emergency descent. Such a clearance is akin to instantly authorizing all aircraft on a controller's frequency to deviate for weather. No controller would ever consider such a clearance. Perhaps this method was originally meant for use by a radio operator at an uncontrolled field, but it is not meant for use in congested radar airspace in today's en route or approach environments.
- 2.7 Effective procedures for handling emergency descents will vary based on a wide variety of factors. A short list of these would include:
- the level of surveillance provided in the operational environment,
  - the equipage of the aircraft especially in regards to ACAS,
  - the type of aircraft and performance characteristics,
  - the density of traffic,
  - meteorological conditions,
  - the ability to communicate with the emergency aircraft,
  - the ability to communicate with other aircraft,
  - the nature of the emergency including the ability of the pilots to control the aircraft,

- the condition of the pilots (i.e. hypoxia, depressurization, health crisis, etc.).

Not only will the most effective emergency descent guidance differ between environments with and without surveillance, but the presence of so many factors means virtually every situation will be unique and will not conform to a “one size fits all” procedure.

- 2.8 In high traffic density environments radio frequency congestion can become a significant factor, limiting the ability of pilots and controllers to effectively manage emergency descent operations. The issuance of a general broadcast, which would most likely be received by unaffected aircraft, could spur a flurry of transmissions from pilots seeking more specific guidance. The ensuing frequency congestion could exacerbate an already disorderly situation. In surveillance environments, specific clearances to affected aircraft will often provide optimal usage of critical radio frequency time and more effective resolution of the emergency descent.
- 2.9 Doc 7030<sup>7</sup> (Regional Supplementary Procedures) provides guidance for pilots in distress who need to execute an emergency descent. The following is from the North Atlantic Supplement. (Note: MNPS is Minimum Navigation Performance Specification, an older version of RNP.)

<p><b>9.1 EMERGENCY DESCENT PROCEDURES</b></p> <p>9.1.1 Action by the pilot-in-command</p> <p>9.1.1.1 Descent through the MNPS airspace</p> <p>9.1.1.1.1 An aircraft that is not MNPS/RVSM-approved and is unable to maintain a flight level above MNPS/RVSM airspace should descend to a flight level below MNPS/RVSM airspace.</p> <p>9.1.1.1.2 An aircraft compelled to make a descent through MNPS airspace, whether continuing to destination or turning back, should, if its descent will conflict with an organized track:</p> <ul style="list-style-type: none"> <li>a) plan to descend to a level below FL 280;</li> <li>b) prior to passing FL 410, proceed to a point midway between a convenient pair of organized tracks prior to entering that track system from above;</li> <li>c) while descending between FL 410 and FL 280, maintain a track that is midway between and parallel with the organized tracks; and</li> <li>d) contact ATC as soon as practicable and request a revised ATC clearance.</li> </ul> <p>9.1.2 Action by the ATS unit Nil.</p>
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- 2.10 The significant guidance here is that the pilot should maneuver between tracks so as to descend outside of any organized track. This method can be effective in the NAT because all aircraft should be on tracks (although in some cases aircraft may cross them). It is less effective in non-oceanic airspace since direct routings and vectors are

commonplace. Doc 7030 offers the controller no guidance, leaving responsibility for separation entirely with the pilot.

2.11 This is from the European Supplement of Doc 7030:

**9.1 EMERGENCY DESCENT PROCEDURES**  
(P-ATM – Chapter 15)

**9.1.1 Action by the pilot-in-command**

9.1.1.1 When an aircraft operated as a controlled flight experiences sudden decompression or a malfunction requiring an emergency descent, the aircraft shall, if able:

- a) initiate a turn away from the assigned route or track before commencing the emergency descent;
- b) advise the appropriate air traffic control unit as soon as possible of the emergency descent;
- c) set transponder to Code 7700 and select the Emergency Mode on the automatic dependent surveillance/controller-pilot data link communications (ADS/CPDLC) system, if applicable;
- d) turn on aircraft exterior lights;
- e) watch for conflicting traffic both visually and by reference to ACAS (if equipped); and
- f) coordinate its further intentions with the appropriate ATC unit.

9.1.1.2 The aircraft shall not descend below the lowest published minimum altitude that will provide a minimum vertical clearance of 300 m (1 000 ft) or, in designated mountainous terrain, of 600 m (2 000 ft) above all obstacles located in the area specified.

**9.1.2 Action by the ATS unit**

9.1.2.1 Immediately upon recognizing that an emergency descent is in progress, air traffic control units shall acknowledge the emergency on radiotelephony.

9.1.2.2 In particular, they may, as required by the situation:

- a) suggest a heading to be flown, if able, by the aircraft carrying out the emergency descent in order to achieve separation from other aircraft concerned;
- b) state the minimum altitude for the area of operation, only if the level-off altitude stated by the pilot is below such minimum altitude, together with the applicable QNH altimeter setting; and
- c) as soon as possible, provide separation from conflicting traffic, or issue essential traffic information, as appropriate.

9.1.2.3 When deemed necessary, air traffic control will broadcast an emergency message, or cause such message to be broadcast, to other aircraft concerned to warn them of the emergency descent. The broadcast emergency message should contain instructions for specific actions to be taken by aircraft addressed in the broadcast or, alternatively, instructions to continue in accordance with their current clearances, and stand by on the appropriate channels for further clearances and instructions.

Note - In the absence of specific instructions provided to the aircraft addressed in the broadcast, it may be expected that such aircraft will clear the area on their own initiative.

- 2.12 This procedure calls for the pilot to turn off the airway, and pilots are typically guided by company procedures as well. Most major carriers call for a turn of around 30° off track to get away from the airway (left or right), so this behavior can be expected in many cases. But this is not necessarily desirable for separation. In modern airspace many aircraft may be off route or there may be strategic offsets or micro-offsets in place. Some pilots have suggested that in these cases remaining exactly on the route may be best.
- 2.13 Flight crew workload can be expected to increase significantly during emergency descents. In order to allow the flight crew to focus on effectively handling the situation, radio frequency changes should be avoided to the extent feasible, consistent with safe operations.
- 2.14 In non-surveillance environments, specific clearances to aircraft may not be feasible. In these instances, informational broadcasts may be more appropriate. When broadcasts are issued, they should contain as much specific information as possible to assist pilots in clearing the emergency descent area.
- 2.15 It should be noted that the pilot in command of an aircraft executing an Emergency Descent may choose to put the TCAS / ACAS mode on 'TA only'. This is intended to avoid triggering a co-ordinated RA, since the emergency aircraft likely cannot respond to the RA. Note that the selection of 'TA only' does not stop the generation of resolution advisories by the TCAS in other aircraft. Also note that the International Coordinating Council of Aerospace Industries Associations recently recommended against this practice.

### **3. Conclusions**

- 3.1 Emergency descent situations are analogous to Resolution Advisories in that they may introduce a second decision-maker within the ATC environment - the pilot of the aircraft executing an emergency descent. Depending on circumstances, the pilot may or may not be able to coordinate the trajectory of the aircraft with the controller.
- 3.2 ICAO provides guidance regarding emergency descent for pilots in Doc 8168 and for both pilots and controllers in Doc 7030 and PANS-ATM sections 15.1.4 and 12.3.2.5.
- 3.3 The guidance in the PANS-ATM is outdated in today's congested environments, and can actually cause more conflicts than it seeks to prevent. The PANS-ATM uses the term "clear the specified area" (15.1.4.2), which directly implies pilots should navigate off their assigned routes at their own discretion, in conflict with core principles of air traffic control.
- 3.4 The guidance in the PANS-ATM does not establish clarity in "the decider" role in the event of an emergency descent and in fact encourages a situation in which all of the affected pilots may be navigating independently. This is likely the worst possible scenario for a controller.

- 3.5 In an emergency descent, both the pilot and the controller must consider multiple factors and instantly determine the best course of action. The pilot may be able to transmit intentions, but if not the controller must attempt to extrapolate the aircraft trajectory. In that case, the pilot must consider the potential for a traffic conflict with aircraft below and take appropriate action, because no other system participant has full knowledge of the future trajectory of the emergency aircraft.
- 3.6 Optimal usage of radio frequency transmission time is critical in any emergency situation.
- 3.7 An aircraft executing an emergency descent cannot be expected to respond to a resolution advisory.

#### **4. Draft Recommendation**

It is recommended that

- 4.1 IFATCA policy is:

**IFATCA supports the modernization of emergency descent procedures.**

and is included in the IFATCA Technical and Professional Manual.

#### **5. References**

- 1 Eurocontrol 2010, Safety Warning Message, Emergency Descent in High Traffic Density Situations
- 2 IFALPA, 2011, IFALPA Policy
- 3 ICAO Doc 4444, Procedures of Air Navigation Services - Air Traffic Management (PANS-ATM)
- 4 ICAO Doc 8168, Aircraft Operations
- 5 ICAO EUR Region 2009, Doc 7030, Part III - 9.1.1 Action by the pilot-in-command - 9.1.1.1
- 6 CASA Emergency Descent Data 2013
- 7 Doc 7030, North Atlantic (NAT) Regional Supplementary Procedures