WORKING PAPER

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ASSEMBLY — 35TH SESSION

TECHNICAL COMMISSION

Agenda Item 24: ICAO Global Aviation Safety Plan (GASP)
24.2: Progress of the ICAO programme for the prevention of controlled flight into terrain (CFIT)

PROGRESS REPORT ON THE ICAO PROGRAMME FOR THE PREVENTION OF CONTROLLED FLIGHT INTO TERRAIN (CFIT)

SUMMARY

This working paper provides a report on the implementation of the ICAO programme for the prevention of controlled flight into terrain (CFIT).
Action by the Assembly is contained in paragraph 7.

REFERENCES

A35-WP/63
Annex 4
Annex 6
Annex 15
Doc 4444, PANS-ATM
Doc 8168, PANS-OPS
Doc 9790, *Assembly Resolutions in Force* (as of 5 October 2001)
State letter AN 11/37-02/7

1. INTRODUCTION

1.1 Assembly Resolution A33-16, ICAO Global Aviation Safety Plan (GASP), noted with concern that controlled flight into terrain (CFIT) and approach and landing accidents remain as significant accidents in airline operations, and reiterated the need for the implementation of the ICAO prevention of CFIT and approach and landing accident reduction (ALAR) programmes. The CFIT programme, which commenced in 1993, was precipitated by the then apparent increasing trend in the numbers of this type of accident.

1.2 Since 1995, every opportunity has been taken by ICAO, international organizations, aircraft manufacturers and the Flight Safety Foundation (FSF) to raise awareness of the CFIT problem and to draw attention to measures available to improve the safety of flight operations. These efforts include promoting implementation of the ICAO provisions, the CFIT prevention programme and the ALAR tool kit. ICAO has circulated State letters, included CFIT on the agenda of many safety seminars and conferences, and published articles in the ICAO Journal.

1.3 ICAO has introduced several provisions related to the prevention of CFIT in its Annexes, Procedures for Air Navigation Services (PANS) and guidance material. Three resolutions (A31-9, A32-15, A33-16), stressing the need to implement ICAO provisions in order to reduce CFIT accidents, were adopted by the ICAO Assembly in 1995, 1998 and 2001 respectively.

1.4 CFIT and approach and landing accidents have caused approximately one third of all passenger fatalities over the past ten years and remain a significant factor in airline accidents.

2. STATISTICAL RECORD – CFIT ACCIDENTS

2.1 The ICAO Accident and Incident Data Reporting (ADREP) System shows that from 1992 to 2003, there was a decreasing trend in the annual total number of fatal accidents involving turbine-powered aeroplanes having a maximum certificated takeoff mass in excess of 5 700 kg used in commercial air transport (Figure 1).

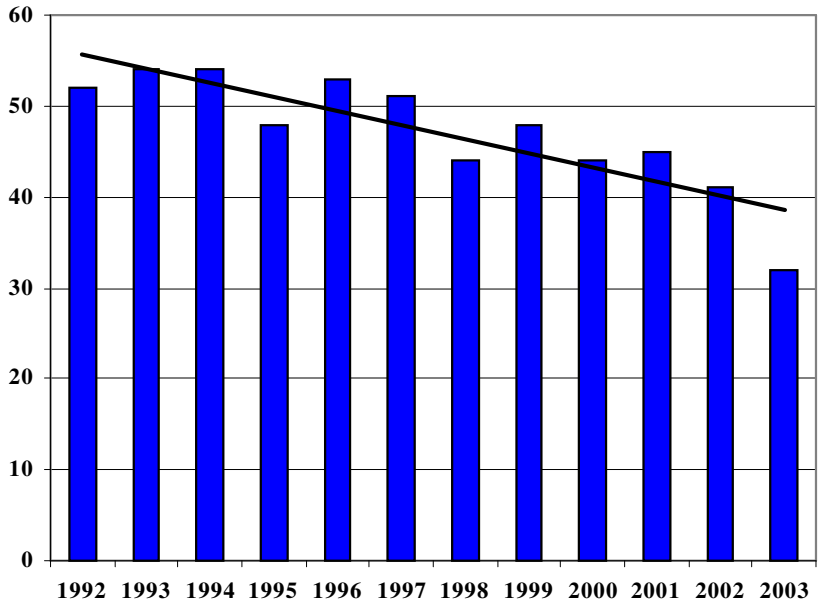

Figure 1
Fatal accidents by year

2.2 However, the ADREP system showed an even more significant decrease in the number of CFIT fatal accidents related to the same category of aircraft, as illustrated in Figure 2. This decrease contributed to the reduction in the total number of fatal accidents.

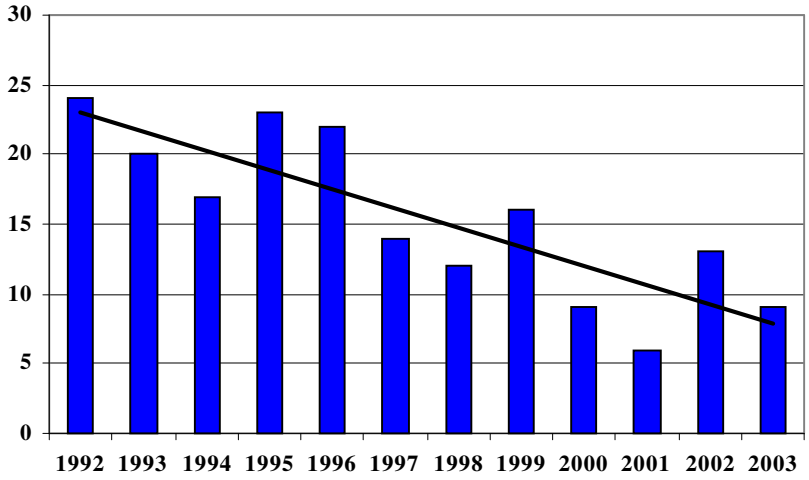

Figure 2
CFIT - Fatal Accidents by year

2.3 The ADREP data also indicated that a high percentage of the CFIT accidents occurred in the approach and landing phases of flight (Figure 3). Therefore, a reduction in the number of approach and landing accidents would be reflected in a reduction of the total number of CFIT accidents.

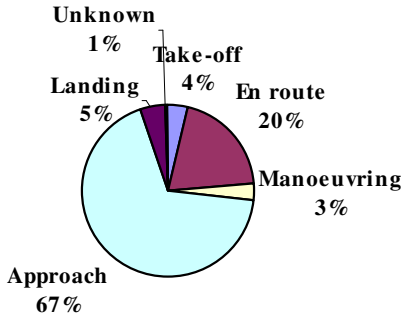

Figure 3

CFIT - Fatal Accidents by flight phases

3. EFFORTS AND ACHIEVEMENTS

3.1 Since 2001, ICAO has introduced several provisions related to the prevention of CFIT in its Annexes and PANS.

3.2 Amendment 52 to Annex 4 — *Aeronautical Charts* , adopted on 7 March 2001, introduced electronic aeronautical charts which are intended to provide flight crews with information related to aircraft position in relation to the surrounding areas in a timely and convenient manner.

3.3 Amendment 26 to Annex 6 — *Operation of Aircraft*, Part I and Amendment 21 to Annex 6, Part II, adopted by Council on 9 March 2001, and Amendment 8 to Annex 6, Part III, adopted by Council on 12 March 2001, introduced new provisions pertaining to approach with vertical guidance (APV) operations so that the intended flight path, as depicted in the published instrument approach procedure, would be maintained without excessive vertical manoeuvring. This allows for the conduct of stabilized approaches rather than the step-down technique, which has been a causal factor in many CFIT accidents.

3.4 On 29 June 2001, the Council approved the 14th edition of the *Procedures for Air Navigation Services — Air Traffic Management* (Doc 4444, PANS-ATM), introducing provisions for the Minimum Safe Altitude Warning System (MSAW). MSAW is an effective air traffic control tool assisting in the prevention of CFIT by generating a timely warning of possible infringement of a minimum safe altitude.

3.5 On 29 June 2001, the Council approved Amendment 11 to the *Procedures for Air Navigation Services — Aircraft Operations,* Volume I — *Flight Procedures* (Doc 8168, PANS-OPS) which included new provisions related to CFIT prevention. These included guidance for pilots to fly a constant approach descent gradient on non-precision approaches; approach procedures with vertical guidance (APV) based on basic GNSS or DME/DME for Baro-VNAV operations and the introduction of human factors elements in standard operating procedures (SOP), checklists and crew briefing. The addition of human factors-related provisions support effective implementation of the technical provisions fostering enhanced situational awareness and organization of tasks, thus contributing to the prevention of CFIT.

3.6 State letter AN 11/37-02/7, dated 31 January 2002, was circulated to Contracting States drawing their attention to elements of Resolution A33-16 on the GASP which address the ICAO Programme for the prevention of CFIT and approach and landing accident reduction (ALAR).

3.7 On 15 March 2002, the Council adopted Amendment 27 to Annex 6, Part I, introducing revised requirements for the ground proximity warning system (GPWS) and forward-looking terrain avoidance function. The amendment extended applicability to include all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers as of 1 January 2007. Also, as of 1 January 2007, piston-engined aeroplanes are required to be equipped with a ground proximity warning system which provides warning of unsafe terrain clearance, excessive descent rate or terrain closure and has a forward looking terrain avoidance function. The revised provisions cover most aeroplanes used in commercial air transport operations.

3.8 On 23 February 2004, the Council adopted Amendment 33 to Annex 15 — *Aeronautical Information Services* introducing new Standards related to the provision and exchange of appropriate, consistent and accurate electronic terrain and obstacle data. Electronic terrain and obstacle data, used in

combination with aeronautical data, will support air navigation applications including, inter alia, GPWS and MSAW systems and will assist in the production of instrument approach procedures, aeronautical charts and on-board databases.

3.9 On 27 April 2004, the Council approved Amendment 13 to PANS-OPS, Volume I to include the procedure altitude concept to facilitate a stabilized descent gradient, and crew briefing guidance that addresses cold temperature correction. Moreover, the Council approved Amendment 12 to PANS-OPS, Volume II to include the procedure altitude concept, a complete revision of Baro-VNAV criteria, and new criteria regarding point in space (PinS) procedures for helicopters.

3.10 On the basis that a large proportion of CFIT accidents occur during the approach and landing phase of flight, ICAO was instrumental in redirecting the efforts of the CFIT Task Force towards the reduction of approach and landing accidents under the direction of a CFIT/ALAR Action Group (CAAG). The CAAG includes representatives from ICAO, civil aviation authorities, the International Air Transport Association (IATA), aircraft and equipment manufacturers, air operators, pilots' associations and the FSF. The CAAG developed new accident prevention material in the form of an *ALAR Tool Kit*, which also incorporates the main elements of the CFIT prevention material. In October 2001, ICAO had acquired a bulk supply of the CD-ROM version of the *ALAR Tool Kit* and distributed over 7 000 copies worldwide to personnel who could directly contribute to the accident prevention effort.

4. IMPLEMENTATION CHALLENGES

4.1 The amendments to Annex and PANS provisions and ICAO guidance material can only contribute to reduce the number of CFIT accidents when implemented by States and air operators. According to the information currently available, no aircraft equipped with a ground proximity warning system having a forward looking terrain avoidance function has been involved in a CFIT accident. Despite the fact that the ADREP system has shown a significant decrease in the number of CFIT fatal accidents, CFIT is still a major cause of fatalities and States should take all necessary measures to implement the ICAO provisions, particularly those concerning the equipage of GPWS having a forward looking terrain avoidance function, and the design and implementation of non-precision instrument approaches with stabilized descent gradients and approaches with vertical guidance (APV).

4.2 The ICAO safety oversight audit results indicate that the GPWS requirements have been implemented by only 75 per cent of the audited States. Prompt implementation of ICAO provisions is a paramount factor in the achievement of a further reduction in the number of CFIT accidents. ICAO should closely monitor implementation of all CFIT prevention related provisions as part of its regular activities, including through regional offices.

4.3 The CAAG conducts workshops in which participants review regional safety statistics and discuss the effective use of the *ALAR Tool Kit* elements. In these workshops, State authorities, industry organizations and air operators familiar with the approach and landing accident trends in their particular regions are encouraged to form and support implementation teams.

5. FUTURE WORK

5.1 The United States Federal Aviation Administration, through the Commercial Aviation Safety Team (CAST) programme and the European Joint Aviation Authorities, through the Joint Safety Strategy Initiative (JSSI), work on the identification of new risks and related safety enhancement measures. ICAO will continue to work with CAST and JSSI, and participate in other industry and government safety initiatives.

5.2 ICAO will continue developing procedures and obstacle clearance criteria based on RNAV systems as well as obstacle clearance criteria for vertical navigation in all phases of flight. ICAO will also examine current safety initiatives to determine their global perspective and likely impact on safety and decide whether they should be proposed for inclusion in the ICAO provisions in order to further reduce the number of CFIT and approach and landing accidents.

5.3 In addition, ICAO will, with the implementation of the unified strategy to resolve safety-related deficiencies, assist State authorities in their efforts to reduce CFIT accidents, and closely monitor implementation of all CFIT prevention related provisions. Details concerning the unified strategy are presented to the Assembly in A35-WP/63. ICAO will also continue supporting ALAR workshops.

6. FINANCIAL IMPACT[1]

6.1 ICAO will monitor implementation of CFIT prevention related provisions, progress future work, and support ALAR workshops as possible within the resources available under major programme II of the draft Programme Budget for 2005-2007.

7. ACTION BY THE ASSEMBLY

7.1 The Assembly is invited to:

a) note that despite the reduction of the number of CFIT accidents, CFIT and approach and landing accidents remain a significant factor in airline accidents;

b) note the progress of the ICAO programme for the prevention of CFIT and ALAR provided in this paper; and

c) urge States to implement CFIT prevention-related provisions, particularly those related to the equipage of GPWS having a forward-looking terrain avoidance function, the design and implementation of approaches with vertical guidance (APV) and the provision of electronic terrain and obstacle data.

—END —

[1] This information is presented only to indicate the estimated financial impact of the proposed action. The funds allocated to this proposed action will depend upon the final form of the Programme Budget of the Organization for 2005-2006-2007 approved by the Assembly.