



**WORKING PAPER**

**TENTH SESSION OF THE STATISTICS DIVISION**

**Montréal, 23 to 27 November 2009**

**Agenda Item 11: Aircraft accidents and safety analysis**

**AIRCRAFT ACCIDENTS AND SERIOUS INCIDENTS**

(Presented by the Secretariat)

**SUMMARY**

Currently, ICAO endorses the use of ECCAIRS by Contracting States to capture accident and incidents data. The coverage of accidents and serious incidents not officially reported to ICAO by the States of occurrence averages around 32 per cent. Consequently, data pertaining to fatal accidents, other accidents and serious incidents are collected from other sources like media, industry, insurance data etc. Serious incidents data are more difficult to gather from other sources and ICAO is dependent on incident information being reported by the Contracting States. Incidents data are critical for the safety analysis function and process of ICAO. In order to increase the coverage of notification and reporting of accidents and serious incidents, to facilitate the verification and validation of the ADREP database and improve the safety analysis function the Fourteenth Meeting of the Statistics Panel (STAP/14) recommended the introduction of a new Air Transport Reporting Form (Form GS) to collect civil aircraft accidents and serious incidents on an annual basis.

Action by the division is in paragraph 4.

**1. INTRODUCTION**

1.1 Aircraft accident and serious incident data are collected under the work programme of the Air Navigation Bureau (ANB). This paper examines the existing methodology of collecting accident and serious incident data and the need to introduce a new Air Transport Reporting Form to capture aircraft accidents and serious incidents<sup>1</sup>

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<sup>1</sup> Accidents and Serious Incidents as defined in Annex 13 to the Convention on International Civil Aviation are shown in Appendix A.

## 2. CURRENT AIRCRAFT ACCIDENTS REPORTING SYSTEM

2.1 The technical work programme of ANB has several mandates, and the main items covered which are relevant to this paper are:

- a) analyzing accident and serious incident data;
- b) providing annual briefing to the Air Navigation Commission (ANC) on accident trends and risk assessment;
- c) facilitating the international exchange of aviation safety data;
- d) providing guidance to States on collection and analysis of accident and incident data;
- e) maintaining the Accident/Incident Reporting (ADREP) System.

In order to achieve the main objectives of the ANB programme, item e) above is of significance.

2.2 The requirements for notification and reporting of accidents and serious incidents to ICAO are summarized in Attachment B of Annex 13 – *Aircraft Accident and Incident Investigation*. The State of occurrence shall notify ICAO of all accidents and serious incidents involving aircraft with maximum take-off mass (MTOM) above 2 250 kg. The State of occurrence shall forward a preliminary ADREP report to ICAO within thirty days of the date of the accident and a data ADREP report shall be forwarded to ICAO as soon as possible after the accident investigation is finalized. The Annex also requires an ADREP report for incidents to aircraft with MTOM above 5 700 kg if they were investigated. The final report of the investigation compiled by the State of occurrence shall also be forwarded to ICAO the same way.

2.3 The reporting may either be carried out by means of a paper-based ADREP reporting system or submitted electronically. Towards this end, an increasing number of States are utilizing the European Co-Ordination Centre for Aviation Incident Reporting Systems (ECCAIRS) software to report electronically to the ICAO ADREP system. Although the use of the ECCAIRS software is encouraged, States may use any type of system to collect and analyze their safety data as long as it is compatible with the ADREP taxonomy to facilitate the exchange of safety data globally. The ECCAIRS software was developed by the European Joint Research Centre and is available to all Contracting States at no cost.

### 2.4 Users of data and Reporting Coverage

2.4.1 Contracting States, ICAO Secretariat, aircraft manufacturers, universities, fleet operators, airport authorities and aviation consultants are some of the major users of the products of the data.

2.4.2 On average, 32 per cent of accidents are not officially reported to ICAO by the States of Occurrence. Data pertaining to most of the fatal accidents as well as a large number of other accidents and even some serious incidents, are collected from other sources, for example the media, industry, insurance data, etc. However, serious incidents data are much more difficult to gather from other sources and ICAO is much more dependent on the States to report serious incidents to the ADREP system. It is thus difficult to determine the number of serious incident reports which do not reach ICAO.

### **3. NEW REPORTING FORM PROPOSAL**

#### **3.1 Previous ICAO Air Transport Reporting Form G (Aircraft Accident Data)**

3.1.1 The ICAO Statistics Programme used Air Transport Reporting Form G (see Appendix B) to collect aircraft accident data (not serious incident data) for aircraft with a MTOM above 5 700 kg in a detailed format (in Part I) and for aircraft less than 5 700 kg MTOM in a summary manner (in Part II). Until 1994, reporting accidents for aircraft above 2 250 kg to 5 700 kg MTOM (included in Part II), was only a recommended practice and, hence, Form G was used to complement the data collected by the ADREP programme. However, since November 1994, the requirement to report accidents above 2 250 kg MTOM has become a standard (Chapter 6, Annex 13). In view of this, it was felt that the need for information required to publish accident data and the accident rates could be met by the data collected under the provisions of the ADREP system. Accordingly, based on the recommendation of Ninth Session of the Statistics Division in 1997, the Form G (Air Transport Reporting Form: Aircraft Accidents) was discontinued. Prior to the discontinuation of the reporting form, an average of between 75-120 forms were processed annually (please note that if no accidents had occurred often no form was submitted).

#### **3.2 Introduction of a summary data collection of accident and serious incident data**

3.2.1 The new Air Transport Reporting Form GS is presented in Appendix C. The new form envisages collection of summary data of aircraft accidents and serious incidents based on the preliminary and data reports required for ADREP reporting. The form is required to be submitted on an annual basis before 5 February of the subsequent year. It is designed in a simple format and follows well established taxonomies and definitions enshrined in the ADREP-Taxonomy<sup>2</sup>, which Contracting States are already familiar with. The new form will not adversely impact reporting, since the ADREP reporting requirements will continue in the existing format.

#### **3.3 Data collection and reporting proposal**

3.3.1 The new Form GS will be available in a web layout in the ICAO Secure Site for quick transmittal of data by Contracting States. It will have inbuilt verification and validation controls in line with Annex 13, the ADREP taxonomy and other reference tables of the ISDB. For States having difficulty in transmitting data through the internet, the forms in excel format could be sent by email to the ICAO Secretariat. The reporting of collected data will mirror the present reporting of ADREP data and hence confidentiality will not be compromised.

#### **3.4 Benefits of new Air Transport Reporting Form GS**

3.4.1 Some of the benefits of this proposed Form GS would be:

- *Increase the coverage of notification and reporting of accidents and serious incidents*

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<sup>2</sup> ADREP 2000 Taxonomy document available in <http://www.icao.int/anb/aig>. This page contains Standards as defined by an International Working Group Chaired by ICAO and implemented in Version 4.2.6 of ECCAIRS – the Accident and Incident Reporting System that Contracting States are familiar with.

- *Further Improve the safety analysis function*<sup>3</sup>
- *Verification and validation checks on the ADREP database.*

In addition, the collection of summary data will assist in providing more accurate safety indicators (shown in Appendix D) as part of the High Level Indicators used by the Council to determine the Organization's overall progress towards achievement of its Strategic Objectives. Studying trends and occurrence categories of accidents and serious incidents with a wider coverage will result in further improvement to the safety analysis function facilitating the monitoring of the safety objective of ICAO, the Contracting States and other stakeholders.

3.4.2 States not sending notifications of accident and serious incidents, as per the requirements of Annex 13, is an issue that is of significance to the State's safety programme and ICAO. It is critical that States have the mechanism and discipline to record and capture occurrences as it will facilitate their own safety analysis and planning decisions.

3.5 *Recommendation of the Fourteenth Meeting of the Statistics Panel (STAP/14-13).* The panel was in agreement that the collection and analysis of accidents and serious incidents data was integral to the activities of the Organization towards achieving its strategic objectives of safety as well as that of the Contracting States and other stakeholders. Hence it recommended the introduction of Air Transport Reporting Form GS, (shown in Appendix C) to collect data of civil aircraft accidents and serious incidents on a yearly basis.

#### 4. ACTION BY THE DIVISION

4.1 The division is invited to recommend that ICAO introduce Air Transport Reporting Form GS - *Accidents and serious incidents of civil aircraft – Commercial operators* (as shown in Appendix C) to be submitted by Contracting States on a yearly basis.

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<sup>3</sup> Some of the Safety Analysis function as done by the Economic Analyses and Databases Section of the Air Transport Bureau are shown in Appendix D

## APPENDIX A

### INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

#### CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for Aircraft Accident and Incident Investigation, they have the following meaning:

**Accident.** An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

- a) a person is fatally or seriously injured as a result of:
  - being in the aircraft, or
  - direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
  - direct exposure to jet blast,

*except* when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

- b) the aircraft sustains damage or structural failure which:
  - adversely affects the structural strength, performance or flight characteristics of the aircraft, and
  - would normally require major repair or replacement of the affected component,

*except* for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

- c) the aircraft is missing or is completely inaccessible.

*Note 1.— For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.*

*Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.*

**Accredited representative.** A person designated by a State, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State.

**Adviser.** A person appointed by a State, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

**Aircraft.** Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

**Causes.** Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident.

**Flight recorder.** Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

*Note.— See Annex 6, Parts I, II and III, for specifications relating to flight recorders.*

**Incident.** An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

*Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual (Doc 9156).*

**Investigation.** A process conducted for the purpose of accident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations.

**Investigator-in-charge.** A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

*Note.— Nothing in the above definition is intended to preclude the functions of an investigator-in-charge being assigned to a commission or other body.*

**Maximum mass.** Maximum certificated take-off mass.

**Operator.** A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

**Preliminary Report.** The communication used for the prompt dissemination of data obtained during the early stages of the investigation.

**Safety recommendation.** A proposal of the accident investigation authority of the State conducting the investigation, based on information derived from the investigation, made with the intention of preventing accidents or incidents.

**Serious incident.** An incident involving circumstances indicating that an accident nearly occurred.

*Note 1.— The difference between an accident and a serious incident lies only in the result.*

*Note 2.— Examples of serious incidents can be found in Attachment C of Annex 13 and in the Accident/Incident Reporting Manual (Doc 9156).*

**Serious injury.** An injury which is sustained by a person in an accident and which:

- a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or

- b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
- c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or
- d) involves injury to any internal organ; or
- e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or
- f) involves verified exposure to infectious substances or injurious radiation.

**State of Design.** The State having jurisdiction over the organization responsible for the type design.

**State of Manufacture.** The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

**State of Occurrence.** The State in the territory of which an accident or incident occurs.

**State of the Operator.** The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

**State of Registry.** The State on whose register the aircraft is entered.

*Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of Inter-national Air Transport (Doc 9587).*

## ATTACHMENT C. LIST OF EXAMPLES OF SERIOUS INCIDENTS

1. The term “serious incident” is defined in Chapter 1 as follows:

**Serious incident.** An incident involving circumstances indicating that an accident nearly occurred.

2. The incidents listed are typical examples of incidents that are likely to be serious incidents. The list is not exhaustive and only serves as guidance to the definition of serious incident.

Near collisions requiring an avoidance manoeuvre to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate.

Controlled flight into terrain only marginally avoided.

Aborted take-offs on a closed or engaged runway, on a taxiway<sup>1</sup> or unassigned runway.

Take-offs from a closed or engaged runway, from a taxiway<sup>1</sup> or unassigned runway.

Landings or attempted landings on a closed or engaged runway, on a taxiway<sup>1</sup> or unassigned runway.

Gross failures to achieve predicted performance during take-off or initial climb.

Fires and smoke in the passenger compartment, in cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents.

Events requiring the emergency use of oxygen by the flight crew.

Aircraft structural failures or engine disintegrations not classified as an accident.

Multiple malfunctions of one or more aircraft systems seriously affecting the operation of the aircraft.

Flight crew incapacitation in flight.

Fuel quantity requiring the declaration of an emergency by the pilot.

Runway incursions classified with severity A. The *Manual on the Prevention of Runway Incursions* (Doc 9870) contains information on the severity classifications.

Take-off or landing incidents. Incidents such as under-shooting, overrunning or running off the side of runways.

System failures, weather phenomena, operations outside the approved flight envelope or other occurrences which could have caused difficulties controlling the aircraft.

Failures of more than one system in a redundancy system mandatory for flight guidance and navigation.

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APPENDIX B

FORM G

INTERNATIONAL CIVIL AVIATION ORGANIZATION  
 AIR TRANSPORT REPORTING FORM  
 AIRCRAFT ACCIDENTS

Note: Report all accidents involving civil aircraft registered in your country  
 If there are no accidents to be reported, write NO REPORTABLE  
 ACCIDENTS in Part I and/or Part II as applicable.

PART I - ACCIDENTS INVOLVING AIRCRAFT WITH MAXIMUM TAKE-OFF WEIGHT (MTOW) OF 5 700 kg (12 500 lb) AND OVER

Report each accident separately in the columns below. Use additional forms if necessary.

Information for Each Accident	A. Date of Accident			B. Date of Accident			C. Date of Accident			D. Date of Accident			E. Date of Accident		
	Day	Month	Year	Day	Month	Year	Day	Month	Year	Day	Month	Year	Day	Month	Year
1. Make and model of aircraft 2. Name of operator 3. Is the above a commercial air transport operator? (Yes or No) 4. Location of accident: a) Country b) Place 5. Type of flight operation (when accident occurred) a) Domestic or international flight b) Scheduled or Non-scheduled transport flight c) Other flight (specify kind of flight if "Other") 6. Crew members a) Total of aircraft b) Number killed c) Number seriously injured 7. Passengers a) Total of aircraft b) Number killed c) Number seriously injured 8. Accident victims not on the aircraft a) Number killed b) Number seriously injured															

PART II - SUMMARY OF ACCIDENTS INVOLVING AIRCRAFT OF LESS THAN 5 700 kg MTOW

Report annual statistics summarized according to the following breakdown.

Description	Aircraft Operated by Commercial Air Transport Operators					Aircraft Operated by All Other Operators	
	2 250 - 5 700 kg MTOW				Less than 2 250 kg MTOW	2 250 - 5 700 kg MTOW	Less than 2 250 kg MTOW
	International scheduled flights	Domestic scheduled flights	Non-Scheduled Transport flights	Other flights	All flights	All flights	
1. Number of accidents: a) Total b) With fatalities							
2. Number of persons killed of which: a) passengers b) crew members c) not on aircraft							
3. Number of persons seriously injured of which: a) passengers b) crew members c) not on aircraft							
4. Number of persons on aircraft a) passengers b) crew members							

Remarks: Include here any unavoidable deviations from reporting instructions.

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APPENDIX C

INTERNATIONAL CIVIL AVIATION ORGANIZATION  
 REPORTING FORM GS  
 ACCIDENT AND SERIOUS INCIDENTS OF CIVIL AIRCRAFT

Contact person: \_\_\_\_\_ State: \_\_\_\_\_  
 Organization: \_\_\_\_\_  
 Tel: \_\_\_\_\_  
 Fax: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

Scheduled operations:   
 Non Scheduled operations:

Year: \_\_\_\_\_

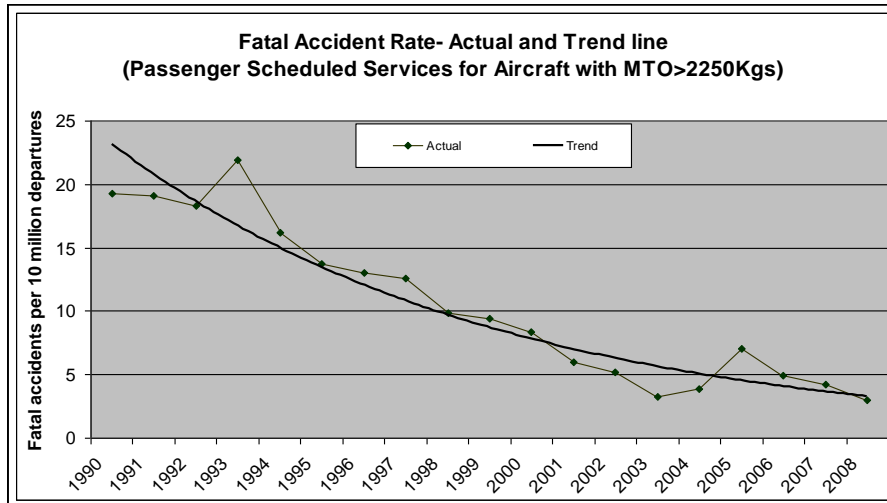
ICAO code	Description	Unit	Aircraft with a MTOM of		Aircraft with a MTOM of	
			2251 - 5700 Kgs	Above 5700 Kgs	2251 - 5700 Kgs	Above 5700 Kgs
			Accidents	Accidents	Serious Incidents	Serious Incidents
	a	b	c	d	e	f
1000	1. TOTAL NUMBER OF ACCIDENTS AND SERIOUS INCIDENTS	number				
1001	2. TOTAL NUMBER OF PASSENGER FATALITIES	number				
1002	3. TOTAL NUMBER OF CREW FATALITIES	number				
1003	4. TOTAL NUMBER OF ACCIDENTS AND SERIOUS INCIDENTS NOT REPORTED TO ICAO YET AS PER ANNEX 13	number				
	5. SEGMENTATION BY MAJOR OCCURRENCE CATEGORIES					
1004	1. ADRM: Aerodrome	number				
1005	2. AMAN: Abrupt manoeuvre	number				
1006	3. ARC: Abnormal runway contact	number				
1007	4. ATM: ATM/CNS	number				
1008	5. CABIN: Cabin safety events	number				
1009	6. CFIT: Controlled flight into or toward terrain	number				
1010	7. EVAC: Evacuation	number				
1011	8. F-NI: Fire/smoke (non impact)	number				
1012	9. F-POST: Fire/smoke (post-impact)	number				
1013	10. FUEL: Fuel Related	number				
1014	11. GCOL: Ground Collision	number				
1015	12. ICE: Icing	number				
1016	13. LALT: Low altitude operations	number				
1017	14. LOC-G: Loss of control - ground	number				
1018	15. LOC-I: Loss of control - inflight	number				
1019	16. MAC: AIRPROX/near miss/midair collision	number				
1020	17. RAMP: Ground Handling	number				
1021	18. RE: Runway excursion	number				
1022	19. RI-A: Runway Incursion - Animal	number				
1023	20. RI-VAP: Runway Incursion - vehicle, a/c or person	number				
1024	21. RI-O: Runway Incursion - other	number				
1025	22. SCF-NP: System/component failure or malfunction [non-power]	number				
1026	23. SCF-PP: powerplant failure or malfunction	number				
1027	24. SEC: Security related	number				
1028	25. TURB: turbulence encounter	number				
1029	26. USOS: Undershoot/overshoot	number				
1030	27. WSTRW: Windshear or thunderstorm	number				
1031	28. OTHR: Other	number				
1032	29. UNK: Unknown or undetermined	number				
3000	Total of Occurrence Categories	number				

Reporting Instructions:

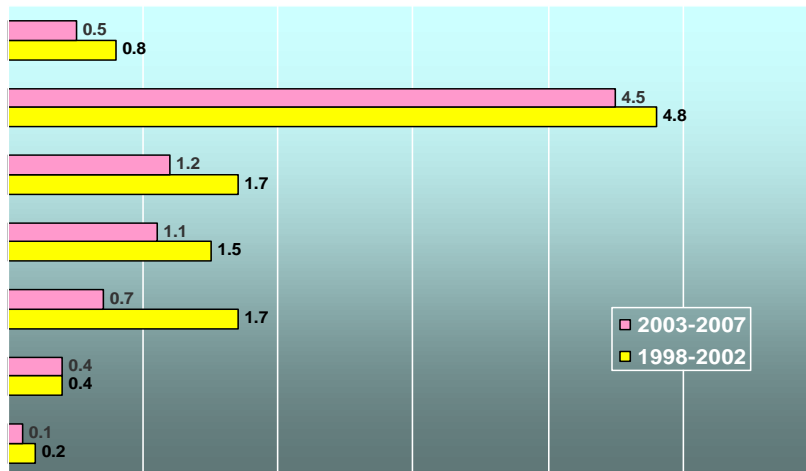
- This form is to be filed by Contracting States in respect of all accidents and serious incidents before 5 February of the subsequent year.
- Occurrence Category reporting should confirm to ADREP 2000 Taxonomy format as indicated in Rows 1004-1032 of the Form.
- Row 3000 should equal Row 1000
- Tick the Appropriate Box on the Top Right Side i.e. if you are reporting Occurrences for Scheduled operations tick Scheduled Operations and if reporting occurrences for Non Scheduled Operations tick the box for Non Scheduled Operations.

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**APPENDIX D**

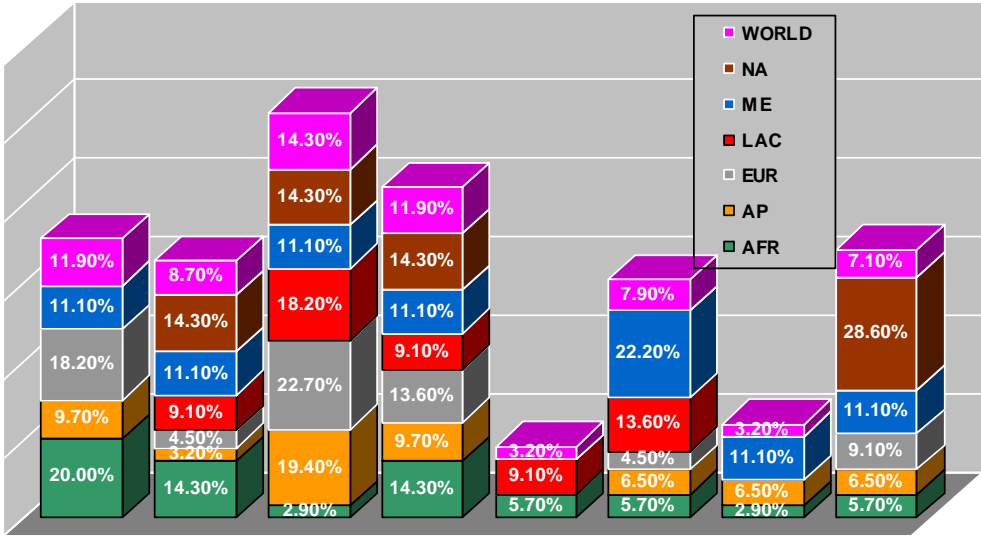


**Accident Rate  
 Fatal Accidents - Scheduled Operations by Region**



**Appendix C (Contd/-)**

**Regional Distribution of major Occurrence Categories**



— END —