International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Fifth Meeting of the Air Traffic Management / Communications, Navigation and Surveillance Subgroup (ATM/CNS/SG/5) - ATM Committee
Lima, Peru, 13-17 November 2006

Agenda Item 1: RVSM Operational use in the CAR/SAM Regions

SUMMARY OF THE ACTIVITIES OF THE GRUPO DE TRABAJO DE ESCRUTINIO (GTE)

(Presented by Rapporteur)

SUMMARY

This working paper summarizes the activities of the Grupo de Trabajo de Escrutinio (GTE).

1. Introduction

1.1 The purpose of this paper is to summarize the activities of the Grupo de Trabajo de Escrutinio (GTE).

2. Background

2.1 Experience has shown that large height deviations (LHDs) of 90m (300ft) or greater in magnitude have had significant influence on the outcome of safety assessments before and after the implementation of RVSM

2.1.1 As outlined in the ICAO Doc 9574, "Manual on the Implementation of 300m (1,000 ft) Vertical Separation Minimum Between FL290 and FL410, Inclusive", one of the primary duties of a Regional Monitoring Agency (RMA) is to monitor the level of risk of collision as a consequence of operational errors and in-flight contingencies resulting in large height deviations.

2.1.2 The Ninth Meeting of Air Traffic Management Authorities and Planners (AP/ATM/9) analyzed a proposal to institute a scrutiny group for the CAR/SAM region. The Meeting agreed to the proposal (Conclusion AP/ATM/9/7) and the ACG/6 of GREPECAS established a scrutiny group, Grupo de Trabajo de Escrutinio (GTE), to analyze LHD events. The Terms of Reference are included in **Appendix A.**

2.1.3 During the AP/ATM/10, with the participation of the States/Territories/International Organizations listed in the terms of reference, the Scrutiny Group members were identified. The Group is composed of subject matter experts in air traffic control, aircraft operation and maintenance, operational pilot groups, regulation and certification, data

analysis, and risk modeling from the involved regions.

2.1.4 The objectives of the Group are to: establish a mechanism for collection, collation and analysis of all reports of height deviations of 90m (300ft) or greater; determine, wherever possible, the root cause of each deviation together with its size and duration; calculate the frequency of occurrence; assess the overall risk (technical combined with operational) in the system against the overall safety objectives and, initiate remedial action as required.

2.1.5 The Group should meet regularly to accurately analyze reports of large height deviations, assess risk, identify trends and recommend remedial actions.

3. Discussion

3.1 In conjunction with the ATM Authorities and Planners workshops, the GTE conducted three meetings since its inception.

3.2 During the first meeting, the groups, analyzed the best way of classifying LHDs, estimating the time spent by an aircraft in a wrong flight level, as well as the number of flight levels crossed without ATC clearance. The groups agreed to the proposal included in **Appendix B**.

3.2.1 The Group applied the new methodology to large height deviation reports submitted to CARSAMMA. When analyzing reports of large height deviations the primary concern of the GTE is the impact of such events on the collision risk and on the overall safety of the system. Therefore data collected by the GTE is used for analysis purposes only and all LHD events reviewed by the GTE are confidential and de-identified

3.2.2 Additionally, LHD reports submitted to CARSAMMA typically lack the clarity of information that would be desirable in this process. Thus, the experience of the members of the Scrutiny Group is essential to provide in depth analysis of each event. The Group recommended that the States/Territories/International Organizations of the Regions encourage complete and accurate reporting.

3.2.3 A review of the data revealed that errors in ATC-unit-to-ATC-unit traffic coordination messages generated 86% of the large height deviations in excess of 1000 feet reported in the Regions. The meeting recognized that large height deviations caused by errors in ATC-unit-to-ATC-unit coordination messages during the process of traffic coordination required urgent action by ATS providers and that some remedial action had to be taken to reduce the number of errors in this category.

3.2.4 The GREPECAS/13 felt that errors in the ATS coordination loop had a direct impact on safety. In order to drastically and significantly reduce the occurrence of this type of error, the CAR/SAM States/Territories/International Organizations should commit to the urgent adoption of the measures referred to in the following conclusion:

CONCLUSION 13/61: MEASURES TO REDUCE OPERATIONAL ERRORS IN THE ATC COORDINATION LOOP BETWEEN ADJACENT ACCs

That, taking into account the impact that operational errors in the ATC coordination loop between adjacent ACCs have on safety, the CAR/SAM States/Territories/International Organizations agree:

a. to adopt, as a matter of urgency, the appropriate measures described in Appendix A1 to this part of the Report, in order to reduce LHDs caused by errors in ATC-unit-to-ATC-unit traffic coordination messages by at least 50% by ***December 2005****, with a view to reaching the optimum operational efficiency;*

b. to continue with the efforts and programmes in order to reach 100% operational efficiency of their ATC coordination; and

c. that ICAO coordinate, assist in, a follow-up the implementation of such remedial action and report the results of the effort to reduce this error to the 6th Meeting of the ATM Committee.

3.2.5 In addition to the aforementioned conclusion, the GTE proposed the following recommendations:

That States/Territories/International Organizations do their utmost to send to CARSAMMA the LHD reports by the 10th of each month, even if no deviations have occurred.

That States/Territories/International Organizations, when completing the LHD form, fill in all the fields in order to permit an adequate analysis and the determination of the time spent by the aircraft in a wrong flight level or altitude.

That all large height deviation reports submitted to CARSAMMA are confidential, containing only de-identified data.

3.3 The second meeting of the Scrutiny Group revealed that, for the second time, the vast majority of the LHDs reported are caused by errors due to ATC-unit-to-ATC-unit coordination message – Code M. The meeting agreed to urge all States, Territories and International Organizations to apply measures contained in the Error Prevention Programme in the Communications between adjacent ACCs. GREPECAS Conclusion 13/61 and the Error Prevention Programme are included in **Appendix C.**

3.3.1 In an effort to acquire a complete synopsis of each reported LHD event, the GREPECAS/13 reviewed and accepted an easier to use Altitude Deviation reporting form. The new form is included in **Appendix D.**

3.4 The GTE reconvened for the third time and reviewed Large Height Deviation Reports submitted to CARSAMMA and noted that for the third Meeting in a row the primary cause of reported LHDs in the CAR/SAM Regions is category “M”, Error in ATC-unit-to-ATC-unit coordination messages and supported the suggested actions which apply to ATC loop errors with the following actions as short and mid-term solutions:

Actions suggested as short-term solution

a. That States, Territories and International Organizations continue their excellent compliance with the LHD requirements to report to CARSAMMA on a monthly basis, and

b. That States, Territories and International Organizations distribute a copy of category “M” error messages (ATC-unit-to-ATC-unit in coordination messages) and category “N” messages (No ATC unit coordination

message was received) to the adjacent ACC involved in addition to CARSAMMA.

c. When a trend is identified from shared reports, the States, Territories, and International Organizations shall share information and shall meet on a bilateral basis to develop a solution to the cause of the identified LHD.

d. Because some ACCs adjoin international oceanic airspace, ICAO NACC and SAM Regional Offices are requested to advise the corresponding adjacent ICAO regional Offices (EUR/NAT, WACAF) that said LHD report will be forthcoming from the adjacent ACC and urge positive interaction with the reporting CAR/SAM unit.

Supported suggested actions as a medium-term solution:

a. In an effort to eliminate the largest contributing LHD error category "M", the solution is to implement a quality management program based upon safety management concepts outlined in Annex 11.

b. The "Progressive implementation of ATS interfacility data communications (AIDC)" will enhance the safety of the airspace and would reduce category "M" errors. However, it is a medium term project incurring a large expense and hereby encourages that the CAR/SAM Regions' States begin arrangements to submit to the World Bank an application for sufficient monies to enhance such implementation systems. The Meeting recalled that the AIDC is seen within the Automation Task Force Program and therefore is not required another action at this point

3.4.1 A summary of event categorizations is included in **Appendix E**.

3.5 States/Territories/International Organizations have demonstrated enthusiasm, support and dedication for the continuation of the GTE activities. However, past scheduled GTE meetings revealed conflicts with concurrent meetings thus limiting GTE membership participation. Additionally, a significant portion of each GTE meeting is allotted to a review of the methodology utilized by the Group therefore reducing the amount of available time to conduct a thorough analysis.

4. Future GTE activities

4.1 In order to ensure that the work of the GTE continues to be of excellent quality, plans are being formulated for training sessions to be conducted in the near future for subject matter experts who are experienced in air traffic management or flight operations in the regions in order to be permanent participants in GTE. In addition, GTE plans to meet in the near future to assess reported large height deviations to continue its work in contributing to the safety of the regions' airspace. The Meeting is encouraged to adopt the following Draft Conclusion:

DRAFT
CONCLUSION ATM/5/XX GTE TRAINING SESSIONS

That, taking into account the need for qualified experts to assist in the activities of the GTE, the CAR and SAM States/Territories/International Organizations agree:

a) to support training sessions on analysis of Large Height Deviations as part of regional SMS activities;

b) to send technical experts to the training sessions with a view to those experts becoming regular participants of the GTE; and

c) that ICAO take the necessary actions to coordinate GTE training sessions in each Region.

5. Suggested Action

5.1 The Meeting is invited to:

a) take note of the information in this Working Paper;

b) support the Draft Conclusion in paragraph 4.1; and

c) promote implementation of an ATM safety culture in accordance with ICAO safety management system provisions

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APPENDIX A

TERMS OF REFERENCE OF THE CAR/SAM RVSM SCRUTINY GROUP (RVSM/GTE)

a. To assemble subject matter experts, as needed, in air traffic control, aircraft operations and maintenance, regulation and certification, data analysis and risk modelling;

b. To analyze and evaluate large height deviations of 300 ft or greater as defined by ICAO Doc 9574;

c. To coordinate the assembly and review of large height deviation data with the Regional Monitoring Agency;

d. To produce an estimate of flight time away from the cleared flying level to be used a primary input in the preparation of an estimate of risk by the Regional Monitoring Agency;

e. To identify large height deviation trends and to recommend remedial actions in order to improve safety;

f. To report results to GREPECAS through the ATM/CNS subgroup;

g. To accomplish other tasks as directed by GREPECAS.

Composition: 1 State/Organization from the CAR Region, 1 State/from the SAM Region, United States, CARSAMMA, COCESNA, IATA, IFALPA, IFATCA.

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APPENDIX B

Description of Criteria

Note: *The following terms, expressions and definitions are not approved by the ICAO's Council and should be used for analysis of Large Height Deviation purpose only.*

Cleared Flight Level – the flight level at which the pilot was cleared or currently operating (eg, Aircrew accepts a clearance intended for another aircraft and ATC fails to capture the read back error or aircrew conforms to a flawed clearance delivered by ATC)

Reference Flight Level – The altitude that would have provided at least the minimum separation (vertical or horizontal) required

That flight level from which the Height Deviation is calculated; this level may be different from the Cleared Flight Level and must often be determined by the Scrutiny Group operational experts from the data in the Large Height Deviation report

Event Flight Level – the flight level of error, the incorrect altitude of operation for an identifiable period of time without having received an ATC clearance

Height Deviation – any altitude variation of 300ft or greater from the assigned altitude, these variations can be the result of turbulence, equipment malfunction, ATC loop errors, etc.

ATC Loop Errors – any incident where there is a misunderstanding between the pilot and the controller, failure to properly coordinate altitude information or unable to maintain situational awareness

Total Deviation – the total amount of feet between the altitudes of current operation prior to the deviation and the point at which the aircraft is once again under ATC supervision, a deviation that resulted in an increase of altitude will be recorded as a positive number, a deviation that resulted in a decrease of altitude will be recorded as a negative number

Hazard Zone – 300ft buffer zone above and below each flight level (Diagram B-1)

Duration - length of time that an aircraft was level at an altitude that was not cleared by air traffic control, duration will be recorded in one second increments (Diagram B-1)

Levels Crossed – the total number of flight levels between the point that the aircraft exits the cleared flight level and is once again under ATC supervision (Diagram B-1)

Levels Final – the cleared flight level after the error/deviation

Code – a category and a subcategory assigned to each event (Diagram B-2)

Rate of Descent		Rate of Climb	
Drift	1000 ft per minute	Minimum	500
Normal	1500+ ft per minute	Normal	750
Rapid	2500+ ft per minute	Expedite	1250

Diagram B-1

RVSM Flight Levels

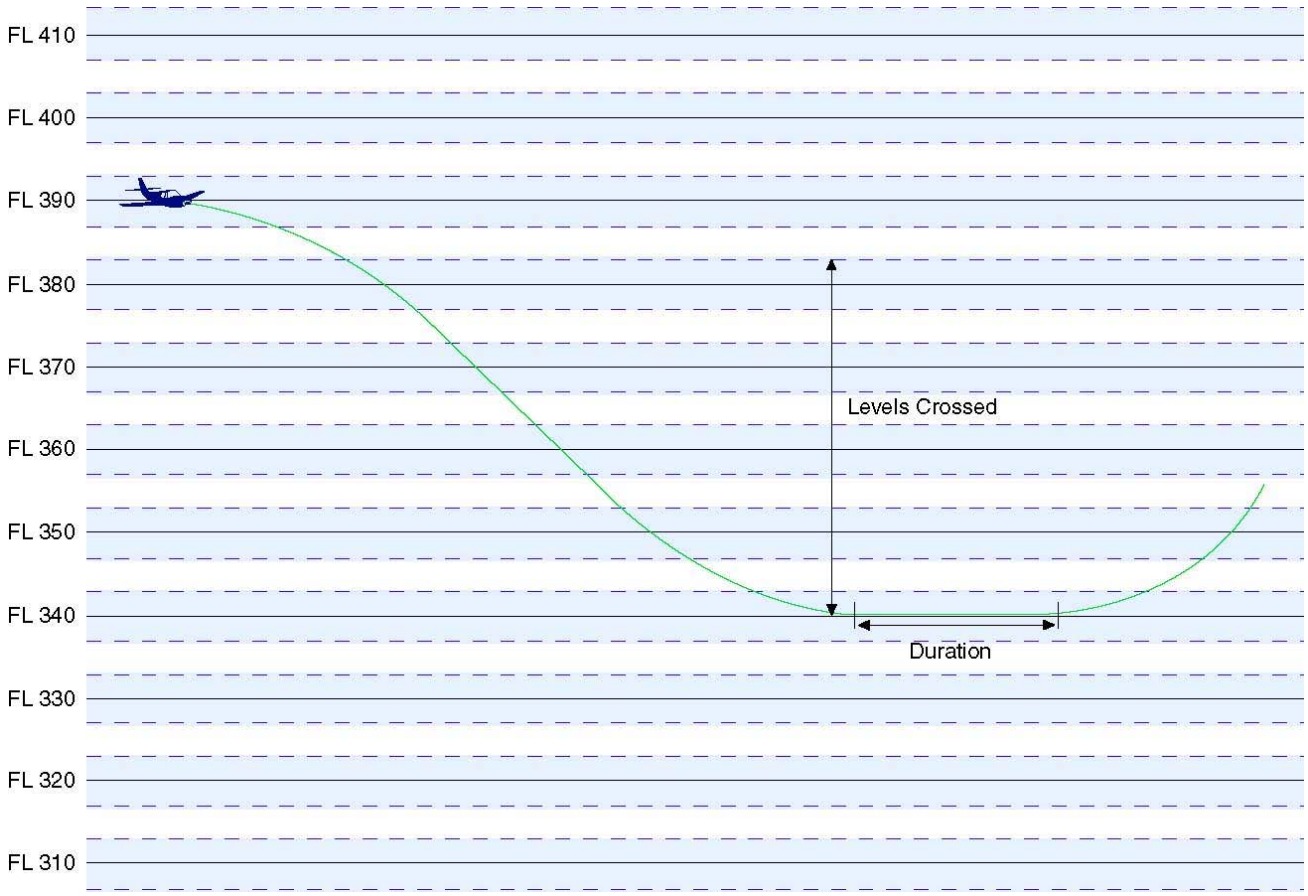

Diagram B-2

Codes for Vertical Errors Used by the CARSAM GTE

Code	Cause of Large Height Deviation
A	Failure to climb/descend as cleared
B	Climb/descend without ATC clearance
C	Entry into airspace at an incorrect flight level
D	Deviation due to turbulence or other weather related cause
E	Deviation due to equipment failure
F	Deviation due to collision avoidance system (TCAS) advisory
G	Deviation due to contingency event
H	Aircraft not approved for operation in RVSM restricted airspace
I	ATC system loop error ; (e.g. pilot misunderstands clearance message or ATC issues incorrect clearance)
J	Equipment control error encompassing incorrect operations of fully functional FMS or navigation system (e.g. by mistake the pilot incorrectly operates INS equipment)
K	Incorrect transcription of ATC clearance or re-clearance into the FMS
L	Wrong information faithfully transcribed into the FMS (e.g. flight plan followed rather than ATC clearance or original clearance followed instead of re-clearance)
M	Error in ATC-unit-to-ATC-unit transition message
N	Negative transfer received from transitioning ATC-unit
O	Other
P	Unknown

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APPENDIX C

GREPECAS CONCLUSION 13/61 AND THE ERROR PREVENTION PROGRAMME

CONCLUSION GREPECAS 13/61 ***MEASURES TO BE ADOPTED TO REDUCE OPERATIONAL ERRORS IN THE COORDINATION LOOP BETWEEN ADJACENT CONTROL CENTRES***

That, taking into account the impact that operational errors in the ATC coordination loop between adjacent ACCs have on safety, the CAR/SAM States/Territories/International Organizations agree:

a) to adopt, as a matter of urgency, the appropriate measures described in Appendix A1 to this part of the Report, in order to reduce LHDs caused by errors in ATC-unit-to-ATC-unit traffic coordination messages by at least 50% by **December 2005**, with a view to reaching the optimum operational efficiency;

b) to continue with the efforts and programmes in order to reach 100% operational efficiency of their ATC coordination; and

c) that ICAO coordinate, assist in, a follow-up the implementation of such remedial action and report the results of the effort to reduce this error to the 6th Meeting of the ATM Committee.

ERROR PREVENTION PROGRAMME IN THE COMMUNICATIONS BETWEEN ADJACENT ACCs

There are many initiatives that can be pursued to prevent operational errors from occurring. However, there are five primary areas, which can directly contribute to its prevention: **communications, phraseology, supervision, teamwork, and ATC proficiency**. In an effort to accomplish the goal of reducing communication errors between adjacent Area Control Centres and thus reduce or minimize the occurrence of large-height deviations, the following objectives should be included in the prevention programme:

The authority shall:

a. identify individual, procedural, and/or equipment deficiencies used in air traffic services;
b. promptly correct individual, procedural, and/or equipment deficiencies which affect coordinations with adjacent and ATS units. This can be achieved through:

- guidance on procedures to be followed;
- implementation of read-back/hear-back programmes;
- training in the filling of LHD forms;
- increase and/or closer monitoring of ATCOs performance;
- immediate coordination programme after a re-authorization or change in flight level;
- changes in procedures and/or corrections/amendments of equipment.

c. communicate performance expectations to ATS supervisors and controllers;
d. ensure the ATS unit maintains a summary of and have information letters on operational errors, causal factors and trends, and incorporate them into training;
e. monitor and evaluate voice recordings (all ATS operational personnel);
f. take initiatives to improve communications among all ATS personnel to create an atmosphere conducive to sharing information;
g. exercise strict monitoring in ATC units;
h. ATS supervisors should:

- communicate performance expectations to controllers, stressing the importance of operational control position discipline, awareness, teamwork, the use of proper phraseology, proper coordination procedures, control position relief briefings and utilization of a position relief checklist;
- take prompt follow-up actions when controller performance does not meet with expectations;
- inform on individual and team accountability, and the consequences for not meeting expectations;
- provide efficient and consistent oversight of the ATS unit operation, and use effective resource management to ensure proper and timely assignment of personnel to promote the safe, orderly, and expeditious handling of air traffic;
- ensure that distractions and noise levels in the ATS unit are kept at a minimum;
- require all personnel to maintain a high degree of professionalism, teamwork, control position discipline, and awareness at all times in the ATS unit environment; and require that each controller knows, applies, and adheres to the appropriate requirements in the performance of his/her operational duties and responsibilities;
- promote an open flow of communications with all ATS personnel, allowing them to provide input to programme;
- place emphasis on hear-back/read-back errors during team meetings.

i. ATC personnel should:

- apply read-back/hear-back procedures when carrying out ATC coordinations;
- keep ATS supervisors advised of traffic problems and equipment limitations; - make suggestions for ATS unit improvements and/or prevention of operational errors;
- maintain situational awareness;
- extend the extra effort to assist busier control position(s);
- continuously review their own operating techniques and ATS unit procedures to effect the highest quality of performance;
- promptly report all ATS incidents to the operational supervisor or other appropriate ATS authority for proper follow-up investigation;
- utilize memory aids.

VOICE RECORDING EVALUATIONS

Voice recording reviews should be conducted to ensure proper phraseology, good operating practices, and adherence to the standards set forth in ICAO provisions, and national/local directives and practices. Voice recording reviews should be conducted as follows:

a. the ATS unit should ensure that voice recording reviews are conducted at least semi-annually on all ATS operational personnel;
b. the ATS supervisor should review the voice recording, document comments and develop an action plan for documenting performance deficiencies; and
c. the ATS supervisor and the controller should review and discuss the voice recording.

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APPENDIX D

CARSAMMA
Caribbean and South American Monitoring Agency

The information contained in this form is confidential and will be used for safety analysis purposes only.

ALTITUDE DEVIATION FORM

Report to the CARSAMMA of an altitude deviation of 300ft or more, including those due to TCAS, Turbulence and Contingency Events

Today's date:	Reporting Unit:		
INCIDENT DETAILS			
Operator Name:	Call Sign:	Aircraft Type:	Mode C Displayed:
Date of Occurrence:	Time UTC:	Occurrence Position (lat/long or Fix):	
Cleared Route of Flight:			
Cleared Flight Level:	Estimated Duration at Incorrect Flight Level (seconds):		Observed Deviation (+/- ft):
Other Traffic Involved:			
Cause of Deviation (*brief title*): (Examples: ATC Loop Error, Turbulence, Weather, Equipment Failure)			

AFTER SEPARATION RESTORED:		
Observed/Reported Final Flight Level*: *Please indicate the source of information – ModeC/Pilot	Mark the appropriate box Is the FL above the cleared level: ❑ Is the FL below the cleared level: ❑	Did this FL comply with the ICAO Annex 2 Tables of Cruising Levels? ❑ Yes ❑ No

NARRATIVE
Detailed Description of Incident (*Please give your assessment of the actual track flown by the aircraft and the cause of the deviation.*)

CREW COMMENTS (IF ANY)

When complete please forward the report(s) to:

Management Center Of Air Navigation Caribbean and South American Monitoring Agency (CARSAMMA)
Av. Brig. Faria Lima, 1941
São José dos Campos, SP
Cep: 12227-000 Brazil
Telephone: (55-12) 3904-5004 or 3904-5010
Fax: (55-12) 3941-7055
E-Mail: carsamma@cgna.gov.br

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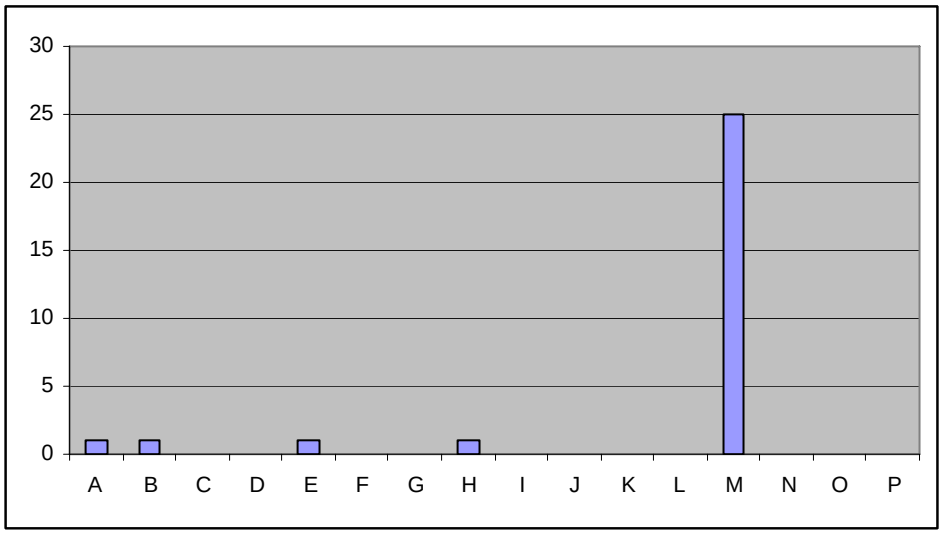
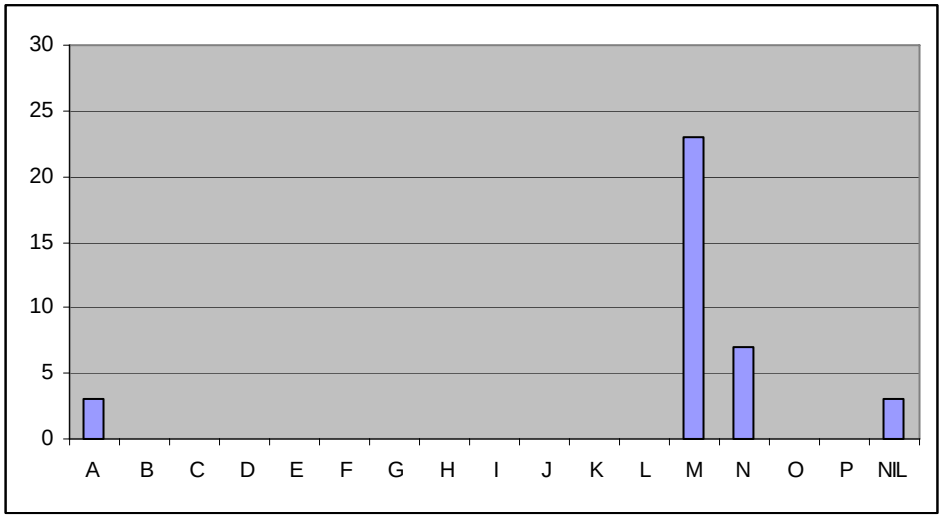
APPENDIX E

SUMMARY OF EVENT CATEGORIZATIONS

Event Categorization for the Period of February 2004 – December 2004



Event Categorization for the Period of January 2005 – December 2005



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