



International Civil Aviation Organization

Fourteenth Meeting of the CAR/SAM Regional Planning and Implementation Group  
(GREPECAS)

San Jose, Costa Rica, 16-20 April 2007

GREPECAS/14-WP/29

**Agenda Item 4: Evaluation of air navigation planning and implementation deficiencies/  
problems in the CAR/SAM Regions**

**PROPOSAL TO ASSIST IN THE RECTIFICATION OF RUNWAY STRIPS AND RUNWAY  
END SAFETY AREAS (RESA) DEFICIENCIES**

(Presented by the United States of America)

**SUMMARY**

In 2004 the *Runway Strips & Runway End Safety Area Task Force*, under AGA/AOP/SG/4 –issued WP/13, dated 03/11/04, that showed the number and causes for non-compliant runway strips and RESAs in the CAR/SAM Regions. Furthermore, WP/13 identified two alternative means for airports that are constrained by land or/and sea environments or located at higher elevations to achieve full or partial compliance with ANNEX 14, Volume I, standards and recommended practices (SARP).

In November 2006, WP/15 to AGA/AOP/SG/5 informed the members of the Montreal Secretariat proposal that dimensions for RESA that are only recommended be elevated to the status of full standards. The proposal would require longer and wider RESAs for the vast majority of runways.

In response for achieving the safety enhancements, the CAR/SAM Secretariats, with the agreement of the Runway Strips & Runway End Safety Area Task Force, created a *Special AD Hoc Committee* to develop additional written guidance for DGCAs. The primary tasks are:

- (1) Determine a list of design questions requiring further clarifications by Montreal,
- (2) Identify various alternatives acceptable to Montreal to achieve compliance, and
- (3) Support CAR/SAM DGCAs in the application of the alternatives, i.e., offer assistance.

This WP illustrates the Montreal proposal and the number and causes of non-compliant runway strips and RESAs in the CAR/SAM Regions. It concludes by proposing a Draft Conclusion for Member action.

**REFERENCES**

ANNEX 14, Volume I, Aerodrome Design and Operations, 4<sup>th</sup> edition  
CAR/SAM REGIONAL PLANNING IMPLEMENTATION GROUP (GREPECAS)  
AGA/AOP/SG/3 - WP/3 dated 27/06/03  
AGA/AOP/SG/4 -WP/13, dated 03/11/04  
AGA/AOP/SG/5 – WP/15, dated 22/11/06

## 1. Introduction

1.1 ICAO concentrates its efforts for reducing the risk of damage to an airplane that undershoots, veer-offs, or overruns the runway by requiring prepared protective areas that surround the runway. To achieve this safety goal, Annex 14, Volume I defines the protective areas as the runway strip, the “graded portion” of the runway strip, and the runway end safety area (RESA). Figure 1 illustrates the relationship among these ICAO protective areas which are categorized as *standards*.

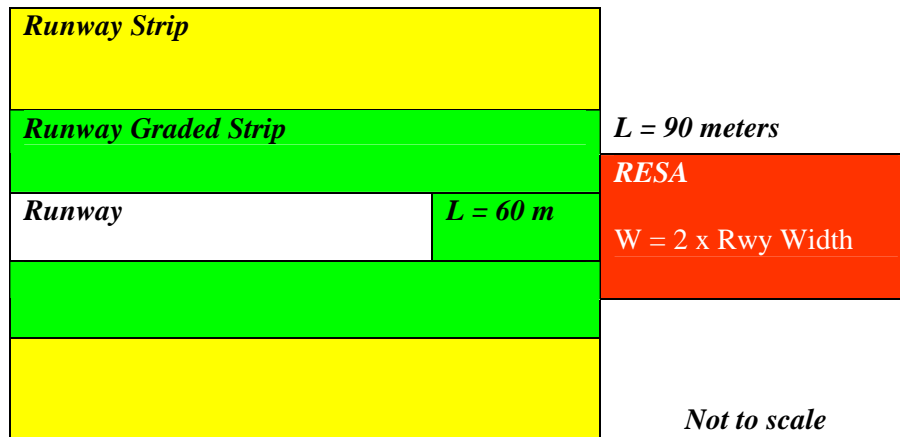


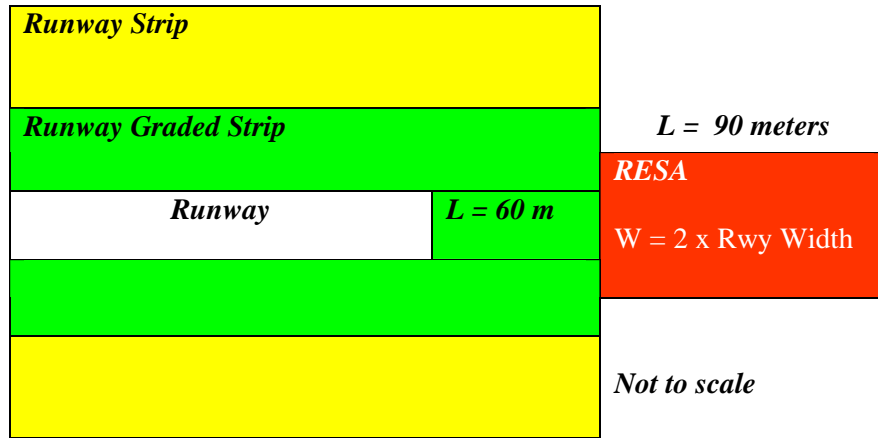
Figure 1 - Schematic of a runway and its runway strip, graded portion of the runway strip, and the runway end safety area (RESA).

- Notes:*
- #1 - Paragraphs 3.4 and 3.5, Annex 14, Volume I provide the dimensional and surface standards and recommended practices.
  - #2 - The length of the runway strip off the runway end for Code 1, non-instrumented runways is 30 meters.
  - #3 - Code 1 and 2 non-instrumented runways are not required to have RESAs.

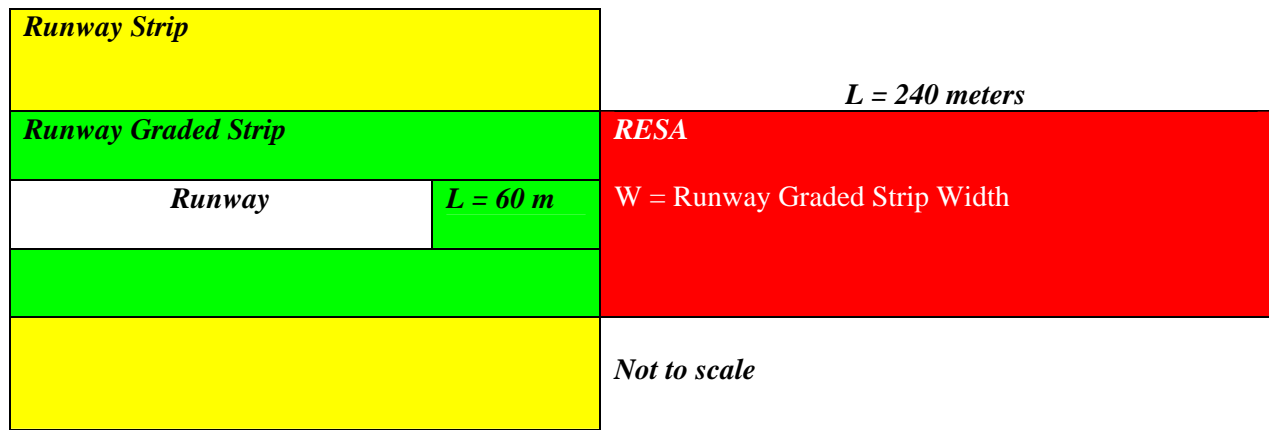
1.2 Appendix A of this WP reproduces the bar graphs from WP/13/AGA/AOP/SG/4 that illustrate the number of and causes for non-compliant RESA and runway strips.

1.3 Appendix B of this WP reproduces the “General Discussion” from WP/13/AGA/AOP/SG/4 that compares the CAR and SAM Regions and indicates the predominant causes for non-compliance.

1.4 In 2005 the ICAO Secretariat delivered a WP to the *Aerodromes Design Working Group (ADWG)* under the Aerodromes Panel that would elevate RESA width and length *recommendations* to the category of full *standard*. Consequently, only those RESAs that are compliant today with the *recommended lengths and widths* will remain compliant. Figure 2, not to scale, illustrates in RED the results of the Montreal proposal.



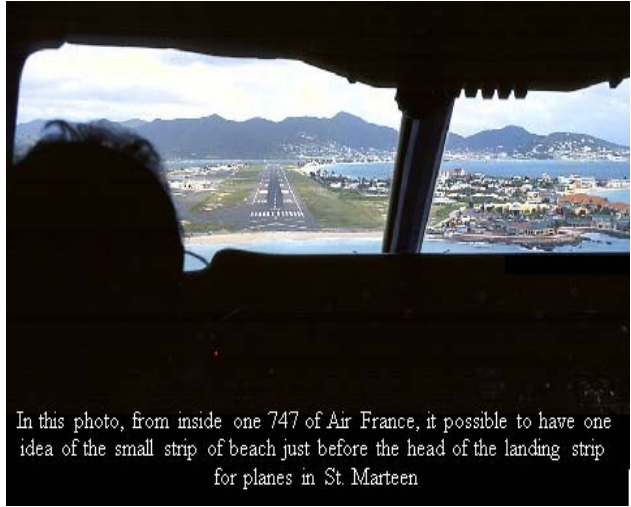
(A) Existing RESA standards



(B) Proposed RESA standards

Figure 2 – Dimensional comparison between existing and proposed RESA dimensions

1.5 Recognizing the extent of non-compliant RESAs and the greater difficulties imposed by the proposed safety enhancement (see figures 3 and 4), ICAO Montreal accepted the position that Member State/Territories could use *alternatives means* to achieve the safety benefits of RESA. Furthermore, ICAO acknowledged the concept of *Engineered Materials Arresting Systems (EMAS)* as a proven method to arrest overruns. Historically, EMAS first appeared in the United States and is now gaining acceptance worldwide (see figures 5 and 6 and IP/###/GREPECAS/14, *Status Of Engineered Materials Arresting Systems Installations In The United States*). However, ICAO and ADWG recognized the substantial costs associated with the installation of EMAS and, are therefore, seeking other *alternative means of compliance*. One alternative in use is the application of *declared distances* to readjust reported runway field lengths, principally ASDA [accelerated-stop distance available] and LDA [landing distance available].



In this photo, from inside one 747 of Air France, it possible to have one idea of the small strip of beach just before the head of the landing strip for planes in St. Marteen



Figure 3 - Flight deck view of the beach view of the landing aircraft on final approach to Runway 09/27 at Saint. Maarten/Philipsburg International Airport of Netherlands Antilles.

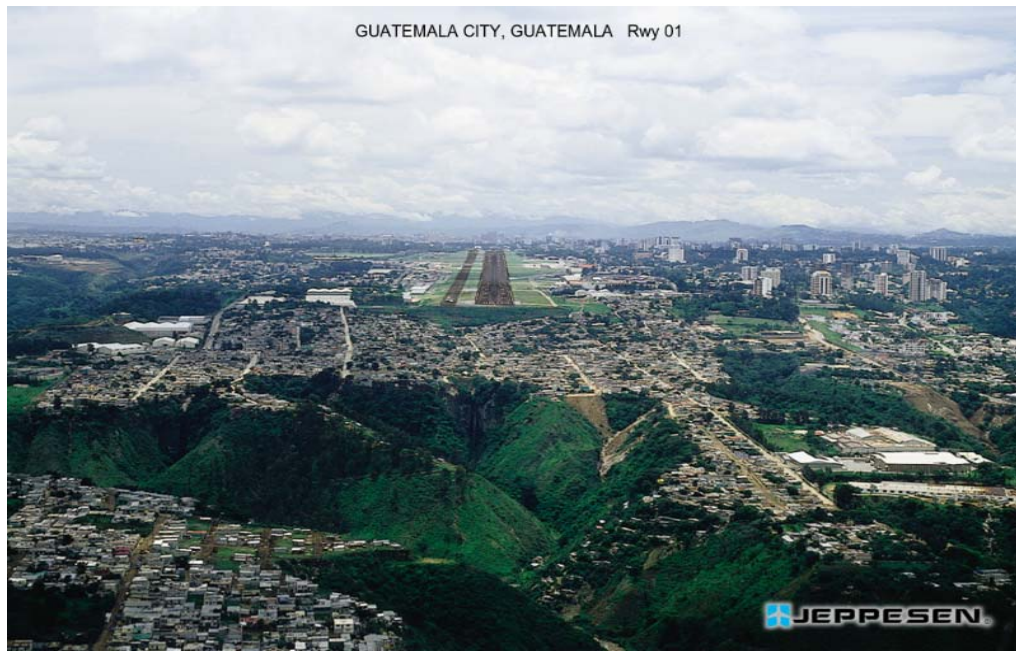


Figure 4 – Steep terrain off Runway 01 at Guatemala City La Aurora International Airport at 1,510 meters above MSL



Figure 5 - Photos of EMAS off Runway 22L at JFK taken the day after the safe arrestment of a SAAB-340 overrun in June 1999 (note the surface area removed to extract the aircraft)



Figure 6 - Aerial photo showing (a) relationship of Hollywood Blvd. off Runway 26 at Burbank Airport, Burbank, California and (b) EMAS installation awaiting chevron-markings

## 2. Discussion

2.1 In November 2006, the rapporteur of the Runway Strips and runway End safety Areas Task Force presented WP/15 to AGA/AOP/SG/5 that informed the members of the Montreal Secretariat proposal that would elevate width and length *recommended* dimensions for RESA to full-standards. The importance of the safety proposal is the requirement for longer and wider RESAs for the vast majority of runways. Consequently, only those RESAs that are compliant today with the *recommended lengths and widths* will remain compliant.

2.2 In response for achieving the safety enhancements, the CAR/SAM Secretariats, with the agreement of the Runway Strips & Runway End Safety Area Task Force, created an *AD Hoc Committee* to develop additional written guidance for DGCAs. The primary tasks are:

- (1) Determine a list of design questions requiring further clarifications by Montreal,
- (2) Identify the aerodrome design and aircraft operational parameters, and length of haul service levels that influence the degree of compliance,
- (3) Identify various alternatives acceptable to Montreal to achieve compliance, and
- (4) Support DGCAs within the CAR/SAM Regions in the application of the alternatives, i.e., offer assistance.

2.3 The AD HOC Committee members are:

George I. Legarreta (United States) – Rapporteur  
george.legarreta@faa.gov

Jose Alberto Palermo (Argentina) – Vice Chairman of AGA/AOP/SG  
[aerodromos@faa.mil.ar](mailto:aerodromos@faa.mil.ar) or albertpalermo@yahoo.com

Aldemar Pinzon (Colombia)  
apinzon@aerocivil.goc.co

Norberto Cabrera Alonso (Cuba) – Chairman of AGA/AOP/SG  
norberto.cabrera@iacc.avianet.cu

Peter Cerda (IATA)  
[cerdap@iata.org](mailto:cerdap@iata.org)

Heriberto Salazar Equiluz (IFALPA)  
dirtecnico@aspa.org.mx

### 3. **Recommendation**

3.1 To better assist the DGCAs in the CAR/SAM Regions in completely eliminating or minimizing recorded deficiencies for RESA and runway strips, the following draft conclusion is forwarded:

#### **Draft Conclusion XX/14**

DGCAs with recorded deficiencies in the areas of RESAs or/and runway strips are welcomed to submit to the *AD HOC Committee of the Runway Strips & Runway End Safety Area Task Force* under AGA/AOP/SG:

- (1) Specific runway ends or/and full runways that are in non-compliance with RESA or/and runway strip SARPs for determining possible mitigation alternatives.
- (2) Alternatives that may potentially achieve compliance with RESA or/and runway strip SARPs.

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## APPENDIX A

### GENERAL DISCUSSION OF PREDOMINANT CAUSES FOR NON-COMPLIANCE FROM WP/13 OF AGA/AOP/SG/4

#### A.1 Runway End Safety Areas (RESA)

A.1.1 **CAR Region**, column No. 3 recorded 22 reported cases (or 22 runways) in 2003 that were deficient in some characteristic. Of these cases, 8 runways were corrected and are now fully compliant for this particular SARP. The positive trend, 8 of 22 runways, demonstrated a significant improvement of 36% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.). In response to the remaining substandard runways, figure B1 of Appendix A was developed to *categorize the causes of non-compliance*. Figure B1 clearly showed the problem to be a *lack of RESAs* as compared to problems *within existing RESAs*. To illustrate this point, of the 14 non-compliant RESA deficiencies, 11 reported no RESA at both ends or at one end, a significantly high rate of 79% (11/14). The category with the predominant deficiency at 57% (8/14) was the category “lack of RESA at both ends.”

A.1.2 **SAM Region**, column No. 7, recorded 7 reported cases (or 7 runways) in 2003 that were deficient in some characteristic. Of these cases, 1 runway was corrected and is now fully compliant for this particular SARP. The positive trend, 1 of 7 runways, demonstrated an improvement of 14% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.) For the SAM Region, figure B2 clearly showed the problem to be a *combination* of the lack or existence of RESAs and problems within existing RESAs. To illustrate the point, of the 6 non-compliant RESA deficiencies, 3 reported no RESA at both ends or at one end, or a rate of 50% (3/6) while 3 reported problems within existing RESAs, or a rate of 50% (3/6).

#### A.2 Runway Strips

A.2.1 **CAR Region**, column No. 4, recorded 43 reported cases or 43 runways. Of these, 12 runways were corrected and are now fully compliant for this particular SARPS. The positive trend, 12 of 43 runways, demonstrated a significant improvement of 28% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.) For the CAR Region, figure B3 clearly showed the problem of *physical size* as compared to problems within existing runway strips. To illustrate the point, of the 30 non-compliant runway strip deficiencies, 22 reported substandard dimensions for a significantly high rate of 73% (22/30). The predominant deficiency was width rather than length.

A.2.2 **SAM Region**, column No. 8, recorded 12 reported cases (or 12 runways.) Of these, 3 runways were corrected and are now fully compliant for this particular SARPS. The positive trend, 3 of 12 runways, demonstrated a significant improvement of 25% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.) For the SAM Region, figure B4 clearly showed the problem to be *within existing runway strips*. To illustrate the point, of the 9 non-compliant runway strip deficiencies, 8 reported no-dimensional problems at a rate of 89% (8/9). Objects, vegetation and/or solid structures, account for 50% (4/8) of the reported deficiencies.

### A.3 **Summary Comparison for CAR/SAM Regions** (figures A5 and A6)

Figures A5 and A6 illustrated the differences between the CAR Region and the SAM Region for each SARPS. For RESAs, figure B5 showed that *both regions share similar types of deficiencies*, with the exception of the much higher rate within the CAR Region for runways lacking RESAs at both ends; *a rate of 8 to 1*. For runway strips, figure B6 showed a *dichotomy of the problem*. That is, the CAR Region faces a dimensional challenge as compared to the SAM Region, which faces a clearing of objects and improved grading conditions.

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## APPENDIX B

Bar graphs illustrating the number of record deficiencies for RESA and runway strips according to physical problems [type of deficiencies] for the CAR/SAM Regions.

Figure B1

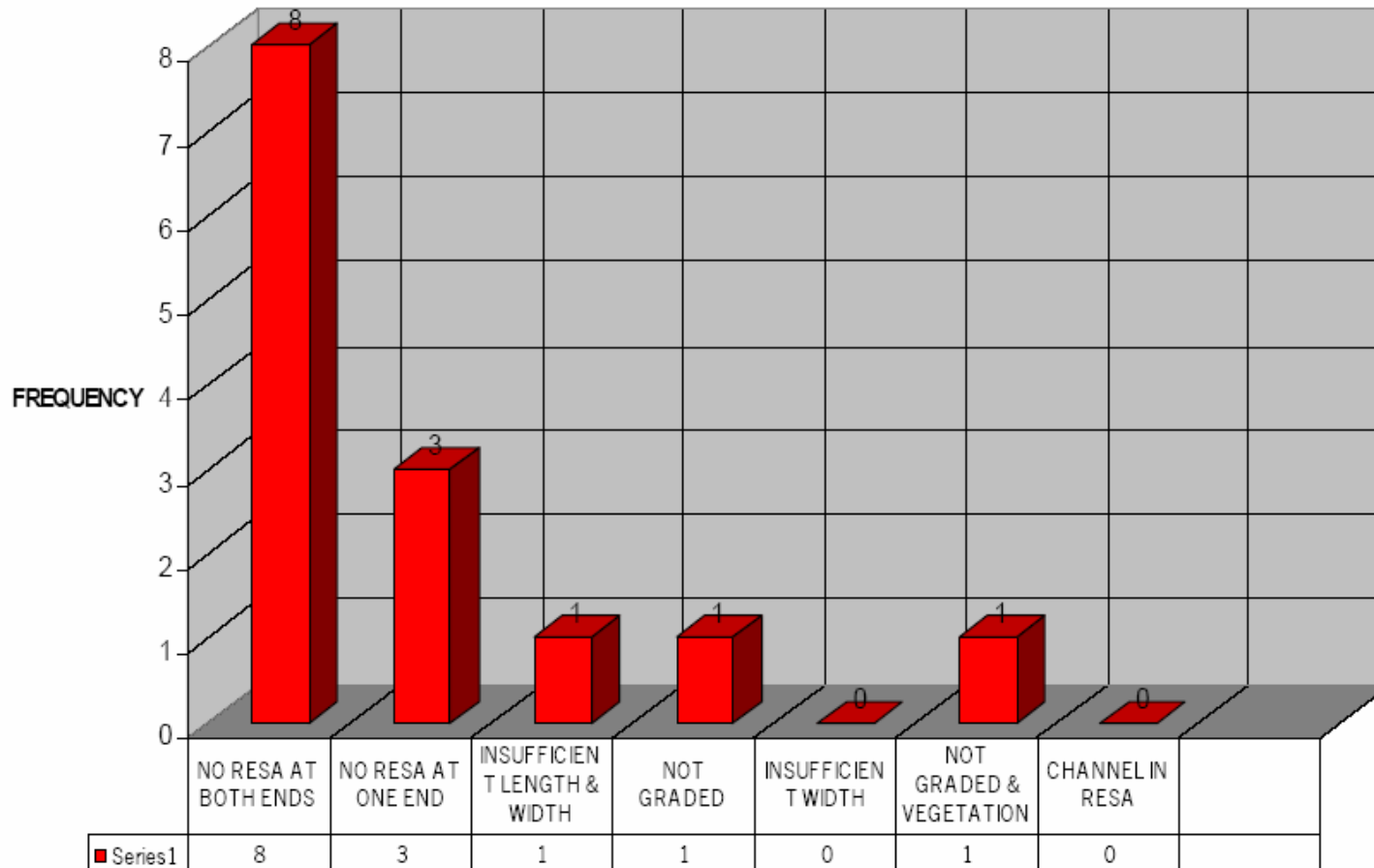
**CAR REGION - RESA DEFICIENCIES BY CATEGORY (10/2004)**

Figure B2

**SAM REGION - RESA DEFICIENCIES BY CATEGORY (10/2004)**

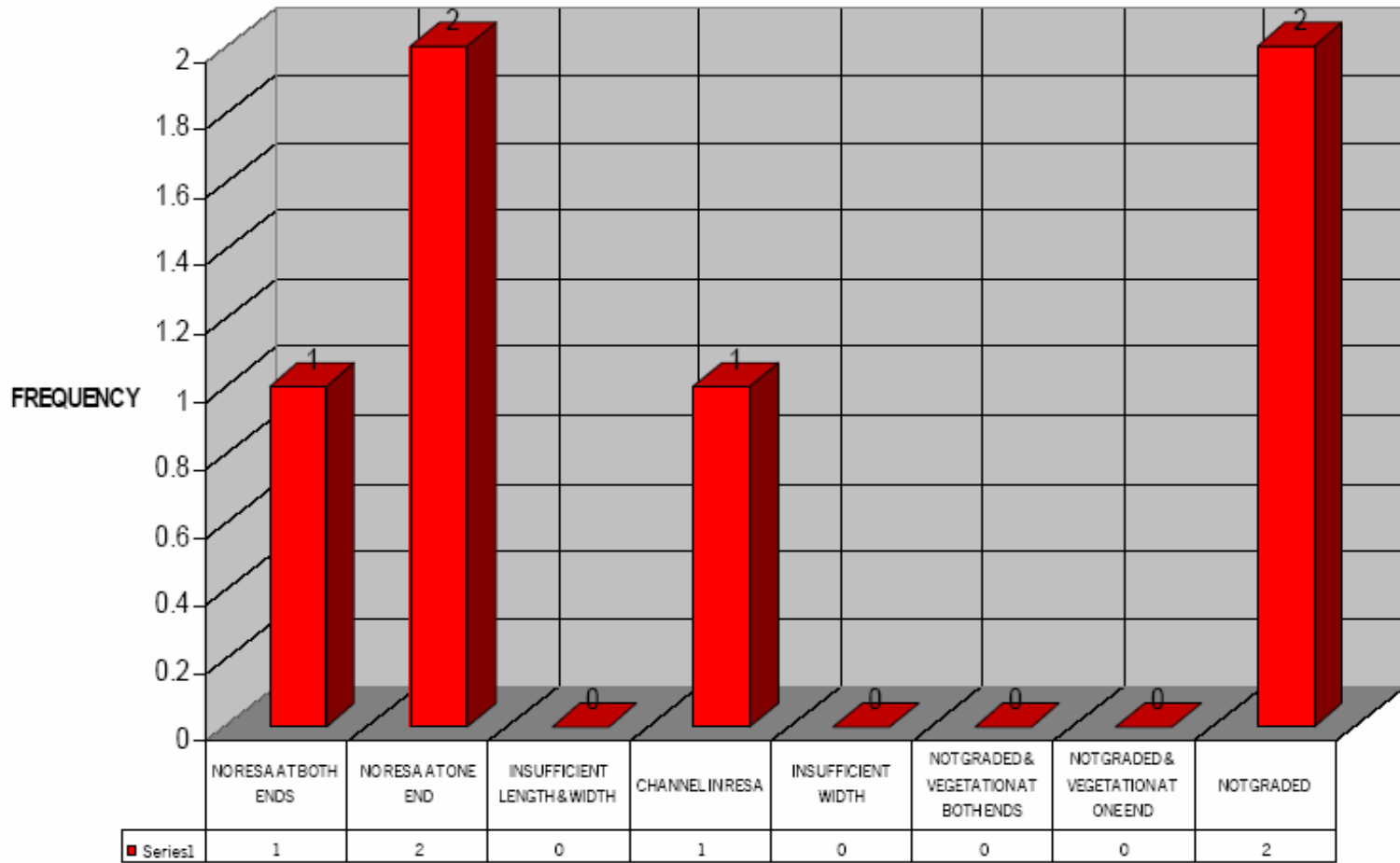


Figure B3

**CAR REGION - RWY STRIP DEFICIENCIES BY CATEGORY (10/2004)**

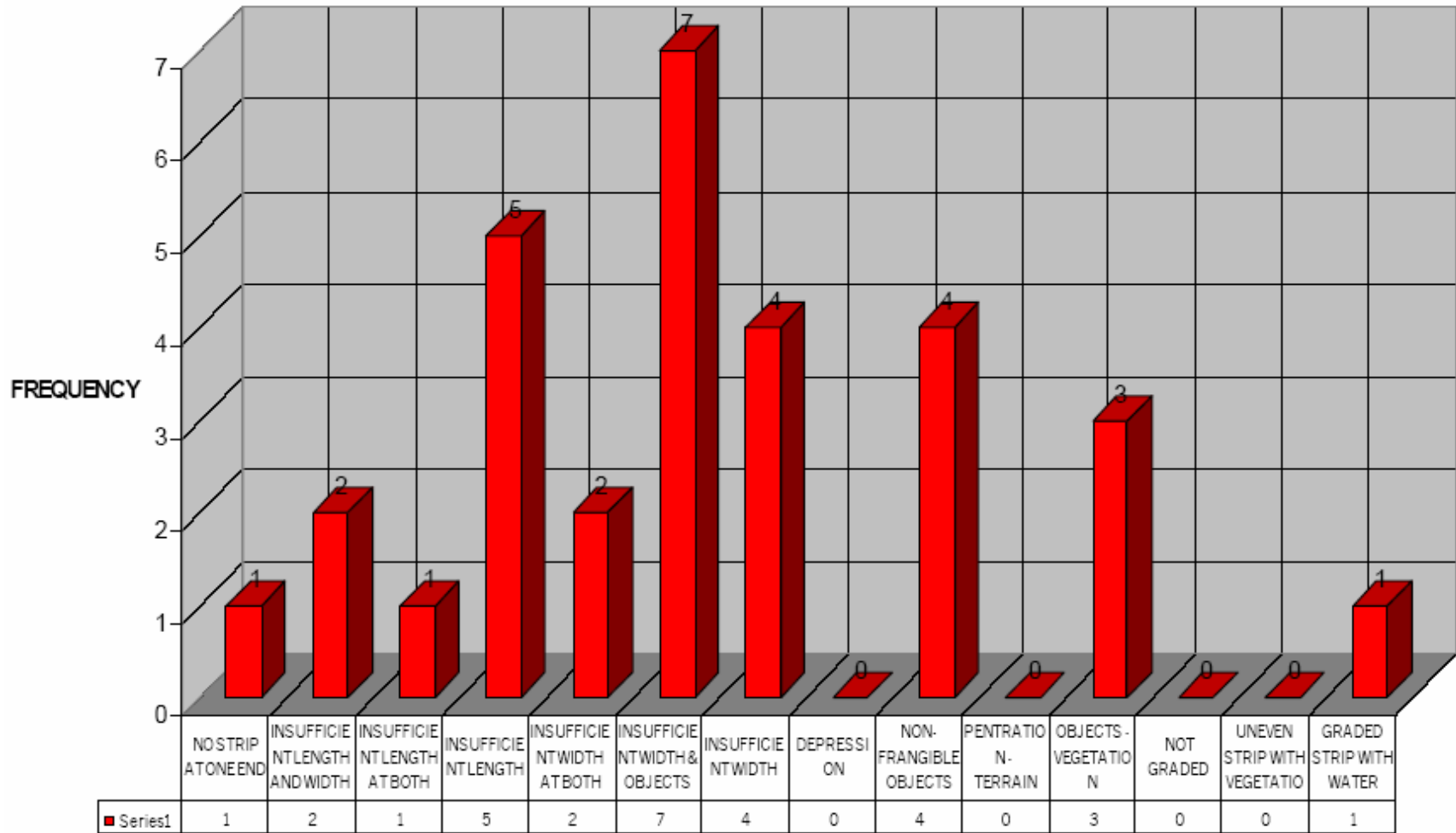


Figure B4

**SAM REGION - RWY STRIP DEFICIENCIES BY CATEGORY (10/2004)**

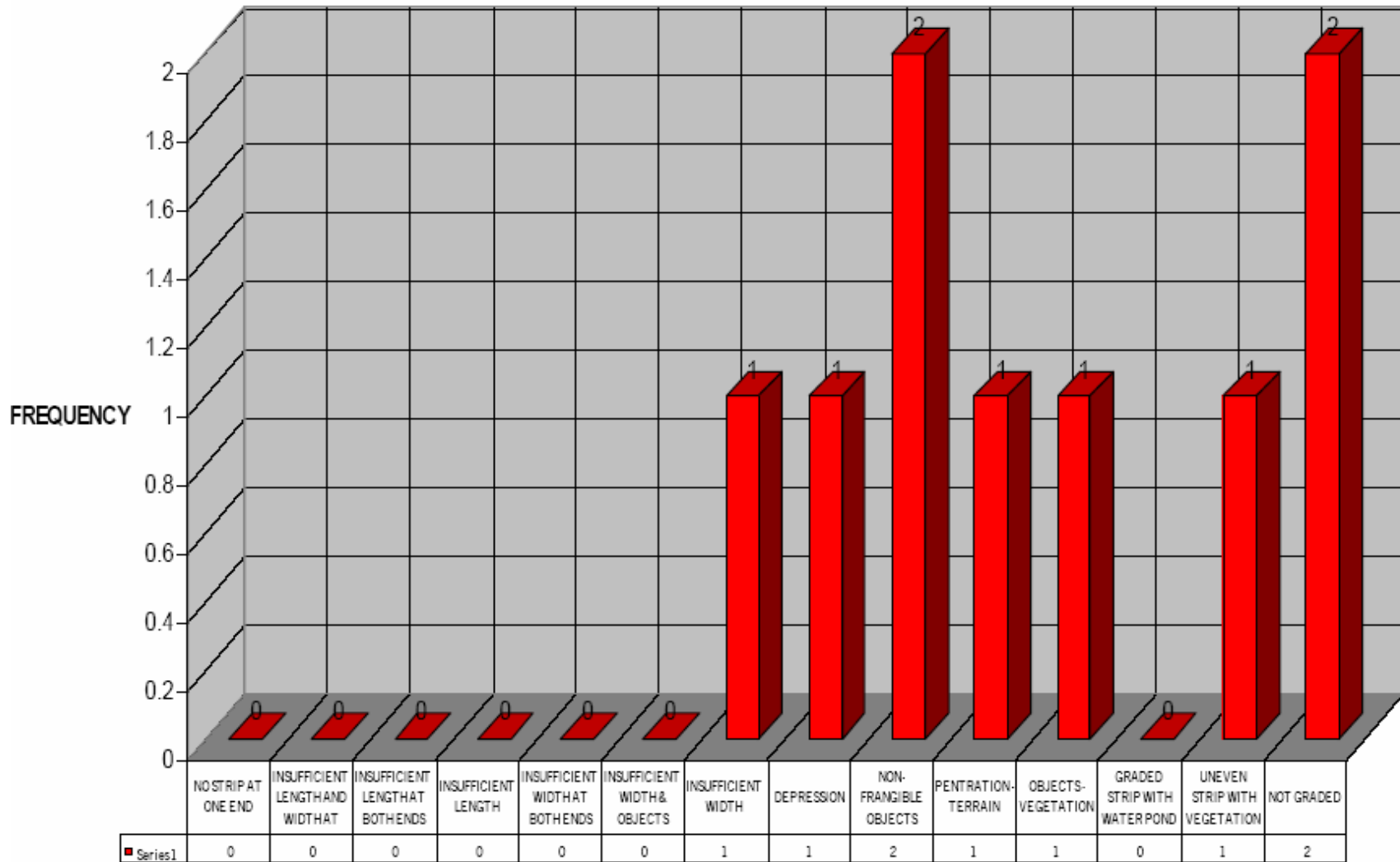


Figure B5

**COMPARISON of RESA DEFICIENCIES FOR  
CAR (///) & SAM (\\) REGIONS (10/2004)**

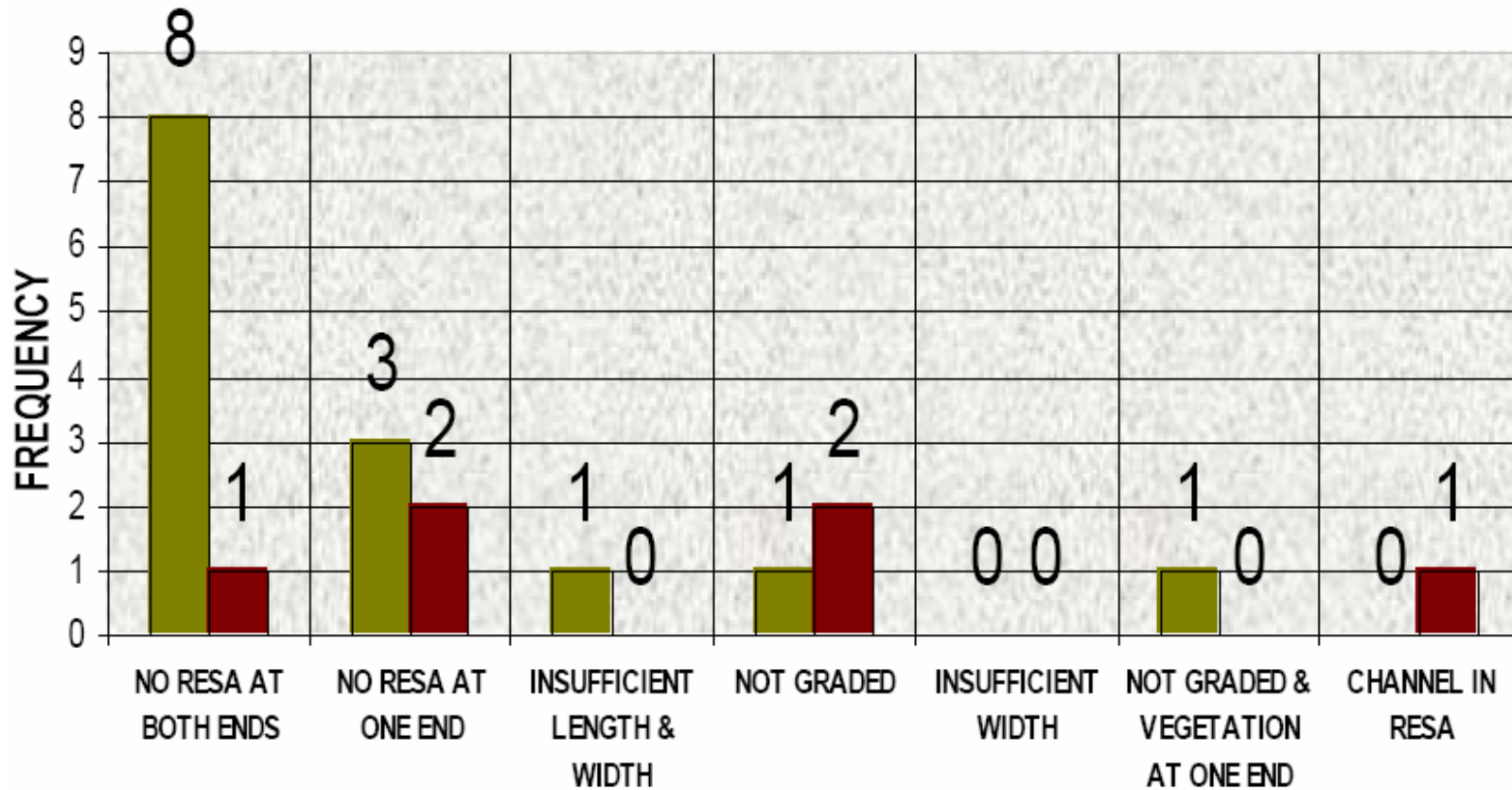
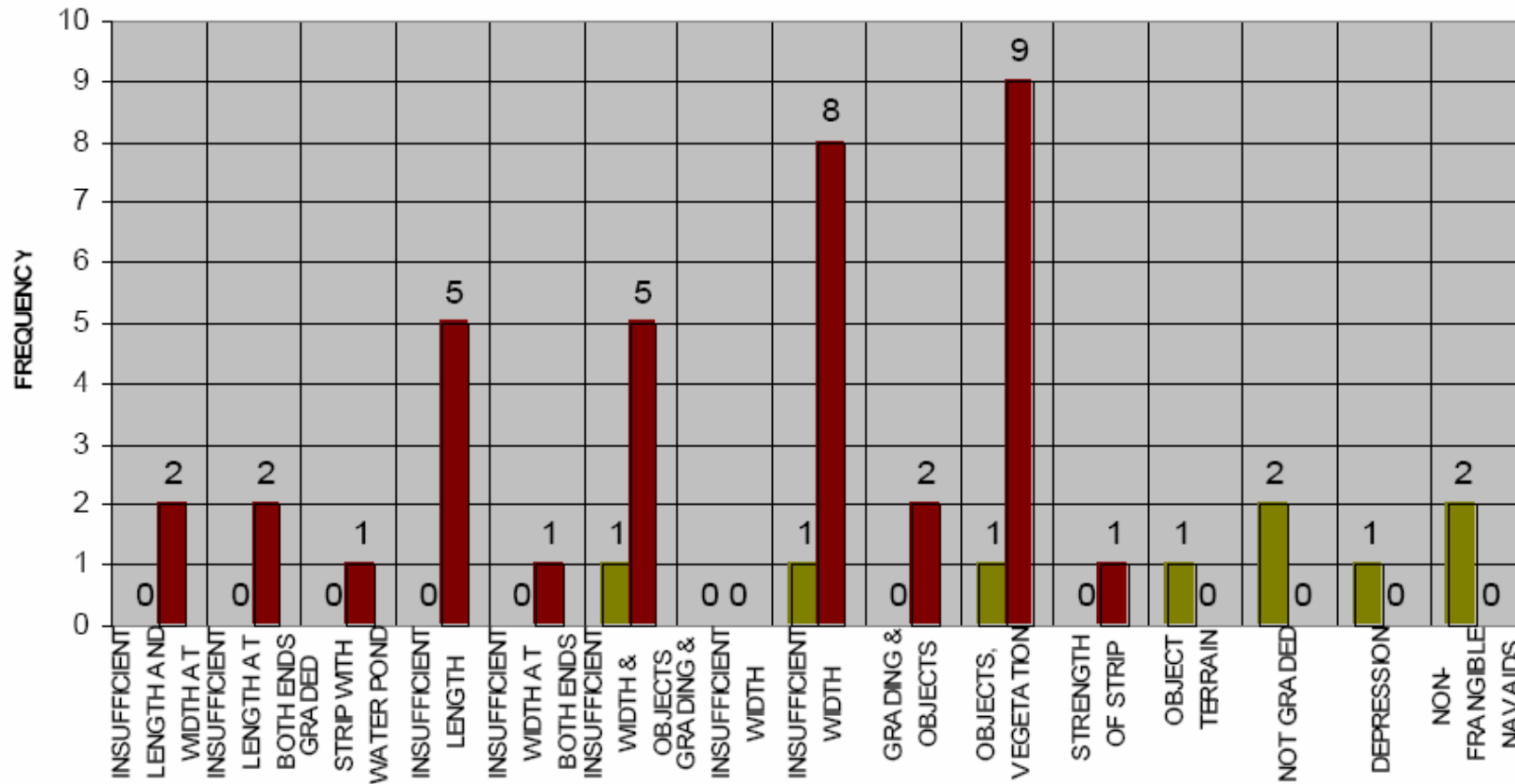


Figure B6

## COMPARISON OF RWY STRIP DEFICIENCIES FOR CAR (///) & SAM (\\) REGIONS (10/2004)



- END -