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North American, Central American and Caribbean Office

WORKING PAPER

CAR/DCA/OPSAN — WP/03
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Safety and Air Navigation Directors of the CAR Region Meeting (CAR/DCA/OPSAN)
Mexico City, Mexico, 18 to 19 February 2014

Agenda Item 3: **NAM and CAR Regional Safety and Air Navigation Priorities**
3.2 Regional Aviation Safety Group – Pan America (RASG-PA)

RASG-PA PROGRESS REPORT

(Presented by the Secretariat)

EXECUTIVE SUMMARY

The Regional Aviation Safety Group — Pan America applies the ICAO Global Aviation Safety Plan (GASP) to various initiatives and aviation projects to enhance aviation safety, mitigate risks, and thereby reduce the fatal accident rate in the Pan American Region.

The participation of States/Territories, international organizations and industry in RASG-PA activities is fundamental to improving safety in the Pan American Region.

Action:	Action presented in Section 4
Strategic Objective:	• Safety
References:	• ICAO Global Aviation Safety Plan (GASP) • RASG-PA/06 Meeting Report • RASG-PA website: www.rasg-pa.org

1. Introduction

1.1 RASG-PA was established in November 2008 to support the establishment and operation of a performance-based safety system in the Pan American Region.

1.2 The RASG-PA mission is to enhance civil aviation safety and efficiency in the Pan American Region through coordination and collaboration of all aviation stakeholders under ICAO's leadership.

1.3 The RASG-PA vision involves all stakeholders in aviation safety to reduce aviation safety risks in the ICAO North American, Central American, Caribbean and South American Regions through harmonized and coordinated efforts aimed at mitigating safety risks and promoting implementation of safety initiatives by all stakeholders.

1.4 RASG-PA uses the ICAO Global Aviation Safety Plan (GASP) as a guide to develop its work programme using a regional perspective.

1.5 RASG-PA membership includes representatives from all NAM/CAR/SAM States/Territories, ICAO, international organizations and industry, such as: Air Safety Support International (ASSI); Airports Council International (ACI); Airbus, Latin American and Caribbean Air Transport Association (ALTA); Boeing; Civil Aviation Navigation Services Organization (CANSO); Caribbean Aviation Safety and Security Oversight System (CASSOS); Corporacion Centroamericana de Servicios de Navegación Aérea (COCESNA); Eastern Caribbean Civil Aviation Authority (ECCAA), Embraer, Flight Safety Foundation (FSF), International Air Transport Association (IATA); International Federation of Airline Pilots Association (IFALPA); International Federation of Air Traffic Controllers Association (IFATCA) and Latin American Civil Aviation Commission (LACAC).

1.6 The RASG-PA Executive Steering Committee (ESC) is composed of two Co-Chairpersons representing States/Territories and international organizations/industry, respectively; four Vice-Chairpersons representing States, and representatives from international organizations. Currently, the Co-Chairpersons are Curacao and Boeing, and the four Vice-Chairpersons are Brazil, Chile, Costa Rica and United States. ICAO is represented by the ICAO NACC (Secretariat) and SAM Regional Offices, and Headquarters.

1.7 In order to conduct its activities, RASG-PA has established the following teams:

- Annual Safety Report Team (ASRT)
- Aviation Safety Training Team (ASTT)
- Information Analysis Team (IAT)
- Pan America – Regional Aviation Safety Team (PA-RAST)

2. Discussion

2.1 The fourth edition of the RASG-PA Annual Safety Report (ASR) reveals that the top three key risk areas in the Pan American Region continue to be Runway Excursion (RE), Controlled Flight Into Terrain (CFIT), and Loss of Control In-Flight (LOC-I). Recently, Mid-Air Collision (MAC) was added to the list as the fourth risk area in the region.

2.2 These four risk areas are considered among the highest priorities of the RASG-PA work programme through development of Safety Enhancement Initiatives (SEIs) and corresponding Detailed Implementation Plans (DIPs), which are voluntarily led by RASG-PA members. Several of these tasks have been completed successfully leading to the development and implementation of additional safety enhancement initiatives for which RASG-PA strongly advocates participation of stakeholders.

2.3 It should be noted that even with limited economic and in-kind resources, and limited participation by State civil aviation authorities in RASG-PA activities and projects, RASG-PA has been able to successfully perform its tasks through great commitment and dedication. The main RASG-PA deliverables include but are not limited to the following:

- Four Pan American Aviation Safety Summits
- Four editions of the RASG-PA Annual Safety Report
- Proposal for Amendment to Aeronautical Legislation to Protect Safety Information Sources Framework
- Runway Excursion Risk Reduction (RERR) Toolkit (Version 2)
- Surveys on go-around policies and unstable approach mitigation
- Advanced maneuvers manual distributed to all operators
- Seven RASG-PA Aviation Safety Workshops/Seminars
- Pilot Monitoring Toolkit
- Manual on Guidance for Maintaining Runways in Accordance with ICAO Annex 14
- Aviation safety training material on the RASG-PA website www.rasg-pa.org
- Standardized CFIT training across the region for operators
- RASG-PA Safety Advisories (RSAs) 001 and 002. See **Appendices A** and **B**
- Runway Safety Teams (RSTs) implemented at the Mexico City International Airport (MMMX), Mexico; Montego Bay, (MKJS), Jamaica; Quito, (SEQU), Ecuador; and Lima (SPIM), Peru
- First Aeronautical Legislation Seminar for the Protection of Safety Information
- RASG-PA signed the first MOU with U.S. CAST on information sharing, which will allow the IAT to analyse, identify and prioritize risks in the region that require mitigation action

2.4 In collaboration with several RASG-PA members, RASG-PA is also working on various projects to enhance safety such as:

- Consistent use of Standard Spanish and English Phraseology in accordance with the ICAO PANS-ATM – *Air Traffic Management* (Doc 4444)
- Establishment of the Central American Accident and Incident Prevention Investigation Commission
- Flight Information Quality Assurance (FOQA) Programme
- Bird Strike Reduction Programme

2.5 RASG-PA is fulfilling its objective to enhance safety in the Pan American Region by reducing duplication of effort, and reducing human and financial resource expenditure.

2.6 The RASG-PA working group meeting reports, as well as other material and documentation related to detailed activities of the group, including training material, can be found on the RASG-PA webpage: www.rasg-pa.org/.

3. Conclusion

3.1 The Pan American Region faces many challenges to improve safety levels such as:

- Some States have low levels of Effective Implementation (EI) of the 8 Critical Elements according to results from the Universal Safety Oversight Audit Programme (USOAP) and ICAO Coordinated Validation Missions (ICVMs)
- There are unresolved infrastructure deficiencies for extended periods as shown in the GREPECAS Air Navigation Deficiencies Database (GANDD)
- States have insufficient human resources and budgets
- Delayed implementation of the ICAO State Safety Programme (SSP) and Safety Management Systems (SMS)

3.2 RASG-PA is serving as the focal point on safety in the Pan American Region to ensure harmonization and coordination of efforts to reduce aviation safety risks collaboratively including all aviation stakeholders.

3.3 The success and continuity of RASG-PA and subsequent enhancement of aviation safety in the region will depend on the commitment, participation and contributions of its members.

4. Suggested action

4.1 The Meeting is invited to:

a) take note of the information provided;

b) participate and support RASG-PA projects, activities and initiatives with national and industry representatives;

c) identify the RASG-PA focal point to the Secretariat (refer to **Appendix C**); and

c) designate an appropriate representative to participate in the various RASG-PA Teams.

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Ref.: N 1-17 — **EMX0865** 2 October 2012

To: States, Territories and International Organizations

Subject: **RASG-PA Safety Advisory (RSA 2011- 001-R0)**

Action Required: **Consider adoption of the subject RSA using the advisory circular on Mode Awareness and Energy State Management Aspects of Flight Deck Automation**

Sir/Madam:

The attached document is being distributed by the Regional Aviation Safety Group – Pan America (RASG-PA). RASG-PA was established to improve civil aviation safety and efficiency in the Pan American Region by applying ICAO Global Aviation Safety Plan (GASP) principles through a collaborative and coordinated approach in partnership with all aviation stakeholders under the leadership of ICAO.

RASG-PA Safety Advisories are issued to encourage States and aviation stakeholders to adopt practices that mitigate the major aviation safety risks in the Pan American Region as identified through the analysis of regional data.

Accept, Sir/Madam, the assurances of my highest consideration.

Loretta Martin
Regional Director
North American, Central American and Caribbean (NACC) Regional Office

Enclosure:
As indicated

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RSA
RASG-PA SAFETY ADVISORY

Regional Aviation Safety Group-Pan America

Subject: Mode Awareness and Energy State Management Aspects of Flight Deck Automation

Date: 1 September 2012

RSA No. RSA 2011- 001-R0

1. Purpose

This RASG-PA Safety Advisory is issued to encourage States and Industry to adopt practices to mitigate Mode Awareness and Energy State Management risks.

2. Background

A regional study undertaken by RASG-PA has identified risks associated with the subject issue. As part of a detailed implementation plan to mitigate these risks, RASG-PA is issuing this RSA to States and Industry.

This RSA is intended to reduce the risk of loss of control, which has been the predominant accident type in the Pan American region for the past ten years.

More detailed information can be found in the RASG-PA Annual Safety Report, which can be found at: www.rasg-pa.org/

3. Recommended Action

States and air operators are encouraged to review the attached model circular and consider adopting its contents.

Loretta Martin
RASG-PA Secretary

CAA/Industry LOGO

RSA
RASG-PA SAFETY ADVISORY

[Civil Aviation Authority of XXX] / [Name of Organization]

Subject: **Mode Awareness and Energy State Management Aspects of Flight Deck Automation**

Date: **xx-xx-2012**

Initiated By: **RASG-PA**

AC No.: **[Insert number]**

1. PURPOSE

This Advisory Circular is issued to alert air operators to the importance that air crews are aware of the automation mode under which the aircraft is operating. It provides a sample automation policy to support the use of aircraft automation.

2. BACKGROUND

Automation has contributed substantially to the improvement in air operator safety around the world. Automation increases the timeliness and precision of routine procedures, and greatly reduces the opportunity to introduce risks and threatening flight regimes.

Nevertheless, in complex and highly automated aircraft, automation has its limits. More critically, flight crews can lose situational awareness of the automation mode under which the aircraft is operating or may not understand the interaction between a mode of automation and a particular phase of flight or pilot input. These and other examples of mode confusion often lead to mismanaging the energy state of the aircraft or to the aircraft deviating from the intended flight path for other reasons. These issues have been identified as factors in several major accidents around the world.

The objective of the sample policy is to help minimize the frequency with which pilots experience mode confusion and undesirable energy states. This, in turn, requires that crews understand the functions of the various modes of automation. The sample policy is based on a set of common industry practices that are known to be effective. Operators should compare this to their existing policies and identify any needed changes. In addition, the sample policy includes practical guidance that air operators may include in their policies in order to help pilots respond effectively to particular types of automation anomalies. The suggested guidance is intended only as examples of effective responses to selected circumstances. The suggested guidance does not necessarily identify the only proper response.

Note: The terminology used in this document and in the examples reflects terminology for Airbus and Boeing aircraft. Air operators may need to amend the terminology to apply this document to their own fleet mixes, the need for consistent language within a single air operator, or other unique characteristics.

3. FINDINGS

In almost all cases, the flight crew did not understand what the automation was doing or did not know how to manipulate the automation to eliminate the error. In such cases, when the crew changed automation levels they often made the problem worse. This problem applied to all automation modes and it applied regardless of whether the crew induced the event or the event was precipitated by a problem with the automation system. *In all 50 cases from the last 5 years of data, pilots were unable to return the aircraft to the desired flight path in a timely manner*.

This was due to two root causes:

- inadequate training and system knowledge; and
- the unexpected incompatibility of the automation system with the flight regime confronting pilots in their normal duties.

For example, the crew may have made a manual input to the flight controls that would have been appropriate with the autopilot disengaged. However, if the auto thrust system was still engaged and was in a mode that did not support the flight control input, the resulting flight path or energy state was often undesirable.

Yet, among the 16 air operator automation policies reviewed, the most common concept simply directs crews to "*use the level of automation that will best support the desired operation of the aircraft.*" This concept is fine if the crew understands what the automation is doing at the time of the problem onset and is then able to determine if the current or another automation level will better suit the operation. However, nearly all incident reports shared one common factor: regardless of whether an error was pilot-induced or was a function of the automation system, pilots did not understand what the automation was doing or did not know how to use the automation to eliminate an error. Consequently, the recommendations emphasize specific elements that should be incorporated into automation policies and then systematically reinforced.

A core philosophy of *"fly the airplane"* should permeate any air operator's policy on automation. While recognizing that automation has brought major improvements to safety, air operators should require and systematically reinforce a philosophy of "*fly the airplane*." If pilots recognize that they do not understand the nature of an anomaly and do not precisely understand the solution, pilots should not continue in an unstable or unpredictable flight path or energy state while attempting to correct an anomaly. Instead, crews should revert to a more direct level of automation until the aircraft resumes the desired flight path and/or airspeed. This may ultimately require the crew to turn off all automation systems and fly the aircraft manually. When the aircraft once again is flying the desired flight path and/or airspeed, the crew can begin to re-engage the automation, as appropriate. Below is a recommended statement to be included in operators' automation policies and which should be systematically reinforced.

At any time, if the aircraft does not follow the desired vertical flight path, lateral flight path or airspeed, do not hesitate to revert to a more direct level of automation. For example, revert from FMS guidance to non-FMS guidance, or when operating in non-FMS guidance but with A/THR or A/T engaged, disengage and set thrust manually.

In addition to this recommended philosophical foundation, air operators are recommended to: prepare, in cooperation with their respective airplane manufacturers, an Automation Policy, which should in particular address the following topics:

- Philosophy
- Levels of Automation
- Situational Awareness
- Communication and Coordination
- Verification
- System and Crew Monitoring
- Workload Sharing and System Use

4. APPLICABILITY

All air operators should review this guidance and ensure that their policy, procedures and training reflect these industry best practices. Confirmation by air operators that the findings and guidance contained in the Advisory Circular will be a positive contribution to flight safety.

Signed by:

(Appropriate Official)

Recommended Automation Policy Sample

1. Philosophy and Approach to the Use of Automation

An automation policy should begin with a description of the organization's philosophy and approach to the use of automation.

1.1 Fly the Aeroplane

First and foremost, though automation has brought major improvements to safety, air operators should promulgate and systematically reinforce the philosophy of "fly the airplane." If pilots recognize that they are uncertain about the autoflight modes or energy state, they should not allow the airplane to continue in an unstable or unpredictable flight path or energy state while attempting to correct the situation. Instead, pilots should revert to a better understood level or combination of automation until the aircraft resumes the desired flight path and/or airspeed. This may ultimately require that pilots turn off all automation systems and fly the aircraft manually. When the aircraft again is flying the desired flight path and/or airspeed, pilots can begin to reengage the automation as appropriate.

Note: This type of statement in the automation policy would help the pilot to know how to correctly interact with automation to reduce workload and increase safety and efficiency.

1.2 Adopt "CAMI" or "VVM" Procedure

Include references to and descriptions of generalized procedures, such as the CAMI or VVM, that have been developed by various air operators as effective means for pilots to validate the arming/engagement of the AFS and to monitor functions/mode changes.

- **CAMI** procedure for the pilot flying:

  Confirm airborne (or ground) inputs to the FMS with the other pilot.
  Activate inputs.
  Monitor mode annunciations to ensure the autoflight system performs as desired.
  Intervene, if necessary.

  or

- **VVM** policy for both flight crew members:

  Verbalize
  Verify
  Monitor

General approaches like these are easy to train and review on the line and have been shown to help flightcrews in their overall approach to the use of automation.

1.3 Other Topics

Operators also should consider including other statements on automation philosophy to provide operational guidance to pilots.

- Appreciate specified capability, limitations, and failure susceptibility of the automation.
- Be wary of autoflight states when crew coordination, communication, and monitoring of automation is more important.
- Resist situations when automation can increase pilot workload or degrade performance.
- Avoid over-reliance on automation to the detriment of manual flying skills.

2. Choice of Systems or "Levels" of Automation

Automation policy should include information to guide pilots on making choices about how to combine and use automated systems. Some airlines have defined "levels of automation" to help with this. However, a definition alone is not adequate for this topic. Below is a list of recommended topics that could add substance to a definition and that could provide practical guidance for pilots.

2.1 Use the Appropriate Automation for the Task

On highly automated and integrated aircraft, several combinations or levels of automation may be available to perform a given task in either FMS modes and guidance or non-FMS modes and guidance.

- The most appropriate level of automation depends on the task to be performed, the phase of flight and the amount of time available to manage a task. A short-term or tactical task, such as responding to an ATC direction to go briefly to a different altitude or heading, should be accomplished in the FCU/MCP. This allows the crew to maintain heads-up flight. A long-term or strategic task that changes most or all of the remaining flight should be accomplished in the FMS CDU, which requires more head-down time by one pilot.
- The most appropriate level also may depend on the level with which the pilot feels most comfortable for the task or for the prevailing conditions, depending on his/her knowledge and experience operating the aircraft and systems. Reverting to hand-flying and manual thrust control actually may be most appropriate, depending on conditions.
- The PF should retain the authority and capability to select the most appropriate level of automation and guidance for the task. Making this selection includes adopting a more direct level of automation by reverting from FMS guidance to selected guidance (that is, selected modes and targets through the use of either the FCP or MCP); selecting a more appropriate lateral or vertical mode; or reverting to hand-flying (with or without FD guidance, with or without A/THR or A/T) for direct control of aircraft vertical trajectory, lateral trajectory, thrust and airspeed.

2.2 Ensure that Pilots Possess Required Skills and Knowledge

Some airlines have also included statements in their automation policies about the requirement for pilots to be skilled in and knowledgeable about the use of certain combinations of automated systems or all possible combinations of systems. Understanding and interacting with any autoflight system ideally requires answering the following fundamental questions:

- How is the system designed?
- Why is the system designed that way?
- How does the system interact and communicate with the pilot?
- How does the pilot operate the system in normal and abnormal situations?

Ensure that pilots fully understand the following aspects in the use of automation:

- Integration of AP/FD and A/THR or A/T modes (that is, pairing of modes), if applicable.
- Mode transition and reversion sequences; Integration of AP/FD and A/THR or A/T modes (that is, pairing of modes), if applicable.
- Pilot-system interaction for:
    - Pilot-to-system communication (that is, for target selections and modes engagement).
    - System-to-pilot feedback (that is, for cross-checking the status of modes and accuracy).

2.3 AP - A/THR Integration

Integrated AP-A/THR or AP-A/T systems pair AP pitch modes (elevator control) with the A/THR or A/T modes (thrust levers/throttle levers). Integrated AP - A/THR or AP-A/T systems operate in the same way as a pilot who hand flies with manual thrust.

- Elevator is used to control pitch attitude, airspeed, vertical speed, altitude, flight-path-angle, and vertical navigation profile or to capture and track a glideslope beam.
- Thrust levers or throttle levers are used to maintain a given thrust or a given airspeed.
- Throughout the flight, the pilot’s objective is to fly either:
    - Performance segments at constant thrust or at idle, as on takeoff, climb or descent; or
    - Trajectory segments at constant speed (as in cruise or on approach).

Depending on the task to be accomplished, airspeed is maintained either by the AP (elevators) or the A/THR (thrust levers) or A/T (throttle levers) as shown in **Table 1** below.

Table 1
AP – A/THR & A/T Mode Integration

	A/THR or A/T	**A/P**
	Thrust levers/ Throttle levers	**Elevators**
Aircraft Performance is controlled by:	**Thrust or idle**	**Speed**
Aircraft Trajectory is controlled by	**Speed**	**V/S Vertical profile Altitude Glide slope**

2.4 Automation Design Objectives

The AFS provides guidance to capture and maintain the selected targets and the defined flight path in accordance with the modes engaged and the targets set by the flight crew on either the flight control unit (FCU)/mode control panel (MCP) or on the flight management system (FMS) control and display unit (CDU).

The FCU/MCP constitutes the main interface between the pilot and the autoflight system for *short-term guidance* (i.e., for immediate guidance such as radar vectors).

The FMS CDU constitutes the main interface between the pilot and the autoflight system for *long-term guidance* (i.e., for the current and subsequent flight phases).

Two types of guidance (modes and associated targets) are available on aircraft equipped with either a flight management guidance system (FMGS) or flight management computer (FMC) featuring both lateral and vertical navigation:

- Selected guidance:

The aircraft is guided to acquire and maintain the targets set by the crew using the modes engaged or armed by the crew (i.e., using either the FCU or MCP target setting knobs and mode arming/engagement push buttons).

- FMS guidance:

The aircraft is guided along a pilot-defined FMS lateral navigation (LNAV) and a vertical navigation (VNAV) flight plan, speed profile, altitude targets/constraints.

2.5 Engaging Automation

Before engaging the AP, ensure sure that:

- Modes engaged (check FMA annunciations) for FD guidance are the correct modes for the intended flight phase and task.
- Select the appropriate mode(s), as required.
- Confirm FD command bars do not display any large displacements; if large displacements are commanded, continue to hand fly until FD bars are centered prior to engaging the AP.

Engaging the AP while large commands are required to achieve the intended flight path may result in the AP overshooting the intended vertical target or lateral target and/or surprise the pilot due to the resulting large pitch / roll changes and thrust variations.

2.6 Other Topics Related to the Choice of Automation Levels

Include other statements to help pilots choose the appropriate level of automation.

- Use optimum automation combination or “level” for comfortable workload, high situation awareness, and improved operations capability (passenger comfort, schedule, and economy).
- Do not try to solve automation problems with conditioned responses from the same level of automation.
- Prioritize correctly (e.g., avoid programming during critical flight phases).

3. Situational Awareness

Policies should include statements about the importance of maintaining situation awareness and, particularly, mode and energy awareness.

3.1 Mode and Energy Awareness

Situational awareness requires that pilots know the available guidance at all times. The FCU/MCP and the FMS CDU are the primary interfaces for pilots to set targets and arm or engage modes. Any action on the FCU/MCP or on the FMS keyboard and line-select keys should be confirmed by crosschecking the corresponding annunciation or data on the PFD and/or ND (and on the FMS CDU). At all times, the PF and PNF should be aware of the status of the guidance modes being armed or engaged and of any mode changes throughout mode transitions and reversions.

3.2 Monitor the Use and Operation of the Automated Systems

- Check and announce the status of the FMA, such as the status of AP/FD modes and A/THR or A/T mode.
- Observe and announce the result of any target setting or change (on the FCU/MCP) on the related PFD and/or ND scales.
- Supervise the AP/FD guidance and A/THR or A/T operation on the PFD and ND (pitch attitude and bank angle, speed and speed trend, altitude, vertical speed, heading, or track).

3.3 Other Topics on Situational Awareness

- Remain alert for signs of deteriorating flying skills, excessive workload, stress, or fatigue (avert complacency).
- Ensure at least one crewmember monitors the actual flight path.
- Consider "hand flying" in manual mode for immediate change of flight path.
- Brief the plan for using automation before takeoff and debrief in flight as the situation dictates.

4. Communication and Coordination

Topics related to communication and coordination to consider in developing the automation policy are statements to help flight crews:

- Announce automatic or manual changes to autoflight status (or update the other pilot at first opportunity).
- Brief and compare programmed flight path with charted procedure/ active routing.
- Coordinate (verbalize) before executing any inputs that alter aircraft flight profile.
- Make callout 1,000 feet before clearance altitude and verbally acknowledge.
- Utilize the "point and acknowledge" procedure with any ATC clearance.
- Brief special automation duties and responsibilities.
- Actively listen for traffic, communication, and clearances.

5. Verification

Include statements about verifying and cross-checking automation selections and anticipating subsequent aircraft performance in an automation policy.

5.1 Know your Modes and Targets

At a high level, the goal of verification can be generalized as "know your modes and targets." The AP control panel and FMS control display unit/keyboard are the prime interactions for pilots to communicate with aircraft systems (to arm modes or engage modes and to set targets). The PFD, particularly the FMA section and target symbols on the speed scale and altitude scale, and ND are the primary interactions for the aircraft to communicate with pilots. These interfaces confirm that aircraft systems have correctly accepted the pilot's mode selections and target entries.

Any action on the autopilot control panel or on FMS keyboard/line-select keys should be confirmed by cross-checking the corresponding annunciation or data on the PFD and/or the ND. The PF and PNF (PM) should be aware of the following:

- Modes armed or engaged
- Guidance targets set
- Aircraft response in terms of attitude, speed, and trajectory
- Mode transitions or reversions

When flight crews perform an action on the FCU/MCP or FMS CDU to give a command, the pilot expects a particular aircraft reaction and, therefore, must have in mind the following questions:

- Which mode did I engage and which target did I set for the aircraft to fly now?
- Is the aircraft following intended vertical and lateral flight path and targets?
- Which mode did I arm and which target did I preset for the aircraft to fly next?

To answer such questions, pilots must understand the certain controls and displays:

- FCU/MCP mode selection keys, target-setting knobs, and display windows
- FMS CDU keyboard, line-select keys, display pages, and messages
- Flight modes annunciator (FMA) on the PFD
- PFD and ND displays and scales (that is, for cross-checking guidance targets)

5.2 Specific Topics Related to Verification

Include statements to help pilots verify and cross-check inputs and aircraft responses.

- Cross-check raw data and computed data, as appropriate.
- Verify (both pilots) entered waypoints and confirm FMS data against printed charts.

- Maintain effective cross-check of system performance with desired flight path.
- Verify programming that alters route, track, or altitude, and cross-check proper mode annunciation.
- Cross-check (verify) result of selections, settings, and changes.
- If a transition is selected or built, verify between pilots that it matches clearance and that it produces desired track.

6. System and Crew Monitoring

Monitoring automation is simply carefully observing flight deck displays and indications to ensure the aircraft response matches your mode selections and guidance target entries and the aircraft attitude, speed, and trajectory match expectations.

- During the capture phase, observe the progressive centering of FD bars and the progressive centering of deviation symbols (during localizer and glideslope capture). This enhances supervision of automation during capture phases and cross-check with raw data, as applicable, to enable early detection of a false capture or capture of an incorrect beam.
- If the aircraft does not follow the desired flight path or airspeed, do not hesitate to revert to a more direct level of automation as recommended by the airplane manufacturer or as required by the operator's SOPs.
- In the event of an uncommanded AP disconnection, engage the second AP immediately to reduce pilot workload.

The effective monitoring of these controls and displays promotes increased pilot awareness of the modes being engaged or armed and the available guidance (flight path and speed control). Active monitoring of controls and displays also enables the pilot to anticipate the sequence of flight modes annunciations throughout successive mode transitions or mode reversions. Operators should also consider the following types of statements to help provide operational guidance to pilots.

- Scan indications to ensure aircraft performs "as expected."
- Monitor status (indications and mode annunciations).
- Monitor ALT capture mode to ensure commands for smooth level-off at assigned altitude are followed when using ALT capture mode of A/P - F/D, or VNAV.
- Maintain one "head up" at all times at low altitude.
- Avoid distraction from duties.
- Do not let automation interfere with outside vigilance.
- Maintain continuous lookout during ground movement and VMC flight PF and PNF monitor each other's actions.
- Do not use any system displaying an inoperative flag or some other failure indication.

7. Workload Sharing and System Use

Consider including statements on workload sharing and system use to provide some operational guidance to pilots, such as the following:

- Ensure PF has responsibility for flight path; remain prepared to assume manual control (abnormal conditions).
- Intervene if the flight status is not “as desired”; revert to lower automation level; disengage any A/F system not operating “as expected.”
- Encourage manual flying for maintaining proficiency when flight conditions permit.
- Clearly establish who controls aircraft under what conditions.
- Allow for switch of PF and PNF duties, providing that control is properly maintained. PF and PNF monitor each other's actions.

8. Summary

The Advisory Circular identifies the above broad topics that should be addressed in automation policies. Only a specific air operator and the respective aeroplane manufacturer knows what is best for particular circumstances. This model circular provides a suggested baseline for developing the operator specific mode awareness and emergency state management policy.

For the optimum use of automation, operators should promote the following, in which the central point remains “fly the airplane.”

- Understanding the integration of AP/FD and A/THR-A/T modes (pairing of modes).
- Understanding all mode transition and reversion sequences.
- Understanding pilot-system interfaces for:
  - pilot-to-system communication (for mode engagement and target selections)
  - system-to-pilot feedback (i.e., for mode and target cross-check)
- Awareness of available guidance (AP/FD and A/THR or A/T status and which modes are armed or engaged, active targets).
- Alertness to adapt the level of automation to the task and/or circumstances, or to revert to hand flying or manual thrust/throttle control, if required.
- Adherence to the aircraft specific design and operating philosophy and the air operator´s SOPs.
- If doubt exists regarding the aircraft flight path or speed control, do not attempt to reprogram the automated systems.
- Selected guidance or hand flying together with the use of navaids raw data should be used until time and conditions permit reprogramming the AP/FD or FMS.

- If the aircraft does not follow the intended flight path, check the AP and A/THR or A/T engagement status.
  - If engaged, disconnect the AP and/or A/THR or A/T using the associated disconnect push button(s), to revert to hand flying (with FD guidance or with reference to raw data) and/or to manual thrust control.
  - In hand flying, the FD commands should be followed. Otherwise, the FD bars should be cleared from display, AP and A/THR or A/T.

9. References

The following documents have been taken into consideration in the preparation of this RSA:

1. ICAO's Cooperative Development of Operational Safety & Continuing Airworthiness Programme (COSCAP) North Asia Advisory Circular for Air Operators, CNA 020 Issue 1. *"Mode Awareness and Energy State Management Aspects of Flight Deck Automation"*
2. Commercial Aviation Safety Team (CAST) Safety Enhancement 30 Rev 5 (CAST SE-30 Rev 5) August 2008 *"Mode Awareness and Energy State Management Aspects of Flight Deck Automation"*
3. EASA Safety Information Bulletin 2010-33 (EASA SIB No:2010-33 issued 18 Nov. 2010) *"Flight Deck Automation Policy – Mode Awareness and Energy State Management"*

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International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

Ref.: N 1-17 — **EMX0899** 23 December 2013

To: States, Territories and International Organizations

Subject: **RASG-PA Safety Advisory (RSA 2013- 002-R0)**

Action Required: **Adoption, as applicable, of the various Safety Enhancement Initiatives (SEIs) developed by RASG-PA, and presented in this RSA**

Sir/Madam:

The attached document is being distributed by the Regional Aviation Safety Group – Pan America (RASG-PA). RASG-PA was established to improve civil aviation safety and efficiency in the Pan American Region by applying ICAO Global Aviation Safety Plan (GASP) principles through a collaborative and coordinated approach in partnership with all aviation stakeholders under the leadership of ICAO.

RASG-PA Safety Advisories are issued to encourage States and aviation stakeholders to adopt practices that mitigate the major aviation safety risks in the Pan American Region as identified through the analysis of regional data.

Accept, Sir/Madam, the assurances of my highest consideration.

Firma Digital Digital Signature

Loretta Martin
Regional Director
North American, Central American and Caribbean (NACC) Regional Office

Enclosure:
As indicated

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RASG-PA SAFETY ADVISORY - RSA

REGIONAL AVIATION SAFETY GROUP – PAN AMERICA (RASG-PA) SAFETY ADVISORY-02 (RSA-02)

1. Introduction

1.1 The mission of the Regional Aviation Safety Group Pan America is to improve civil aviation safety and efficiency in the Pan American Region (North American, Central American, Caribbean (NAM/CAR), and South American (SAM) Regions) by applying the ICAO Global Aviation Safety Plan (GASP) principles through a collaborative approach in partnership with all aviation stakeholders under the leadership of ICAO.

1.2 RASG-PA has become the focal point to ensure harmonization and coordination of safety efforts aimed at reducing aviation safety risks in the Pan American Region and promote implementation of resulting safety enhancement initiatives by all stakeholders including ICAO, States/Territories, International Organizations and industry.

2. RASG-PA Safety Enhancement Initiative (SEI)

2.1 RASG-PA has performed an analysis of the three main safety risk areas based on Pan American regional data. As a result, various Safety Enhancement Initiatives (SEIs) were developed to reduce the rate of fatal accidents for the three main risk areas: Runway Excursions (REs), Controlled Flight Into Terrain (CFIT) and Loss of Control In-Flight (LOC-I).

2.2 To implement the SEIs, RASG-PA developed Detailed Implementation Plans (DIPs), which are championed by the member States/organizations who have volunteered to lead the specific initiative based on their area of expertise.

2.3 The progress of the associated DIPs is:

- 9 DIPs developed
- 2 in progress
- 7 completed

2.4 The progress of the associated DIP outputs is:

- 27 outputs developed
- 3 in progress
- 24 completed

2.5 Each SEI has outputs that rely on various groups for action.

3. RASG-PA Detailed Implementation Plans (DIPs)

3.1 The following RASG-PA DIPs are completed:

DIP	Description	Champion	Output	Comments
3.1.1	Runway Excursion (RE) DIPs			
RE/04	Promote pilot adherence to Standard Operating Procedures (SOPs) for approach procedures including the go-around decision-making process	ALTA	1. Distribution 2. Training	It ensures that the operators establish flight crew Standard Operating Procedures (SOPs) that fit that operator's particular operation, institute SOP training, and encourage operators to follow SOPs.
RE/11	Develop guidance material and training programmes to create action plans for runway safety teams	DGAC Mexico	1. Gather and publish available material on the RASG-PA website that may be used to mitigate hazards related to runway safety. 2. Electronic checklist development. 3. Develop a roll-out plan.	ICAO published the Runway Safety Team Handbook (draft) in April 2013. ICAO HQ, in coordination with ICAO NACC and SAM Regional Offices, and sponsorship and support from ACI-LAC, IFALPA, IFATCA, ECCAA, FAA, and other organizations delivered Regional Runway Safety Seminars in Miami, United States; Quito, Ecuador; and St. John's, Antigua and Barbuda.

DIP	Description	Champion	Output	Comments
3.1.2	Loss of Control in-flight (LOC-I) DIPs			
LOC-I/06	LOC Training – Human factors and automation.	PA-RAST	1. Review and evaluate the advisory circular created by the ICAO COSCAP's in Asia. 2. ICAO will distribute a copy of the developed generic advisory circular to each State in the Region. 3. Each State in the Region will use the generic advisory as a template to prepare a State Advisory Circular on mode awareness and energy state management aspects of flight deck automation. 4. Mode awareness and energy state management aspects of flight deck automation guidance is provided by operators to all their pilots.	It is designed to reduce Loss of Control accidents by encouraging air carriers to adopt consensus policies and procedures relating to mode awareness and energy-state management, as appropriate to their respective operations.
LOC-I/07	LOC Training – Advanced maneuvers	ALTA	1. Listing of training materials available from regulators, industry, operators, academia and other sources. 2. Advanced Maneuvers Training provided to all operators. 3. Advanced Maneuvers Training provided by all operators. The expectation is that this training will be accomplished during initial training and as part of the recurrent training programme via ground and simulator instruction within the certified flight envelope, with emphasis on recognition, prevention and recovery technique.	Advanced maneuvers training (AMT) refers to training to prevent and recover from hazardous flight conditions outside of the normal flight envelope, such as in-flight upsets, stalls, ground proximity and wind shear escape maneuvers, and inappropriate energy-state management conditions.
LOC-I/09	LOC Training - Pilot monitoring policies and procedure for the operator and training programme for crews	IFALPA	1. Listing of training materials available from industry, operators and other sources. 2. Raise awareness of availability and need for Pilot Monitoring Training. 3. Pilot Monitoring Training material provided to all operators. 4. Pilot Monitoring Training provided by operators to all their pilots.	It reduces LOC-I accidents by improving pilot situational awareness.

DIP	Description	Champion	Output	Comments
3.1.3	Controlled Flight into Terrain (CFIT) DIPs			
CFIT/02	Specific ALAR/CFIT Training for Pilots	IATA	1. CAA conducts a review of all operators to ascertain which operators have CFIT prevention training and procedures in their approved training manual. 2. If an operator does not have CFIT training, it will be encouraged to incorporate CFIT training into the airline training programme.	It encourages air carriers to implement syllabi that train and evaluate flight crews on stabilized approaches, unusual attitudes, and upset recoveries. Specific topics related to stabilized approaches should include: crew resource management, go-around criteria, approaches with system malfunctions, unusual conditions, emphasis on basic airmanship, approach briefings, and approach and missed approach procedures.
CFIT/04	CRM/Situational Awareness for pilots and air traffic controllers	IFALPA & IFATCA	1. Incorporate and/or update CRM/situational awareness training programmes for all flight crew members of air transport operators emphasizing aircraft position with relation to terrain and reviewing past occurrences. 2. Incorporate CRM/situational awareness training programmes for all air traffic controllers and Air Navigation Service Providers (ANSP) emphasizing aircraft position with relation to minimum allowable altitude.	It reduces CFIT accidents by improving pilot and air traffic controller Situational Awareness, and adds CFIT prevention training and procedures to air carrier training curricula, emphasizing pilot Situational Awareness and escape procedures for flight crews to use in the event of a terrain warning indication.

4. Summary

4.1 The reactive data analysed by RASG-PA for the Pan American Region continues to identify Loss of Control In-flight (LOC-I), Runway Excursions (RE) and Controlled Flight into Terrain (CFIT) as the top fatal accident categories for the 2001-2012 period.

4.2 According to its mandate, RASG-PA has developed Safety Enhancement Initiatives for the Pan American Region. To date, RASG-PA has completed 7 out of 9 DIPs, and completed 24 of 27 associated outputs.

4.3 RASG-PA is in the process of finalizing pending DIPs and developing new DIPs for RE, CFIT, LOC-I, and Mid Air Collisions (MACs).

4.4 RASG-PA is fulfilling the objective of enhancing safety in the Pan American Region by reducing duplication of efforts and human and financial resource expenditure.

4.5 RASG-PA encourages all respective aviation stakeholders to implement the applicable SEIs listed above and developed by RASG-PA.

4.6 For additional information visit: www.rasg-pa.org/ and/or contact: info@rasg-pa.org

— END —

APPENDIX / APÉNDICE C

International Civil Aviation Organization
Organización de Aviación Civil Internacional

Regional Aviation Safety Group — Pan America/
Grupo Regional de Seguridad Operacional de la Aviación — Pan América (RASG-PA)

RASG-PA FOCAL POINT REGISTRATION FORM/ FORMULARIO DE REGISTRO DE PUNTOS FOCALES DE RASG-PA

1.	**NAME/NOMBRE**	
2.	**POSITION/PUESTO**	
3.	**ORGANIZATION/ ORGANIZACIÓN**	
4.	**STATE/ESTADO**	
5.	**TELEPHONE/ TELÉFONO**	
6.	**E-MAIL/ CORREO ELECTRÓNICO**	

RASG-PA TEAMS FOCAL POINT REGISTRATION FORM/ FORMULARIO DE REGISTRO DE PUNTOS FOCALES DE LOS EQUIPOS DE RASG-PA

Pan America — Regional Aviation Safety Team Meeting/ Pan-América - Equipo Regional de Seguridad Operacional de la Aviación (PA-RAST)					
Name/ Nombre		Position/ Puesto		E-mail/ Correo Electrónico	
Annual Safety Report Team/Equipo a cargo del Informe Anual sobre Seguridad Operacional (ASRT)					
Name/ Nombre		Position/ Puesto		E-mail/ Correo Electrónico	
Aviation Safety Training Team/ Equipo de Instrucción de Seguridad Operacional de la Aviación (ASTT)					
Name/ Nombre		Position/ Puesto		E-mail/ Correo Electrónico	

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