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TECHNICAL COMMISSION

Agenda Item 32: Air Navigation — Policy

PLANNING FOR DEVELOPMENT OF WAKE VORTEX FLIGHT SAFETY SYSTEM

(Presented by the Interstate Aviation Committee)

EXECUTIVE SUMMARY

This working paper presents a brief overview of the Wake Vortex Flight Safety System (WVSS) concept and architecture along with a proposal to incorporate development and standardization of WVSS in the ICAO Global Air Navigation Plan (GANP, Doc 9750) among other activities addressing wake turbulence issues in accordance with Recommendation 2/4 of the ICAO Twelfth Air Navigation Conference.

The use of WVSS would allow introduction of the aircraft wake turbulence separation with increasing capacity of airports and airspace, while maintaining the flight safety level, within two Performance Improvement Areas: Airport Operations (Area 1) and Optimum Capacity and Flexible Flights (Area 3).

Action: The Assembly is invited to recommend incorporating WVSS technology development tasks in the Fourth Edition of GANP (Doc 9750) and the Aviation System Block Upgrades (ASBU) on the basis of the system concept and architecture presented.

Strategic Objectives:	This working paper relates to the Safety and the Environmental Protection and Sustainable Development of Air Transport Strategic Objectives.
Financial implications:	Financing within ICAO Regular Program budget allocated for capacity and efficiency improvements and wake turbulence safety issues.
References:	Global Air Navigation Plan for 2013-2028 (GANP, Doc 9750, Fourth Edition – 2013) Aviation System Block Upgrades (ASBU) Report of the ICAO 12th Air Navigation Conference (Doc 10007) A38-WP/283, TE/126 (presented by the Russian Federation)

[1] English and Russian versions provided by IAC.

(3 pages)

1. INTRODUCTION

1.1 The ICAO strategy presented in the Global Air Navigation Plan for 2013-2028 (GANP, Doc 9750) and Aviation System Block Upgrades (ASBUs) aimed at reduction of the aircraft separation minima under wake vortex conditions should ensure an increase of the airspace and airport capacity while meeting safety targets for current and projected air traffic conditions. It was submitted that this task would be addressed by implementation of means and measures that include development and introduction of a wake vortex flight safety system (WVSS).

1.2 As a result of discussions on these issues the ICAO 12th Air Navigation Conference, in its Recommendation 2/4 - Optimized management of wake turbulence, recommended, among other things, to pursue development of dynamic wake turbulence separation provisions. This recommendation also calls for development of the WVSS concept description along with a proposed system architecture with the possibility for WVSS to be included in the appropriate ASBU modules.

2. BRIEF OVERVIEW OF THE WAKE VORTEX FLIGHT SAFETY SYSTEM CONCEPT

2.1 WVSS (details of the system concept and architecture are provided in reference 4) represents an integrated software and/or hardware designed for a resolving of a wake vortex flight safety task, effective use of and access to the airspace taking into account existing rules and procedures as well as recommended practices for the air traffic management.

2.2 WVSS is based on a concept of determination of a minimum safe wake vortex separation intervals stipulated in the existing rules or identified dynamically taking into account current flight conditions, meteorological conditions, specific types of aircraft being separated and their flight envelopes.

2.3 Depending on the airport equipment and its air traffic capacity WVSS offers air navigation providers a possibility of selecting the normalized static wake vortex aircraft separation or a pair-wise dynamic wake vortex separation.

2.4 The pair-wise dynamic aircraft separation in the terminal area (TMA) is used when a demand on the take-off and landing operations is higher than the standard runway capacity, aerodrome is equipped with an appropriate ground WVSS segment, and the stable weather conditions at the aerodrome contribute to drifting wake vortexes from the runway.

2.5 Application of the pair-wise dynamic aircraft separation at all phases of flight will assist in the improvement of wake vortex safety, especially in specific weather conditions when a low disturbed atmosphere, low crosswind, thermal stratification of atmosphere etc. lead to a situation when safe distances could be significantly higher than the standard ones.

2.6 In order to ensure the wake vortex safety, effectiveness of use and access to the airspace WVSS, depending on its level of service, is capable of providing airspace users with information and recommendations for aircraft separation including for pair-wise separation taking account of current and forecast wake vortex conditions.

2.7 The design of WVSS represents a distributed system comprising airborne and ground segments and is built upon basic and specialized technologies and means of air navigation, as well as on flight management and air navigation avionics.

2.8 The WVSS implementation can make use of digital air navigation data links, which represent intrinsic components of the automatic surveillance systems. Each aircraft equipped with airborne WVSS segment should provide via “air-to-air” and “air-to-ground” data links its wake vortex parameter data or information concerning own aircraft , which allows calculating its wake vortex. In order to forecast the wake vortex dynamics the airborne WVSS segment should also ensure measurement and transmission of the external meteorological parameters measured on board.

2.9 Additional data sources used for the WVSS operation are ground means for wake vortex remote monitoring providing data on the location and intensity of wake vortexes, which are required for evaluation of the wake vortex hazard level and calculation of the hazardous wake turbulence zones at the aerodrome and TMA. The ground WVSS segment also integrates the wake turbulence conditions received from the ground facilities for wake vortex monitoring and the data from the airborne WVSS segment received through the “air-to-ground” air navigation data links and provides information and recommendations to airspace users through the “ground-to-air” data links.

3. WVSS DEVELOPMENT PLANNING IN GANP AND ASBU

3.1 Draft 4th edition of GANP and ASBU, as presented to the Assembly, address wake vortex safety issues primarily under two Performance Improvement Areas: Airport Operations (Area 1) and Optimum Capacity and Flexible Flights (Area 3). Modules B-WAKE (formerly B-70) and B-ASEP (formerly B-85), which belong to these two areas respectively, do not contain however any material regarding WVSS development and standardization.

3.2 On the other hand, there are well known activities in a number of Contracting States and international agencies aiming at the development of prototypes and system elements enabling, subject to proper integration, envisaged WVSS architecture and functions. Results received so far confirm the viability and potential of the system concept as an essential element of measures providing for capacity and safety improvements.

3.3 The pace of studies and development also confirm the feasibility of achieving system implementation phase by the end of the time interval for series B1 modules (Block 1, 2014-2018). Accordingly, inclusion of the WVSS operational capabilities and standardization as a new Block 1 module in the Airport Operations improvement area, or preferably in the Optimum Capacity and Flexible Flights improvement area of the fourth edition of GANP (Doc 9750) and ASBU is necessary and timely. Subsequent phases of the WVSS evolution as a part of series B2 modules (Block 2, post 2018) could be determined in the next review of GANP according the proposed triennium update cycle.

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