

Accepted Manuscript

Conceptual design, performance and stability analysis of a 200 passengers Blended Wing Body aircraft

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PII: S1270-9638(16)31264-0
DOI: <https://doi.org/10.1016/j.ast.2017.09.037>
Reference: AESCTE 4222

To appear in: *Aerospace Science and Technology*

Received date: 11 December 2016
Revised date: 15 September 2017
Accepted date: 20 September 2017

Please cite this article in press as: S. Ammar et al., Conceptual design, performance and stability analysis of a 200 passengers Blended Wing Body aircraft, *Aerosp. Sci. Technol.* (2017), <https://doi.org/10.1016/j.ast.2017.09.037>

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1 Conceptual design, performance and stability analysis of a 200 passengers
2 Blended Wing Body aircraft

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6

7 **Abstract**

8 The Blended Wing Body (BWB) is a type of innovative aircraft, based on the flying wing concept. For this
9 aircraft, the literature has reported performance improvements compared to conventional aircraft: economy of
10 fuel, reduction of the weight of the structure, increased payload capacity and less impact on the environment.
11 However, most BWB studies have focused on large aircraft and it is not sure whether the gains are the same for
12 smaller aircraft. The main objective of this study is to perform the conceptual design of a 200 passengers BWB
13 and compare its performance against an equivalent conventional A320 aircraft in terms of payload and range.
14 Moreover, an emphasis will be placed on obtaining a stable aircraft, with the analysis of static and dynamic
15 stability over its flight envelope. This kind of aircraft has a lack of stability due to the absence of vertical tail.
16 Most studies of stability were already realized on reduced size models of BWB, but there is no study on a 200
17 passengers BWB. The design of the BWB was realized with the platform called Computerized Environment
18 for Aircraft Synthesis and Integrated Optimization Methods (CEASIOM). The airplane, the engines and the
19 control surfaces were obtained in the geometrical module AcBuilder. This design platform, suitable for
20 conventional aircraft design, has been modified and additional tools have been integrated in order to achieve
21 the aerodynamic, performance and stability analysis of the BWB aircraft. The aerodynamic coefficients are
22 calculated from Tornado program. The BWB flight envelope was created based on aeronautical data of A320
23 aircraft. From this flight envelope, we have got back several thousand possible points of flight. The static and
24 dynamic stability was studied using the longitudinal and lateral matrices of stability and the Flying Qualities
25 Requirements for every flight point.

26
27 Keywords: Blended Wing Body, CEASIOM, Aerodynamic analysis, Aircraft Performance, Low fidelity optimization, Flight dynamic

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