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# Datasheet for the decision of 6 July 2021

**Case Number:** T 3021/19 - 3.2.01

**Application Number:** 13161307.7

**Publication Number:** 2644498

**IPC:** B64C23/06, B64C5/10

**Language of the proceedings:** EN

**Title of invention:**
PERFORMANCE-ENHANCING WINGLET SYSTEM AND METHOD

**Patent Proprietor:**
The Boeing Company

**Opponents:**
1.AIRBUS OPERATIONS LIMITED/2.AIRBUS OPERATIONS SAS/
3.AIRBUS OPERATIONS S.L./4.AIRBUS SAS/5.AIRBUS OPERATIONS GMBH

**Headword:**

**Relevant legal provisions:**
EPC Art. 123(2), 87, 56

**Keyword:**
Amendments - added subject-matter (no)
Priority - basis in priority document (yes)
Inventive step - main request (yes) - non-obvious modification

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

**Case Number: T 3021/19 - 3.2.01**

# D E C I S I O N
# of Technical Board of Appeal 3.2.01
# of 6 July 2021

| | |
|---|---|
| **Appellant:** (Opponents) | 1.AIRBUS OPERATIONS LIMITED/2.AIRBUS OPERATIONS SAS/3.AIRBUS OPERATIONS S.L./4.AIRBUS SAS/ 5.AIRBUS OPERATIONS GMBH<br>Aerospace Avenue, Filton/Site de Martin du Touch 316 Route de Bayonne/Paseo John Lennon/2 rond-point Emile Dewoitine/Kreetslag 10<br>Toulouse/Getafe Madrid/Blagnac/Hamburg<br>Bristol BS34 7PA (GB) |
| **Representative:** | Abel & Imray<br>Westpoint Building<br>James Street West<br>Bath BA1 2DA (GB) |
| **Respondent:** (Patent Proprietor) | The Boeing Company<br>100 North Riverside Plaza<br>Chicago, IL 60606-1596 (US) |
| **Representative:** | Boult Wade Tennant LLP<br>Salisbury Square House<br>8 Salisbury Square<br>London EC4Y 8AP (GB) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 4 September 2019 concerning maintenance of the European Patent No. 2644498 in amended form.** |

**Composition of the Board:**

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| **Chairman** | G. Pricolo |
| **Members:** | A. Wagner |
| | O. Loizou |

## Summary of Facts and Submissions

I. The appeal of the joint opponents lies against the decision of the Opposition Division to maintain the European patent No. 2 644 498 in amended form on the basis of the main request filed during opposition proceedings.

II. In its decision, the Opposition Division held that none of the grounds of opposition raised by the joined opponents under Article 100(a) EPC in combination with Article 54 and Article 56 EPC and under Article 100(c) EPC was prejudicial to the maintenance of the patent according to the main request. The objection concerning the validity of the claimed priority of the patent in suit was held unfounded.

In order to come to these conclusions the opposition division considered, among others, the following documents:

D1: WO 2012/171023 A1
D3: WO 2012/007358 A1

III. To support their objections under Article 100(a) EPC, the appellants (opponents) filed with their grounds of appeal

D9: *Wingtip Devices: What They Do and How They Do It*, Doug McLean, Published - 2005, 2005 Boeing Performance and Flight Operations Engineering Conference

D10: YouTube Video "Boeing 737 MAX Advanced Technology winglet design unveiled" - published 9 May 2012, accessible at:

https://www.youtube.com/watch?v=o6A6arPgXVc

IV. Oral proceedings by videoconference were held before the Board on 6 July 2021.

V. The appellants (opponents 1 to 5) requested that the decision under appeal be set aside and the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed (main request) in the alternative that the patent be maintained in amended form on the basis of one of the auxiliary requests 1 to 4 filed during the opposition proceedings or one of auxiliary requests 5-9 filed with the reply to the statement of grounds of appeal.

VI. The main request includes two independent claims. Claim 1 of the main request reads as follows:

An aircraft (10) comprising a winglet system (98) and a pair of wings (50), each wing (50) having a wing tip including a wing tip chord, the winglet system (98) comprising for each wing (50):
an upper winglet (100) and a lower winglet (200) mounted to the wing (50);
the lower winglet (200) having a static position when the wing (50) is subject to a ground static loading; and
the lower winglet (200) being configured such that upward deflection of the wing under an approximate 1-g flight loading causes the lower winglet (200) to move from the static position to an in-flight position and resulting in a relative span increase of the wing (50), wherein the lower winglet (200) is oriented at an anhedral angle from approximately 15 degrees to

approximately 30 degrees during upward deflection of the wing under the approximate 1-g flight loading,
wherein the upper winglet (100) is oriented at a dihedral angle of at least approximately 60 degrees during upward deflection of the wing under the approximate 1-g flight loading,
wherein the lower winglet (200) has a length of from approximately 50 to 80 percent of a length of the upper winglet (100) extending from an upper winglet root (102) to an upper winglet tip (106),
wherein the upper winglet (100) and the lower winglet (200) each have a root chord;
and characterized in that
the upper winglet (100) root chord and the lower winglet (200) root chord each have a length of from approximately 60 to 100 percent of a length of the wing tip chord.

Claim 6 of the main request reads as follows:

A method (300) of enhancing performance of an aircraft (10), the method being characterized by the steps of, for each wing of a pair of wings:
providing (302) an upper winglet (100) and a lower winglet (200) on the wing, the lower winglet (200) having a length of from approximately 50 to 80 percent of a length of the upper winglet (100) extending from an upper winglet root (102) to an upper winglet tip (106), the lower winglet (200) having a static position when the wing is subject to a ground static loading;
upwardly deflecting (304) the wing under an approximate 1-g flight loading;
moving (306) the lower winglet (200) from the static position to an in-flight position during upward deflection of the wing;

causing (308, 310) a relative span increase of the wing when moving the lower winglet (200) from the static position to the in-flight position;
orienting the lower winglet (200) at an anhedral angle from approximately 15 degrees to approximately 30 degrees during the upward deflection of the wing;
orienting the upper winglet (100) at a dihedral angle of at least approximately 60 degrees during the upward deflection of the wing; and
dividing a wing tip aerodynamic load between the upper winglet (100) and the lower winglet (200), the upper winglet (100) and the lower winglet (200) each having a root chord having a length of from approximately 60 to 100 percent of a length of the wing tip chord.

VII. The appellants' (opponents) arguments may be summarized as follows:

*Added subject-matter*

Comparing the meaning of the "winglet system" between the specification as filed and the main request, new subject-matter was added because in each case the respective "winglet system" was defined differently.
In the original application a "winglet system" had only one upper and one lower winglet and the aircraft had two "winglet systems", one at the end of each wing (column 2, lines 14 -16 and 43, 44 and column 4, lines 4-47 and 51-54 of the application as published).
Claim 1 of the main request disclosed a "winglet system" having two upper winglets and two lower winglets, one for each wing. Nowhere in the application as originally filed a basis could be found for the definition according to claim 1.

*Priority/ Novelty*

Neither the dependency of the claims nor a specific embodiment of the priority document could provide sufficient support to the specific feature combination of claim 1.

The features described in para. [0038] of the priority document "*the upper winglet root chord and the lower winglet root chord each have a length of from approximately 60 to 100 percent of a length of the wing tip chord*" and the features described in para. [0050] of the priority document "*the lower winglet (200) at an anhedral angle from approximately 15 degrees to approximately 30 degrees" and "a dihedral angle of at least approximately 60 degrees"* were not unambiguously presented in combination but formed part of separate embodiments.

Even if the features were considered as being disclosed in combination, they were disclosed only in combination with other features, e.g. the "leading edge sweep angle 214" or the "twist angle 222" (see para. [0042, 0043] of the priority document). The features of claim 1 were extracted from a specific embodiment constituting an unallowable intermediate generalisation.

As the priority claim was not valid, D1 and D10 constituted prior art according to Article 54 EPC, both being novelty destroying for the subject-matter of claim 1 and of claim 6 of the main request.

*Inventive step*

The Opposition Division did not formulate the objective technical problem correctly (impugned decision, page 10, penultimate paragraph) as D3 already solved this problem posed (D3, page 4, lines 19-26).
The distinguishing features of claim 1 did not provide any substantive benefit or any new fundamental teaching over the disclosure of D3, in particular as claim 1 did not place any limits on the types of wing for which the winglet was used. However the effect of a winglet system depended on the wing.
It was part of the skilled person's general knowledge that the geometric parameters of the wing tip device could be varied depending on the performance objective and/or the wing. The distinguishing features only constituted an optimisation of the D3-winglet for another wing. There was no evidence that the device of claim 1 offered anything more than a suitable design configuration.
An appropriate objective technical problem might be seen in "*looking for an alternative geometry of the device of D3*" or in "*optimising the D3-winglet system for a different wing*".

*D3 with general knowledge*
The distinguishing features were obvious choices based on common general knowledge when trying to find a winglet system for a different wing. D3 disclosed at least 5 different embodiments and thus taught that the geometry of the wingtip device could be readily altered without changing the core function. The geometrical features of claim 1 and of claim 6 were only small changes, normal workshop variants, as compared to those disclosed in D3. Even if such an optimisation might be complex or time consuming and even if multiple

parameters needed to be considered, the claimed modifications still did not deliver any effect different to those provided by the features according to D3.

*D3 with D9*

D9 summarised the common general knowledge. The skilled person was taught that the size of a wingtip device should be optimized for the baseline airplane and/or performance objectives (page 4.19, last sentence of first paragraph). Further the skilled person was taught to consider changing the size and the dihedral angle of the lower winglet (page 4.14, last paragraph to page 4.15, first paragraph, figure 1.1(6)). From D9 it became clear that the specific values required by claim 1 and claim 6 were an aggregation of values that when starting from D3 were individually and collectively obvious to try. The potential onerousness in selecting values of parameters from a number of possibilities must not be confused with inventiveness.

VIII. The respondent's (patent proprietor) arguments may be summarized as follows:

*Added subject-matter*

The phrase "winglet system" did not have a restricted meaning to the skilled person in the sense that it necessarily defined a single pair of upper and lower winglets. In any case, the amendments did not provide any new technical information as whatever aspect of claim 1 was labelled a "winglet system", the claimed subject-matter remained unchanged.

*Priority/Novelty*

The claimed features were based on claims 1, 2, 3, 5, 6 and 8 of the priority application and shown in combination in figures 1, 2, 3 and 8. According to the brief description of the drawings all these figures referred to the same embodiment. The additional feature concerning the upper limit of "*approximately 30 degrees*" was disclosed in para. [0050] of the priority document in combination with the lower limit already claimed in claim 2 of the priority application.

The alleged intermediate generalisation was unfounded as para. [0042] of the priority document did not limit the leading edge sweep angle 214 to any specific angle. Also the twist angle 222 was only disclosed as being optional (para. [0035, 0043]). Additionally the features under discussion were functionally independent as they referred to reduction of load bending of the wing and to load distribution along the length of the lower wing.

As the priority of the patent in suit was valid, D10 did not constitute prior art according to Article 54 EPC. Furthermore D10 should not be admitted into the proceeding as it was not prima facie relevant. Furthermore D1 did not show, inter alia, the features of the characterising portion of claim 1.

*Inventive step*

The objective technical problem as set out in the impugned decision was correct. D3 solved the problem of offsetting at least some of the decrease in wing span that occurred due to aeroelastic deformation (page 4, lines 19 to 21), not the problem of reducing drag

without compromising structural and aerodynamic stability (para. [0006] of the patent in suit).

*D3 with general knowledge:*

The cited prior art did not disclose the novel features. D3 taught away from the novel features, e.g. because it disclosed an upper winglet essentially larger than the lower winglet. On the contrary claim 1 aimed at a much larger lower winglet relative to the upper winglet.

The device of D3, figure 12, could not be modified in a way that all novel features could be realized. If the anhedral angle would be decreased such as to be in the range of 15° to 30°, the length of the lower wing had to be decreased and would never reach 50% to 80% of the length of the upper wing as the span limits needed to be respected e.g. in view of airport gates. Furthermore the design of a winglet system was a complex multi-disciplinary technical problem, involving aerodynamic and structural considerations.

D9 should not be admitted into the appeal proceedings, inter alia, because D9, being a scientific article, was not cited as a secondary document but as evidence for common general knowledge. According to the Case Law of the Boards of Appeal, normally common general knowledge did not include scientific articles.

## Reasons for the Decision

1. **Article 123(2) EPC**

1.1 The opposition division decided that the requirements of Article 123(2) EPC are met. The Board shares this view for the reasons given in the impugned decision (chapter 14.2).

1.2 The opponents' arguments are not convincing as the technical information of the original application and of claim 1 remains the same. Whether the aircraft comprises a "winglet system" for each wing or a "winglet system" including the winglets of both wings is just a matter of labelling as pointed out by the respondent.

**2. Priority**

2.1 The opposition division decided that the claimed subject-matter is entitled to the claimed priority date. The Board shares this view for the reasons given in the impugned decision (chapter 15).

2.2 The patent in suit claims priority from document US2012/13436355, to which the text passages, claims and figures mentioned herein below refer to.

2.3 As pointed out by the respondent, the description and the figures of the patent in suit and of the priority application are identical. The only difference is in the dependency of the sub-claims, which in the priority document are dependent on claim 1 only.
Claim 1 of the main request combines the features of claim 1 and of dependent claims 2, 3, 5, 6 and 8 of the priority document, and further includes the feature concerning the upper limit of "*approximately 30 degrees*" which is based on para. [0050]. All the features of these claims are however disclosed in combination in figures 1, 2, 3 and 8, that relate to the same embodiment (see in particular para. [0011] to [0018]). Therefore, although claims 2, 3, 5, 6 and 8 are dependent on claim 1, no new technical information is introduced when combining the features of these dependent claims with claim 1 and with each other, as

the basis for this combination is clearly and unambiguously derivable from the embodiment disclosed in the figures and the description. It is noted that the appellants' objection that the feature "*the upper winglet root chord and the lower winglet root chord each have a length of from approximately 60 to 100 percent of a length of the wing tip chord*" is only based on para. [0038] fails, as this feature is recited in dependent claim 6.

2.4 As mentioned above, claim 1 further includes the feature concerning the upper limit of "*approximately 30 degrees*" based on para. [0050]. This paragraph starts by a first sentence specifically describing the embodiment of figure 8, and then, in a second sentence, discloses the upper limit of approximately 30 degrees in relation to "*a further embodiment*". The appellants concluded therefrom that this upper limit does not unambiguously apply to the embodiment of figure 8. The Board disagrees because the wording of the second sentence can only be understood as restricting a general disclosure made with respect to the embodiment of figure 8, in which the lower winglet is oriented at an anhedral angle of no less than approximately 15 degrees, to a more specific disclosure "*of from approximately 15 to approximately 30 degrees*" which clearly and unambiguously still applies to the embodiment of figure 8 (which includes all the features of claims 1, 2, 3, 5, 6 and 8).

## 3. Novelty/ Admissibility of D10

3.1 As the patent in suit validly claims priority, novelty over D1 and D10 (the sole documents relied upon by the appellants for novelty) is undisputedly not an issue.

3.2 Indeed D1 does not belong to the prior art according to Article 54 EPC as correctly concluded by the Opposition division, chapter 16.1 and 17.1 of the impugned decision, and D10 as well, as it was published on 9 May 2012, i.e. after the validly claimed priority date (30 March 2012)
Accordingly the issue of admissibility of D10 raised by the respondent becomes moot and needs not be decided.

4. **Inventive step - claim 1 and claim 6**

4.1 The opposition division decided that the claimed subject-matter involves an inventive step. The Board shares this view.
The following argumentation regarding claim 1 applies mutatis mutandis to claim 6.

4.2 All parties agreed upon that D3, fifth embodiment shown in figures 12 and 13, was closest prior art for the subject-matter of both independent claims.

4.3 All parties agreed that the aircraft of claim 1 differs from the known aircraft in that:

- the lower winglet is oriented at an anhedral angle from approximately 15 degrees to approximately 30 degrees during upward deflection of the wing under the approximate 1-g flight loading,
- the lower winglet has a length of from approximately 50 to 80 percent of a length of the upper winglet extending from an upper winglet root to an upper winglet tip,
- the upper winglet root chord and the lower winglet root chord each have a length of from approximately 60 to 100 percent of a length of the wing tip chord.

4.4 Contrary to the respondent's opinion, D3 already mentions on page 4, lines 22 to 26 that a winglet with a lower element reduces drag on the wing. Therefore the objective technical problem may be seen in adapting the geometry of the known device to another wing type.

A skilled person knows that the geometry of a wing tip device is adapted to a specific wing and a specific performance target. Therefore the wing tip device of D3 needs to be modified when the wing design changes e.g. for another aircraft type. The problem can thus be seen in optimizing the device of D3 for a different wing and/or airplane.

4.5 Starting from D3 and having regard to the general knowledge of the skilled person, it would be obvious to consider reducing wing drag or improving other performance aspects when looking for an alternative wing tip device. The skilled person further knows that the length of the winglets, the dihedral or anhedral angle or other geometries of the wing tip device may be varied in order to find a solution to the problem posed.

4.6 However the appellants' (opponents) argumentation that the distinguishing features of claim 1 only constitute normal design optimisation and that the range of geometries in claim 1 are small changes compared to those disclosed in D3 is not convincing for the following reasons.

4.6.1 The fact that D3 discloses a wing tip device with an upper and a lower winglet is per se not sufficient to conclude that all possible geometries for such a device would be obvious.

4.6.2 The cited prior art does not give any indication why the skilled person would specifically modify the parameters according to the above-mentioned distinguishing features such that they would fall in the claimed ranges.
The parameters that may be varied are not limited to

those claimed, and as stated by the opposition division and confirmed by the appellants, the skilled person also knows that each modification of a single parameter in the winglet design has immediate consequences on the other parameters.

4.6.3 As D3 is a specific solution adapted to a specific wing/airplane design the skilled person has no incentive to make essential changes to the geometry of D3.

In particular, in figure 12 of D3, the anhedral angle has a value of 54°. In another embodiment shown in figure 7, the minimal anhedral angle has a value of 42°. The claimed range between 15°-30° is distant from the disclosed values of 54° and 42° and thus cannot be qualified as a "small change".

D3, page 5, lines 9-11, states that the upper winglet "*is larger than the lower winglet*" and that "*the lower wing-like element may have an element planform area less than approximately 25% of the upper wing-like element planform area*", see also the lower winglet size in comparison to the upper winglet size in figure 10 or 13.
The size of the lower winglet in relation to the upper winglet also is restricted as the lower winglet is not fixed to the wing tip but to the upper winglet (D3, page 5, line 17). Such a mounting restricts the structural support for carrying the aerodynamic loads produced by the lower winglet.

In contrast, the patent in suit claims that not only the upper winglet but also the lower winglet has a chord length of from approximately 60 to 100% of a length of the wing tip chord and furthermore that the

lower winglet has a length of from approximately 50 to 80% of a length of the upper winglet. Both features, as stated by the opposition division (decision page 11, last full paragraph) imply a relatively larger lower winglet, in relation to the upper winglet, than the lower winglet of D3. These features result in a lower winglet having a planform area essentially larger than 25% of the upper winglet planform area.

4.6.4 Consequently the distinguishing features, all referring to the design of the lower winglet, cannot be regarded as small changes but as essential modifications over D3. In the absence of any indications in the prior art, these modifications cannot thus be regarded as obvious.

4.7 D9 was filed to support the appellants' argument that the novel features of the main request are obvious choices based on common general knowledge.

4.7.1 The Board agrees with the appellants (even without considering the disclosure of D9) that it is common general knowledge that the performance of a winglet system depends on the wing/airplane design, and that the skilled person knows that changing the geometry of the winglets influences the performance of the winglet system.

4.7.2 However D9 fails also to disclose or to hint to the three distinguishing features of claim 1. The attack based on a combination of D3 with D9 is thus not more convincing than the attack based on D3 with general knowledge. Accordingly there is no need to deal with the issue of admissibility of D9 raised by the respondent.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano G. Pricolo

Decision electronically authenticated