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Datasheet for the decision of 4 February 2021

Case Number: T 2219/18 - 3.2.01

Application Number: 09767892.4

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IPC: B64C3/10, B64C11/18, B64C23/06, B64C27/46

Language of the proceedings: EN

Title of invention:
CURVED WING TIP

Patent Proprietor:
Aviation Partners, Inc.

Opponent:
Airbus Operations Limited/Airbus Operations GmbH /Airbus Operations SAS/Airbus Operations SL/ Airbus SAS

Headword:

Relevant legal provisions:
EPC Art. 100(c), 56
RPBA 2020 Art. 13(2)

Keyword:
added subject-matter (yes)
inventive step (no)
admission of late filed requests (no)
Amendment after summons - exceptional circumstances (no)

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 2219/18 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 4 February 2021

Appellant: (Patent Proprietor)	Aviation Partners, Inc. 7213 Perimeter Road South Seattle, WA 98108-3812 (US)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Appellant: (Opponent)	Airbus Operations Limited/Airbus Operations GmbH /Airbus Operations SAS/Airbus Operations SL/ Airbus SAS Pegasus House, Aerospace Avenue, Filton/ Kreetslag 10/316, route de Bayonne/ Paseo John Lennon/2 rond-point Emile Dewoitine Bristol BS99 7AR/ Hamburg/Toulouse/Madrid/Blagnac (GB)
Representative:	Abel & Imray Westpoint Building James Street West Bath BA1 2DA (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 29 June 2018 concerning maintenance of the European Patent No. 2303685 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	C. Narcisi
	A. Jimenez

Summary of Facts and Submissions

I. The European patent No. 2 303 685 was maintained in amended form according to the decision of the Opposition Division posted on 29 June 2018. Against this decision an appeal was lodged by the Opponent and by the Patentee in due form and in due time pursuant to Article 108 EPC.

II. Oral proceedings were held on 4 February 2021.
Appellant I (Patentee) requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or, alternatively, that the appeal of the Appellant II (Opponent) be dismissed (and the patent be maintained in the form allowed by the Opposition Division) or, that the patent be maintained in amended form on the basis of auxiliary requests 2 to 3, filed on 26 March 2019 or, that the patent be maintained on the basis of auxiliary requests 5, filed on 23 December 2020 or on the basis of auxiliary request 6 as filed during the oral proceedings.
Appellant II (Opponent) requested that the decision under appeal be set aside and that the patent be revoked.

III. Claim 1 of the main request reads as follows:

"A curved wing tip (200) connected to a wing (210) for an aircraft swept toward the aft of the aircraft and having a wing leading edge (212) and a wing trailing edge (216) that exhibits a wing trailing edge sweep angle (218), the curved wing comprising:

a leading edge (212) curved to maintain attached air flow and defining a first parabolic line from the wing leading edge to a leading end point (228);
a trailing edge (216)curved to maintain elliptic loading over the wing tip defining a second parabolic line from the trailing edge to a trailing end point (232); and
an end segment (234) connecting the leading end point and the trailing end point, the end segment being swept at an end segment angle close to or equal to the wing trailing edge sweep angle (218) to maintain a trailing vortex position close to the trailing end point."

Claim 1 according to the form allowed by the Opposition Division (auxiliary request 1) differs from claim 1 of the main request in that the wording "trailing vortex position close to the trailing end point" is replaced by "trailing vortex position close to the trailing end point, wherein the leading edge forms the first parabolic line starting generally tangential with the wing leading edge and approaching a free stream direction at the leading end point, and wherein the trailing edge forms the second parabolic line starting generally tangential from the wing trailing edge and approaching the freestream direction at the trailing end point".

Claim 1 of auxiliary request 2 differs from claim 1 of the main request in that the wording "the end segment being swept at an end segment angle" is replaced by "the end segment having a length and being swept at an end segment angle".

Claim 1 of auxiliary request 3 differs from claim 1 of auxiliary request 1 in that the wording "the end segment being swept at an end segment angle" is

replaced by "the end segment having a length and being swept at an end segment angle".

Auxiliary request 4 was withdrawn.

Claim 1 of auxiliary request 5 differs from claim 1 of auxiliary request 3 in that the wording "to maintain a trailing vortex position close to the trailing end point" is replaced by "to maintain a trailing vortex position close to the trailing end point, wherein the ratio of the length of the end segment (BD) and a wing tip height (h) is $0.15 < BD/h < 0.20$,".

Claim 1 of auxiliary request 6 is identical with claim 1 of auxiliary request 5.

IV. The Patentee's arguments may be summarized as follows:

The subject-matter of granted claim 1 (main request) does not include subject-matter extending beyond the content of the application as filed (see published patent application, hereinafter designated as WO-A).

The feature reading "the end segment being swept at an end segment angle close to or equal to the wing trailing edge sweep angle (218)" (hereinafter designated as feature (i)) is originally disclosed in WO-A. This feature is not directly or inextricably linked to the features (hereinafter designated as (ii)) included in dependent claim 2 (i.e. "the leading edge forms the first parabolic line starting generally tangential with the wing leading edge and approaching a free stream direction at the leading end point, and wherein the trailing edge forms the second parabolic line starting generally tangential from the wing trailing edge and approaching the freestream direction

at the trailing end point") of WO-A. Although feature (i) is based on dependent claim 3 of WO-A, depending only on claim 2, nevertheless it is disclosed also in paragraph [0028] including no reference to paragraphs [0026], [0027], which include feature (ii). Indeed, the wording "in one embodiment" at the start of each of paragraphs [0027] and [0028] evidently indicates that these are separate and distinct embodiments. Further, feature (i) is disclosed in paragraph [0005] of WO-A, where no mention of feature (ii) occurs. Finally, feature (i) only refers to a sweep angle of the trailing edge of the wing, contrary to feature (ii) referring to a trailing edge of the wing tip, thus no functional or technical relation exists between features (i) and (ii). For these reasons, the omission of feature (ii) in granted claim 1 does not lead to subject-matter extending beyond the content of WO-A.

The subject-matter of auxiliary request 1 involves an inventive step over document D2 (Article "Wingtip Design", March 1984, R. Finch) in view of further documents D2A (Extract from Jane's all the World's Aircraft 1979-80, concerning F-4 aircraft) and D2B (Extract from Jane's all the World's Aircraft 1983-84, concerning F-16 aircraft).
The Opposition Division held the claimed subject-matter to be inventive, as a skilled person would not necessarily choose the end segment angle close to or equal to the wing trailing edge sweep angle, in particular given that it would not anticipate the technical effect that the trailing vortex position would be maintained close to the trailing end point (see appealed decision, 9.1.4 and 9.2).
The Opponent's suggestion or allegation, the objective technical problem consisting merely in how to provide an alternative end segment geometry or alternative

design, cannot be accepted. The Opponent even considers said claimed design feature as being a mere workshop variant. However, even following the Opponent for the sake of the argument, no evidence is provided. In particular, no reasons are given as to why the skilled person would choose the claimed design feature from an infinite variety or multiplicity of possible solutions, and the Opponent does not even prove that this particular design was known from the prior art.

The skilled person would not look for any possible alternative design, since not any design meets the specifically given requirements, in particular that the tip vorticity remains at a position close to the extreme wing tip (see claim 1). Thus, the specific design according to feature (i) provides an additional effect in that it does not significantly change the position of the tip vorticity relative to the desired position close to the extreme wing tip.
Document D14 (declaration of Dr. Mark Maughmer PhD), cited by the Opponent as evidence for feature (i) not providing said specific technical effect, does indeed support the Patentee's case since it states e.g. that Prof. Maughmer "is unable to see how the angle of "the end segment" being close to the angle of the trailing edge of the wing, would have any effect on the tip vortex, whether to maintain its position or otherwise" (see D14, page 1). Similar statements in D14 may further be cited supporting the Patentee's case, i.e. that feature (i) provides said additional technical effect (see e.g. page 12 last sentence "Therefore the geometry of the tip itself would have little or no effect on the position of the vortex in any of these cases"). Summarizing, D14 appears to support the view that the position of the tip vorticity

might indeed not be changed due to the technical measure implied by feature (i).

From the above arguments it ensues that D2 in conjunction with the skilled person, or in conjunction with D2A or D2B does not lead in an obvious manner to the subject-matter of claim 1, particularly in view of the following objective technical problem: how to provide an alternative end segment geometry, whilst maintaining the position of the tip vorticity at the extreme position of the wing tip (see published patent specification (hereinafter designated as EP-B), [0005], [0018], [0026]). Specifically the prior art does not teach the design according to feature (i), let alone the technical effect implied by this design. In effect, D2 actually teaches "reducing the induced vortex drag to a bare minimum", since "it extracts lift out of the remaining weakened vortex and using the gentle persuasion of pressures pushes the vortex outboard" (D2, column 1, second paragraph, lines 4-9).

The Opponent's objections against claim 1 of auxiliary request 3 are late filed and should not be admitted into the appeal proceedings. The Board noted in its communication in preparation of the oral proceedings that no submissions had been made by the Opponent concerning the auxiliary requests. Auxiliary request 3 includes amendments about the end segment "having a length", thus taking into account the Opponent's objections in view of documents D6 (GB-A-467 357), D7 (FR-A-768 392) and D8 (US-A1-2002/0162917) related to point tips allegedly constituting an end segment. The Opponent did not comment at all on this auxiliary request and should not be given an opportunity to comment at this very late stage of the proceedings.

No further remarks are made concerning the Opponent's late filed line of argument (against claim 1 of auxiliary request 3) based on lack of inventive step in view of D2 as closest prior art (see above).

Auxiliary requests 5 and 6 should be exceptionally admitted into the appeal proceedings, as the Board in its communication did not share the view that the Opponent's line of argument on inventive step in view of D2 as closest prior art (see auxiliary request 1) also applied to claim 1 of auxiliary request 3. Therefore these objections came unexpectedly. Consequently, auxiliary requests 5 and 6 should be admitted into the proceedings, considering moreover that the claimed subject-matter due to the added features is clearly new and inventive.

V. The Opponent's arguments may be summarized as follows:

The subject-matter of claim 1 (main request) extends beyond the content of the application as originally filed (WO-A), for feature (i) has been introduced into claim 1 while omitting feature (ii), which is directly linked to feature (i), as demonstrated by the disclosure of WO-A. The same applies for claim 1 of auxiliary request 2.

The subject-matter of claim 1 of auxiliary request 1 is not inventive over D2 in view of the skilled person's common general knowledge, or of documents D2A and D2B. Indeed, feature (i) constitutes only an arbitrary design feature, which is deprived of any technical effect, as illustrated in document D14. Consequently, the skilled person looking for an alternative wing tip design would consider feature (i) merely as a design choice or alternative which would be obtained in an

obvious manner by the skilled person when fitting the wing tip of D2 to a F-4 (see D2A) aircraft wing or to a F-16 XL (see D2B) aircraft wing (see Opponent's drawings on page 21 of the statement of grounds of the appeal), as is explicitly suggested in D2 (column 1, paragraph 3, lines 1 to 7). Moreover, feature (i) would be obtained in an obvious manner by the skilled person when fitting the wing tip of D2 to a generic swept wing aircraft (see Opponent's drawing on page 21 of the statement of grounds of appeal), as also suggested in D2 (see column 1, lines 9-11).

The objections submitted against claim 1 of auxiliary request 3 should be admitted into the appeal proceedings, these objections having been filed already with the statement of grounds of appeal and being the same objections as already discussed in relation to claim 1 of auxiliary request 1.

Auxiliary requests 5 and 6 should not be admitted into the appeal proceedings, these requests having been filed at a very late stage of the proceedings and not being prima facie allowable.

Reasons for the Decision

1. The appeals are admissible.

2. The Board concurs with the appealed decision that the ground for opposition under Article 100(c) prejudices the maintenance of the European patent as granted (main request), since the inclusion of feature (i) in conjunction with the omission of feature (ii) in granted claim 1 leads to subject-matter extending beyond the content of the application as filed (WO-A).

In the Board's judgement feature (ii) is directly and indissolubly linked to feature (i). In effect, it is evident that "the end segment being swept at an end segment close to or equal to the wing trailing sweep angle" is only technically meaningful in the context of said further omitted features (included in claim 2 and paragraph [0027] of WO-A), which describe the overall geometry and the main structure of the wing tip, with feature (i) representing only a further detail, said end segment being a small portion of the wing tip.

Contrary to the Patentee's view there is clearly a functional and structural relationship between features (i) and (ii), given feature (i) stipulating said end segment angle being close or equal to the wing trailing edge sweep angle, this angle being identical with the angle of the tangent to the second parabolic line (of the wing tip) starting from the wing trailing edge according to feature (ii). A further functional and structural relationship between feature (i) and feature (ii) is given by the fact that the shape and configuration of the wing tip's curved leading edge is essential for maintaining attached flow (hence preventing premature vortex formation too far upstream of the wing tip end segment), as clearly acknowledged in paragraph [0005] (WO-A), thus establishing a link between feature (ii) and the alleged technical effect (i.e. "stabilizing tip vorticity and maintain the vortex position close to the extreme wing tip").

Finally, it is evident from the wording "in one embodiment" in paragraphs [0027] (disclosing feature (ii)) and [0028] (disclosing feature (i)) (see WO-A) that one and the same embodiment is implied, the latter paragraph merely describing a further preferred

embodiment based and depending on the former paragraph. Similarly, as mentioned hereinbefore paragraph [0005] indeed confirms that feature (i) (and the alleged technical effect) are directly linked to the "curved leading edge" and the "curved trailing edge" being "designed to achieve optimal results", e.g. as set out in feature (ii) and/or in paragraph [0027] of WO-A.

3. In accordance with the appealed decision (see pages 6 to 8) the features of claim 1 reading "a leading edge (212) curved to maintain attached air flow and defining a first parabolic line from the wing leading edge to a leading end point (228)" and "a trailing edge (216) curved to maintain elliptic loading over the wing tip defining a second parabolic line from the trailing edge to a trailing end point (232)" can only be construed as defining a leading and a trailing edge having, respectively, a curvature in a broad sense. This is based on the following reasons.

First, there is a manifest and evident incompatibility between the feature "first" and "second parabolic line" on the one hand, and the features of dependent claims 3 and 4 (and equivalent passages in the description) in EP-B on the other hand, these latter features including mathematical equations representing curves not even encompassing or including "parabolic lines" (in their general mathematical form), and this for no one of the parameter values corresponding to the indicated parameter ranges (see parameter ranges specified for exponents m_1, m_2, n_1, n_2).

Further, "maintain attached air flow" and "maintain elliptic loading" constitute merely an entirely conventional design consideration for a wing and/or wing tip and is inherent on virtually any wing type

device. In particular, no specific and concrete technical measure is indicated in claim 1 for achieving these results (going beyond aforementioned non-limiting features).

4. The subject-matter of auxiliary request 1 does not involve an inventive step in view of D2 in conjunction with the skilled person's common general knowledge or with D2A or D2B (Article 56 EPC).

The Board concurs with the appealed decision in that the disclosure of D2 differs from the subject-matter of claim 1 in that the claimed subject-matter provides an aircraft having a "wing trailing edge that exhibits a wing trailing edge sweep angle" (see appealed decision, Reasons, point 8.2.1, 8.2.2), i.e. a wing trailing edge inclined toward the aft of the aircraft by an angle different from 0°. This is undisputedly the starting point considered by the parties for the discussion of inventive step in respect of D2.

The objective problem starting from D2 consists in adapting the wing of D2 to provide an alternative geometry that is to be used on a wing with a trailing edge exhibiting a trailing edge sweep angle different from 0° degrees. From the skilled person's perspective this objective problem results directly from D2, for D2 explicitly suggests applying its technical teaching to F-4 and F-16 XL aircrafts (D2, column 1, paragraph 3, lines 3-7) both having "swept" wings (towards the aft of the aircraft), as well as to any kind of aircraft (see D2, column 1, paragraph 3, lines 9 to 11), e.g. including any aircraft having generally swept wings. In accord with the view taken in the appealed decision (see Reasons, 9.1.3) the skilled person would fit the wing tip of D2 such as to match the root profile of the

wing tip to the tip profile of the wing (i.e. as stated in claim 1: the (wing tip) leading edge starting generally tangential with the wing leading edge and approaching a free stream direction at the leading end point; the (wing tip) trailing edge starting generally tangential from the wing trailing edge and approaching the freestream direction at the trailing end point), avoiding any discontinuities which would inevitably lead to drag penalties. Thus, the features already known from D2 will stay unaffected.

As to feature (i) (i.e. "the end segment being swept at an end segment angle close to or equal to the wing trailing edge sweep angle (218)"), the skilled person starting from D2 would implement this feature in an obvious way when fitting the wing tip of D2 to the wing of a F-4 aircraft (as shown in D2A) or of a F-16 XL aircraft (as shown in D2B), given that this feature is clearly already suggested in D2 showing that the "un-swept" wing's trailing edge is approximatively and almost parallel to the end segment of the wing tip. The skilled person would naturally adopt this technical measure, acknowledging that it is advantageous to follow a prudent and cautious conservative design that avoids any possible misalignments and discontinuities (leading to aerodynamic drag) in the wing trailing edge region, as illustrated by D2. In addition, the skilled person would have no reason to substantially deviate from the wing and wing tip design disclosed in D2, based on the implicit reasonable assumption that (as for any prior art in this technical field) it is fundamentally intended and conceived to minimize drag, unless any evidence to the contrary is provided. Consequently, the skilled person would arrive at feature (i) in an obvious manner, regardless and

irrespective of any alleged new (proven or unproven) technical effect, as submitted e.g. by the Patentee.

In particular, the alleged new technical effect that the trailing vortex position would be maintained close to the trailing end point cannot render inventive the claimed subject-matter (contrary to the view of the Opposition Division), if the skilled person would anyway arrive in an obvious manner at the claimed subject-matter independently and irrespectively of said alleged new technical effect. Moreover, as noted by the Opponent and confirmed by the Declaration of Dr. Maughmer (D14), as a matter of fact no experimental evidence or physical arguments are given in EP-B or were submitted by the Patentee, which would support the existence of the alleged new technical effect.

5. Auxiliary request 2 is not allowable for the same reasons as the main request (added subject-matter), as claim 1 likewise includes feature (i) but omits feature (ii).

6. The Opponent’s arguments objecting to claim 1 of auxiliary request 3 were taken into consideration by the Board pursuant to Article 13(2) RPBA (Rules of Procedure of the Boards of Appeal) 2020.

The Board considered that exceptional circumstances are given in the present case, for the arguments submitted by the Opponent against claim 1 of auxiliary request 3 during oral proceedings (based on lack of inventive step, starting from D2 in view of the skilled person’s general knowledge, D2A or D2B) are entirely identical with the arguments submitted with the statement of grounds of appeal against claim 1 of auxiliary request 1 and for it is immediately apparent that these

arguments likewise apply against claim 1 of auxiliary request 3. Indeed, the amendment introduced in claim 1 of auxiliary request 3, according to which the wing tip end segment has a finite length, is a trivial feature (any segment indeed has a finite length) which as such is moreover immediately apparent from D2 (see e.g. second figure from the top on page 1). The Opponent's arguments based on D2 hence likewise apply (unaltered) to claim 1 of auxiliary requests 3. The Patentee likewise implicitly acknowledged this, since it did not consider necessary to add any further comments in response to the Opponent's arguments based on D2.

In view of the above, the Board considers that the Patentee (and any person of ordinary technical knowledge in the field) could readily infer that the Opponent's arguments based on lack of inventive step in the statement of grounds of appeal (starting from D2) would equally apply (without changes) to claim 1 of auxiliary request 3. Consequently, the Opponent's submissions during oral proceedings were by no means unexpected, and indeed almost self-evident. The Board's communication lacking a preliminary opinion concerning auxiliary request 3 cannot corroborate the Patentee's contentions that the Opponent's submissions were late filed. Indeed, in the Board's communication it was only noted that no explicit submissions were made by the Opponent concerning auxiliary requests 2 and 3, thus solely rendering clear that such submissions should be filed if deemed necessary. There is no obligation for the Board pursuant to Article 15(1) RPBA (Rules of Procedure of the Boards of Appeal) 2020 to give any preliminary opinion, let alone on auxiliary requests which were not explicitly addressed by the Opponent.

For the above reasons, the Opponent’s objections to claim 1 of auxiliary request 3 were taken into consideration by the Board.

7. The subject-matter of claim 1 of auxiliary request 3 is not inventive (Article 56 EPC) over D2 in view of the skilled person’s common general knowledge, or in view of D2A or D2B, the same arguments discussed in relation to claim 1 of auxiliary request 1 applying identically in this case. In effect, as detailed above, the amendment introduced into claim 1 according to this auxiliary request (i.e. “having a length”) undisputedly represents a feature known from D2 (see figures), disclosing that the wing tip end segment has a finite length.

8. The Board did not admit into the appeal proceedings auxiliary requests 5 and 6 which represent an amendment to the Patentee's appeal case filed after the notification of the summons to oral proceedings pursuant to Article 13(2) RPBA 2020. The Board’s communication giving a preliminary opinion (on the main request and auxiliary request 1) does not represent an invitation or opportunity to submit further auxiliary requests, given the parties’ complete case having been set out in their statement of grounds of appeal and in their respective reply, thus auxiliary requests having already been filed with said submissions (as fallback position), taking into account a possible unfavourable opinion of the Board on higher ranking requests.

Moreover, no new or surprising arguments were invoked by the Board in its communication, i.e. any argument going beyond those submitted by the Opponent. As detailed hereinbefore, the Board taking into consideration the Opponent’s objection to auxiliary

request 3 likewise cannot be regarded as an exceptional circumstance which would justify the admittance of these late filed requests, it being abundantly clear to the Patentee (and anybody having ordinary technical knowledge in the field) that the objections raised in the Opponent's statement of grounds of appeal (against claim 1 of auxiliary request 1) would identically apply to claim 1 of auxiliary request 3. These circumstances, implying the Opponent's arguments being taken into consideration (see also point 5 hereinabove), for the very same reasons do not warrant admittance of these auxiliary requests.

Finally, the Board considers that Article 13(2) RPBA 2020 gives the Board no discretion to admit late filed auxiliary requests when no exceptional circumstances justified with cogent reasons are present, regardless of these requests being or not prima facie allowable (which was however not discussed during oral proceedings and represents merely the Patentee's contention).

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar: The Chairman:

D. Magliano G. Pricolo

Decision electronically authenticated