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Case Number: T 2361/12 - 3.2.01

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Title of invention:
AEROSPACE VEHICLE LEADING EDGE SLAT DEVICES AND CORRESPONDING METHODS

Patent Proprietor:
The Boeing Company

Opponent:
Airbus Operations SAS/ Airbus Operations Limited/
Airbus Operations GmbH/ Airbus Operations S.L.
Airbus SAS

Headword:

Relevant legal provisions:
EPC Art. 123(2), 54, 56

Keyword:
Extended subject-matter (auxiliary request III : no)
Novelty (main request , auxiliary requests A, B, I, II : no)
Inventive step (auxiliary request III : yes)

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Catchword:

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Case Number: T 2361/12 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 24 April 2015

Appellant: (Patent Proprietor)	The Boeing Company 100 North Riverside Plaza Chicago, IL 60606-1596 (US)
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Representative:	UEXKÜLL & STOLBERG Patentanwälte Beselerstrasse 4 22607 Hamburg (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 4 September 2012 concerning maintenance of the European Patent No. 1843942 in amended form.**

Composition of the Board:

Chairman H. Geuss
Members: C. Narcisi
D. T. Keeling

Summary of Facts and Submissions

I. European patent No. 1 843 942 was maintained in amended form by the decision of the Opposition Division posted on 4 September 2012. An appeal against this decision was lodged by the joint Opponents on 13 November 2012 and by the Patentee on 14 November 2012. The appeal fees were paid at the same time when filing the notices of appeal and the statements of grounds of appeal were respectively filed on 14 January 2013 and 11 January 2013.

II. Oral proceedings were held on 24 April 2015. Appellant I (joint Opponents) requested that the decision under appeal be set aside and the patent be revoked. Appellant II (Patentee) requested that the decision under appeal be set aside and the patent maintained as granted (main request) or, in the alternative, that the patent be maintained in amended form on the basis of the claims of any one of auxiliary requests A, B, I or II, (all filed with the grounds of appeal on 11 January 2013), or, in the further alternative, on the basis of the claims of auxiliary request III (filed during the oral proceedings before the Opposition Division on 6 July 2012; amended form in which the patent was upheld by the Opposition Division).

III. Granted claim 1 (main request) reads as follows:

"An aerospace vehicle system (100), comprising:
an airfoil (102a; 702) having a leading edge;
a first flow body (120; 720; 820) fixedly coupled to the airfoil (102a; 702) to form at least one gap (114; 714) between the leading edge (104; 704; 804) of the airfoil (102a; 702) and the first flow body (120; 720; 820); and

a second flow body (130; 730; 830) movably coupled to the airfoil (102a; 702) and being movable between:
a retracted position where the second flow body (130; 730; 830) is positioned to at least approximately aerodynamically seal the at least one gap (114; 714); and
an extended position where the second flow body (1310; 730; 830) is positioned to allow fluid flow (F) through the at least one gap (114; 714);
characterized in that the at least one gap (114; 714) includes at least one first gap (114; 714) and the extended position of the second flow body (130; 730; 830) includes a first extended position, and
wherein the second flow body (130; 730; 830) is movable to a second extended position where the second flow body (130; 730; 830) is positioned to allow fluid flow (F) through the at least one first gap (114; 714) and to form at least one second gap (116; 716) between the second flow body (130; 730; 830) and the first flow body (120; 720; 820)."

Claim 1 of auxiliary request A reads as follows:

"An aerospace vehicle system (100), comprising:
an airfoil (102a; 702) having a leading edge;
a first flow body (120; 720; 820) fixedly coupled to the airfoil (102a; 702) to form at least one gap (114; 714) between the leading edge (104; 704; 804) of the airfoil (102a; 702) and the first flow body (120; 720; 820; and
a second flow body (130; 730; 830) movably coupled to the airfoil (102a; 702) and being movable between:
a stationary retracted position where the second flow body (130; 730; 830)is positioned to at least approximately aerodynamically seal the at least one gap (114; 714); and

a stationary extended position where the second flow body (130; 730; 830) is positioned to allow fluid flow (F) through the at least one gap (114; 714); characterized in that the at least one gap (114; 714) includes at least one first gap (114; 714) and the stationary extended position of the second flow body (130; 730; 830) includes a first stationary extended position, and wherein the second flow body (130; 730; 830) is movable to a second stationary extended position where the second flow body (130; 730; 830) is positioned to allow fluid flow (F) through the at least one first gap (114; 714) and to form at least one second gap (116; 716) between the second flow body (130; 730; 830) and the first flow body (120; 720; 820)."

Claim 1 according to auxiliary request B differs from claim 1 of the main request in that the wording "characterized in that the at least one gap (114; 714)" is replaced by the wording "characterized in that the second flow body (130; 730; 830) and the leading edge (104; 704; 804) of the airfoil (102a; 702) enclose the first flow body (120; 720; 820) when the second flow body (130; 730; 830) is in the retracted position; and the at least one gap (114; 714)".

Claim 1 according to auxiliary request I differs from claim 1 of the main request in that the wording "to form at least one second gap (116; 716) between the second flow body (130; 730; 830) and the first flow body (120; 720; 820)" is replaced by the wording "to form at least one second gap (116; 716) between the second flow body (130; 730; 830) and the first flow body (120; 720; 820), the second flow body (130) includes a recess (136), an upper trailing edge (134a), and a lower trailing edge (134b), and wherein when the

second flow body (130) is in the retracted position, the first flow body (120) is located in the recess (136), the upper trailing edge (134a) is at least proximate to the leading edge (104) of the airfoil (102a), and the lower leading (sic¨!) edge (134b) is at least proximate to the leading edge (104) of the airfoil (102a)."

Claim 1 of auxiliary request II differs from claim 1 of auxiliary request I in that the wording "the upper trailing edge (134a) is at least proximate to the leading edge (104) of the airfoil (102a), and the lower leading edge (134b) is at least proximate to the leading edge (104) of the airfoil (102a)" is replaced by the wording "the upper trailing edge (134a) is proximate (i.e. touching or near) to the leading edge (104) of the airfoil (102a), and the lower leading (sic !) edge (134b) is proximate (i.e. touching or near) to the leading edge (104) of the airfoil (102a)".

Claim 1 of auxiliary request III (amended form of the patent as upheld by the Opposition Division) differs from claim 1 as granted in that the wording "characterized in that" is replaced by the wording "wherein: the at least one gap (114; 714) includes at least one first gap (114; 714) and the extended position of the second flow body (130; 730; 830) includes a first extended position, and wherein the second flow body (130; 730; 830) is movable to a second extended position where the second flow body (130; 730; 830) is positioned to allow fluid flow (F) through the at least one first gap (114; 714) and to form at least one second gap (116; 716) between the second flow body (130; 730; 830) and the first flow body (120; 720; 820), the second flow body (130) includes a recess (136), an upper trailing edge (134a), and a lower

trailing edge (134b), and wherein when the second flow body (130) is in the retracted position, the first flow body (120) is located in the recess (136), the upper trailing edge (134a) is at least proximate to the leading edge (104) of the airfoil (102a), and the lower leading (sic !) edge (134b) is at least proximate to the leading edge (104) of the airfoil (102a) and further comprising first and second sealing devices (118a, 118b) positioned between the second flow body (130) and the airfoil (102a) to aid in preventing fluid flow (F) through the at least one gap (114) when the second flow body (130) is in the retracted position (102a), the first sealing device (118a) being located between the upper trailing edge (134a) of the second flow body (130) and the airfoil (102a) and the second sealing device (118b) being located between the lower trailing edge (134b) of the second flow body (130) and the airfoil (102a)."

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

The subject-matter of claim 1 as granted is new over E1 (US-A-3 949 956). Claim 1 is directed to an aerospace vehicle system and particularly to a high-lift device or slat forming part of the aircraft's airfoil. This device, located at the airfoil's leading edge is an essential part of the aircraft and this small edge portion of the airfoil assumes different configurations during various phases of flight. The slat device as claimed differs from the known device of E1 essentially in respect to feature (i) , i.e. "a retracted position where the second flow body (130; 730; 830) is positioned to at least approximately aerodynamically seal the at least one gap (114; 714)", and in respect to feature (ii), i.e. "the extended position of the

second flow body (130; 730; 830) includes a first extended position" within the meaning of claim 1. With regard to feature (i) document E1 does not disclose a second flow body which at least approximately aerodynamically seals the gap formed between the first flow body and the leading edge of the airfoil, as required by claim 1. According to E1 the gap is sealed by a lower door element 231 (see figures 10, 11; description, column 13, lines 50-57) mounted to the first flow body 201. Further, as the second flow body 203 does not fully enclose the first gap, both at its upper and lower portion, in its retracted position, it is questionable whether an approximate aerodynamic seal within the meaning of claim 1 is achieved. As to feature (ii), E1 does not disclose (in the embodiment of figures 10 and 11) a first extended position within the meaning of claim 1, since E1 does not disclose an intermediate position of the second flow body, which moreover allows flow through a first gap formed between the first flow body and the leading edge of the wing. This is equally confirmed by looking at the further embodiments of E1 (e.g. figures 1 to 3), disclosing only a retracted position of the second flow body at cruising speed, a double slotted landing position and a take-off position with one slot, this slot being formed between the second and the first flow body.

The subject-matter of claim 1 of auxiliary requests A and B is new over E1. Specifically, from claim 1 of auxiliary request A it explicitly and unambiguously results that said first and second extended positions of the second flow body are both "stationary" positions, which features are not disclosed in E1. Similarly, claim 1 of auxiliary request B clearly distinguishes from E1 in that the second flow body and the leading edge of the airfoil enclose the first flow

body in the retracted position. The airfoil illustrated in figures 10, 11 of E1 shows that the second flow body at best only partly encloses the first flow body, given that the lower trailing edge of the second flow body is positioned at a distance from the leading edge of the airfoil.

The subject-matter of claim 1 of auxiliary requests I or II is new over E1. The use of the wording "at least proximate" (in auxiliary request I) and "proximate" (in auxiliary request II) specifies that the upper and lower trailing edges of the second flow body are located in the immediate vicinity and nearly contacting (or touching) the leading edge of the airfoil, such as to prevent any significant amount of fluid flow from passing through the gap, as defined in paragraph [0027] of the patent specification (hereinafter denominated as EP-B). The gap is thus aerodynamically sealed.
This is different in the arrangement according to figures 10, 11 of E1, for in its retracted position the second flow body 203 is not located "proximate" (or "at least proximate") to the leading edge of the airfoil and does not approximately aerodynamically seal the gap. Furthermore, no recess is shown in E1 receiving the first flow body in the second flow body's retracted position.

The subject-matter of claim 1 of auxiliary request III is inventive over E1, in view of further prior art E7 (EP-A1-100 775) and E8 (WO-A-97/49607). In effect, in order to arrive at the claimed subject-matter the skilled person would have to perform major structural changes and modifications in respect to the configuration of the second flow body 203 illustrated in figures 10, 11 of E1. These modifications would further imply additional changes to the overall

configuration of the slat assembly of E1, particularly concerning the first flow body and the lower door element 231. These modifications are not obvious even in view of E7 and E8 and, on the contrary, E1 explicitly teaches away from any structural changes that would imply a greater chord length of the second flow body 203 (see column 13, lines 50-57).

V. The Opponents' arguments may be summarized as follows:

The subject-matter of claim 1 of the main request lacks novelty over E1. Particularly, feature (i) is disclosed in E1, for figure 11 clearly shows a retracted position of the second flow body 203, which "approximately aerodynamically seals" the first gap 207, formed between the first flow body 201 and the airfoil's leading edge. From the configuration of the slat assembly shown in figure 11 it ensues that an approximate aerodynamic seal is achieved by the second flow body regardless of the position of the lower door element 231, since no significant amount of air flow through the first gap 207 is anyway allowed. As to disputed feature (ii) a first extended position of the second flow body is indeed present according to E1 in the embodiment of figures 10 and 11. Indeed, intermediate positions of the second flow body equivalent to said first extended position of the second flow body are likewise included in all other embodiments of E1 (e.g. figures 1 to 3). In this respect it is noted that claim 1 does not exclude that in said first extended position (as defined by claim 1) a second gap (between said first and second flow body) is likewise formed. Therefore, any intermediate position of the second flow body (i.e. between the retracted and the second extended position) is

equivalent to said first extended position, once the the lower door element is open (or even irrespective of the position of the door element, since according to claim 1 the second body in its (first) extended position merely "allows" fluid flow but does not necessarily urge or promote fluid flow through said first gap).

The subject-matter of claim 1 of auxiliary requests A and B is not new over E1, for the features added (according to these requests) to claim 1 of the main request are known from E1 too. On the one hand, it is implicitly derivable from E1 that said first and second extended positions of the second flow body are "stationary" positions. This results for instance from the sliding continuous motion of the second flow body 203 (E3, column 13, lines 23-27) which is caused by pressurized actuators. On the other hand, it clearly results from figure 11 of E1, that the second flow body 203 and the leading edge of the airfoil enclose the first flow body 201 when the second flow body is in the retracted position. Indeed, it is not required that the first flow body be fully enclosed.

The subject-matter of claim 1 of auxiliary requests I and II lacks novelty over E1. In effect, the terms "at least proximate" or "proximate" do not give a clear indication of the position of said second flow body's (upper and lower) trailing edges relatively to the airfoil's leading edge in the retracted position. Hence no distinction can be made between the claimed subject-matter and the slat assembly of E1, particularly since a sealing element (or similar element) interposed between the second flow body and the airfoil's leading edge is not ruled out by the mentioned terms.

The subject-matter of claim 1 of auxiliary request III is not inventive over E1, particularly in view of E7 and E8. Following a first line of argument, the claimed subject-matter is not inventive with respect to E1 and the skilled person's general knowledge and capabilities. Indeed, regarding the constructional elements (such as for instance the lower door element 231) located between the second flow body's 203 lower trailing edge and the airfoil's leading edge as a second sealing device, the only difference between the slat assembly of E1 and the claimed subject-matter resides in a first sealing device being provided according to the invention between the second flow body's upper trailing edge and the airfoil's leading edge. However this technical measure, intended to improve aerodynamic sealing at said location, comes within the customary practice of the skilled person and does not involve an inventive step. According to a second line of argument, regarding both sealing devices as not disclosed in E1, the skilled person would in an obvious manner also consider simplifying the configuration of the slat assembly of E1 and improving the sealing effect at the second flow body's lower trailing edge, further to adding a first sealing device at the upper trailing edge (see first line of argument). Therefore, the skilled person, starting from E1, would arrive in an obvious manner (relying on its own general knowledge and capabilities) at the claimed subject-matter by modifying the second flow body extending its lower trailing edge portion such as to nearly contact the airfoil's leading edge and such as to fully enclose the first flow body, and at the same time by replacing the lower door element 31 with a second sealing device located between said lower trailing edge and said leading edge. According to a third line of argument the skilled person would equally

envisage implementing the mentioned technical measures in view of further prior art E7 and E8, these documents both showing a slat, similar and corresponding to said second flow body, having upper and lower trailing edges contacting and aerodynamically sealing the airfoil's leading edge in the slat's retracted position. Finally, the skilled person would also arrive in an obvious manner to the subject-matter of claim 1 starting from E7 and in view of E1. In effect, the skilled person would essentially merely modify the one slot configuration of the slat assembly disclosed in E7 such as to likewise allow a two-slot configuration (specifically for the landing phase of the flight), as shown in E1.

Reasons for the Decision

1. The appeals are admissible.

2. The subject-matter of claim 1 as granted (main request) lacks novelty with respect to E1. As to disputed feature (i), which reads "a retracted position where the second flow body (130; 730; 830) is positioned to at least approximately aerodynamically seal the at least one gap (114; 714)", no difference emerges as compared to the disclosure of E1. E1 shows (see figure 11) that the second flow body 203 in its retracted position approximately aerodynamically seals the at least one gap formed between the leading edge of the airfoil and the first flow body 201, as required by the claim. This is the case, given that the retracted position indeed differs in all the embodiments of E1 from the corresponding one-slot and two-slot configurations (see e.g. figure 1 by contrast to figures 2 and 3) in that essentially no fluid flow

through the the first (and second) gap occurs in this position, which is used at high speed or at cruising speed, where usually no additional aerodynamic lift is required. Thus, as is obvious from figure 11, the second flow body 203 closes both the first gap (or slot, between the first flow body and the airfoil's leading edge) and the second gap (between the second flow body's trailing edge and the first flow body). This is achieved by the second flow body's upper trailing edge portion contacting or nearly contacting the airfoil's leading edge as immediately visible from figure 11. Whether or not the lower door element 231 contributes to the aerodynamic sealing of the first gap is immaterial, since this is anyway not excluded by the wording of the claim.

As to feature (ii), i.e. "the extended position of the second flow body (130; 730; 830) includes a first extended position", in the Board's view intermediate positions of the second flow body corresponding to said first extended position are implicitly disclosed in E1. This results merely from the fact that the second flow body's actuation occurs by a sliding movement (E1, column 13, lines 23-27) which necessarily passes through all intermediate positions situated between the retracted and the outermost extended position of the second flow body 203. It is also implicitly derivable from E1 that in a landing configuration the lower door 231 is open in order to obtain the two-slot configuration required for landing, as e.g. in the embodiment of figures 1 to 3 (see in particular figure 2; column 4, lines 45-48). Also, the lower door 231 will necessarily be open in said intermediate positions of the second flow body at least during landing, for otherwise no double slotted landing configuration with variable slot width could be obtained, contrary to the other embodiments disclosed in E1. This is however

essential in order to allow adapting lift to specific flight parameters such as speed during different landing phases. Hence, intermediate positions of the second flow body corresponding to feature (ii) are disclosed in E1, wherein in these positions at least a first gap is formed between the leading edge of the airfoil and the first flow body (whether or not a second gap is formed is irrelevant since it is not excluded by claim 1) and airflow is allowed therethrough. It being not disputed that the remaining features of claim 1 are known from E1, the claim lacks novelty (Article 54 EPC).

3. The subject-matter of claim 1 of auxiliary requests A and B is known from E1. In particular, the fact that said retracted position, as well as first and second extended positions of the second flow body are "stationary" positions does not render the claimed subject-matter new over E1. E1 does not mention explicitly that any of these positions is stationary, nonetheless the retracted position implicitly and evidently is stationary, given that this position has to be maintained over longer time periods at cruising speed. The same holds for said second extended position, for instance at the outermost extended position of the second flow body during landing, producing maximum aerodynamic lift and drag. The first extended position according to feature (ii), corresponding to said intermediate positions of the second flow body as seen above (see point 2) (with lower door 231 open), also necessarily represents at least a possible stationary position (depending on actuators' control), as it is required by the finite duration of specific flight phases during landing and as obtained through the sliding movement of the second flow body member 203 (E1, column 13, lines 24-26) whose

position is controlled (and in particular also held stationary when necessary) by pressure actuators (see E1, column 13, lines 20-22; column 13, lines 4-17). Therefore, in conjunction with the reasons given above (see point 2), the subject-matter of claim 1 of auxiliary request A is not new over E1.

The features added by way of amendment to claim 1 of auxiliary request B, implying that in the retracted position the second flow body and the leading edge of the airfoil "enclose" the first flow body, do not render the claimed subject-matter new with respect to E1. In effect, as illustrated in figure 11 of E1, the second flow body 203 and the airfoil's leading edge "enclose" the first flow body 201, the wording "enclose" by no means requiring that the first flow body be fully and completely surrounded or encircled by said second flow body and the airfoil's leading edge. Such an interpretation would moreover contradict specific embodiments of the invention (see dependent claim 8 as granted) comprising further constructional elements (sealing devices) interposed between the second flow body and the airfoil.

4. The subject-matter of claim 1 of auxiliary requests I and II is not new over E1. Contrary to the Patentee's view, the terms "proximate" (see auxiliary request II) or "at least proximate" (see auxiliary request I) cannot distinguish the claimed subject-matter from E1, for they do not necessarily imply that the upper and lower trailing edges of the second flow body contact or touch the leading edge of the airfoil. Moreover, these terms likewise do not give any indication concerning the distance from the airfoil at which said upper and lower trailing edges are located, as seen e.g. in relation to the airfoil's chord length. The further

amendments made to claim 1 include features also known from E1, given that figures 10 and 11 clearly show a recess formed by the second flow body's 203 lower contour surface, this recess at least partially receiving the first flow body 201 in the retracted position, which is depicted in figure 11. Therefore, in conjunction with the reasons given concerning claim 1 of the main request, claim 1 of auxiliary requests I and II lacks novelty over E1.

5. The amendments introduced into claim 1 of auxiliary request III do not contravene Article 123 (2) EPC. These amendments are based on dependent claims 4 and 8 as granted (corresponding to dependent claims 4, 8 and 11 of the published patent application (hereinafter designated as WO-A)) and on paragraph [0028] of the published patent specification (hereinafter designated as EP-B), corresponding to paragraph [0025] of WO-A. The Opponent essentially submitted that the amendments related to paragraph [0028] of EP-B constitute a generalization of the content of the mentioned paragraph, especially in that the more general term "sealing device" is used in the claim instead of the "bulb seal" disclosed in the description (see EP-B, paragraph [0028]), which is positioned to "contact" the leading edge of the airfoil in the retracted position. In the Board's view no generalization has occurred by way of said amendments, because said paragraph is not limited to "bulb seals", but on the contrary generally deals with "sealing devices" (see e.g. "Sealing devices can be used to aid the second flow body in aerodynamically sealing the first gap... For example, a first sealing device.."). The disclosure of "bulb seals", particularly contacting the airfoil, is limited exclusively to a specific embodiment of the first sealing device, located between the upper trailing edge

of the second flow body and the airfoil (see "In the illustrated embodiment.."). Also, the disclosure of "second sealing devices", located between the lower trailing edge of the second flow body and the airfoil, is completely general and not limited to bulb seals, which are not even mentioned in conjunction with said second sealing device.

6. The subject-matter of claim 1 of auxiliary request III involves an inventive step over E1, in view of the skilled person's general knowledge and the cited prior art. The Board considers that none of the lines of argument presented by the Opponent gives convincing reasons as to why the the claimed subject-matter would be obvious for the skilled person.

According to the Opponent's first line of argument, regarding the constructional elements (such as for instance the lower door element 231) located between the second flow body's 203 lower trailing edge and the airfoil's leading edge as a second sealing device, the only difference between the slat assembly of E1 and the claimed subject-matter resides in a first sealing device being provided according to the invention between the second flow body's upper trailing edge and the airfoil's leading edge. Thus, in the Opponent's view, starting from E1 as closest prior art, the skilled person would arrive at the claimed invention merely by interposing a first sealing device, as based on common general knowledge, between the upper trailing edge of the second flow body and the airfoil. However, the Opponent's assumption that a "second sealing device" (as claimed), located between the lower trailing edge of the second flow body and the airfoil, is known from E1, is not shared by the Board. In particular, this assumption is not compatible with a

consistent reading based on E1 of claim 1, given that figures 10 and 11 of E1 unambiguously indicate that a portion of the first flow body 201 is disposed between the trailing edge of the second flow body 203 and the airfoil and that this portion of the first flow body cannot be equated to a "second sealing device". On the other hand, regarding solely the lower door 231 as a "second sealing device", then in accord with the claim's terminology and technical features it would follow from figures 10 and 11 of E1 that said second sealing device would be located between the first flow body's trailing edge and the airfoil. Either way, the conclusion is that a second sealing device within the meaning of claim 1 is not disclosed in E1. Hence this line of argument fails, regardless of whether or not it would be obvious for the skilled person to interpose a first sealing device, as based on common general knowledge, between the upper trailing edge of the second flow body and the airfoil.

If, according to the second and third line of argument, both sealing devices are regarded as not being disclosed in E1, then at least the claimed features relating to the second sealing device would not be obvious for the skilled person. Indeed, there would be no incentive and motivation for the skilled person to modify the known slat assembly of E1 by introducing a second sealing device as claimed, i.e. between the lower trailing edge of the second flow body and the airfoil. In the first place, extending the lower trailing edge portion of the second flow body, such as to nearly contact the airfoil's leading edge in the retracted position, would considerably add to the weight of the second flow body and to the complexity of its configuration. The increase in weight moreover also implies a significant increase in bending moment

exerted on the actuators, particularly at the outermost extended position (see figure 11), thus imposing more stringent requirements on the power and robustness of the actuators. This would be particularly disadvantageous for the slat assembly of E1 in its outermost extended position, given that it is specifically designed to achieve maximum chord (area) increment of leading edge devices and a double slotted edge slat the downstream slot of which is located as far to the rear as possible on the wing (E1, column 2, lines 13-15; lines 35-40), e.g. "an aerodynamically effective chord length 23 (E1, figure 2) about 36% of the chord of the basic airfoil", extending between leading edge and trailing edge of the leading edge device (E1, figure 2; column 5, lines 6-10), or "an effective chord 205 of about 34% of cruise chord" (figure 10; column 13, lines 23-26). These facts by themselves would by far outweigh the alleged simplification mentioned by the Opponent, the modifications necessary to arrive at the claimed features alternatively implying at least a necessary and considerable reduction in the chord length of the leading edge device, which would run counter to the technical teaching of E1. In addition, the leading edge device of E1 discloses in all its embodiments control of air flow through the first gap (between the first flow body and the airfoil) solely at the upper leading edge of the airfoil, e.g. by means of the upper trailing edge of the second flow body in the embodiment of figures 10 and 11. By contrast, the modifications necessary to arrive at the aforementioned claimed feature would clearly imply simultaneous control of the first gap both at the upper and lower leading edge of the airfoil. This amounts to a major modification of aerodynamic flow conditions of the slat device disclosed in E1, requiring in all likelihood

considerable changes to its design and configuration, for which the skilled person would not have any valid reasons, or any incentive or motivation. In conclusion, the subject-matter of claim 1 is not obvious in view of E1 and the skilled person's capabilities and common general knowledge.

The assessment of inventive step of the subject-matter of claim 1 starting from E1 and taking into account E7 or E8 leads to similar conclusions as above. Indeed, the same reasons as above still hold, given that E7 and E8 disclose a slat assembly with only one slot (or gap) and one slat (or flow body) at the airfoil's leading edge and translating these constructions to the slat assembly of E1 would lead to the same difficulties as mentioned above. In particular, the structure of the flow body as shown in E7 (see figures 1,2 or 5,6) and E8 (see figures 2, 3 ,4 , 6) is significantly different, as regards weight and shape, from that of the first flow body 203 of E1 (see figure 10), which by comparison has a slim and lean configuration with reduced weight, to compensate for the large effective chord causing higher loads. Moreover, both the assemblies of E7 and E8 have specific supporting elements for the slat in order to sustain already quite substantial loads (see E7: figure 1, panel 22, I-beam 23; page 5, line 28-page 6, line 3; E8 : support arms 76) and it would not be obvious, let alone possible or reasonable, to translate these elements to the two-slot assembly of E1 without excessively increasing loads and bending moments which would become higher still, due to the effective chord of about 34% or more of cruise chord length (see above) in the outermost extended position of the second flow body in the slat assembly of E1. Finally, adoption of the structure of the flow body as shown in E7 or E8 for the second flow body

disclosed in E1 would inevitably lead to the formation of a first gap requiring control at both the upper and lower leading edges of the airfoil. This, however, would make major changes necessary in the aerodynamic configuration of the slat device of E1. For the given reasons the claimed subject-matter cannot be derived in an obvious manner from E1 in view of E7 and E8.

The above conclusions hold true when starting from E7 (or E8) and considering a possible combination with E1, since reasons essentially similar to the aforesaid reasons remain valid. In effect, E7 would not be an appropriate starting point for the assessment of inventive step of the claimed subject-matter, given that it relates to a one-slot assembly and not to a two-slot assembly like the claimed one or that of E1. Consequently, fundamental conceptual differences in structure and (aerodynamic) configuration exist between E7 and E1, concerning e.g. the structure and geometry of the flow body located upstream (second flow body as claimed) and its support elements and actuators (see above) as well as the overall effective chord length of the leading edge device (see above), such that it would not be obvious for the skilled person in which way at all to combine E7 (or E8) and E1. Therefore the subject-matter of claim 1 fulfils the criteria of Article 56 EPC.

Order

For these reasons it is decided that:

The appeals are dismissed.

The Registrar: The Chairman:

A. Vottner H. Geuss

Decision electronically authenticated