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# Datasheet for the decision of 21 November 2018

**Case Number:** T 0301/16 - 3.2.01

**Application Number:** 06851620.2

**Publication Number:** 1951568

**IPC:** B64C9/14

**Language of the proceedings:** EN

**Title of invention:**
LIFT AUGMENTATION SYSTEM AND ASSOCIATED METHOD

**Patent Proprietor:**
The Boeing Company

**Opponent:**
AIRBUS SAS(FR)/ AIRBUS OPÉRATIONS SAS(FR)/ AIRBUS OPERATIONS LTD (GB)/ AIRBUS OPERATIONS GMBH (DE)/ AIRBUS OPERATIONS S.L. (ES)

**Headword:**

**Relevant legal provisions:**
EPC Art. 54(1), 56

**Keyword:**
Novelty - main request (no)
Inventive step - auxiliary request 1 (yes)

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
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**Case Number: T 0301/16 - 3.2.01**

# D E C I S I O N
## of Technical Board of Appeal 3.2.01
## of 21 November 2018

| | |
|---|---|
| **Appellant I:** (Patent Proprietor) | The Boeing Company<br>100 North Riverside Plaza<br>Chicago, IL 60606-1596 (US) |
| **Representative:** | Bartelds, Erik<br>Arnold & Siedsma<br>Bezuidenhoutseweg 57<br>2594 AC The Hague (NL) |
| **Appellant II:** (Opponent) | AIRBUS SAS(FR)/ AIRBUS OPÉRATIONS SAS(FR)/ AIRBUS OPERATIONS LTD (GB)/ AIRBUS OPERATIONS GMBH (DE)/ AIRBUS OPERATIONS S.L. (ES)<br>1 Rond-Point Maurice Bellonte<br>316 route de Bayonne/New Filton House<br>Filton/Kreetslag 10/Avenida de John Lennon s/n<br>F-31707 Blagnac/F-31060 Toulouse<br>Bristol BS99 7AR/D-21129 Hamburg/<br>ES-Madrid (FR) |
| **Representative:** | Bird & Bird LLP<br>Großer Grasbrook 9<br>20457 Hamburg (DE) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 2 December 2015 concerning maintenance of the European Patent No. 1951568 in amended form.** |

**Composition of the Board:**

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|---|---|
| **Chairman** | P. Guntz |
| **Members:** | W. Marx |
| | J. J. de Acha González |

## Summary of Facts and Submissions

I. The appeals by the patent proprietor (appellant I) and the opponent (appellant II) are directed against the decision of the opposition division to maintain European patent No. 1 951 568 in amended form on the basis of the claims 1 and 8 filed on 5 June 2015 according to the auxiliary request 1.

II. In its decision the opposition division held that the method claim 8 of the main request (patent as granted) was not new over document D2, whereas the subject-matter of claim 1 was new. The subject-matter of claims 1 and 8 of the auxiliary request 1 filed on 5 June 2015 was found to comply with the provisions of Article 56 EPC. The opponent based its arguments on the following prior art documents:

D1: US 3 142 457 A;
D2: DE 1 481 580 A1;
D3: US 2005/0103944 A1;
D4: US 1 829 616 A.

III. Oral proceedings before the board took place on 21 November 2018.

The appellant I (patent proprietor) requested that the decision under appeal be set aside and the patent be maintained as granted or, in the alternative, that the patent be maintained in amended form in accordance with the impugned interlocutory decision of the opposition division (auxiliary request 1). The request for a reimbursement of the appeal fee was withdrawn.

The appellant II (opponent) requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

IV. Claims 1 as granted (main request) is identical to claim 1 according to the auxiliary request 1 and reads as follows:

"A system for generating lift provided by a multi-element aircraft wing (10) comprising:
a main wing element (14);
a slat (12) interconnected to the main wing element (14); and
a flap (16) interconnected to the main wing element (14);
said system further comprising at least one port (s) defined in an aft portion of an upper surface of the slat (12), at least one port (m) defined in an aft portion of an upper surface of the main wing element (14), and at least one port (f) defined in an upper surface of the flap (16); and at least one fluidic device (18) operable to simultaneously regulate fluid flow into and out of the at least one port (s) in the slat (12), the at least one port (m) in the main wing element (14) and the at least one port (f) in the flap (16) to control boundary layer flow over the slat (12), the main wing element (14) and the flap (16)."

Claim 8 as granted (main request) reads as follows:

"A method for increasing lift of an aircraft comprising:
initiating fluid flow over a multi-element aircraft wing (10) comprising a slat (12), a main wing element (14) and a flap (16); and
simultaneously regulating fluid flow through at least one port (s) defined in an aft portion of an upper surface of the slat (12), at least one port (m) defined in an aft portion of an upper surface of the main wing

element (14) and at least one port (f) defined in an upper surface of the flap (16) to control boundary layer flow over the slat (12), the main wing element (14) and the flap (16)."

The wording of claim 8 according to the auxiliary request 1 differs from the wording of claim 8 of the main request only in that the term "simultaneously regulating fluid flow through at least one port (s)..." is replaced by "simultaneously regulating fluid flow into and out of at least one port (s)..."

V. The appellant I (patent proprietor) essentially argued as follows:

Claim 8 of the patent as granted was novel over D2 for the following reasons:

(a) D2 did not disclose that the embodiments of Fig. 8 or Fig. 13 might be combined with the embodiments of Figs. 9 and 10, which was further illustrated by the use of different reference numerals. The invention disclosed in D2 was to shape the recess that was already present in a slat, wing or flap in a particular way, i.e. like a profile, provided with a discharge edge and a blowing slot. The statement on page 2, lines 30-34 could only be understood in this way. It did not suggest that the slat and flap(s) should all be provided with suction bores in their upper surfaces, and it was entirely silent about the main wing.

(b) Neither the central suction bores 31 in Fig. 8 of D2 (in a mid section of the slat 25), nor the blowing slot 54 just behind the nose (i.e. a front portion or leading edge of the slat) in Fig. 13 (arranged even further forward in slat 52) could be considered as a port in an aft portion of an upper

surface of the slat. The meaning in aeronautics of the word "aft" was well defined (see Oxford Dictionary, Merriam Webster), meaning a location of the slat towards the rear/tail of an aircraft, or closer to the rear than to the front. In case of two or more ports (as shown in D2), all of them had to be in the aft portion of the upper surface, as required by the definition of the ports in claim 1 ("at least one port..."). No other disclosure of ports was to be found in the patent specification (see column 7, figures). In fact, the word "aft" was mentioned in D2 only in connection with the location of the suction bores 39 in the main wing element 34 (page 5, lines 13-16).

(c) D2 failed to disclose any simultaneous regulation of the fluid flow through the "ports". D2 was completely silent about the manner in which fluid flow through the suction bores 31, 39, 44 and through the blowing slots 33, 40, 41 was initiated and controlled. There was no disclosure of any control unit or any fluid device. Even the passage on page 2, lines 30-34 did not disclose any simultaneous operation of the various openings in these embodiments. The opponent's reasoning in this respect implied that the system disclosed in D2 was entirely passive, i.e. the only means of initiating fluid flow through the "ports" was a pressure differential between the upper surface and the recess. However, such a pressure differential depended on various aerodynamic parameters, and D2 did not include any disclosure how these parameters should be controlled to achieve fluid flow through the various openings, let alone how to achieve any "simultaneous regulation" of the fluid flow.

(d) Although the term "through" in general might not define a direction, a direction was defined by the

term "through" as used in granted claim 8 by virtue of the close connection between method claim 8 and the system of claim 1 of the patent. Interpreting claim 8 with "a mind willing to understand", the skilled person would readily appreciate that the term "through" as used in claim 8 was intended to denote the same direction of flow as defined by the phrase "into and out" in claim 1, which was found to be not disclosed in D2.

(e) A final reason why the disclosure of D2 did not take away novelty of claim 8 as granted was that D2 was not primarily directed at "increasing lift", as was the method of claim 8.

As regards claims 1 and 8 of auxiliary request 1, the opponent's novelty attack on the basis of D2 relied on the interpretation of the terms "aft portion" (see above, point (b)) and "into and out of":

(f) It was clear and supported by the description, that the fluidic device regulated (as specified in the claims) fluid flow "into and out of" the at least one port in each of the slat, the main wing element and the flap, rather than fluid flow into a port in one of these elements in combination with fluid flow out of a port in another one of the elements. In D2, e.g. the slat had only suction openings 31 or only a blowing slot 54.

Document D3 related to an entirely different system, not aimed at providing high lift (see paragraph [0008] of patent in suit), but rather at varying the properties of trailing edge vortices in a spanwise direction in order to limit wake turbulence downstream of the wing (paragraph [0004]: management of vortices trailing aerodynamic structures; or paragraphs [0006], [0012]). So-called "separation control devices" (SCDs)

were used to either diminish or promote separation of boundary layer (paragraph [0016]) and to either enhance or reduce lift (paragraphs [0063]-[0067]; Figs. 7a, b), which was in clear contradiction with the stated aim of the patented invention (paragraph [0008]) to avoid boundary layer separation. There was no incentive in D3 to change ports in order to increase lift. Even if the skilled person tried to position ports elsewhere, it was only with the aim to reduce vortices.
Paragraph [0063] in D3 only related to the spanwise (not: chordwise) placement of SCDs, i.e. the inside and outside edges of the flaps, and Figs. 4a and 4b still showed ports in the front portion. There was no hint to place ports in an aft portion of the slat. Fig. 9 (a schematic drawing) showed SCDs on the slat or on the main wing element arranged at the leading edge or the lowermost point. Although Fig. 9 showed SCDs at various locations of the flap, this could not be applied to all elements of the multi-element wing. Paragraph [0074] clearly referred to very specific examples, explaining that if SCDs were to be place otherwise, they would be placed in the cove or leading-edge regions, and it was not suggested to place them anywhere else. There was also no hint to be found in the prior art to position ports in an aft portion of the slat.

The teaching of D1 was opposite to the stated aim of the patented invention and would not be consulted. D1 disclosed a system for reducing/cutting out boundary layer control and promoting stalling of the root section of the wing only, i.e. a conscious destruction of lift. The position of the nozzles 12 at the leading edge of D1 resembled the location 76 of the SCD in D3, and nozzles 13 were not placed in the wing's upper surface but below. D1 would not incite the skilled person to change anything in D3 about the position of

the SCD 78 at the leading edge of the slat. And although D1 suggested that the system might function equally well by sucking air from the trailing edge area or the leading edge area, it did not suggest where exactly such suction should occur.

D4 was a very old document relating to an obsolete type of an aircraft and outdated technology (large hole in the middle of the wing to power a prime mover which operated a blower), which would not be consulted by the skilled person when trying to improve a high-lift system. It did not disclose any multi-element aircraft wing configuration including a high-lift system in the sense of claims 1 and 8 (i.e. no slat or flap), nor any fluidic device operable to regulate flow into and out of one and the same port, nor any preference for the location of ports on the main wing, a slat or a flap. If the skilled person were to divide the main wing of D4, it was not clear how the combination would look like, e.g. whether he would add a flap and a slat and whether each element would include a hole and a blower.

VI. The arguments of the appellant II (opponent) regarding the present decision may be summarised as follows

The subject-matter of granted claim 8 lacked novelty in view of document D2:

(a) The arrangements of D2 showed both slats and flaps (page 2, lines 2-6, 30-34), each including suction bores (page 2, lines 27-30, referred to in line 32: "auf diese Weise"), so the skilled person was taught to combine Fig. 8 or 13 with Figs. 9 and 10. In view of this general and specific disclosure, D2 disclosed (irrespective of the different reference numerals used) suction bores provided in each of the slat, the main wing element and the flap.

(b) Some of the suction bores 31 in Fig. 8 of D2 were defined in the same region as the ports in the slat in the opposed patent, and Fig. 9 showed ports in an aft portion of the upper surface of the main wing element and the flap. Moreover, Fig. 13 of D2 showed an embodiment of the slat constituted by a deployable nose portion 53 and an aft portion, and the blow out port 54 was provided behind the nose portion in the surface of the aft portion of the slat. The opposed patent did not define the term "aft portion" and did not explain (also taking into account the measurement results in Figs. 3 to 9) a particular technical effect of placing the ports in an aft portion as compared to other portions of the upper surface of the slat and the main wing element (see international publication, page 7, lines 18-21). Fig. 2 of the opposed patent showed a port s1 which was closer to the slat's leading edge, so the term "aft" in the claims required only a port somewhere in the upper surface except for the very leading point. No strict geometric but a more functional interpretation had to be applied.

(c) Lift ("Höchstauftrieb") was considerably increased in D2 by providing all ports 31, 39, 44 at the same multi-element wing and, evidently, if the ports were operated at the same time. Thus, fluid flow was regulated simultaneously through all ports, thereby allowing for boundary layer flow control (see page 2, lines 24 to 25). According to the opposed patent (see column 7), regulating was achieved by actuating the various ports, including opening a port (it was not specified how a fluidic device actually operated as long as it regulated the flow). In D2, the flow was initiated by deflecting the wing elements 25, 36, 37. In a non-deflected position of the slat 25 or flaps 36, 37,

fluid flow trough the respective ports was blocked, as the leading edges (forming fluidic devices) of the main wing element or of the flaps were received in corresponding recesses.

(d) Claims 1 and 8 included the different language "into and out of" and "through", respectively.

(e) D2 related to a high lift device (page 2, line 1; claim 1) and was directed at increasing lift by providing bores (page 2, line 34).

The subject-matter of claims 1 and 8 according to the auxiliary request 1 was also not new over D2 in view of the above and the following reasons:

(f) The simultaneous regulation as claimed referred to the entirety of the ports as a whole (see column 7, lines 24 to 31: "several ports may be actuated simultaneously"), and the fluid flow was regulated into and out of this combined plurality of ports. Thus, it was only required that there was at least one port (somewhere) into which fluid flowed and at least one port (somewhere) out of which fluid flowed, and that the flow as a whole was regulated by the at least one fluidic device.

The subject-matter of claims 1 and 8 as maintained by the opposition division lacked an inventive step in view of document D3. As found by the opposition division, D3 disclosed all features of claims 1 and 8, with the exception that the ports 78 and 76 were not in an aft portion of the upper surfaces of the slat and the main wing element. The port (78) defined on the slat (8d) was, however, in a very similar position than the port (s1) according to the opposed patent (which referred to it as being in an aft portion, column 7, lines 5-7), so it was actually placed in an aft portion of the slat (keeping in mind that Fig. 9 of D3 was only

a schematic drawing). Moreover, the gap between the deployed slat and the main wing element had the purpose of guiding air through the gap towards the upper surface of the main wing element in order to avoid flow separation. Therefore, it would have been immediately obvious to provide one of the SCDs in the aft portion of the upper surface of the slat to assist the action of the gap. Moving the port 76 to the aft portion of the main wing element was not considered inventive in the contested decision (see also D1 in this respect).

It was also obvious to apply the flap's configuration of ports shown in D3 (Fig. 9: ports 71 to 74) to the slat. According to paragraphs [0062] and [0075] of D3, slats (8a-f) formed part of the high-lift system and the SCDs could span the entire high-lift device. Moreover, a similar placement of SCDs as shown for the flaps was suggested for the slats (see last sentence in paragraph [0063]), and it was also said that SCDs avoided separation. Figs. 10d, 10e showed examples of SCDs regulating fluid flow into and out of a port. Thus, it was obvious to provide further ports on the slat and to achieve a distribution similar to that shown in D3 for the flap. Paragraph [0063] referred only to examples of the placement of SCDs 10, 11 on the flap, which could be applied to other wing elements, so it was obvious to transfer the configuration of ports shown in Fig. 9 for the flap to the slat. This improved the high-lift capability of the wing. In order to achieve such improvement for the wing as a whole, also the boundary layer of the main wing element had to be controlled, so it was obvious to apply ports also in the rear portion of the main wing element. Moreover, it was obvious in view of document D1 (showing nozzles 12 at the leading edge and nozzles 13 at the trailing edge of the main wing element at the very end of the upper

surface) to arrange port 76 in the aft portion of the upper surface of the main wing element (see also D1, column 4, lines 22-32).

In any case, the opposed patent did not state that any particular effect was achieved by choosing the aft portion. In this regard, D3 stated in paragraph [0063] that the SCDs (ports 78 and 76 in Figure 9) could be arbitrarily placed depending on the needs, and according to paragraph [0075] the ports or SCDs could span the entire high-lift device and the location of the ports 78 and 76 was dictated by the flow over the high lift elements. Thus, the skilled person was explicitly taught and would have been motivated to examine the flow over a particular multi-element aircraft wing and to arrange the ports in the aft portion if flow could be improved. If such improvement could not be achieved, the placement of the ports was entirely arbitrarily and could not support an inventive step already for this reason. Looking for alternatives the skilled person would find solutions in D3.

D4 showed a multi-element aircraft wing (Figs. 1 and 5) comprising a main wing element ("wing") and an aileron (11) and ports (12) distributed over the entire upper surfaces, i.e. also in an aft region thereof. A fluidic device in form of a blower (3) was in fluid connection with the ports (12) on the upper surfaces of the main wing element and the aileron, so fluid flow was regulated simultaneously through ports on all wing elements. Thus, the subject-matter known from D4 differed form the subject-matter of claims 1 and 8 in that the multi-element wing of D4 did comprise a slat and a flap, each provided with the respective ports. However, providing a slat and a flap for the purpose of controlling boundary layer flow and influencing lift

was well-known in the prior art (see D2, D3) and was not inventive. Further, the skilled person would immediately define ports in the flap and attach these to the fluidic device in order to improve the flaps' efficiency, as described in D4 for the aileron, i.e. also in an aft portion. Finally, defining ports in the aft region of an upper surface of the slat was also not inventive in view of D4. In Fig. 8 of D4 ports (12, 23) were also defined in the upper surface of the leading edge area of the main wing element, i.e. where a slat would be placed. D4 did not teach to define ports in an aft region of the slat. However, the aft region of the upper surface of the slat according to the opposed patent covered nearly the entire upper surface of the slat, so the skilled person would most likely define ports in the aft region of the slat.
In any case, providing the wing of D4 with a slat and a flap constituted dividing the main wing element in three elements movable with respect to each other, and which could be brought into a configuration identical to the main wing element of D4. Thus, the skilled person would retain the distribution of the ports over the entire upper surface.

## Reasons for the Decision

1. *Main request - novelty (Article 54(1) EPC)*

1.1 The subject-matter of independent method claim 8 as granted is not new in view of the disclosure of document D2 (Article 54 (1) EPC).

1.2 Document D2 discloses a method for increasing lift of an aircraft (page 2, line 34: "... Höchstauftrieb erheblich gesteigert") comprising initiating fluid flow

over a multi-element aircraft wing (see Figures 8, 9) comprising a slat (25), a main wing element (34) and a flap (36, 37) and simultaneously regulating fluid flow through at least one port (31) defined in an aft portion of an upper surface of the slat, at least one port (39) defined in an aft portion of an upper surface of the main wing element and at least one port (44) defined in an upper surface of the flap to control boundary layer flow (see page 2, lines 24 to 25) over the slat, the main wing element and the flap.

1.2.1 The appellant I contests that the embodiments according to Figs. 8 and 9 (showing different reference numerals) could be combined, and argues that the statement on page 2, lines 30-34 of D2 only related to the invention as disclosed in D2 to shape the recess present in a slat, wing or flap in a particular way (like a profile, provided with a blowing slot), not suggesting any suction bores in the respective upper surfaces.

However, in the context of the invention disclosed in D2, suction bores provided in the outer surfaces of the slat or flap are explicitly mentioned (page 2, lines 27-30). D2 also states that both slats and flaps can be designed according to the claimed invention (page 2, lines 30-34: "Bei zugleich erfindungsgemäß gestalteten Vorflügeln und Klappen..."), referring to the suction bores mentioned before (page 2, line 32: "auf diese Weise"), i.e. both slats and flaps can be provided with suction bores. Concrete embodiments of the invention are then discussed with reference to the drawings (see page 3, third paragraph: "Ausführungsbeispiele der Erfindung sind in der Zeichnung veranschaulicht. Es zeigen: Abb. ..."). Taking this information in D2 together, it is clear to the skilled reader that a concrete embodiment of the claimed invention in D2, in

particular as regards the claimed "and"-combination ("erfindungsgemäß gestalteten Vorflügeln und Klappen"), has to rely on a combination of two drawings, since the drawings in D2 either show the front portion of the wing including a slat (Fig. 8), or the rear wing portion including a flap (Fig. 9). Since Fig. 9 in D2 also represents details on the design of the main wing element, it is irrelevant that the passage on page 2 of D2 is silent about this part of the wing, as asserted by appellant I.

1.2.2 The board finds that the term "aft" used in claim 8 has a well-defined meaning and will be construed by the skilled reader accordingly, i.e. describing a position towards the rear of an element. Therefore, contrary to the allegation of appellant I, Fig. 8 of D2 shows at least some of the suction bores (31) located in the aft portion, i.e. closer to the rear than to the front of the upper surface of the slat. In case of a slat showing two or even more ports, it is not required that all of them must be in the aft portion of the upper surface, as argued by the appellant I. The wording of claim 8 only requires "at least one port defined in an aft portion of an upper surface of the slat", so it does not exclude that further ports might be situated somewhere else , e.g. in the mid portion of the slat as shown in D2. As to the main wing element, the location in the aft portion is explicitly mentioned (page 5, lines 13-16) in D2.

1.2.3 The appellant I also argues that D2 was completely silent about the manner in which fluid flow was initiated and controlled through the suction bores and blowing slots, so that D2 failed to disclose any simultaneous regulation of the fluid flow as claimed.

However, even the opposed patent remains rather vague with regard to the term "regulating". It defines (see column 7, lines 22-26) that actuating a port includes opening a port, thus including a passive operation relying solely on a pressure differential between the upper surface and the recess of a wing element. Such a passive operation is known from D2, which shows a slat and flaps which are retractable (page 1, paragraph 1). In the retracted state, the flow of fluid entering the bores is blocked (e.g. due to the leading edge of the main wing element 27 being supported in the profile of slat 25, see Fig. 8), and fluid flow is regulated by opening or closing the ports 31, 39 and 44 in D2 when deploying or retracting the movable surfaces. Moreover, as argued already above (see Figs. 8 and 9), D2 discloses an embodiment in which the slat, the main wing element and the flaps are provided with suction bores, and it is clear from D2 (page 2, lines 30 to 34: "Höchstauftrieb erheblich gesteigert") that maximum lift is achieved when both the slat and the flaps are deflected. Thus, D2 shows (as represented in Figs. 8 and 9) an operating state in which all the ports are opened at the same time. Thus, D2 discloses that fluid flow is initiated and simultaneously regulated through all ports 31, 39, 44 as required by claim 8. It is noted that the wording of claim 8 does not specify further details on the regulation, as alleged by the appellant I with reference to various aerodynamic parameters to be controlled.

1.2.4 The board does not follow the appellant I that the term "through" used in claim 8 should have the same meaning as the term "in and out of" used in claim 1, allegedly by virtue of the close connection between both claims. Both terms cannot be considered as synonyms, since the term "through" in its general meaning does not give any

indication of a direction of fluid flow into or out of a port. Moreover, both claims 1 and 8 are formulated as independent claims in order to define separate subject-matter for which protection is sought. In the absence of any further definition in the patent specification, it has to be assumed that by using the term "through" intentionally a different scope of protection is defined by claim 8.

1.2.5 Finally, as has been set out above in points 1.2 and 1.2.3, the method known from D2 also explicitly aims at increasing lift, contrary to the allegation of appellant I.

1.3 Accordingly, the board comes to the conclusion that the method of claim 8 as granted is not new over D2.

*2. Auxiliary request 1 - novelty (Article 54(1) EPC)*

2.1 The subject-matter of independent claims 1 and 8 according to the auxiliary request 1 is new with respect to document D2 (Article 54(1) EPC).

2.2 Claim 8 was amended in auxiliary request 1 by replacing the term "through" by "into and out of", corresponding to the term already used in granted claim 1 (which remains unchanged in auxiliary request 1). According to the appellant II, the simultaneous regulation as claimed referred to the entirety of the ports and required only that air was sucked into at least one port (somewhere) and blown out of at least one port (somewhere). In this respect, the appellant II argues by combining Figs. 13 and 9 of D2, since Fig. 9 shows suction bores provided in the main wing element and the flaps and Fig. 13 a blow out port 54 provided in the slat.

Even following the interpretation of the appellant II with regard to the feature of simultaneous regulation of fluid flow "into and out" of ports, Fig. 13 of D2 does not show a port in an aft portion of the upper surface of the slat as required by the wording of claims 1 and 8. In the absence of any explicit definition of the term "aft portion" in the patent specification, the board finds that the meaning of the word "aft" is well-known to the skilled person in the field of aeronautics, meaning a location of the slat towards the rear or trailing edge, i.e. closer to the rear than to the front, or in the rear half. Such understanding is not inconsistent with the location of ports in the slat as represented in the schematic drawing of Fig. 2 in the opposed patent and the corresponding passage in the description, which states (column 7, lines 5-6; also page 7, lines 18-21 of the international publication) that the two ports s1 and s2 are defined in an aft portion of the slat. Fig. 2 shows a port s2 close to the trailing edge of the slat, and further a port s1 which is located somewhere close to the slat's centre, which in the board's view does not provide a clear teaching that would require to deviate from the common understanding of the meaning of "aft" as being located e.g. in the rear half. The board holds that a schematic drawing, such as Fig. 2 of the opposed patent, cannot serve as a basis to attribute an overly broad meaning to a term, such as the term "aft", which has a well-recognised meaning to the skilled person when reading the claims. Therefore, irrespective of whether a geometric or functional interpretation were to be applied, the board cannot see that the skilled person would take from Fig. 2 of the opposed patent the clear teaching that the port s1 is located closer to the slat's leading edge, so that the term "aft" in the

claims required only a port somewhere in the upper surface except for the very leading point, as argued by the appellant II.

The blow out port 54 in Figure 13 of D2 opens to the upper surface of the slat when the nose portion is deployed from a further portion (which is referred to by the appellant II as "aft portion"). However, the wording of claim 1 and 8 does not require a port in the surface of the aft portion of the slat, as argued by appellant II, but in the aft portion of an upper surface of the slat. As such, the term "aft" refers to upper surface of the slat as a whole, not to a portion of the slat only.

Accordingly, the board concludes that a port such as the blow out port 54 of Fig. 13 of D2 which is located in the front or nose area of the slat does not fall under the wording of claims 1 and 8, which requires a port in an aft portion of an upper surface of the slat. Whether such placement of the ports has a technical effect is not an issue when judging on novelty, as long as the feature is a technical feature.

2.3 Since D2 already fails to show a port in an aft portion of an upper surface of the slat, novelty of the subject-matter of claims 1 and 8 over D2 has to be acknowledged. Thus, the question whether the feature "in and out of at least one port" distinguishes the claimed subject-matter further from D2 can be left open.

*3. Inventive step (Article 56 EPC)*

3.1 The subject-matter of claims 1 and 8 of the auxiliary request 1 involves an inventive step (Article 56 EPC),

taking into account the lines of arguments presented by the appellant II either starting from the closest prior art as known from D3 (in combination with the general knowledge or with D1) or as disclosed in D4 (in combination with the general knowledge).

3.2 Starting from document D3 as the closest prior art, it is agreed that D3 shows (Figs. 3 and 9) a multi-element aircraft wing comprising (see Fig. 9) a main wing element (1), a slat (8d) and a flap (5) and boundary layer separation control devices (SCDs 10) placed thereon. Examples of SCDs shown in D3 (Figs. 10d, 10e) have an orifice in the upper surface of the respective wing elements, so that in this configuration Fig. 9 of D3 shows ports at specific locations in the upper surface of the flap (71, 72, 73, 74). This type of SCDs is also operable to simultaneously regulate fluid flow into and out of the port (as indicated in Figs. 10d, 10e) and is used for boundary layer control (as indicated by the term "SCD", see above).

3.2.1 As correctly found by the opposition division, D3 does not show ports in aft portion of the upper surfaces of the slat and the main wing. The board cannot see that the port 78 of the slat shown in Fig. 9 of D3 is placed in a position similar to that of port s1 in Fig. 2 of the opposed patent, so that it allegedly could be referred to as being located (as stated in the opposed patent, column 7, lines 5-7) in the aft potion of the slat. The port 78 shown in D3 is definitely located close to the forward edge of the slat. Admittedly, Fig. 9 represents only a schematic drawing, but it is explicitly stated in D3 (paragraph [0074]) that the SCDs (i.e. also ports) are located on the slat "at leading-edge device locations 77 and 78".

3.2.2 The board does not follow the appellant II that it would have been immediately obvious to provide one of the SCDs in the aft portion of the upper surface of the slat to assist the gap provided between the slat and the main wing element in guiding air towards the upper surface of the main wing element in order to avoid flow separation. In the board's view, this line of argument has the character of a mere allegation not supported by any facts why the skilled person would contemplate such an additional measure in the aft portion of the slat. The prior art cited by the appellant II is totally silent on any nozzles or ports provided in the aft region of an upper surface of the slat. Document D1 e.g. relates only to the main wing element when it teaches that nozzles provided in the main wing element might function equally well in the trailing edge area and the leading edge area. In fact, the appellant II has not used D1 to argue in respect of ports located in the aft region of the slat.

3.2.3 A further line of argument of the appellant II relies on several passages of the disclosure of D3, in particular Fig. 9 and paragraphs [0062], [0063] and [0075]. Fig. 9 represents a cross-section of the top view of the multi-element wing shown in Fig. 3, as described in paragraph [0062], which refers to the slats as "leading-edge devices 8a-f that also form part of the high-lift system". The high-lift system of D3 is formed by a multi-element wing structure comprising an inboard flap 2 composed of two elements, a flaperon 4, an outboard flap 5, aileron 6, spoilers 7 and the leading edge devices 8a-f. According to paragraph [0063], boundary layer separation control devices (SCDs) can be placed arbitrarily on the high-lift system. However, this passage is rather vague and does not yet refer to any concrete element of the multi-

element wing to be selected for placing SCDs. Then it is referred to examples of the placement of SCDs on the flap 2 and on the outboard flap 5 as shown in Fig. 3. However, the SCDs shown in Fig. 3 are all placed in a fore region of the flaps 2 and 5, as confirmed by the details of the outboard flap 5 shown in Figs. 4a and 4b. Moreover, paragraph [0063] explicitly refers to a distribution of SCDs in the spanwise direction only ("inner and outer separation control devices 10 and 11"). Thus, the final statement in paragraph [0063] ("Similar placement of SCDs can be achieved only, 1, 4, 6, 7, and 8a-f", which is somewhat unclear due to the word "only"), might at most indicate that SCDs might be placed similarly, i.e. in the fore region of the slats 8a-f and distributed in a spanwise (not in a chordwise) direction.

The appellant II argues that the configuration of ports shown in D3 for the flap in Fig. 9 would obviously be applied also to the slat. It is acknowledged that Fig. 9 and the related description in paragraph [0074] explicitly suggest that SCDs might be placed in an aft portion of an upper surface of the flap ("Locations on the flap can be in the vicinity of the flap leading-edge 71; on the fore part of the flap 72; on the aft part of the flap 73, or at the flap trailing edge 74."). Moreover, it is stated that SCDs (although preferred on the flap) "could also, or otherwise, be placed in the cove or leading-edge regions if more efficient or convenient", in particular "in the lower surface cove 75, on the main element 76; or at leading-edge device locations 77 and 78" (locations 77, 78 refer to the slat, see Fig. 9). Thus, this passage again can only lead the skilled person to provide ports in the fore part of the slat. The further passage in paragraph [0075] stating that the SCDs "can span the

entire high-lift device" does not teach to provide SCDs in the aft region of the slat. As clearly expressed by the following sentence in this paragraph (SCDs "need not lie along a line parallel to the device leading or trailing edge, but may be angled"), paragraph [0075] refers again at most to a spanwise distribution of SCDs and cannot provide a teaching that SCDs should be located in the aft portion of the slats.

It is also noted that paragraph [0063] relates to the placement of SCDs in the context of a vortex management strategy, and the specific example given in Fig. 9 (to which paragraph [0074] refers to) must be seen against this background. The different solutions described in paragraph [0063] might indicate that SCDs could also be placed on the slat. However, the examples of placement of SCDs described in this context do not provide any hint to place SCDs in the aft region of the slat, but only at the leading edge, as argued above. Thus, it is not considered obvious to transfer the configuration of ports shown in Fig. 9 for the flap to the slat.

Therefore, when D3 speaks in general terms about a high-lift system (see paragraph [0062]) and then of arbitrarily placing SCDs on the high-lift system to control boundary layer separation and similar placement of SCDs on the slats (as argued by appellant II with respect to paragraph [0063]), this cannot be considered as providing a clear indication that each and every teaching in D3 on how to place SCDs on the flaps would obviously applied to the slats. This is all the more true since D3 includes a specific guidance as regards the placement of SCDs on the slats (see Fig. 9 and paragraph [0074]).

3.2.4 Finally the appellant II argues that no particular technical effect was achieved by choosing the aft portion of the slat. If no improvement of flow over the high-lift elements was achieved, such placement of the ports on the slat allegedly could not support an inventive step.

However, the opposed patent explicitly shows simulation results (see e.g. Fig. 3 or 4) of embodiments of the invention, i.e. comprising ports as defined by claims 1 and 8, which demonstrate that ports arranged in the aft portion of the upper surface of a slat (in particular, in addition to ports already provided in the upper surfaces of the main wing element and the flap) contribute to an increase in the lift coefficient CL and thus to an improvement of air flow over the high-lift multi-element aircraft wing. D3 might suggest in general that SCDs can be placed arbitrarily on the high-lift system. However, in the board's view, the claimed subject-matter is not the mere result of simple routine examination of air flow over a multi-element aircraft wing, as apparently argued by appellant II. The inventive contribution of the claimed invention (for which there is no teaching in the cited prior art) resides in having recognised that the provision of ports in an aft portion of the upper surface of the slat, in addition to ports provided in the main wing element and the flaps, can provide a considerable increase in lift coefficient, as shown in Fig. 4B of the opposed patent.

Whether a particular technical effect is achieved by choosing the aft portion of the slat (in comparison to the fore portion, as known from D3) affects the formulation of the technical problem to be solved by this distinguishing feature of claims 1 and 8. Even

assuming that the claimed invention only provides an alternative solution to a known problem which was already solved in the prior art, the board was not convinced that the skilled person would transfer the specific configuration of ports on the flap as shown in Fig. 9 of D3 to the slat, as argued already above.

3.2.5 Accordingly, the board was not convinced that the skilled person in view of document D3 and the common general knowledge, also taking into account the teaching of document D1 (which does not show any ports in the slat), would contemplate placing ports in an aft portion of the upper surface of the slat. The presence of inventive step already has to be acknowledged on the basis of this distinguishing feature alone, irrespective of whether further arranging a port in the rear portion of the main wing element involves an inventive step.

3.3 Assuming that document D4 published in 1929 might be considered as the closest prior art, which was contested by the appellant I, the board finds that the skilled person starting from D4 would not arrive at the subject-matter of claims 1 and 8 in an obvious manner.

The aircraft wing known from D4 comprises a main wing element and an aileron, but no slat or flap, as acknowledged by the appellant II. Although deployable slats and flaps are well-known in current aircraft technology in order to achieve high levels of lift during take-off and landing (see opposed patent, paragraph [0007]), the board has already difficulties in following the appellant II when alleging that the skilled person would divide the main wing element of D4 in three elements movable with respect to each other. D4 already discloses a wing which shows increased lift

characteristics, and why the skilled person would additionally provide a slat and a flap remains unjustified. Dividing the main wing element of D4 in three elements to incorporate a slat and a flap would require a complete reconstruction of the wing of D4, which is not an obvious modification the skilled person would consider.

Moreover, it is not clear how the multi-element wing would look like when adding a slat and a flap to the wing known from D4, i.e. whether each element would include at least one port and whether, in particular, the at least one port of the slat would be provided in an aft region of the upper surface of the slat, as required by the wording of claims 1 and 8. As admitted by the appellant II, D4 does not contain any teaching in this respect, so it is considered purely speculative to conclude that the skilled person, when providing a slat in D4, would provide ports in an aft region of the upper surface of the slat. It is not a matter of whether the skilled person could arrive at such a configuration, or where he would most likely define ports, as stated by the appellant II, but whether the skilled person would have done so because of promptings in the prior art. The fact that D4 discloses openings in the upper surface near the leading edge area of the wing, i.e. in a region where a slat would possibly be placed, is no indication at all in this respect.

3.4 As follows from the above, none of the lines of arguments presented by the appellant II renders the subject-matter of claims 1 and 8 according to the auxiliary request 1 obvious.

**Order**

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

Both appeals are dismissed.

The Registrar: The Chairman:

A. Vottner P. Guntz

Decision electronically authenticated