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Case Number: T 0370/16 - 3.2.01

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Title of invention:
AEROSPACE VEHICLE YAW GENERATING SYSTEMS AND ASSOCIATED METHODS

Patent Proprietor:
The Boeing Company

Opponent:
Airbus Operations GmbH

Headword:

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

Keyword:
Novelty - (no) - main and auxiliary requests 1 to 7
Amendments - added subject-matter (yes) - "additional" auxiliary request

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Catchword:

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Case Number: T 0370/16 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 11 January 2019

Appellant: (Patent Proprietor)	The Boeing Company 100 North Riverside Plaza Chicago, IL 60606-1596 (US)
Representative:	Bartelds, Erik Arnold & Siedsma Bezuidenhoutseweg 57 2594 AC The Hague (NL)
Respondent: (Opponent)	Airbus Operations GmbH Kreetslag 10 21129 Hamburg (DE)
Representative:	Bird & Bird LLP Großer Grasbrook 9 20457 Hamburg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 27 November 2015 revoking European patent No. 1893480 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	G. Pricolo
Members:	C. Narcisi
	S. Fernández de Córdoba

Summary of Facts and Submissions

I. European patent No. 1 859 972 was revoked by the decision of the Opposition Division posted on 27 November 2015. Against this decision an appeal was lodged by the Patentee in due form and in due time pursuant to Article 108 EPC.

II. Oral proceedings were held on 11 January 2018. The Appellant (Patentee) requested that the impugned decision be set aside and that the patent be maintained in amended form according to the main request or, in the alternative, according to the first to fourth auxiliary request (all these requests filed on 7 April 2016), or according to the fifth to seventh auxiliary request, or according to the further "additional" request (all these requests filed on 8 April 2016). The Respondent (Opponent) requested that the appeal be dismissed.

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

"An aerospace vehicle (101) having a fuselage (110;810) with a first portion (112;812) and a second portion (114); and a yaw generating system (100), said yaw generating system (100) comprising a movable control surface (142) coupled to the fuselage (110) and, when retracted, extending generally in a horizontal plane, the control surface (142) being movable to a deflected position in which the control surface (142) is positioned to create a flow pattern proximate to the fuselage (110) when the aerospace vehicle (101) is located in a flow field (F), the flow pattern being positioned to create a pressure differential (P1) between the first portion (112) of the fuselage (110;810) and the second portion (114) of the fuselage

(110), the first and second portions (112,114) being located so that the pressure differential (P1) produces a yawing moment (Ym1) on the aerospace vehicle (101), wherein a wing section (120) is coupled to the fuselage (110), the control surface (142) being located on the wing section (120) within the first third of the wing span, measured from the fuselage (110) to the tip of the wing section (120), and wherein the control surface (142) is positioned to accelerate portions of the fluid flow in some areas, thereby increasing dynamic pressure and decreasing local or static pressure, and to decelerate other portions of the flow, reducing dynamic pressure and increasing local or static pressure so as to create the flow pattern that creates the pressure differential (P1); wherein the control surface (142) includes a spoiler surface."

Claim 1 of the first auxiliary request reads as follows:

"An aerospace vehicle (101) having a fuselage (110) with a first portion (112) and a second portion (114); and a yaw generating system (100), said yaw generating system (100) comprising two movable control surfaces (142) coupled to the fuselage (110) and each, when retracted, extending generally in a horizontal plane, each control surface (142) being movable to a deflected position in which the control surface (142) is positioned to create a respective flow pattern proximate to the fuselage (110) when the aerospace vehicle (101) is located in a flow field (F), the flow pattern being positioned to create a pressure differential (P1) between the first portion (112) of the fuselage (110) and the second portion (114) of the fuselage (110), the first and second portions (112,114) being located so that the pressure differential (P1)

produces a yawing moment (Ym1) on the aerospace vehicle (101), wherein two wing sections (120) are coupled to the fuselage (110), a respective one of the control surface (142) being located on each wing section (120) within the first third of the wing span, measured from the fuselage (110) to the tip of the wing section (120), and wherein one of the control surfaces (142) only is positioned in a deflected position, or one of the control surfaces is deflected greater than the other control surface, to accelerate portions of the fluid flow in some areas, thereby increasing dynamic pressure and decreasing local or static pressure, and to decelerate other portions of the flow, reducing dynamic pressure and increasing local or static pressure so as to create the flow pattern that creates the pressure differential (P1); wherein each control surface (142) includes a spoiler surface, the spoiler surfaces symmetrically located with respect to the fuselage."

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that the wording "the spoiler surfaces symmetrically located with respect to the fuselage" is replaced by "and wherein the yawing moment (Ym1) includes a first yawing moment that is produced by the pressure differential (P1) between the first and second portions (112, 114) of the fuselage (110), and in that the system (100) further comprises an electronic flight control system operatively coupled to each control surface (142) to move automatically the one control surface (142) to the deflected position, or to deflect automatically the one control surface greater than the other control surface, when an asymmetric thrust condition creates a thrust yawing moment (Ymt) on the aerospace vehicle (101) at one or more selected operating conditions, the first

yawing moment (Ym1) being at least approximately opposite the thrust yawing moment (Ymt)".

Claim 1 of the third auxiliary request differs from claim 1 of the second auxiliary request in that the wording "creates a thrust yawing moment (Ymt) on the aerospace vehicle (101) at one or more selected operating conditions" is replaced by "creates a thrust yawing moment (Ymt) on the aerospace vehicle (101) due to loss of an engine at low speed during the takeoff roll".

Claim 1 of the fourth auxiliary request reads as follows:

"A method of operating:
An aerospace vehicle (101) having a fuselage (110;810) with a first portion (112;812) and a second portion (114); and a yaw generating system (100), said yaw generating system (100) comprising two movable control surfaces (142) coupled to the fuselage (110) and each, when retracted, extending generally in a horizontal plane, each control surface (142) being movable to a deflected position in which the control surface (142) is positioned to create a respective flow pattern proximate to the fuselage (110) when the aerospace vehicle (101) is located in a flow field (F), the flow pattern being positioned to create a pressure differential (P1) between the first portion (112) of the fuselage (110;810) and the second portion (114) of the fuselage (110), the first and second portions (112,114) being located so that the pressure differential (P1) produces a yawing moment (Ym1) on the aerospace vehicle (101), wherein two wing sections (120) are coupled to the fuselage (110), a respective one of the control surface (142) being located on each

wing section (120) within the first third of the wing span, measured from the fuselage (110) to the tip of the wing section (120), and wherein one of the control surfaces (142) can be positioned to accelerate portions of the fluid flow in some areas, thereby increasing dynamic pressure and decreasing local or static pressure, and to decelerate other portions of the flow, reducing dynamic pressure and increasing local or static pressure so as to create the flow pattern that creates the pressure differential (P1); wherein each control surface (142) includes a spoiler surface, the spoiler surfaces symmetrically located with respect to the fuselage, the method comprising the step of positioning one of the control surfaces only in the deflected position, or deflecting one of the control surfaces greater than the other, in response to the loss of an engine at low speed during the takeoff roll."

Claim 1 of the fifth auxiliary request differs from claim 1 of the fourth auxiliary request in that the wording "in response to the loss of an engine at low speed during the takeoff roll" is replaced by "in response to the loss of an engine at low speed during the takeoff roll when an asymmetric thrust condition creates a thrust yawing moment (Ymt) on the aerospace vehicle (101), the first yawing moment (Ym1) being at least approximately opposite the thrust yawing moment (Ymt)."

Claim 1 of the sixth auxiliary request reads as follows:

"An aerospace vehicle (101) having a fuselage (110;810) with a first portion (112) and an opposite side second portion (114); and a yaw generating system (100), said

yaw generating system (100;800) comprising first and second movable control surfaces (142a,142b) coupled to the fuselage (110;810) and, when retracted, extending generally in a horizontal plane, the control surfaces (142a,142b) being movable to a deflected position in which the surfaces (142a,142b) are positioned to create a flow pattern proximate to the fuselage (110) when the aerospace vehicle (101) is located in a flow field (F), the flow pattern being positioned to create a pressure differential (P1) between the first portion (112) of the fuselage (110) and the opposite side second portion (114) of the fuselage (110), the first and opposite side second portions (112,114) being located so that the pressure differential (P1) produces a yawing moment (Ym1) on the aerospace vehicle (101),
characterized in that wing sections (120) are coupled to the fuselage (110), each of the control surfaces (142a,142b) being located on the respective wing section (120) within the first third of the wing span, measured from the fuselage (110) to the tip of the wing section (120), and in that the control surfaces (142a, 142b) are positioned to accelerate portions of the fluid flow in some areas, thereby increasing dynamic pressure and decreasing local or static pressure, and to decelerate other portions of the flow, reducing dynamic pressure and increasing local or static pressure so as to create the flow pattern that creates the pressure differential (P1); and
wherein: the first control surface (142a) is located proximate to a first side (111) of the fuselage (110) that is opposite a second side (113) of the fusselage (110) and the second control surface (142b) is located proximate the opposite second side (113) of the fuselage (110), the first and second control surfaces each including a respective spoiler surface.”

Claim 1 of the seventh auxiliary request differs from claim 1 of auxiliary request 6 in that the wording "the first and second control surfaces each including a respective spoiler surface is replaced by "the pressure differential (P1) between the first portion (112) of the fuselage (110) and the second portion (114) of the fuselage creates a side force (S1) that produces the yawing moment (Ym1), thee side force (S1) having a direction extending outwardly from the fuselage (110) and away from the second side (113) of the fuselage (110), and
the first control surface (142a) in the deflected position is positioned to create a flow pattern proximate to the fuselage (110) to create the pressure differential (P1) between the first portion (112) of the fuselage (110) and the second portion (114) of the fuselage (110) while creating an at least approximately balanced net rolling moment (Rmnet) on the aerospace vehicle (101) when the vehicle (101) is located in the flow field (F) at low speed during the takeoff roll, wherein when the first control surface (142a) is in the deflected position a first amount of lift (L1) created by the first wing section (120a) is less than a second amount off lift (L2) created by the second wing section (120b), thus creating a lift rolling moment (Rml), while side force (S1) is positioned above a c.g. of the aerospace vehicle (101), thus creating a first rolling moment (Rm1) which is generally opposite the lift rolling moment (Rml), resulting in the net rolling moment (Rmnet) that is approximately balanced".

Claim 1 of the "additional" auxiliary request differs from claim 1 of the third auxiliary request in that the wording "said yaw generating system (100) comprising two movable control surfaces (142) coupled to the fuselage (110) and each," is replaced by "said yaw

generating system (100) consisting of two movable control surfaces (142) coupled to the fuselage (110) and each,", and the wording "the first yawing moment (Ym1) being at least approximately opposite the thrust yawing moment (Ymt)" is replaced by "the first yawing moment (Ym1) being at least approximately opposite the thrust yawing moment (Ymt), the electronic flight control system controlling the amount of time the control surface remains in the deflected position; and wherein each control surface (142) is located proximate to a respective first side (111) of the fuselage (110), and wherein the pressure differential (P1) between the first portion (112) of the fuselage (110) and the second portion (114) of the fuselage (110) creates a side force (S1) that produces the yawing moment (Ym1), the side force (S1) having a direction extending outwardly from the fuselage (110) and away from the second side (113) of the fuselage (110)."

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

The subject-matter of claim 1 of the main request is new over prior art D1 (US-A-5 375 793) since D1 does not disclose that the control surface includes a spoiler surface located within the first third of the wing span (i.e. inboard spoiler) and which is deflected to create a yawing moment on the aerospace vehicle (hereinafter designated as feature (i)). In conjunction with feature (i) the further features reading "the control surface (142) being movable to a deflected position in which the control surface (142) is positioned to create a flow pattern proximate to the fuselage (110) when the aerospace vehicle (101) is located in a flow field (F), the flow pattern being positioned to create a pressure differential (P1) between the first portion (112) of the fuselage

(110;810) and the second portion (114) of the fuselage (110), the first and second portions (112,114) being located so that the pressure differential (P1) produces a yawing moment (Ym1) on the aerospace vehicle (101)" (hereinafter designated as feature (ii)) and "wherein the control surface (142) is positioned to accelerate portions of the fluid flow in some areas, thereby increasing dynamic pressure and decreasing local or static pressure, and to decelerate other portions of the flow, reducing dynamic pressure and increasing local or static pressure so as to create the flow pattern that creates the pressure differential (P1)" (hereinafter designated as feature (iii)) are likewise not disclosed in D1.

In effect, D1 does not disclose deflection of said inboard spoiler to create a yawing moment, for it merely discloses deflection of spoiler 6 (in the technical context of the Airbus A340) (see D1, column 4, lines 20, 29), which is the outermost spoiler. This is confirmed by the entry in "Jane's All The World's Aircraft" (reproduced on www.aviamarket.org/civil-aircraft/521-airbus-a340.html), indicating also that the inboard spoiler (No. 1 spoiler) is not used for roll control, i.e. cannot be deflected asymmetrically.

Moreover, the skilled person would understand and derive from the disclosure of D1 alone (even without the printout from "Jane's") that during take-off in order to provide low speed compensation of a lateral path deviation (due to engine failure) (D1, col. 1, lines 56-59) maximum yaw torque should be produced at a minimum drag supplement. Therefore, if (according to D1) a spoiler 13 is to be deflected in order to minimize roll torque on "an aircraft, whose wings only have the standard one and not two ailerons on each

side" (D1, column 3, lines 55-58) it is only logical to use the spoiler 13 which is closest to the position of second aileron which it replaces. In other words, the outermost spoiler, which is designated as spoiler 6 in D1 (D1, column 4, lines 20-42).
The expert opinion of Dr. Martin confirms (see e.g. point 20) that deflection of the inboard spoiler (to generate yaw moment) is only hypothetical and will never occur in practice.

The subject-matter of claim 1 of the first auxiliary request 1 is new over D1. With respect to claim 1 of the main request it is further specified that control surfaces on both sides of the fuselage are provided. Therefore novelty is given over D1, at least for the same reasons as mentioned in relation to claim 1 of the main request.

The subject-matter of claim 1 of the second auxiliary request is new over D1. With respect to claim 1 of the first auxiliary request an electronic flight control system is introduced, which automatically deflects the control surface when an asymmetric thrust condition is detected. This does not apply to the aircraft of D1, where the deflection of the aileron(s) and spoiler(s) is controlled depending on deflection of the rudder bar (D1, column 3, lines 21-22), which may be actuated by the pilot not only in the event of an asymmetric thrust condition, but also in the event of other asymmetries, e.g. external loads, crosswinds etc. (see D1, column 1, lines 48-53). By contrast, claim 1 defines a fully automatic deflection of the inboard spoiler, depending on detection of an asymmetric thrust condition (see patent specification (hereinafter designated as EP-B), paragraph [0032]). Therefore, the claimed subject-

matter is new over D1, at least for the same reasons as set out in relation to the main request.

With respect to claim 1 of the third auxiliary request the same reasons apply as for claim 1 of the second auxiliary request.

The subject-matter of the fourth auxiliary request is directed to a method of operating an aerospace vehicle including the features of claim 1 of the first auxiliary request. Therefore it is new over D1, at least for the same reasons. In addition, D1 does not disclose deflecting a control surface in response to the loss of an engine but rather in response to deflection of the rudder.

The subject-matter of claim 1 of the fifth auxiliary request is new over D1, at least for the same reason as detailed in relation to the fourth auxiliary request.

The subject-matter of claim 1 of the sixth auxiliary request is new over D1. The additional features of this request further distinguish claim 1 from other prior art documents (e.g. D4 (Guillaume Fillola, Marie-Claire Le Pape and Marc Montagnac, Numerical simulations around wing control surfaces, ICAS Report 2004 and ICAS Congress 2004, Yokohama, Japan, 29.8.-3.9.2004) and D5 (ESDU Data Item No. 96026, Drag and yawing moment due to spoilers, published in November 1999)) and novelty over D1 results from at least the same reasons as for the first and second auxiliary request.

The subject-matter of claim 1 of the seventh auxiliary request is new over D1. D1 does not disclose any side force acting on the fuselage above the centre of

gravity. In D1 the deflection of the aileron(s) creates an upward rolling moment on the wing carrying the ailerons, which is then counteracted by a downward rolling moment due to loss of lift when an outboard spoiler is deflected. Since all relevant control surfaces are located as far as possible from the aircraft fuselage, deflection of these control surfaces will not cause flow patterns proximate to the fuselage which can produce a side force. In that respect it should be stressed that the side force S1 on the fuselage is a suction force (or "pulling force") acting on the side of the fuselage that is opposite to the wing carrying the deflected spoiler. This suction or "pulling" force is the result of the locally decreased static pressure, which in turn is caused by the acceleration of the fluid at that side of the fuselage. This local acceleration of the flow is the result of the deflection of the flow as the inboard spoiler is deployed (see aforementioned feature (ii) and (iii)). This effect simply cannot be achieved by deflecting the outboard spoiler or aileron as disclosed in D1. At least for that reason claim 1 of the seventh auxiliary request is new over D1.

The subject-matter of claim 1 of the "additional" auxiliary request does not extend beyond the content of the application as filed. Specifically, the feature reading "said yaw generating system (100) consisting of two movable control surfaces coupled to the fuselage" is based on the patent application as filed (see published patent (hereinafter designated as WO-A), page 10, lines 25-28).

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

The subject-matter of claim 1 of the main request is known from D1. Specifically, feature (i) is known from D1, as the most inboard spoiler (13) (see figure 1) is located within the first third of the wing span, a plurality of spoilers being arranged on each wing section and being movable between a retracted position (D1, figure 1) and a deflected position (D1, column 2, lines 59-63); column 3, lines 40-45). Functional features (ii) and (iii) are also derivable from D1, for the flow pattern resulting from the specific arrangement of the structural features as indicated in claim 1 has to be the same as the flow pattern resulting from the structural features disclosed in D1, given that the structural features disclosed in claim 1 and in D1 are the same.

The subject-matter of claim 1 of the first auxiliary request is not new over D1 since nothing substantive has been added as compared to claim 1 of the main request.

The subject-matter of claim 1 of the second auxiliary request is not new over D1. Claim 1 does not state that the control surfaces are “only” controlled automatically by the flight control system (as disclosed in EP-B, paragraph [0032]), as term “only” was omitted. Therefore, a fully automated system is not implied by claim 1, and automatic deflection of the control surface by means of the “fly by wire” (D1, column 3, lines 20-25) upon detection (by the “fly by wire”) of a (significant) rudder deflection anticipates the claimed feature. Indeed, the rudder is deflected by the “fly by wire” for compensating an asymmetric thrust condition (D1, column 1, lines 20-23).

The subject-matter of claim 1 of the third auxiliary request is not new over D1, for the process of D1 can be applied to all cases of asymmetry liable to be encountered at low speed (D1, column 2, lines 27-30).

The subject-matter of method claim 1 of the fourth auxiliary request (which is a method of operating an aerospace vehicle according to claim 1 of the first auxiliary request) is not new over D1, given that said process in D1 can be used at low speed during take-off roll (see hereinabove).

The subject-matter of claim 1 of the fifth auxiliary request is not new over D1, as D1 can be used to counter an asymmetric thrust condition as previously discussed inter alia with regard to the third auxiliary request.

The subject-matter of claim 1 of the sixth auxiliary request is not new over D1, since no substantial difference can be determined between claim 1 and claim 1 of the first auxiliary request.

The subject-matter of claim 1 of the seventh auxiliary request lacks novelty over D1. The forces and lift rolling moments described in claim 1 are functional features that describe the physical effect of actuating the respective control surfaces. Hence, any aerospace vehicle exhibiting all structural features of claim 1 will necessarily also exhibit the respective forces and lift moments.

The subject-matter of claim 1 of the “additional” auxiliary request does not comply with Article 123(2) EPC. In effect, there is no basis in the patent application as filed (WO-A) for the feature reading

"said yaw generating system consisting of two movable control surfaces coupled to the fuselage".

Reasons for the Decision

1. The appeal is admissible.

2. The subject-matter of claim 1 of the main request is not new over D1, for the aforementioned disputed features (i), (ii) and (iii) are known from D1.
D1 generally teaches control of an aircraft's control surfaces for the low speed compensation of a lateral path deviation (D1, column 1, lines 8-11), due to engine trouble occurring during take-off (D1, column 1, lines 13-17). In order to counter the yaw torque resulting from engine trouble the pilot uses in particular rudder deflection (D1, column 1, lines 20-24), and (beyond a given deflection threshold) a deflection of the control surfaces of one of the two wings is controlled, said wing being that on the side of the deflected rudder, so as to supply a drag supplement to said wing and therefore a yaw torque to the aircraft (D1, column 1, lines 59-65). Therefore, according to D1, it is possible to control deflection of at least one aileron of the wing (on the side of the deflected rudder) or, if said wing has two ailerons, a differential deflection of the ailerons of the wing in question is controlled, one being deflected downwards and the other upwards, so as to minimize the roll torque (D1, column 1, line 64-column 2, line 3). In addition, it is possible to upwardly deflect at least one spoiler (e.g. by individual control of one spoiler) (on the wing on the side of the deflected rudder) by a quantity such that the roll torque created by all the

deflected control surfaces is minimized (D1, column 2, lines 4-10), and insofar as the deflection of the mentioned control surfaces can vary the overall drag difference between the wings in the desired sense.

Thus, it follows already from the general teaching in the introductory portion of D1 that both in aircrafts having two ailerons and only one aileron on each wing, additional controlled upward deflection of any individual spoiler or more spoilers (i.e. "at least one") is possible and disclosed (contrary to the Appellant's view), depending only on the given circumstances and requirements, namely on whether the yaw torque is increased in the desired way by the required amount (effectively countering the yaw torque resulting from engine trouble) and on whether the overall roll torque is balanced.

More importantly, the specific description of D1 is based on the detailed example of figure 1 (illustrating the case of an "aircraft of the airbus type"; D1, column 2, lines 52-53), and shows an aircraft of the "airbus type" having six spoilers (reference sign 13) and an innermost (inboard) spoiler (also indicated with reference sign 13) arranged on each wing, the inboard spoiler clearly and unambiguously within the first third of the wing span (in agreement with aforesaid feature (i)), this "series of spoilers 13" being provided inter alia for "asymmetrical assisting the ailerons" (D1, column 3, lines 59-63). In complete analogy to the above general case, here again it is stated that in case of each wing having two ailerons (as in figure 1) "for increasing the yaw torque, one or more spoilers 13 can be deflected upwards on said same wing by a quantity such that the roll torque created by all the deflected surfaces (ailerons, control surfaces,

spoilers) is minimized". In other words, the deflection of anyone (or a combination) of the six illustrated spoilers (in addition to aileron deflection) is explicitly disclosed and possible, depending only on the required amount of yaw torque (necessary to compensate engine failure) and on the required specific amount of roll torque (needed to balance overall roll torque). Hence, obviously, if under given circumstances the required amount of yaw torque to be generated by the spoiler is not too high (e.g. due to minor and only partial engine power loss), deflection of the inboard spoiler would just be sufficient, irrespective of the outer spoilers generating more yaw torque. Therefore feature (i) is known from D1.

Finally, D1 reiterates (column 3, lines 56-62) that for specific aircrafts having only one aileron on each wing "use will be made of the deflection of the combination of spoilers and the single aileron for achieving the sought aim". Thus, again, the choice of the specific spoiler(s) to be deflected depends only upon considerations concerning the specific amount of yaw torque and roll torque to be generated or compensated.

The "remainder of the description" in D1 (D1, column 3, lines 63-66) describes a further specific example based on the aircraft Airbus A340. Therein deflection of "spoiler 6" (D1, column 4, lines 8-38) is described in combination with deflection of the rudder and of two ailerons located on the same wing. Since D1 does not elucidate which spoiler is actually implied by the wording "spoiler 6", this question remains open and no definite and conclusive answer can be given. Nonetheless, even on the assumption that the Appellant's contentions based on "Jane's All The World's Aircraft" (reproduced on www.aviamarket.org/

civil-aircraft/521-airbus-a340.html)" are plausible and well-founded, this does not detract in the least from the above conclusions. Quite to the contrary, this fits well within the overall teaching of D1, confirming that a priori any spoiler (or combination of spoilers) of the wing on the side of the deflected rudder can be deflected (in addition to the aforesaid control surfaces), depending on specific circumstances (e.g. such as the extent of engine failure or power loss and resulting yawing moments and minimizing overall roll torque) and on specific aircraft type.

As to features (ii) and (iii), these are purely functional features relating to static and dynamic pressure in the air flow field around the aircraft's fuselage. These feature are therefore determined by structural features, such as the specific aircraft configuration and control surfaces (including their operation), and by selected operating conditions (such as flow field parameters including airspeed, angle of attack etc.). Hence, the operating conditions (e.g. during take-off) being entirely analogous to those given for the aircraft according to D1 and being not contentious, features (ii) and (iii) are also to be regarded as known from D1, as the only disputed structural feature (i) has to be regarded as known from D1 (see hereinabove). Moreover, the patent specification (EP-B) discloses no specific features relating to structure (configuration) or operation of the aircraft which could lead to or imply a substantial difference to the aircraft of D1, and no such differences were ever pointed out and detailed by the Appellant.

For the above stated reasons the subject-matter of claim 1 of the main request lacks novelty (Article 54 EPC) over D1.

3. The subject-matter of claim 1 of the first auxiliary request is not new over D1, for the yaw generating system of D1 (in addition to the features discussed in relation to the main request) likewise comprises (at least) two movable control surfaces 12, 13 (figure 1), which are deflected differentially (D1, column 2, line 1; column 2, line 63).

4. The subject-matter of claim 1 of the second auxiliary request is not new over D1. In effect, D1 (in addition to the features disclosed in relation to the main and first auxiliary request) likewise discloses an electronic flight control system coupled to each control surface to move automatically (using automatic detection of rudder deflection based on fly by wire) said one control surface to the deflected position when an asymmetric thrust condition occurs (D1, column 3, lines 20-27; column 3, line 67-column 4, line 3).

5. The subject-matter of claim 1 of the third auxiliary request is not new over D1. In particular, D1 (in addition to the features discussed in relation to the main request, as well as first and second auxiliary request) likewise discloses that the yaw generating system is used e.g. during the take-off roll at low speed (D1, column 1, lines 8-10, 13-16, 56-58).

6. The subject-matter of method claim 1 of the fourth auxiliary request is not new over D1. Indeed this subject-matter includes substantially the same features and is equivalent to the subject-matter of claim 1 of the first auxiliary request.

7. The subject-matter of claim 1 of the fifth auxiliary request is not new over D1. Indeed, as discussed in relation to the third auxiliary request, the yaw generating system of D1 can be used to counter or balance the yaw moment resulting from an engine (partial) failure, e.g. during take-off at low speed (D1, column 1, lines 48-65).

8. The subject-matter of claim 1 of the sixth auxiliary request is not new over D1. This subject-matter does not substantially differ from that of the previous requests, in particular from the main request and first auxiliary request.

9. The subject-matter of claim 1 of the seventh auxiliary request is not new over D1. In effect, the added (functional) features relating to said side force S1 creating a first rolling moment Rm1, to the lift rolling moment Rml (generated by said first and second wing section) and to the approximately balanced net rolling moment Rmnet are likewise known from D1.

Indeed, D1 clearly discloses that deflection of the control surfaces (e.g. rudder, ailerons and (inboard) spoilers) leads to minimizing and balancing roll torque (D1, column 2, lines 4-10, column 3, lines 38-45). Further, said side force and said rolling moments in claim 1 are a result of the flow field configuration implied by functional features (ii) and (iii) (see e.g. claim 1, "the pressure differential (P1) ... creates a side force (S1)"), as also stated by the Appellant, the flow field being created by the specific operation of the control surfaces aimed at balancing net rolling moment. Consequently, under similar and equivalent operating conditions (see also point 2 above), and with

completely similar or equivalent structural features and entirely similar operation of control surfaces (resulting in a balanced net rolling moment) (no differences in this respect are disclosed in EP-B or were pointed out and detailed by the Appellant), the aircraft of claim 1 and that of D1 necessarily lead to the same or equivalent functional features (ii) and (iii) relating to the flow field. As a further consequence, the mentioned features relating to said side force and rolling moments are likewise necessarily known from D1 (being a result of the known and equivalent flow field).

10. The subject-matter of claim 1 of the "additional" auxiliary request contravenes Article 123(2) EPC. In particular, the amended feature reading "said yaw generating system (100) consisting of two movable control surfaces coupled to the fuselage" is not disclosed in the application as filed (WO-A). Indeed, WO-A solely states that "in yet other embodiments, the system 100 includes only one control surface 142 to aid other control device(s) 140 in providing directional control during a loss of a critical engine during takeoff". The "other control devices" mentioned therein "include devices that can generate moments or forces to control the aerospace vehicle 101 during operation or flight (e.g. attitude thrusters, aerodynamic surfaces, and thrust vectoring nozzles)" (WO-A, page 6, lines 25-28) and in "figure 1, the control devices 140 include control surfaces 142, rudder surfaces 141, and other control devices 143" (WO-A, page 6, lines 28-29). Consequently, it results from WO-A that the yawing system of the invention does not include just two movable control surfaces, contrary to what is implied by said amended feature, since cooperation of more than

two control surfaces results from said cited passages in WO-A.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Pricolo

Decision electronically authenticated