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**D E C I S I O N**  
**of 30 May 2000**

**Case Number:** T 0933/98 - 3.2.1

**Application Number:** 90201175.8

**Publication Number:** 0443213

**IPC:** B60T 8/32, B64C 25/42

**Language of the proceedings:** EN

**Title of invention:**  
Improved carbon brake control for aircraft

**Patentee:**  
THE BOEING COMPANY

**Opponent:**  
Dunlop Limited

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56, 100(c)

**Keyword:**  
"Added subject-matter (no)"  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0933/98 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 30 May 2000

**Appellant:** Dunlop Limited  
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**Representative:** Shaw, Laurence  
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**Respondent:** THE BOEING COMPANY  
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**Representative:** Bartelds, Erik  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 22 July 1998  
rejecting the opposition filed against European  
patent No. 0 443 213 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** F. Pröls  
**Members:** S. Crane  
J. van Moer

## Summary of Facts and Submissions

- I. European patent No. 0 443 213 was granted on 20 March 1996 on the basis of European patent application No. 90 201 175.8.

Independent claims 1 and 7 of the granted patent read as follows:

- "1. A method of controlling carbon brakes (6,8) of multiple brake aircraft comprising measuring the speed of the aircraft when braking, measuring the desired braking intensity, comparing the speed and the desired braking intensity to preset values and if both the speed and the braking intensity are below said preset values, disabling at least one of the said carbon brakes (6,8) during said braking and thereafter selectively disabling other said carbon brakes (6,8) during succeeding brake applications, **characterized in that** the aircraft speed is compared with the preset value for aircraft speed only at the moment at which a brake application is detected and only the desired braking intensity is compared with the preset value for braking intensity continuously throughout braking."
- "7. A system for controlling carbon brakes of an aircraft, comprising means (10) for determining the speed of the aircraft; means (30) for measuring the desired intensity of braking action; means (32) to compare the aircraft speed and desired braking intensity to predetermined values; means (32) for disabling at least one of the brakes (6,8) upon sensing desired braking

intensity and aircraft speed below said predetermined values; means (32) for disabling the other said brakes (6,8) under like conditions upon successive brake applications; and means (36,42) for sequencing the successive brake disablements to provide for substantially uniform brake heating, **characterized in that** said comparing means (32) is arranged to compare the aircraft speed to the predetermined aircraft speed value only at the moment at which a brake application is detected, and to continuously compare only the desired brake intensity to the predetermined brake intensity value throughout braking."

Dependent claims 2 to 6 and 8 to 14 relate to preferred embodiments of the method of claim 1 and the system of claim 7 respectively.

II. The granted patent was opposed by the present appellants on the grounds that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC) and that there had been an inadmissible addition of subject-matter (Article 100(c) EPC).

The appellants relied on two prior art documents, namely EP-A-0 329 373 (D1) and its family equivalent GB-A-2 216 209 (D2); only the former has played a role in the appeal proceedings.

III. With its decision posted on 22 July 1998 the Opposition Division rejected the opposition.

An appeal against this decision was filed on 21 September 1998 and the fee for appeal paid at the same time.

The statement of grounds of appeal was received on 23 November 1998.

- IV. Oral proceedings before the Board were held on 30 May 2000.

The appellants requested that the decision under appeal be set aside and the patent revoked in its entirety.

The respondents (proprietors of the patent) requested that the appeal be dismissed and the maintenance of the patent in unamended form be confirmed.

- V. In support of their request the appellants argued substantially as follows:

In comparison with the claims of the original application, which were specifically directed to a method and means for extending the life of carbon brakes for aircraft, the granted claims were directed to a method and system for "controlling" such brakes, there no longer being any requirement associated with an extension of their useful life. There was no basis in the original application for this change of emphasis, which accordingly constituted an inadmissible addition of subject-matter within the terms of Article 100(c) EPC.

The underlying principle on which the claimed invention was based, namely the selective use of different ones of the available brakes during a series of brake application during taxiing of the aircraft before take-off and after landing, was fully disclosed and explained in document D1. That document also clearly disclosed how selective disabling of the brakes is

dependent on the aircraft speed and the desired braking intensity, in order to provide full braking power when it was required, for example on landing. The person skilled in the art would immediately recognise that the use of a weight switch and time delay as taught in this context in document D1 was merely exemplary and that making the disablement decision dependent on the aircraft speed as the brakes were applied, as presently claimed, was a clear alternative hereto, particularly having regard to the fact that the aircraft speed would inevitably decrease on braking. The effects of the two techniques on extending the life of the brakes would in any case be the same; the suggestion in the patent specification that the claimed invention represented an improvement in this respect over the teachings of document D1 was not justified.

VI. In reply the respondent put forward essentially the following arguments:

It was not to be denied that the general principle of selectively disabled braking to extend the life of carbon brakes was known from document D1. What the invention offered with respect to this prior art was an improvement with respect to the switch-over between heavy braking, when this was required, and disabled braking. There was nothing in document D1 which could suggest to the person skilled in the art the method and system claimed.

Although the granted claims 1 and 7 no longer explicitly stated that effect achieved of extending carbon brake life of aircraft, this was the inevitable consequence of the technical features stated in the claims. With regard to those technical features the

independent claims of the granted patent had been narrowed with respect to the equivalent claims of the original application, so that there had clearly been no inadmissible extension of subject-matter.

### **Reasons for the Decision**

1. The appeal complies with the formal requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.
  
2. As explained in the introductory description of the original application, it had been found that the life of a carbon brake for an aircraft was dependent on the number of times the brake had been applied rather than the total amount of energy that had been absorbed in use, as was the case with conventional steel brakes. A consequence of this was that with conventional brake control systems, where all brakes on one side of an aircraft were applied simultaneously, the multiple application of the brakes during taxiing before take-off and after landing made a much more significant contribution to brake wear, despite the relatively low amount of energy absorbed, than the heavy braking required on landing. The original application therefore proposed a method and means of extending the life of such brakes in which, in very general terms, one of the brakes was disabled if the aircraft speed and the braking intensity were below preset values and another of the brakes was selectively disabled on a succeeding brake application.

The basis principles on which the originally claimed invention was founded had however already been clearly

disclosed in document D1, which was duly cited in the Search Report. In the face of this prior art the respondents restricted the claims by reference to a particular technique for determining whether there should be brake disablement or not. More specifically the granted independent claims 1 and 7, which differ in category but are not otherwise significantly different with regard to their subject-matter, now require that the aircraft speed is compared with the preset value for aircraft speed **only** at the moment at which a brake application is detected and **only** the desired braking intensity is compared with the preset value for braking intensity continuously throughout braking (emphasis added by the Board). The sense of this becomes clearer when account is taken of the relevant passage of the description at column 3, line 31 to column 4, line 19 of the patent specification, corresponding to column 3, line 47 to column 4, line 19 of the published application. In particular, the purpose of these measures is to ensure on the one hand that following a high speed brake application the brake release command for some of the brakes will not be produced as the aircraft decelerates through the preset brake disable speed threshold value; this disable signal would thus only be produced at low speed after the brakes had been released, then reapplied. On the other hand, in the event of the need for an emergency stop during low speed taxiing where some of the brakes are disabled then the increase in the desired braking intensity over the preset threshold value will immediately lead to full application of the brakes.

During the opposition proceedings the appellants objected under Article 100(c) EPC that the requirement of the independent claims 1 and 7 concerning comparison



of the aircraft speed with the preset value "only" at the moment of application of the brakes found no proper basis in the original application. However, that objection was not maintained on appeal and at the oral proceedings before the Board the appellants stated that they were satisfied with the explanations given in the contested decision in this respect. Nevertheless, they raised a new objection under Article 100(c) EPC which went to the fact that the granted independent claims were directed to a method and system for "controlling" carbon brakes, rather than extending their life as had been the originally filed claims. However, in the opinion of the Board there can be no genuine doubt that the inevitable effect of the braking method set out in claim 1 and the braking system set out in claim 7 is a reduction in brake wear and hence extension of brake life in comparison with conventional arrangement in which all brakes on one side of an aircraft were applied simultaneously during taxiing of the aircraft. In practical terms the Board cannot see how the method and system of claims 1 and 7 respectively could be used, as suggested by the appellants, for merely steering the aircraft on the ground. Accordingly the amendment in question has not added any subject-matter extending beyond the content of the application as filed and the objection under Article 100(c) EPC must fail.

3. Document D1 discloses various proposals for putting the fundamental principle of selective brake disabling into practice. In the preferred embodiment described there an electronic control unit receives **inter alia** a wheel speed signal and compares it with preset upper and lower threshold values. If the wheel speed lies within this range then half of the brakes are disabled; if on

a subsequent brake application the conditions for partial brake disablement are met, then it is the other half which is disabled. The lower threshold value is there to ensure the availability of full braking power when the aircraft is at rest, eg to hold it against full engine thrust. The system may also be provided with an over-ride capability so that all brakes are applied if the input level at the pilot's brake pedal exceeds a predetermined value.

It is apparent that with the system described there will be a change from full braking to partial braking as the wheel speed decreases after application of the brakes. As indicated in the last paragraph of column 2 of document D1 it is however preferred that the disabling system is rendered inoperative during the landing run, ie full braking is provided throughout the run including any period when the wheel speed falls below the upper threshold value. This may be achieved, see first paragraph, column 3, by means of a time delay actuated by a "weight switch" which responds to the aircraft weight being imposed on the landing gear on touch-down. In this context the contrast to the method and system presently claimed is unambiguous. With the latter the wheel speed when the brakes are first applied after landing will be above the preset value for actuating partial brake disablement; all brakes will therefore be applied and will stay applied until the brakes have been released. Only on a subsequent application during taxiing can there be partial disabling if the requisite conditions are met. The subject-matter of present claims 1 and 7 is therefore novel.

The appellants argue that given the fact that the use

of a "weight switch" and time delay is only mentioned in document D1 as one possibility of avoiding partial brake disablement during the landing run, then the person skilled in the art would be encouraged to consider other possibilities. But even if that were true the Board can see nothing in document D1 itself or in the common general knowledge of the person skilled in the art which could suggest to him the reorganisation of the system disclosed there such that it functioned in the manner presently claimed. In particular, it is to be noted that the required reorganisation is not one which would be restricted to a modification of what happens during a landing run, but is operative at all times.

The Board therefore comes to the conclusion that the subject-matter of claims 1 and 7 is not rendered obvious by the cited state of the art and therefore involves an inventive step (Article 56 EPC).

The appellants have invested considerable argument into the question of whether the claimed arrangement provides any improvement in brake service like over and above that achieved according to the teachings of document D1. However, it is not a requirement for the patentability of the claimed subject-matter for this to be the case. All that is required, as concluded above, is that this subject-matter is novel and involves an inventive step.

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

S. Fabiani

F. Pröls