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**Datasheet for the decision
of 2 November 2021**

Case Number: T 1035/18 - 3.5.01

Application Number: 14198163.9

Publication Number: 2899685

IPC: G06Q50/06

Language of the proceedings: EN

Title of invention:

Systems and methods for estimating net solar energy production for airborne photovoltaic systems

Applicant:

The Boeing Company

Headword:

Estimating airborne photovoltaic energy production/BOEING

Relevant legal provisions:

EPC Art. 56

RPBA 2020 Art. 13(2)

Keyword:

Inventive step - simulating the electrical energy production of a photovoltaic system (no - not technical) - estimating fuel savings (no - not technical)

Decisions cited:

G 0001/19, T 1227/05, T 0641/00



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Case Number: T 1035/18 - 3.5.01

D E C I S I O N
of Technical Board of Appeal 3.5.01
of 2 November 2021

Appellant: The Boeing Company
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Representative: Boulton Wade Tennant LLP
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 14 December
2017 refusing European patent application No.
14198163.9 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman W. Chandler
Members: I. Kürten
C. Schmidt

Summary of Facts and Submissions

- I. The appeal is against the examining division's decision to refuse the European patent application 14198163.9 for lack of inventive step (Article 56 EPC).
- II. The examining division considered that claim 1 of all requests defined a non-technical method whose computer implementation was obvious to the skilled person in view of a general-purpose computer system, as also disclosed in D1 (US 2005/039787 A1).
- III. In the statement setting out the grounds of appeal, the appellant requested that the decision to refuse the application be set aside and that a patent be granted on the basis of the main request or one of the first to fourth auxiliary requests filed therewith and corresponding to the refused requests. Oral proceedings were requested on an auxiliary basis.
- IV. In the communication accompanying the summons to oral proceedings, the Board referred to G 1/19 and outlined its preliminary opinion that the subject-matter of claim 1 of all requests related to a simulation method, which did not produce a technical effect going beyond the simulation's implementation on a computer.
- V. In a reply, the appellant filed new fifth to ninth auxiliary requests together with arguments in favour of inventive step.
- VI. At the oral proceedings, held by videoconference on 2 November 2021, the appellant confirmed its requests submitted in writing.

VII. Claim 1 of the main request reads (with the examining division's labelling of the features):

"A computer-implemented method for predicting electrical energy production of a photovoltaic system included in at least one aircraft (110), said method comprising:

[a] determining a first predicted amount of solar irradiance for each of a plurality of geographical points (104) as a function of location and time;

[b] determining a second predicted amount of solar irradiance received by the at least one aircraft along a flight path of the at least one aircraft, wherein the flight path (112) includes a subset of the plurality of geographical points, wherein the flight path has a starting time and an ending time, and wherein the second predicted amount is based at least in part on the first predicted amount; and

[c] determining a predicted amount of electrical energy produced by the photovoltaic system (200) along the flight path, based at least in part on the second predicted amount."

VIII. Claim 1 of the first auxiliary request adds to the end of feature [b] *"and the total surface area of the photovoltaic system"* and to the end of feature [c] *"and a system efficiency of the photovoltaic system"*.

IX. Claim 1 of the second auxiliary request adds to claim 1 of the first auxiliary request in features [b] and [c] that the second predicted amount of solar irradiance and the predicted amount of electrical energy are determined for multiple flight paths.

- X. Claim 1 of the third auxiliary request adds to the end of feature [a] of claim 1 of the second auxiliary request:

"wherein determining the first predicted amount comprises:

generating a weather and atmosphere attenuation model by parsing weather data to determine a probability of one or more weather events occurring at each of the plurality of geographical points;

calculating solar parameters for each of the plurality of geographical points; and

generating an irradiance model by combining the solar parameters with the weather and atmosphere attenuation model to determine, at each of the plurality of geographical points, an amount of solar irradiance attenuated due to weather conditions."

- XI. Claim 1 of the fourth auxiliary request adds to the penultimate addition to claim 1 of the third auxiliary request *"including an azimuth, a declination, an hour angle and a solar time"* and at the end of feature [b] *"and a model of the at least one aircraft, wherein the model defines surface angles and surface areas"*.

- XII. Claim 1 of the fifth to ninth auxiliary requests adds the following feature at the end of claim 1 of the main and first to fourth auxiliary requests respectively (labelling added by the Board):

"[d] translating the predicted amount of electrical energy into an estimated saving in fuel used by the at

least one aircraft, wherein the estimated saving in fuel is expressed in pounds (0.45 kgs) of fuel".

Reasons for the Decision

1. The invention
 - 1.1 The invention is about estimating the electrical energy production of a photovoltaic system of an aircraft in flight (paragraph [0002] of the published application).
 - 1.2 Looking at Figures 1 and 2, the method starts by estimating a first amount of solar irradiance 106 generated by the Sun 108 and received at a plurality of geographical points 104 as a function of time (feature [a]). Based on this, a second amount of solar irradiance received by an aircraft 110 travelling along a flight path 112 is determined. The flight path 112 includes a subset of the geographical points 104 and has a starting and an ending time (feature [b]). Based on the solar irradiance on the aircraft, the amount of electrical energy produced by the photovoltaic system 200 on the aircraft 110 is predicted (feature [c]).

Finally, the predicted amount of electrical energy is translated into estimated fuel savings (feature [d] of the fifth to ninth auxiliary requests).

2. Inventive step
 - 2.1 The Board finds it convenient to start with the ninth auxiliary request because it is the clearest and most concrete definition of the invention.

2.2 The Board decided to admit this late-filed request (as well as the fifth to eighth auxiliary requests which were filed at the same time) into the proceedings.

Amended claim 1 of the ninth auxiliary request aims at overcoming the Board's objections raised in the communication accompanying the summons to oral proceedings. As these objections were based on G 1/19, which was issued after the grounds of appeal were filed, the appellant could not have anticipated and addressed them earlier. In the Board's judgment, these are cogent reasons that justify the exceptional circumstances required by Article 13(2) RPBA 2020.

2.3 The examining division held that steps [a] to [c] defined a prediction method at a high level of abstraction that could be performed by purely mental or mathematical means. This was in contrast to the case in T 1227/05 (*Circuit Simulation/Infineon*) where the deciding Board held that the simulation could not be performed purely by such means and provided for realistic prediction of the performance of a designed circuit.

2.4 In the grounds of appeal, the appellant argued that the present case resembled that in T 1227/05 because steps [a] to [c] simulated the performance of a photovoltaic system under realistic conditions. Therefore, the claimed method related to the simulation of an adequately defined class of technical systems under technically relevant conditions, which was held patentable in T 1227/05 (see point 3.5.2).

2.5 The Board considers that the question of whether or not the present case resembles that of T 1227/05 is moot in view of G 1/19, which supersedes T 1227/05. According

to G 1/19, whether a simulation contributes to the technical character of the claimed subject-matter does not depend on the degree to which the simulation represents reality (point 111); nor does it depend on the technicality of the simulated system (point 120). What counts is whether the simulation contributes to the solution of a technical problem (point 120).

2.6 It is common ground that steps [a] to [c] define a simulation method. The method produces calculated numerical data, i.e. a prediction of the amount of electrical energy produced by the photovoltaic system during multiple flight paths. The Board agrees with the examination division's decision that these steps do not involve a technical effect.

2.7 Following the principles laid out in G 1/19, the Board considers that whether the simulation achieves a technical effect depends on the further use of these numerical data (G 1/19, point 124).

The appellant argued for such an effect on the basis of step [d], added during the appeal, which specifies a further use of the predicted amount of electrical energy, namely translating this amount into estimated fuel savings. The issue in the present case is, thus, whether the estimated fuel savings provide a technical effect.

2.8 In its written submissions, the appellant argued that estimating the savings in pounds of fuel, i.e. in terms of weight, was a technical feature. It defined a technical purpose for the predicted amount of electrical energy.

2.9 The Board is not convinced by this argument because estimating the fuel savings for a flight is a non-technical administrative activity. All that the invention adds is another parameter in this estimation, namely an additional source of energy and its associated fuel equivalent.

2.10 During the oral proceedings, the appellant argued that the estimated fuel savings implied a more precise estimation of the amount of fuel needed by the aircraft for a flight. This was a technical effect because refuelling the aircraft with the optimal amount of fuel would enable the aircraft to traverse the flight path more efficiently.

According to the appellant, refuelling the aircraft with the optimal amount of fuel was implicit in the claim. Consequently, steps [a] to [d] contributed to the technical character of the invention (e.g. point 137 of G 1/19).

2.11 The Board considers that although refuelling is a technical process, it is not a direct consequence of the estimated fuel savings but would only occur as a result of a human decision (see also G 1/19, point 123). Moreover, the estimated fuel savings can also be used for business decisions, such as whether the savings merit the production and installation of the photovoltaic system or whether they permit a reduction of the flight tickets' prices. Hence, the estimations do not have an implied technical use that can be the basis for an implied technical effect (see also G 1/19, points 98, 128).

2.12 The appellant also argued during the oral proceedings that step [a] described an accurate model for

predicting the solar irradiance at a plurality of geographical points. This, in turn, led to a more precise estimation of the fuel savings. According to point 111, second sentence, of G 1/19, the accuracy of a simulation might be taken into consideration in the assessment of inventive step.

2.13 In the Board's view, however, the simulation's accuracy might play a role in the assessment of inventive step only if the simulation contributes to the technical character of the invention. In view of the above (points 2.8 to 2.11), the Board judges that the simulation does not contribute to the technical character of the invention. Hence, the simulation's accuracy is irrelevant for the assessment of inventive step.

2.14 As features [a] to [d] do not contribute to the technical character of the invention, they can be legitimately incorporated into the technical problem solved, as constraints to be met (T 641/00). The Board concurs with the examining division that the technical problem solved is how to implement the non-technical features in a general-purpose computer system. The claimed solution amounts to straightforward automation, which is obvious to the skilled person.

2.15 Accordingly, claim 1 of the ninth auxiliary request does not involve an inventive step (Article 56 EPC).

2.16 Since claim 1 of the main and first to eighth auxiliary requests have a broader scope than that of claim 1 of the ninth auxiliary request, they do not involve an inventive step (Article 56 EPC) for the same reasons as given above.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



T. Buschek

W. Chandler

Decision electronically authenticated