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**Datasheet for the decision
of 16 December 2022**

Case Number: T 2726/17 - 3.4.01

Application Number: 12400052.2

Publication Number: 2741106

IPC: G01S13/94, G01S13/90

Language of the proceedings: EN

Title of invention:

An obstacle and terrain warning radar system for a rotorcraft

Applicant:

AIRBUS HELICOPTERS DEUTSCHLAND GmbH

Headword:

Warning radar system / Airbus Helicopters Deutschland

Relevant legal provisions:

Article 2 of the Decision of the President of the European
Patent Office of 10 September 2014
EPC Art. 56, 84

Keyword:

Filing of Notice of Appeal via Web-form filing, sufficient time
for informing appellant

Principles of legitimate expectations and of good faith

Inventive step - main request (no)

Claims - clarity - auxiliary request 1 to 4 (no)

Decisions cited:

T 0014/89



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Case Number: T 2726/17 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 16 December 2022

Appellant: AIRBUS HELICOPTERS DEUTSCHLAND GmbH
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 27 July 2017
refusing European patent application No.
12400052.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman D. Rogers
Members: T. Zinke
P. Fontenay

Summary of Facts and Submissions

- I. The Examining Division refused the application with a decision dated 27 July 2017. It was held that independent claims 1 of a main request and of auxiliary requests 2 and 3 lacked an inventive step and that claim 1 of an auxiliary request 1 lacked clarity. An auxiliary request 4 filed during oral proceedings before the Examining Division was not admitted into the proceedings.

- II. The appellant filed a notice of appeal on 13 September 2017 using the EPO web-form filing service. The appeal fee was debited from the appellant's account. The grounds of appeal were filed on 9 November 2017 again using the EPO web-form filing service.

- III. On 13 November 2017, the appellant received a communication from the EPO (dated 16 November 2017) by fax referring to the notice of appeal dated 13 September 2017 and the grounds of appeal dated 9 November 2017 and stating: "With reference to your above mentioned submissions we draw your attention to the decision of the President of the European Patent Office dated 10 September 2014 and inform you hereby that the use of the web-form filing service is not allowed for filing documents in respect of appeal proceedings (Article 106 to 112 EPC)."

- IV. The appellant re-filed the statement of grounds by fax on 13 November 2017.

- V. The appellant re-filed the notice of appeal by fax on 21 November 2017.
- VI. With a submission dated 4 January 2018 the appellant requested that the notice of appeal should be considered as having been received in due time and provided arguments for its position. As an auxiliary request, the appellant requested re-establishment of rights under Article 122 EPC and provided corresponding grounds.
- VII. With a letter dated 17 January 2018 the Board informed the appellant of its preliminary opinion that "the Board is inclined to consider the notice of appeal as having been duly received".
- VIII. With the grounds of appeal, the appellant requested that the Examining Division's decision to refuse the application be set aside and that a patent be granted on the basis of the set of claims of one of a main request and auxiliary requests 1 to 4, being identical to the respective requests on which the decision under appeal was based. Oral proceedings were requested if the Board was not minded to allow the appeal.
- IX. The Board summoned for oral proceedings and provided its preliminary opinion. In particular, it was pointed out that the Board still considered the notice of appeal as having been duly filed. The Board, however, raised lack of inventive step objections against all

requests and lack of clarity objections against auxiliary requests 1 to 4.

X. In reply the appellant withdrew its request for oral proceedings and requested a decision based on the state of the file.

XI. The Board canceled the oral proceedings.

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

A rotorcraft (2) with an obstacle and terrain warning radar system (1) that comprises a plurality of radar units (11), said rotorcraft (2) having at least one main rotor (20) with an axis of rotation (21), at least two blades (22), a rotor head (23), and a cover (24), each radar unit (11) transmitting a radar beam (17) with beam width in azimuth (α) of at least 5° and beam width in elevation (ε) of at least 5° , the elevation direction being along said axis of rotation (21) of said main rotor (20), and the zone scanned in azimuth by said radar beam (17) being in a plane perpendicular to said axis of rotation (21), the radar system (1) being characterized in that it comprises at least two assemblies (10) positioned and fixed mounted in regular manner around said axis of rotation (21) on said rotor head (23) between said blades (22), each assembly (10) having at least one radar unit (11), each radar unit (11) transmitting a centrifugal radar beam (17), said radar system (1) scanning the surroundings around said rotorcraft (2) electronically in elevation with an angular coverage of at least $\pm 15^\circ$ and automatically in azimuth with an angular coverage of 360° during the

rotation of the said main rotor (20), wherein the cover (24) covers the rotor head (23) and the plurality of radar units (11).

Claims 2 to 8 are dependent claims.

XIII. Claim 1 of the auxiliary request 1 is amended as compared to claim 1 of the main request by further defining the position of the at least two assemblies and by removing the features referring to the cover so that claim 1 reads (emphasis by the Board as compared to claim 1 of the main request):

A rotorcraft (2) with an obstacle and terrain warning radar system (1) that comprises a plurality of radar units (11), said rotorcraft (2) having at least one main rotor (20) with an axis of rotation (21), at least two blades (22), and a rotor head (23), ~~and a cover (24)~~, each radar unit (11) transmitting a radar beam (17) with beam width in azimuth (α) of at least 5° and beam width in elevation (ϵ) of at least 5°, the elevation direction being along said axis of rotation (21) of said main rotor (20), and the zone scanned in azimuth by said radar beam (17) being in a plane perpendicular to said axis of rotation (21), the radar system (1) being characterized in that it comprises at least two assemblies (10) positioned and fixed mounted in regular manner around said axis of rotation (21) on said rotor head (23) and in the elevation direction between said blades (22), each assembly (10) having at least one radar unit (11), each radar unit (11) transmitting a centrifugal radar beam (17), said radar system (1) scanning the surroundings around said rotorcraft (2) electronically in elevation with an angular coverage of at least +/- 15° and automatically

in azimuth with an angular coverage of 360° during the rotation of the said main rotor (20), ~~wherein the cover (24) covers the rotor head (23) and the plurality of radar units (11).~~

XIV. Claim 1 of the auxiliary request 2 is amended as compared to claim 1 of the main request by removing the features referring to the cover, as in claim 1 of auxiliary request 1, and further defining the radar units (emphasis as compared to claim 1 of the main request by the Board):

A rotorcraft (2) with an obstacle and terrain warning radar system (1) that comprises a plurality of radar units (11), said rotorcraft (2) having at least one main rotor (20) with an axis of rotation (21), at least two blades (22), and a rotor head (23), and a cover (24), each radar unit (11) transmitting a radar beam (17) with beam width in azimuth (α) of at least 5° and beam width in elevation (ϵ) of at least 5°, the elevation direction being along said axis of rotation (21) of said main rotor (20), and the zone scanned in azimuth by said radar beam (17) being in a plane perpendicular to said axis of rotation (21), the radar system (1) being characterized in that it comprises at least two assemblies (10) positioned and fixed mounted in regular manner around said axis of rotation (21) on said rotor head (23) between said blades (22), each assembly (10) having at least one radar unit (11), each radar unit (11) being incorporated into said rotor head (23) and transmitting a centrifugal radar beam (17) with a radar frequency lying in a range from 10 GHz to 100 GHz, said radar system (1) scanning the surroundings around said rotorcraft (2) electronically in elevation with an angular coverage of at least +/-

15° and automatically in azimuth with an angular coverage of 360° during the rotation of the said main rotor (20), ~~wherein the cover (24) covers the rotor head (23) and the plurality of radar units (11).~~

- XV. Claim 1 of the auxiliary request 3 is amended as compared to claim 1 of auxiliary 2 by narrowing the range of the radar frequency, so that the feature reads (emphasis by the Board):

...

each radar unit (11) being incorporated into said rotor head (23) and transmitting a centrifugal radar beam (17) with a radar frequency lying in a range from 70 GHz to 80 GHz,

...

- XVI. Claim 1 of the auxiliary request 4 is amended as compared to claim 1 of the auxiliary request 2 by incorporating features referring to a cover (similarly as in claim 1 of the main request) and the amendment made to claim 1 of the auxiliary request 1, referring to the position of the at least two assemblies. It reads (emphasis as compared to claim 1 of the auxiliary request 2 by the Board):

A rotorcraft (2) with an obstacle and terrain warning radar system (1) that comprises a plurality of radar units (11), said rotorcraft (2) having at least one main rotor (20) with an axis of rotation (21), at least two blades (22), and a rotor head (23), and a cover (24) that covers the rotor head, each radar unit (11) transmitting a radar beam (17) with beam width in azimuth (α) of at least 5° and beam width in elevation

(ε) of at least 5° , the elevation direction being along said axis of rotation (21) of said main rotor (20), and the zone scanned in azimuth by said radar beam (17) being in a plane perpendicular to said axis of rotation (21), the radar system (1) being characterized in that it comprises at least two assemblies (10) positioned and fixed mounted in regular manner around said axis of rotation (21) on said rotor head (23) and in the elevation direction between said blades (22), each assembly (10) being covered by said cover and having at least one radar unit (11), each radar unit (11) being incorporated into said rotor head (23) and transmitting a centrifugal radar beam (17) with a radar frequency lying in a range from 10 GHz to 100 GHz, said radar system (1) scanning the surroundings around said rotorcraft (2) electronically in elevation with an angular coverage of at least $\pm 15^\circ$ and automatically in azimuth with an angular coverage of 360° during the rotation of the said main rotor (20).

Reasons for the Decision

Notice of appeal received in due time

1. According to Article 2 of the Decision of the President of the European Patent Office of 10 September 2014 (OJ EPO 2014, A98, "Decision") the filing of appeal documents via the EPO web-form filing service is not permitted, the consequence being that such documents are deemed not to have been received, see Article 2(2) of the Decision. Pursuant to the last sentence of Article 2(2) of the Decision, the sender of such web-form filed documents, if identifiable, will be notified without delay of this deemed non-receipt.

2. The sender of the notice of appeal was identifiable. Between the actual filing of the notice of appeal on 13 September 2017 and the final date of the time limit for filing the notice of appeal (6 October 2017) there was sufficient time for the EPO to notice the irregularity in the filing of the notice of appeal, to inform the appellant thereof and for the appellant to resubmit the notice of appeal by accepted means. It appears from the file that no such notification was issued. The appellant has confirmed this in its letter dated 4 January 2018.

3. In the light of the above, the Board, in accordance with the principles of legitimate expectations and of good faith (see, for instance, T 14/89, OJ 1990, 432, headnote), considers the notice of appeal as having been duly received.

Main request

4. The appellant's argumentation in the statement of grounds with regard to inventive step of the main request are focused on three distinguishing features of independent claim 1 as compared to document D1 (US-A-5,451,957):
 - (a) a cover, "wherein the cover (24) covers the rotor head (23) and the plurality of radar units (11)"

 - (b) "said radar system (1) scanning the surroundings around said rotorcraft (2) electronically in elevation with an angular coverage of at least +/- 15°"

(c) "two assemblies (10) positioned and fixed mounted in regular manner around said axis of rotation (21) on said rotor head (23) between said blades (22), each assembly (10) having at least one radar unit (11) "

5. Whereas the Examining Division started from D1 when evaluating inventive step, also document D3 (US-A-5,614,907) is a promising starting point. D3 discloses:

- A rotorcraft with an obstacle and terrain warning radar system that comprises a plurality of radar units,
D3: claim 1, lines 9 to 13; col. 1, lines 40 to 42;
- said rotorcraft having at least one main rotor with an axis of rotation, at least two blades, a rotor head, and cover,
D3: claim 1, Figures 6 and 7
- each radar unit transmitting a radar beam ~~with beam width in azimuth (a) of at least 5° and beam width in elevation (e) of at least 5°~~, the elevation direction being along said axis of rotation of said main rotor, and the zone scanned in azimuth by said radar beam being in a plane perpendicular to said axis of rotation:
D3: "ROSAR" type radar sensor, column 1, lines 32 - 37; claim 1
- the radar system being characterized in that it comprises at least two assemblies positioned and fixed mounted in regular manner around said axis of rotation on said rotor head between said blades:
D3: claim 1, lines 16-18, Figures 4A, 4B, 4C

- each assembly having at least one radar unit, each radar unit transmitting a centrifugal radar beam, said radar system scanning the surroundings around said rotorcraft ~~electronically in elevation with an angular coverage of at least $\pm 15^\circ$~~ and automatically in azimuth with an angular coverage of 360° during the rotation of the said main rotor
D3: claim 1, lines 19-21; col. 3, lines 13-18;
Fig.1, "ROSAR type radar sensor"

 - wherein the cover covers the rotor head and the plurality of radar units:
D3: col. 3, lines 7 to 10, Figures 6 and 7
6. The particular values for the beam width in elevation and azimuth (at least 5° , respectively) are not disclosed in D3. Also, there is no electronic scanning in the elevation direction in D3. Different elevation angles are obtained by using radar antennas that have different elevational directions (D3: claim 1). The value for an angular coverage in elevation (at least $\pm 15^\circ$) is also not disclosed in D3.
7. Starting from document D3 as closest prior art, the skilled person would arrive at the claimed rotorcraft in an obvious way.
8. The values for the beam width in azimuth and elevation as well as for the angular coverage in elevation seem to be nothing more than a simple design choice made by the skilled person, possibly resulting from a trade off between the domain of space to be observed and the resolution required. No particular technical effect by using these particular values is described in the patent application and no particular technical

difficulty seems to be present in obtaining these values. It is further submitted that the skilled person would also not be in a position to derive any such effect from the patent application. For instance, by using radar antennas with different elevational directions as described in D3, no particular limit to an angular coverage in elevation seems to be present. Also the patent application seems not to be concerned about the achievable angular coverage. The obtainable values differ largely (cf. A1-publication [0045]: "The angular coverage in elevation of the radar system 1 i.e. the electronic scanning angle is at least $\pm 15^\circ$. This angular coverage in elevation may be as great as $\pm 30^\circ$, or preferably at least $\pm 60^\circ$ achieved by increasing the angle of the electronic scan of the radar units.") neither mentioning any difficulty in obtaining these values nor any particular technical effect beside the obvious one: adapting the angle to the region that should be observed. This goal, however, is considered to be an obvious design choice for a skilled person.

9. Scanning electronically in the elevation direction is also an obvious choice for the skilled person. In the Board's understanding "scanning electronically" actually refers to beamforming-techniques using antenna arrays as disclosed in document D4 (Waanders et al. "Miniaturized and Low-Cost Obstacle Warning System", European Rotorcraft Forum, Amsterdam, NL, September 4-7, 2012, pages 1-9). Therein it is stated: "The novelty in this research project is the use of a commercial off-the-shelf electronically steerable radar developed for automotive applications. The reasons for using this specific radar technology are multiple; it is highly optimized in terms of cost and SWaP, it is a mature technology already used for automotive obstacle

detection, it has a favourable detection performance under adverse weather conditions." (D4, section 3.4).

10. A skilled person trying to find an alternative radar sensor as compared to document D3, that is low-cost and favourable under adverse weather conditions, would obviously try to use such a "commercial off-the-shelf electronically steerable radar" of D4 in the system of D3.
11. In the statement of grounds (see, for instance, section II.1.3, pages 8 to 11) the appellant pointed to the different concepts for scanning the surrounding as reflected in D1 - wherein a ROSAR-scheme is used as in D3 ("ROSAR": rotating synthetic aperture radar) - and an electronically steerable radar with non-rotating radar units as in D6 (DE-A-10 2006 053354) or in D4. The Board, however, does not see any disclosure that would discourage the skilled person from using the same radar sensors as those disclosed in D4 in a rotating environment as in D3. Nowhere (also not in the present patent application) is there any hint that a problem would occur with electronically steerable radar sensors in rotating surroundings.
12. In the statement setting out the grounds of appeal (section II., "Preliminary Observations", page 4, 1st to 3rd paragraph; and section II.1.2, pages 6 to 8), the appellant discussed a further difference between the subject-matter of claim 1 and the teaching of D1, which can be transferred to the teaching of D3: According to D1 a "turnstile" was used as a mechanical support for the radar unit, whereas in claim 1 the assembly with the radar unit(s) was mounted in a fixed position on the rotor head.

13. The Board does not agree. Whereas both documents D1 and D3 refer to a "turnstile" as support for the radar units, it is the Board's understanding that also the assemblies 10a-10d as depicted in Figures 3 and 5 of the application are arranged in a "turnstile"-fashion. The assemblies 10a-10d together with parts of the rotor head that are visible in these figures build a cross, which can be considered as a "turnstile". Possibly, the "support arms" of the cross in D1 and D3 are longer than in the application, but this does not mean that the radar units in D1 and D3 are not "positioned and fixed mounted to the rotor head" (i.e. via the support arms of the turnstile).
14. Hence, the subject-matter of claim 1 of the main request lacks an inventive step starting from D3 in combination with D4.

Auxiliary request 1

15. In claim 1 of auxiliary request 1 the features regarding the cover were removed as compared to claim 1 of the main request. A feature is added specifying that the assemblies are positioned and fixed mounted on the rotor head in the elevation direction between the rotor blades.
16. The Board concurs with the Examination Division that this expression is not clear (Article 84 EPC, cf. decision, grounds, section 13). First, it should be mentioned that the rotor blades are not arranged in the elevation direction, but normally in azimuth direction. Hence, it is already questionable, how it is possible to arrange the assemblies between the rotor blades in the elevation direction.

17. From the explanation provided by the appellant (statement of grounds, section II.2.1, pages 12 to 14), it seems that it was meant to define that the rotor blades are arranged at a common level in the elevation direction, and that this level is the same as the level for arranging the assemblies around the rotor head. A corresponding formulation would be considered clear, but it is doubtful that such a formulation can be used without introducing undisclosed subject-matter (Article 123(2) EPC).

18. The Board wants to address a further point with regard to this feature. There is no disclosure in the patent application how actually it is possible to arrange the assemblies on the rotor head at the same elevation level with the rotor blades. (In Figures 3 and 5 the assemblies are actually positioned above the common level of the rotor blades and not at the same common level.) It also does not appear trivial to arrange the assemblies at these positions of the rotor head. As is described in document D9 ("Rotor Head", Wikipedia 2017, cited by the appellant in the statement of grounds), depending on the type of rotor head used, the rotor blades are mounted on hinges, bearings, gimbals etc. Whether this provides enough room to securely arrange radar units assemblies in-between seems not to be evident for all kind of rotors. Consequently, also an objection under Article 83 EPC might be raised. If such an arrangement is considered to be an easily derivable alternative to other arrangements, lack of inventive step (Article 56 EPC) would result.

Auxiliary request 2

19. Claim 1 of auxiliary request 2 includes the additional limitations that each radar unit is incorporated into said rotor head and that the radar frequency lies in the range of 10 GHz to 100 GHz. The features defining the cover (from the main request) and with regard to the position of the assemblies in elevation direction between the blades (from auxiliary request 1) are not present in this claim.
20. Claim 1 of the auxiliary request 2 lacks clarity (Article 84 EPC), since the radar units are defined - as part of the assembly - as being positioned and fixed on the rotor head and as being incorporated into the rotor head. This is a contradiction. If - on the other hand - both terms are considered to define the same arrangement of the radar units in relation to the rotor head, then the claim wording is not concise.
21. With regard to the additional limitation of the range of possible radar frequencies, the Board notes that document D4 discloses a radar frequency of 77 GHz (D4: section 3.4), which is in the defined range of 10 GHz to 100 GHz. Hence, the (obvious, see above) use of the radar sensors of D4 in the system of D3 would automatically result in a radar frequency in the defined range.

Auxiliary request 3

22. In claim 1 of auxiliary request 3 the range of the radar frequency is limited to 70 GHz to 80 GHz. The other features are identical to those recited in claim 1 of auxiliary request 2.

23. The objected feature of the radar units being incorporated into the radar head in combination with the assemblies including the radar units being fixed mounted on the rotor head is still present. Hence, the lack of clarity objections raised above against auxiliary request 2 equally apply.
24. In addition, the radar frequency used in D4, 77 GHz, still lies in this range. Hence, the same considerations as for auxiliary request 2 apply as well.

Auxiliary request 4

25. Claim 1 of auxiliary request 4 combines the features of claims 1 of the main request, auxiliary request 1 and auxiliary request 2.
26. The Board maintains its position as expressed during the discussion above with regard to these requests.
27. Claim 1 of auxiliary request 4 lacks clarity and lacks inventive step starting from D3 in combination with D4.

Conclusion

28. Since none of the main request and the auxiliary requests 1 to 4 is allowable, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Meyfarth

D. Rogers

Decision electronically authenticated