

UNMANNED HELICOPTER COMPRISING A SELF-SUPPORTING
HOUSING

5 The invention pertains to an unmanned helicopter with an internal combustion engine and a dedicated fuel tank.

Unmanned aircraft are frequently used for reconnaissance flights over hazardous areas. These unmanned aircraft are radio-controlled. Helicopters are particularly practical for taking reconnaissance photographs because they are able to hover in
10 a practically stationary position and have vertical take-off and vertical landing capabilities.

Conventional unmanned helicopters comprise a main body that accommodates the internal combustion engine and essentially consists of a covered three-
15 dimensional framework. The manufacture of such a design is relatively costly and also results in a heavy construction that may reduce the maximum payload.

The invention is based on the objective of developing an unmanned helicopter that can be easily manufactured and has a compact design. This is achieved in that the
20 unit consisting of the internal combustion engine and the transmission is arranged in a self-supporting housing that is at least partially closed on all sides and preferably consists of carbon fiber-reinforced plastic (CFK), with a nose body being connected to the front of said housing.

25 In addition to the compact design of the unmanned helicopter according to the invention, the housing for accommodating the unit consisting of the internal combustion engine and the transmission may also be realized in an at least partially hollow fashion and used as fuel tank. In this embodiment, it is not necessary to manufacture a separate fuel tank and to install this separate fuel tank
30 with consideration of the position of equilibrium of the helicopter.

In one practical embodiment of the invention, the exhaust of the internal combustion engine is arranged in a recess of the housing that accommodates the

unit consisting of the internal combustion engine and the transmission, wherein said recess is open toward the outside and can be closed with a cover.

5 In order to optimize the cooling of the internal combustion engine, a radiator of the internal combustion engine is arranged on the upper side of the nose body and a coolant flows through said radiator. Consequently, the radiator is directly subjected to the air accelerated by the helicopter rotors such that the cooling effect is optimized.

10 An oil cooler is advantageously arranged underneath the radiator of the internal combustion engine. This means that the cooling air arriving from the rotors is utilized twice.

15 The exhaust is cooled in order to remain inconspicuous to thermal imaging cameras. This is realized by surrounding the exhaust of the internal combustion engine with a double casing, wherein the cooling air arriving from the radiator flows through the outer annular space and the cooling air arriving from the rotor bearing of the internal combustion engine flows through the adjacent inner annular space.

20 The invention is described in greater detail below with reference to one embodiment that is illustrated in the figures. However, the invention is not limited to this particular embodiment.

25 The figures show:

- Figure 1, a schematic representation of a helicopter according to the invention;
Figure 2, a schematic representation of the housing for accommodating the internal combustion engine and of the nose body, wherein this illustration is enlarged in comparison with Figure 1;
30 Figure 3, a section through the housing provided with the fuel tank, and
Figure 4, a section through the exhaust.

The figures show that a helicopter according to the invention comprises a housing 2 that essentially accommodates the unit 1 consisting of the internal combustion engine and the transmission, wherein a nose body 3 is connected to said housing and the unit 1 protrudes into this housing. A tail section 4 is
5 connected to the rear of the housing. The internal combustion engine of the unit 1 is realized in the form of a rotary engine that drives a main rotor 5 and a tail rotor 6.

The housing 2 for accommodating the unit 1 is realized in a hollow fashion, and
10 the hollow space serves as a fuel tank 7 that is provided with a fuel line 8. A recess 10 of the housing 2 is open toward the outside and accommodates the exhaust 9, the design of which is discussed below with reference to Figure 4. A through-opening 11 is provided for the shaft of the main rotor 5.

15 A radiator 12 of the internal combustion engine is arranged on the upper side of the nose body 3, and a coolant flows through this radiator. The radiator 12 is subjected to the air current generated by the main rotor 5 such that the cooling effect is optimized. The air emerging from the radiator 12 subsequently flows through an oil cooler 13.

20 The exhaust 9 is cooled in order to remain inconspicuous to thermal imaging cameras. According to Figure 4, the conical exhaust pipe 14 is surrounded by a double casing. The cooling air arriving from the radiator 12 flows through the outer annular space 15, and the cooling air arriving from the rotor bearing of the
25 internal combustion engine flows through the inner annular space 16. This makes it possible to largely isolate the exhaust gas flowing through the exhaust pipe 14. In addition, the recess 10 containing the exhaust 9 is closed with a not-shown cover.

30 The scope of the invention allows various modifications. For example, the cooling could be realized in a different way. It would also be possible to arrange the exhaust at a different location, etc.

CLAIMS

1. An unmanned helicopter with an internal combustion engine and a dedicated fuel tank, **characterized in** that the unit (1) consisting of the internal combustion engine and the transmission is arranged in a self-supporting housing (2) that is at least partially closed on all sides and preferably consists of carbon fiber-reinforced plastic (CFK), with a nose body (3) being connected to the front of said housing.
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- 10 2. The unmanned helicopter according to Claim 1, **characterized in** that the housing (2) for accommodating the unit (1) consisting of the internal combustion engine and the transmission is realized in an at least partially hollow fashion and used as a fuel tank (7).
- 15 3. The unmanned helicopter according to Claim 1 or 2, **characterized in** that the exhaust (9) of the internal combustion engine is arranged in a recess (10) of the housing (2) that accommodates the unit (1) consisting of the internal combustion engine and the transmission, wherein said recess is open toward the outside and can be closed with a cover.
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4. The unmanned helicopter according to one of Claims 1 - 3, **characterized in** that a radiator (12) of the internal combustion engine is arranged on the upper side of the nose body (3) and a coolant flows through this radiator.
- 25 5. The unmanned helicopter according to Claim 4, **characterized in** that an oil cooler (13) is arranged underneath the radiator (12) of the internal combustion engine.
- 30 6. The unmanned helicopter according to one of Claims 1 - 5, **characterized in** that the exhaust (9) of the internal combustion engine is surrounded by a double casing, wherein the cooling air arriving from the radiator (12) flows through the outer annular space (15) and the cooling air arriving from the rotor bearing of the internal combustion engine flows through the adjacent inner annular space (16) of the double casing.