

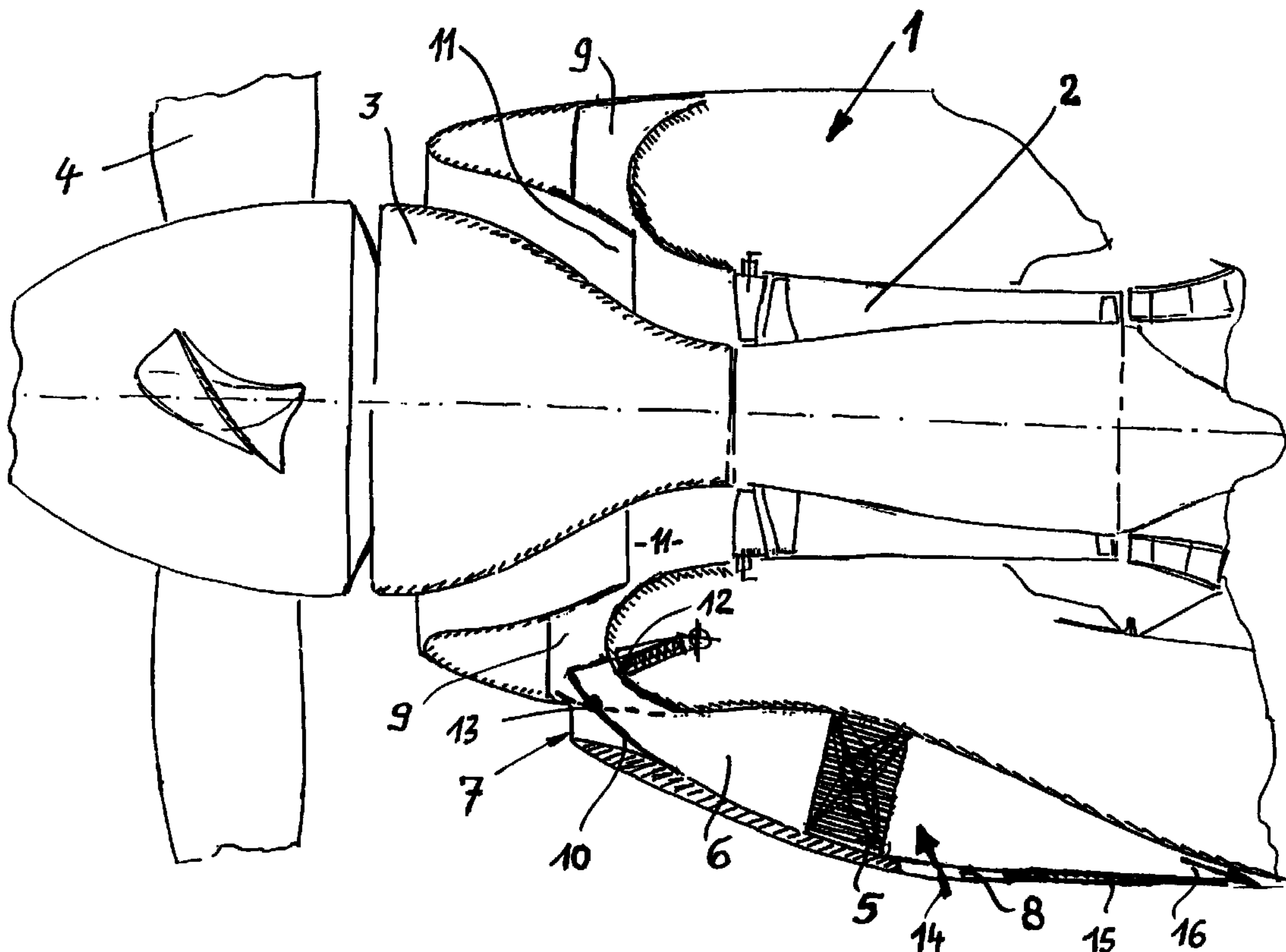


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(54) Titre : GROUPE PROPULSEUR A TURBINE A GAZ D'AERONEFS, POURVU D'UN ECHANGEUR DE CHALEUR LIQUIDE-AIR

(54) Title: AIRCRAFT GAS TURBINE ENGINE WITH A LIQUID-AIR HEAT EXCHANGER



(57) Abrégé/Abstract:

The invention concerns a turboprop engine comprising an oil cooler (5) which is disposed in the engine pod (1) and upon which cooling air acts. The oil cooler (5) is disposed in a flow duct (6) which at the rear opens into the environment and at the front can be connected alternately to an air-inlet opening (7) or to the feed duct (11) of the compressor (2) of the aircraft gas turbine.





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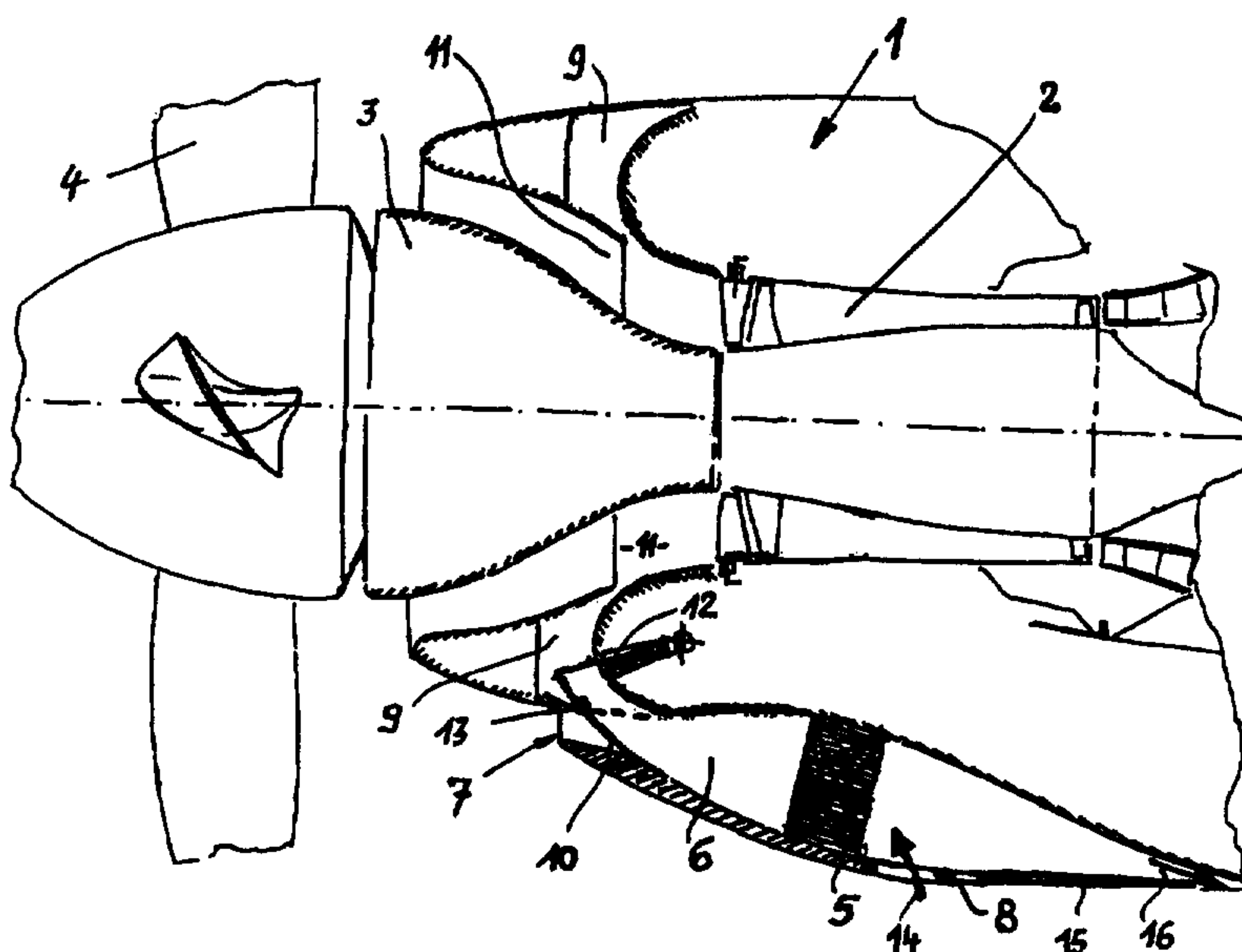
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(54) Title: AIRCRAFT GAS TURBINE ENGINE WITH A LIQUID-AIR HEAT EXCHANGER

(54) Bezeichnung: FLUGGASTURBINEN-TRIEBWERK MIT EINEM FLÜSSIGKEITS-LUFT-WÄRMETAUSCHER



(57) Abstract

The invention concerns a turboprop engine comprising an oil cooler (5) which is disposed in the engine pod (1) and upon which cooling air acts. The oil cooler (5) is disposed in a flow duct (6) which at the rear opens into the environment and at the front can be connected alternately to an air-inlet opening (7) or to the feed duct (11) of the compressor (2) of the aircraft gas turbine.

Translation of PCT/EP96/02553

AIRCRAFT GAS TURBINE ENGINE WITH A
LIQUID-AIR HEAT EXCHANGER

The invention relates to an aircraft gas turbine engine, particularly a turboprop engine, having a liquid/air heat exchanger, particularly an oil cooler, which is arranged in the engine cage and which can be acted upon by a restrictedly delivered cooling air flow which is supplied by way of an opening in the engine cage. Concerning the known state of the art, reference is made in the manner of an example to European Patent Application EP 0 514 119 A1.

It may be required to arrange air-cooled liquid heat exchangers and particularly oil coolers on aircraft gas turbine engines in such a fashion that cooling air optimally flows against these heat exchangers during the flying operation as well as during the forward rolling of the aircraft as well as during the backward rolling of the aircraft on the ground. This requirement is particularly significant in the case of turboprop engines because relatively large amounts of heat must be carried away by way of the oil coolers of these engines.

A problem, particularly during the backward rolling of the aircraft is the delivery of the air current acting upon the heat exchanger. It is therefore an object of the invention to indicate a particularly advantageous solution for this problem.

For achieving this object, it is provided that the heat exchanger is arranged in a flow duct which, on the back side, leads out into the environment and which, on the front side, can optionally be connected with an air
5 inlet opening or with an inflow duct of the compressor of the aircraft gas turbine.

The invention will be explained in detail by means of the schematic diagram of a preferred embodiment. In this
10 case, reference number 1 indicates the engine cage of an only partially shown turboprop engine. In this engine cage, which is illustrated in a partially sectional view, an aircraft gas turbine is arranged of which essentially only the compressor 2 is shown. By means of a transmission
15 3, the aircraft gas turbine drives a propeller 4. Because of the high power to be transmitted, the lubricating oil of the transmission 3 is heated to such an extent that an effective oil cooling must always take place. For this purpose, a liquid/air heat exchanger 5, which in the
20 following will also be called an oil cooler 5, is arranged essentially within the engine cage 1.

This oil cooler 5 must always be acted upon by a cooling air flow. For this purpose, the oil cooler/heat
25 exchanger 5 is arranged in a flow duct 6 which is machined into the engine cage 1. On the front side of the engine cage 1, an air inlet opening 7 is provided which can be

connected with the flow duct 6. In this case, a flow
guiding flap, which has the reference number 10, is in the
position illustrated by a broken line. On the other side of
the oil cooler 5, the flow duct 6 leads either by way of a
conventional nozzle according to the arrow 16 into the
environment; or by the displacement of a movable flap 15 ,
the flow duct 6 can also be connected with the environment
by way of a transfer opening 8 in the engine cage 1.

Close to the air inlet opening 7, a so-called
connecting duct 9 branches off the flow duct 6, an
adjustable flow guiding flap 10 being provided in the area
of the branch-off. By means of an adjusting lever 12, the
flow guiding flap 10 can be swivelled about a pivot 13.
This flow guiding flap 10 is illustrated in its two
different end positions. When the flow guiding flap 10 is
in the position illustrated by a broken line, a possible
connection from the flow duct 6 to the connecting duct 9 is
interrupted; that is, no air transfer is possible from the
flow duct 6 into the connecting duct 9. For acting upon the
oil cooler 5, the cooling air flow can then enter by way of
the air inlet opening 7 directly into the flow duct 6 and
can emerge again downstream of the oil cooler 5 as a cooler
exhaust air flow according to arrow 16 by way of the nozzle
into the environment. In this case the indicated direction
of the arrow 14 has no significance.

The connecting duct 9 can establish a connection between the flow duct 6 as well as the inflow duct 11 of the compressor 2 by way of which the gas turbine operating air is supplied to the compressor 2. As illustrated, in the forward area of the engine cage 1, the flow duct 6 is situated essentially beside the inflow duct 11. When now the flow guiding flap 10 is moved from the position illustrated by a broken line into the position illustrated by a solid line, by way of the now opened connecting duct 9, the flow duct 6 is connected with the inflow duct 11, while the air inlet opening 7 is closed. Simultaneously, the flap 15 is displaced such that the nozzle is closed and the transfer opening 8 is opened. This has the result that, during the operation of the gas turbine or of the compressor 5, air is sucked off from the flow duct 6 into the inflow duct 11. As a result, an air flow arrives according to the direction of the arrow 14 by way of the transfer opening 8 in the flow duct 6, penetrates the oil cooler 5 and is finally sucked off by the compressor 2. This method of operation or this position of the flow guiding flap 10 as well as of the displaceable flap 15 will therefore be selected if, for cooling purposes, an air flow is to be sent through the oil cooler 5 but if - for example, because of a reversing of the aircraft - virtually no air flow can reach the oil cooler 5 by way of the air inlet opening 7. In the sense of an advantageous combination of functions, the compressor 2 will then simultaneously operate as a delivery

device for a cooling air flow which acts upon the liquid/air exchanger 5.

Since the partially relatively hot cooler exhaust air is supplied to the compressor 2 during the delivery of the cooling air flow acting upon the oil cooler 5, this action upon the compressor 2 by hot air should take place so that it is as much as possible uniformly distributed along the circumference of the compressor 2. Since, as usual, the inflow duct 11 of the compressor 2 has a ring-shaped construction, the connecting duct 9, being adapted to the essentially ring-shaped engine cage 1, also has a ring-shaped construction. By means of the transfer of the cooler exhaust air by way of the opened flow guiding flap 10 into the connecting duct 9, this hot cooler exhaust air will be distributed at least essentially uniformly along this ring-shaped connecting duct 9 and will thus arrive in the compressor inflow duct 11 in an essentially uniformly distributed manner. If, at a later point in time, the flow again approaches the described aircraft gas turbine engine from the front, so that a sufficiently high cooling air flow is available which acts upon the air inlet opening 7, the flow guiding flap 10 is again brought into the position illustrated by a broken line so that, as usual, cooling air will again flow through the oil cooler 5 from the front toward the rear with respect to the engine. By means of the described arrangement, it is therefore possible to provide a sufficiently large cooling air flow for the admission to the

liquid/air heat exchanger or oil cooler 5 in a simple manner under all operating conditions. Naturally, a large number of details, particularly of a constructive type, may be designed to deviate from the illustrated embodiment without leaving the content of the claims.

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CLAIMS:

1. Aircraft gas turbine engine having a heat exchanger arranged in a cage of the engine and which can
5 be acted upon by a restrictedly delivered cooling air flow supplied through an opening in the cage of the engine, wherein the heat exchanger is arranged in a flow duct which, on a back side thereof, leads into an environment and, on a front side thereof, is connected with one of:
10 i) an air inlet opening and ii) an inflow duct of a compressor of the aircraft gas turbine.

2. The aircraft gas turbine engine of claim 1, wherein the engine is a turboprop engine.

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3. The aircraft gas turbine engine according to any one of claims 1 and 2, wherein, in a front-side area of the cage of the engine, a connecting duct, which has an adjustable flow guiding flap, is arranged between the
20 compressor inflow duct and the flow duct situated beside it.

4. The aircraft gas turbine engine according to any one of claims 1 to 3, wherein the cage of the engine is
25 ring-shaped, the connecting duct, being adapted to the cage of the engine, having a ring-shaped construction.

5. The aircraft gas turbine engine according to any one of claims 1 to 4, wherein the flow duct leads on the
30 back side by displacing a flap by way of one of: i) a nozzle and ii) a transfer opening, into the environment.

