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OVERVIEW OF APARICIO-MEMBRANE DEVICES AND CONTROL SCHEMES

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ABSTRACT

The full and static pressure System is designed to supply full and static pressure to instruments and systems that measure altitude and flight speed.

KEYWORDS: *degrees, height, speed, lift coefficient, aerodynamic forces, deformation.*

DISCUSSION

Theoretical information about indicators of speed and altitude.The system of full and static pressures is designed to supply full and static pressures to instruments and systems that measure altitude and flight speed. Airspeed instruments are called airspeed indicators. They are divided into the following types:

1) Indicators of the indicated speed;
2) Indicators of true airspeed.

Along with the indicator of the true airspeed, the indicator of the number M is used. This device shows the value of the true airspeed in relative units (in relation to the speed of sound).

Speed and swing indicators. The indicator of the indicated speed (US) is used as a flight instrument. Its principle of operation is based on measuring the dynamic pressure of the oncoming air flow using a manometric box, the deformation of which is transmitted to the arrow by a special mechanism. Thus, the indicator of the indicated speed measures the speed head $\Delta p = \gamma V2 / 2g$, which depends not only on the flight speed, but also on the air density.

This device will show the true airspeed only at the altitude at which it was calibrated. Typically, the indicated airspeed indicator is calibrated at normal air density $\gamma = 1.225$ kg / m3, so the readings of the device will correspond to the true airspeed when flying near the ground. It is known that the aerodynamic forces acting on years in flight are also proportional to the

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velocity head. For example, the magnitude of the lift is expressed by the formula

$$Y = c_y S \frac{\gamma V^2}{2g},$$
(1.1)

where su is the coefficient of lift; S is the area of the bearing surfaces. Therefore, to maintain the required flight mode, it is important to know not the true airspeed, but the indicated flight speed. Therefore, according to the indicator of the indicated speed, it is easy to withstand the required flight modes. This device essentially gives information about the lift of the aircraft at any flight altitude, which is especially important to know when the lift is approaching a critical value.

The airspeed indicator can also be used as a navigation device to determine the true airspeed. In this case, corrections must be made to his readings. True Airspeed Indicator (TRI). Designed to measure true airspeed. Its principle of operation, like the indicator of the indicated speed, is based on the measurement of the dynamic pressure of the oncoming air flow. The difference is that static pressure is also measured in the IVS indicator. In addition, a standard atmosphere temperature correction is automatically introduced. In this formula, the correction for compressibility is approximately considered constant, since its change is insignificant in comparison with the change in air density.

$$A = \sqrt{\frac{2kgR}{k-1}} \text{ и } f\left(\frac{\Delta p}{p}\right) = \sqrt{\left(\frac{\Delta p}{p} + 1\right)^{\frac{k-1}{k}} - 1},$$
(1.2)

then expression (1.2) takes the form

$$V = A\sqrt{T} f\left(\frac{\Delta p}{p}\right).$$
(1.3)

We transform the function f= $\left(\frac{\Delta p}{p}\right)$ taking into account that pn = p + Δp

Then

$$f\left(\frac{\Delta p}{p}\right) = \sqrt{\left(\frac{p_n}{p}\right)^{\frac{k-1}{k}} - 1}.$$
(1.4)

Equality (1.4) can be approximately replaced by the power expression

$$f\left(\frac{\Delta p}{p}\right) = \left(\frac{\Delta p}{p}\right)^{\alpha},$$
(1.5)

where α is the exponent chosen from the condition of the best approximation of expression (1.5) to equality (1.4). Thus, the calibration formula (1.2) taking into account (1.3) and (1.5) takes the form. As can be seen from equation (1.6), the measurement of the true airspeed is possible if the device contains sensitive elements that determine the dynamic pressure p, static pressure p and temperature T at the flight altitude. The functional diagram of such a device is shown in Fig. eleven.
It is difficult to constructively implement such a scheme. The device turns out to be very complex. The design of the device is greatly simplified if we apply a circuit with incomplete temperature compensation (Fig. 1.2).

The introduction of temperature compensation in this scheme is based on the assumption that temperature, like pressure, changes with increasing altitude according to the standard law. Hence, temperature and pressure are functionally related. Therefore, the change in temperature with change in altitude is taken into account by measuring the static pressure.

Many characteristics of an airplane depend on the number M. Thus, for example, when the number M changes from 0.6 to 1.0, the drag coefficient cx increases, while the lift coefficient cc decreases. At M>

1.0, both coefficients slowly decrease and the resistance of the jet engine air intake changes. All this leads to a change in the characteristics of the aircraft's controllability. Therefore, the pilot needs to know the values of the M number at which such a change occurs.

The device with which the number M of flight is measured is called the indicator of the number M. The existing indicators of the M number are based on measuring the ratio of the dynamic pressure p of air to the static pressure p. The M number is a function of the dynamic to static pressure ratio, regardless of the air temperature.

A simplified calculation formula for determining the number M can be obtained if the value of the velocity V from the approximate formula (1.6) is substituted into the expression M = V / α:

$$V = A\left(\frac{\Delta p}{p}\right)^{\alpha}\sqrt{T}, \quad (1.7)$$

$$M = \frac{A\left(\frac{\Delta p}{p}\right)^{\alpha}\sqrt{T}}{\sqrt{kgRT}} = A_1\left(\frac{\Delta p}{p}\right)^{\alpha}, \quad (1.8)$$

where A1 is a constant coefficient.

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