Begin
# 406

ignore
previos
card.

21367

S/021/61/000/012/004/011
D251/D305

101210

AUTHOR: Panchenkov, A. M.

TITLE: Hydromechanical characteristics of a wing near a solid boundary

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 12, 1961, 1566-1570

TEXT: The author states that the problem of hydromechanical characteristics of a wing near a solid boundary is of interest in designing submarine and aircraft. A method of solving the plane case is given. An equation is obtained based on the characteristic function, the complex velocity of circulation and the condition of the solid boundary. The force is obtained by means of Chaplyhin's formula

$$P - iQ = -\frac{\rho}{2} \int_{C} \bar{v}_0^2(z) dz$$

Card 1/4

where $B = \Gamma + iQ = \bar{v}_{\infty}(\zeta)d\zeta$, where Γ is the strength of the vortex, and Q is the strength of the source. The circulation begins at point ζ. By means of the function of M. Ye. Kochyn $H(-\lambda)$ (Ref. 1: Tr. konf. po. teor. voln. soprot. M. TsAGI, 65 (1937)), a solution is obtained for the force

$$P_{\bar{h}_0} = \varrho v_0 \Gamma_\infty - \frac{\varrho \Gamma_\infty^2}{4\sqrt{2}\pi R \cos\alpha_0} \frac{1}{\sqrt{8\bar{h}^2+1}} F_1 + \frac{\varrho v_0 \Gamma_\infty \cos\alpha_h}{2R\cos\alpha_0}\left(1 - \frac{4\bar{h}}{\sqrt{2}} \frac{1}{\sqrt{8\bar{h}^2+1}} F_1\right). \quad (8)$$

where

$$\gamma_{h_0} = \frac{\Gamma_{h_0}}{\Gamma_\infty}$$

Card 2/4

21367
S/021/61/000/012/004/011
D251/D305

$$\gamma_{\bar{h}_0} = 1 - \frac{\sin(\alpha_0 + \alpha_h)}{\sqrt{2}\sqrt{8\bar{h}^2+1}\cos\alpha_0} F_1 + \frac{\cos\alpha_h}{2\cos\alpha_0}\left(1 - \frac{4\bar{h}}{\sqrt{2}\sqrt{8\bar{h}^2+1}} F_1\right). \qquad (9)$$

The method is applied to the aerofoil of M. Ye. Zhukovs'kyy. The results obtained correspond well with experimental data. There are 1 figure and 3 Soviet-bloc references.

Card 3/4

21367
S/021/61/000/012/004/011
D251/D305

Hydromechanical characteristics ...

ASSOCIATION: Instytut hidrolohiyi ta hidrotekhniky AN URSR (Institute of Hydrology and Hydrotechnics AS UkrSSR)

PRESENTED: by H. Ye. Pavlenko, Academician AS UkrSSR

SUBMITTED: May 17, 1961

S/3083/63/022/000/0022/0029

ACCESSION NR: AT4028731

AUTHOR: Panchenkov, A. M. (Panchenkov, A. N.)

TITLE: The movement of an underwater wing in stationary waves

SOURCE: AN UkrRSR. Insty*tut gidrologiyi i gidrotekhniky*. Visti, v. 22(29), 1963. Gidromekhanika sudna (Ship hydromechanics), 22-29

TOPIC TAGS: wing, underwater wing, wing design, hydrodynamics, hydromechanics

ABSTRACT: The article deals with the problem of the movement of an underwater wing in stationary waves. The solution is obtained through the use of an approximate method (A. M. Panchenkov, Pro rukh kry*la pobly*zu vil'noyi poverkhni ridy*ny*, "Prikladna mekhanika", vy*p. 2, 1962). General formulas are obtained for the forces on an underwater wing of arbitrary contour. In the particular cases of a circular cylinder with circulation and the N. Ye. Zhukovskiy wing, finite results are given which permit study of the effect of the wave phase on the lifting force and wave resistance of underwater wings and can be

Card 1/2

ACCESSION NR: AT4028731

employed in practical computations. Orig. art. has: 32 formulas

ASSOCIATION: Insty*tut gidrologiyi i gidrotekhniky* AN UkrRSR. (Institute of Hydrology and Hydrotechnology AN UkrRSR)

SUBMITTED: 00 DATE ACQ: 16Apr64 ENCL: 00

SUB CODE: AS, ME NO REF SOV: 002 OTHER: 000

29225

S/198/61/007/005/011/015
D274/D303

24.4300

AUTHOR: Panchenkov, A.M. (Kyyiv)

TITLE: Motion of a cylinder near the free surface of a fluid

PERIODICAL: Prykladna mekhanika, v. 7, no. 5, 1961, 547 - 553

TEXT: The motion of a cylinder near the free surface of a fluid was considered by L.M. Sretens'kiy, M.V. Keldysh and M.Ye. Kochin (Refs: 1, 2, 3 published by TsAGI (Central Institute of Aerohydrodynamics im. Zhukovskiy) in 1934, 1935 and 1937). The last two authors simulated the motion of the cylinder by the motion of a dipole near the free surface. For motion in an unbounded stream, the potential of motion of the dipole is the cylinder potential, since one of the stream lines is formed by the cylinder contour. If the motion takes place in the neighborhood of the free surface, this contour is deformed and the dipole simulates the motion of an oval-shaped profile. This problem can be solved by the variational principles of conformla mapping. Taking the boundary conditions from

Card 1/6

29225

S/198/61/007/005/011/015
D274/D303

the theory of small waves, an expression for the characteristic function of the dipole motion near the free surface, is obtained (Ref. 3: Op.cit.). By means of mapping functions which map the exterior of nearly-circular regions, the characteristic function of cylinder motion can be obtained. The motion for $F_r = v/\sqrt{gb} \to \infty$ is considered. The characteristic function and the complex velocity are expressed by

$$W_h(z) = -v_0\left(z + \frac{a^2}{z}\right) + \frac{v_0 a^2}{z - 2ih} + \frac{\Gamma}{2\pi i}\ln(z) + \frac{\Gamma}{2\pi i}\ln(z - 2ih), \quad (1)$$

$$\frac{dW_h(z)}{dz} = -v_0\left(1 - \frac{a^2}{z^2}\right) - \frac{v_0 a^2}{(z-2ih)^2} + \frac{\Gamma}{2\pi i}\frac{1}{z} + \frac{\Gamma}{2\pi i}\frac{1}{(z-2ih)}. \quad (2)$$

Hence the contour equation

$$\psi = -v_0\left(R - \frac{a^2}{R}\right)\sin\theta - \frac{v_0 a^2}{R}\left[\frac{\sin\theta - 2\bar{h}}{1 - 4\bar{h}\sin\theta + 4\bar{h}^2}\right] - \frac{\Gamma}{2\pi}\ln R^2\sqrt{1 - 4\sin\theta\bar{h} + 4\bar{h}^2}, \quad (3)$$

S/198/61/007/005/011/015
D274/D303

is obtained, ($\bar{h} = h/R$). For $\sin\theta = 0$, one obtains

$$R_0 = a\sqrt{\frac{1+C}{1-D}}; \quad (5)$$

$$C = \frac{4\bar{h}^2 - 1}{(4\bar{h}^2 + 1)^2}; \quad D = \frac{\Gamma\bar{h}}{\pi v_0 R(1 + 4\bar{h}^2)}.$$

Assuming that the oval contour is close to a circle with radius R_0, one obtains

$$R = R_0[1 + \delta(\theta)], \quad (6)$$

$$/\delta(\theta)/ \leq \varepsilon; \quad /\delta'(\theta)/ \leq \varepsilon; \quad /\delta''(\theta)/ \leq \varepsilon,$$

and the function which effects a conformal mapping of the oval on the circle, as

$$f(z, c) = R_0\left\{z\left[1 - \frac{1}{2\pi}\int_0^{2\pi}\delta(t)\frac{e^{it} + z}{e^{it} - z}dt\right] + Q(\varepsilon^2)\right. . \quad (7)$$

Expressing $\delta(\theta)$ in the form of a Fourrier series, one obtains

$$f(z, c) = R_0\left\{z - z\left[\frac{a_0}{2} + \sum_{n=1}^{\infty} a_{2n} z^n - i\sum_{n=1}^{\infty} b_{2n+1} z^{2n+1}\right] + Q(e^{\eta})\right\}. \tag{11}$$

The forces are obtained by M.Ye. Kochin's method. Introducing the function

$$H(\lambda) = e^{-\lambda h} \int_C e^{-i\lambda \frac{f(z,c)}{R_0}} \frac{dW_\infty(z)}{dz}\, dz, \tag{12}$$

the lifting force P_h of the cylinder is expressed by

$$P_h = \rho v_0 \Gamma_\infty - \frac{Q}{2\pi}\int_0^\infty /H(\lambda)/^2 d\lambda. \tag{13}$$

Transforming (12) and using the theorem of residues, one obtains

$$H(\lambda) = e^{-\lambda h_1}\left[\Gamma + 2\pi v_0\lambda\left(\frac{Ra}{R_0}\right)^2\left(1-\frac{a_0}{2}\right)\right], \quad (14)$$

$$P_h = \varrho v_0\Gamma_\infty - \frac{\varrho\Gamma_\infty^2}{4\pi h} - \frac{\varrho\Gamma_\infty v_0\left(\frac{R}{R_0}\right)^2 a^2}{2h^2}\left(1-\frac{a_0}{2}\right) - \frac{\varrho\pi v_0^2\left(\frac{R}{R_0}\right)^4 a^4}{2h^3}\left(1-\frac{a_0}{2}\right)^2. \quad (15)$$

Hence H and P can be determined if the first coefficient a_0 of the Fourrier expansion of δ is known. The calculation of this coefficient leads to elliptical integrals. These integrals can be found by formulas and tables of the references. The function δ can be also obtained by a different expansion. Thereupon, one obtains

$$f(z, c) = z - \frac{1}{\sqrt{K}}(a_0' - ib_1 z + a_2 z^2 - ib_3 z^3 + a_3 z^4 - \ldots) \quad (19)$$

Card 5/6

Card 6/6

S/021/62/000/002/005/010
D299/D304

AUTHOR: Panchenkov, A. M.

TITLE: Influence of shallows on the lift force of a wing in the vicinity of a free fluid-surface

PERIODICAL: Akademiya nauk UkrRSR. Dopovidi. no. 2, 1962, 169-172

TEXT: The motion of a wing is considered near the free surface of a fluid of finite depth with $F_{rb} = v/\sqrt{gb}$, where b is the wing chord. The boundary conditions at the surface and at the fixed edge are:

$$I_m\left(i\,\frac{dw}{dz}\right) = 0; \quad \frac{\partial \varphi}{\partial x} = 0, \text{ for } y = ih \tag{1}$$

$$\frac{\partial \varphi}{\partial y} = 0 \text{ for } y = -\,ih_o \tag{2}$$

Card 1/6

The expression for the complex velocity of flow is obtained from the formula for the complex velocity of the vortex source. There-upon S. N. Chaplygin's first formula is used and N. Ye. Kochin's function (Ref. 1: Trudy konferentsii po teorii volnovogo sprotivleniya, TsAGI, 1937) introduced:

$$H(\lambda) = \int_C e^{-i\lambda z} \bar{v}_\infty (z)\,dz \qquad (4)$$

one obtains

$$P_{hh_0} = \varrho v_0 \Gamma_\infty - \frac{\varrho}{2\pi}\left[\int_0^\infty |H(\lambda)|^2 \left(\sum_{k=0}^\infty e^{-k\tau\lambda} - \sum_{k=0}^\infty e^{-\left(k+\frac{1}{2}\right)\tau\lambda}\right) d\lambda + \right.$$
$$+ \int_0^\infty |H(-\lambda)|^2 \left(\sum_{k=0}^\infty e^{-\left(k+\frac{1}{2}\right)\tau\lambda} - \sum_{k=1}^\infty e^{-k\tau\lambda}\right) d\lambda. \qquad (5)$$

S/021/62/000/002/005/010
D299/D304

Influence of shallows ...

$$\Delta\alpha_0 = \frac{\frac{1}{4\sqrt{2}}\left[\frac{K\delta}{(8\bar{h}_0^2+1)^{3/2}}F_2(\bar{h}) + \frac{(1-k)\delta}{(8\bar{h}_0^2+1)^{3/2}}F_2(\bar{h}_0)\right]}{\Psi_{h,\lambda}}, \qquad (10)$$

where λ is the relative elongation; α_0 - the angle of zero lift force in an infinite flow; a_∞ - the tangens of the angle of inclination of the curve C_y; ζ_1 - a correction term contributed by the interaction of the convergent vortices; τ_1 - factors contributed by the shape of the wing; K - the ratio of the thickness of the profile above the chord to the total relative thickness; $\mu = \frac{0.77\delta}{1-0.6\delta}$; δ - the relative thickness of the profile; $\sum\zeta_1$ is found from a formula. The drag coefficient of the wing near shallows is

Card 4/ 6

Influence of shallows ...

$$c_{xi} = \frac{c^2_{y\lambda}}{\pi\lambda}(1 + \delta_1)\sum \zeta_i$$

The relative decrease in the drag coefficient can be estimated by the quantity $\varepsilon = \sum \zeta_i / \zeta$. In recalculating the results of tests made near the surface o° an infinite fluid, to the case of finite depth, one obtains for the lift coefficient:

$$c_{y\lambda} = \frac{\Gamma_{\bar{h}_o} c_{y\bar{h}_\infty}}{1 + \frac{\varphi_{h_o h} a_\infty}{\pi\lambda}(1 + \tau_1)\sum \zeta_i} \qquad (13)$$

There are 2 Soviet-bloc references.