

# THE PROBLEM OF EQUILIBRIUM AND STABILITY OF CAPILLARY FLUID WITH DISCONNECTED FREE SURFACE

N. D. KOPACHEVSKY<sup>1</sup>, Z. Z. SITSHAYEVA<sup>2</sup>  
(SIMFEROPOL<sup>1</sup>, UKRAINE<sup>1</sup>, SIMFEROPOL<sup>2</sup>, UKRAINE<sup>2</sup>)

The report addresses the problem of static and stability of hydrodynamic system in which capillary fluid has disconnected free surface, under conditions close to low-gravity.

We assume that fluid partially fills a cylindrical container that has an opening in the horizontal bottom. It is also supposed that top part  $\Gamma_0$  of free surface of fluid is horizontal.

Namely, we study the problem of finding the equilibrium shape and stability of fluid drop that is positioned below the opening in the bottom part of the cylindrical container that filled with liquid.

As a result of our research the algorithms for finding profile  $\Gamma_1$  of the drop in the two-dimensional and axially symmetric problems are developed.

Also, the spectral criterions of stability of equilibrium states of the drop are established.

Besides, if drop volume  $V$ , radius  $r_0$  of the hole, Bond number  $B$  (that equals to the ratio of gravity and capillary forces) are fixed, the methods of finding a boundary of the hydrosystem stability are proposed. These algorithms generalize the constructions that are given in the monographs [1-2].

According to the developed technique for different values of the parameters numerical calculations have been carried out.

Based on this numerical results stable and unstable static equilibrium profiles of the drop are built.

## References

- [1] Myshkis A.D., Babckii V.G., Kopachevskii N.D., Slobozhanin L.A., Tyuptsov A.D., *Low-Gravity Fluid Mechanics*, Springer-Verlag, Berlin, Heidelberg, New York, London, Paris, Tokio, 1987.
- [2] Babckii V.G., Zhukov M.Yu., Kopachevsky N.D., Myshkis A.D., Slobozhanin L.A., Tyuptsov A.D., *Methods for solving of problems in fluid mechanics for weightlessness conditions*, Naukova Dumka, Kiev, 1992 (in Russian).

TAURIDA NATIONAL UNIVERSITY,  
PR. VERNADSKOGO 4, SIMFEROPOL, 95007, UKRAINE  
*E-mail address:* kopachevsky@list.ru

CRIMEA ENGINEERING AND PEDAGOGICAL UNIVERSITY,  
SEVASTOPOLSKAYA STR., TRAINING LANE 8, SIMFEROPOL, 95015, UKRAINE  
*E-mail address:* szz2008@mail.ru