30. On the Phenomena of Instability in Undamped Quasi-harmonic Vibration. Part II.

By Katsutada SEZAWA and Ikuo UTIDA.

Aeronautical Research Institute, Tokyo Imperial University.

(Comm. by K. SEZAWA, M.I.A., March 13, 1944.)

1. *Preliminary notes.* In the previous paper[1], some cases of quasi-harmonic vibration, namely, the cases in which there are periodically varying inertia mass as well as elasticity, have been discussed from mathematical point[2]. It has been concluded that instability with a certain range occurs when 1–, 1/3, ... cycle, namely, odd number fraction of a cycle of ripple in periodically varying coefficient synchronizes with two cycles of reference natural vibration, whereas instability with zero range should occur when 1/2–, 1/4–, ... cycle, namely, even number fraction of a cycle of ripple in periodically varying coefficient synchronizes with two cycles of reference natural vibration[3]. In the present paper, results of our experimental investigation with a model as well as the formulation of the equations most adapted to such experiments are mainly stated, from which it is possible for us to ascertain that features found from theory well agree with experimental phenomena.

2. *Experiments with a rotating two-blade model propeller.* We shall now consider such a special case that the propeller and the engine, as a whole, are liable to be in tilting motion under a finite resistance in the elastic force of the engine mounting. In the present case, furthermore, tilting motion in a plane is only present, in consequence of which the experiment and the analysis are much simplified. The skeleton view of the model is shown in Fig. 1.

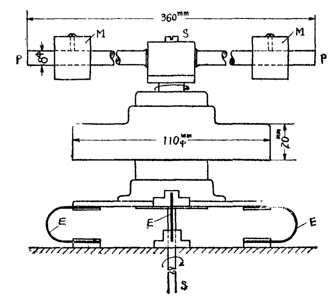

Fig. 1.

A bar PP corresponding to the propeller rotates with a shaft SS. It is possible for the reference natural vibrations to change by shifting the affixed masses M, M along PP. The elastic resistance corresponding to the engine mounting arises from the springs E, E, E. The condition represented in Fig. 1 indicates the state with the reference natural vibration

1) K. Sezawa and I. Utida, Proc. **19** (1943), 646–652.

2) Erratum to the previous paper. $\sqrt{1-k^2 \sin \tau}$ in line 3, p. 647 should be read as $\sqrt{1-k^2 \sin^2 \tau}$.

3) Some careless explanation in the previous paper is now corrected.

(a) "1–, 3–, ... cycles" and "odd numbers of cycles" in line 2, p. 651 should be "1–, 1/3–, ... cycle" and "odd number fraction of a cycle", respectively.

(b) "2–, 4–, ... cycles" and "even numbers of cycles" in lines 5, 6, p. 651, should be "1/2–, 1/4–, ... cycle" and "even number fraction of a cycle", respectively.

(c) "multiple" in line 19, p. 651, is to be "fraction".