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Paper work

DEPARTMENT OF COMMERCE
CIVIL AERONAUTICS ADMINISTRATION
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SAFETY REGULATION RELEASE NO. 129

SUBJECT: Prevention of Engine Mount Failures in Low Powered Aircraft.

PREPARED BY: Aircraft Engineering Division

The number of reports of engine mount failures recently received indicates that such failures are becoming chronic for several models of light aircraft powered by 4-cylinder opposed type engines and incorporating the platform type engine mount (See Fig. 2). None of the reported failures has so far resulted in a serious accident but the nature of the failures indicates that a serious accident might occur if remedial action is not taken.

The reported failures are usually cracks found in or near welded joints and are principally due to recurrent resonant vibration. As you know, most engines have "rough" spots at certain RPM values at which the engine will vibrate somewhat more than usual. The vibration responsible for fatigue cracks occurring in these mounts is due to the engine vibrating about its thrust axis, and is produced by the firing impulse frequency from the engine (2 times crankshaft RPM). A great many experimental changes have been tried on platform type engine mounts to reduce or eliminate the engine mount frequency responsible for these failures. The problem can be overcome, but thus far it requires greater weight, complication and cost. Until such time as permanent corrective measures have been determined, it is believed that the steps listed below will result in safer operation and will reduce the occurrence of cracks in the engine mounts.

Vibration is always undesirable and in many cases it will produce such failures as are indicated above. In addition, it will cause a general deterioration of the airplane structure and is apt to produce power plant failures due to the failure of fuel and oil lines, or malfunctioning of the various components. Vibration cannot be eliminated but, in many cases, it can be greatly reduced by avoiding engine operation at "resonant" speeds (RPM's). Therefore, it is recommended that the following brief checks be performed on <u>each</u> airplane you own equipped with a "flat four" engine on a platform type mount (See Fig. 2 for example of the type of mount).

1. Run the engine while the airplane is on the ground, starting with the lowest idling speed used, (which should be no lower than 550 RPM) gradually increasing engine speed to practically full throttle and noting any particularly rough speed encountered. Care should be taken not to overheat the engine.

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2. Note this speed, go above it, and check it also while decreasing RPM.

3. If this critical or rough speed is in the normal flight range, check it also in flight.

NOTE: Due to tachometer inaccuracies such rough speed readings should only be taken from the instrument installed in the airplane even though one operator might have several aircraft of the identical model.

Roughness due to propeller unbalance will usually persist over a wide speed range and become worse only at higher speeds. Resonant vibration on the other hand is characterized by the vibratory motion of the engine or of some other component of the engine installation attaining a maximum amplitude while in resonance and then diminishing as engine speed is either increased or decreased.

4. This rough speed may then be indicated essentially as shown on the attached sketch (Fig. 1), on or near the glass face of the tachometer in order to remind pilots that continued operation within 100 RPM of this speed is to be avoided. For example, Figure 1 is marked to indicate a resonant vibration speed which had been found to exist at 1100 RPM.

5. If it is known that an airplane has been subjected to excessive vibration for any appreciable length of time, it is advisable that the engine mount be visually inspected for cracks before further operation is attempted. In any event, a careful visual inspection of the engine mount should be made at the time of the next periodic inspection of the airplane. The engine and mount need not be removed from the airplane for this inspection.

While in flight, if any unusual roughness becomes apparent, and changing to another RPM does not eliminate it, land as soon as possible and remedy the difficulty before resuming flight.

By direction of the Administrator:

John F. Warlick
Acting Director, Safety Regulation

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Attachments

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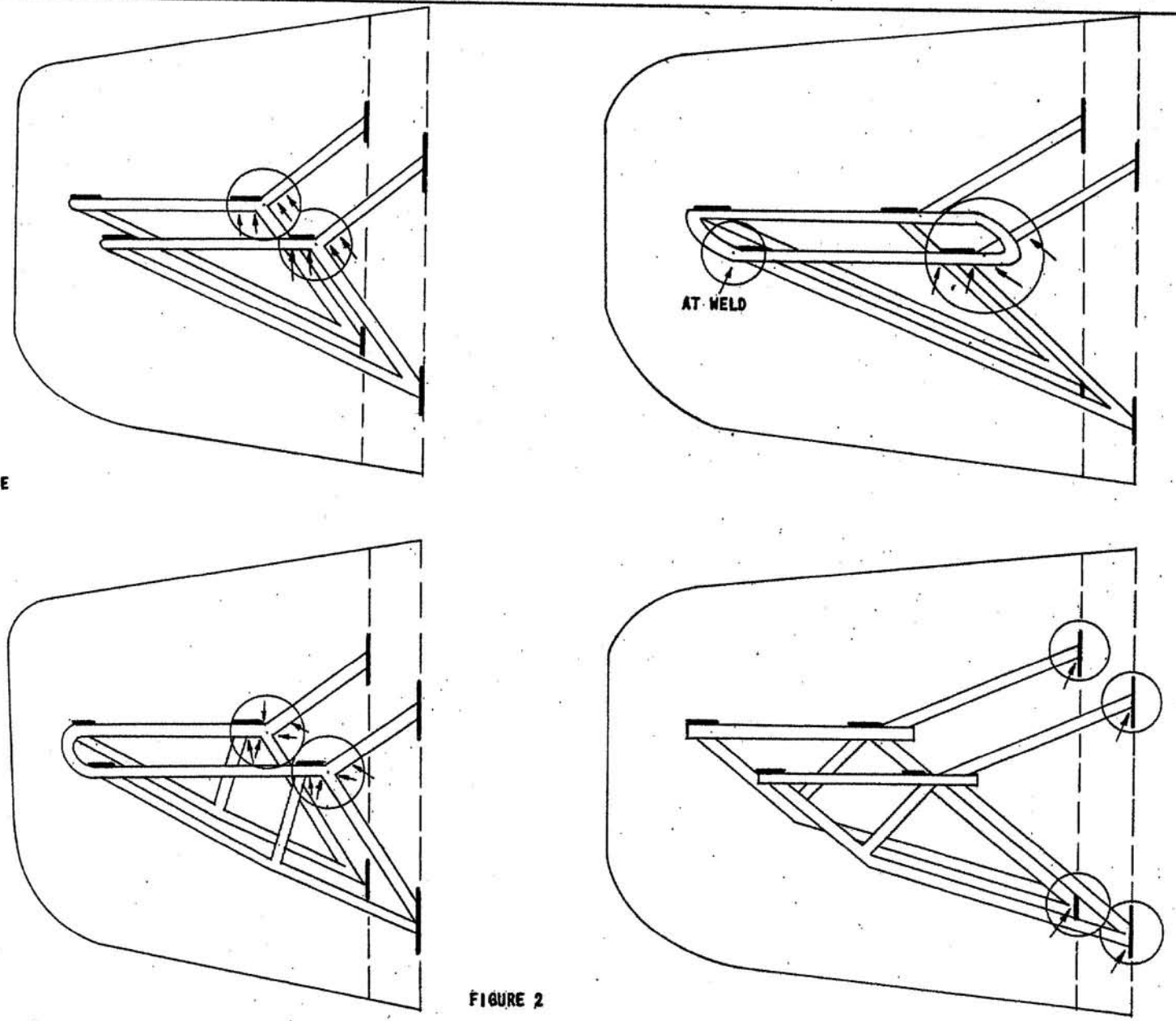

FIGURE 2

LOCATION OF TYPICAL ENGINE MOUNT FAILURES

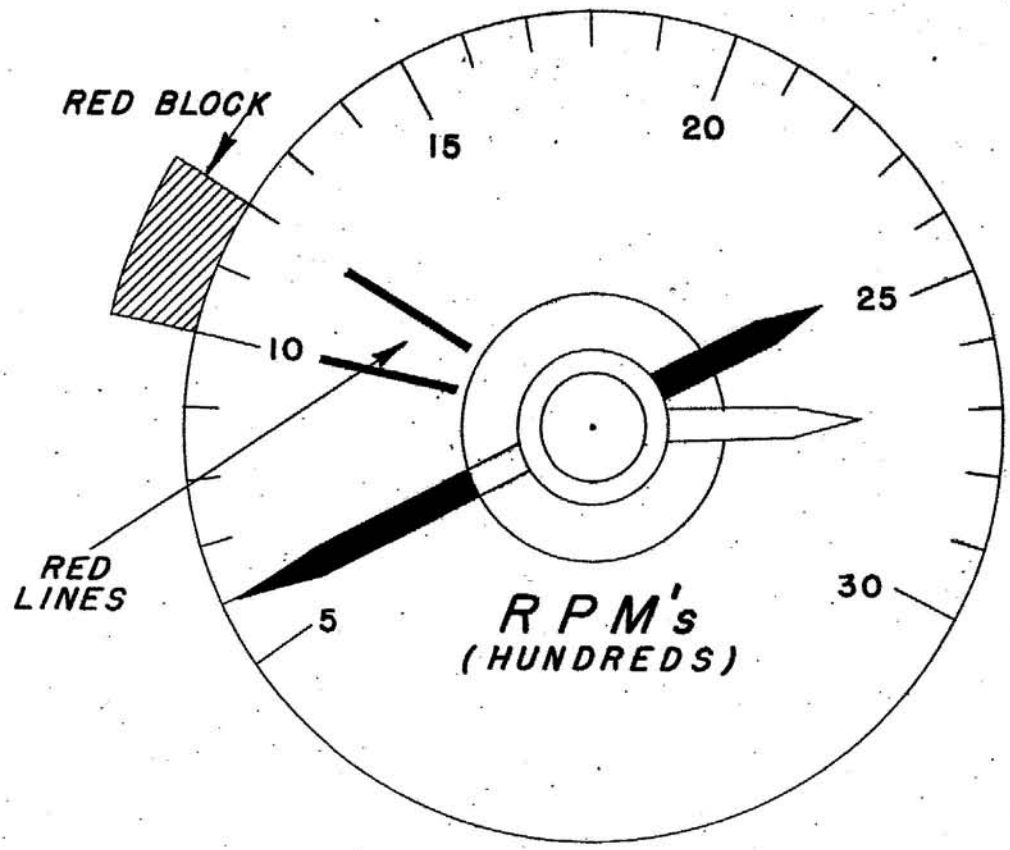

FIGURE 1

TACHOMETER MARKINGS

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