PKBWL comments to item **"14.2 Findings - Table 2"**:

The information provided to PKBWL shows, that the listed types of propellers, despite different dimensions of individual blade elements, have the blade mounting parts of the same design, made in the same technology and of the same material. The nature of the destruction of the blade mounting in both cases was very similar, which confirms the assumption about design and/or manufacturing errors of this element.

The propeller manufacturer claims that against his warnings, the Tecnam P92 ECHO pilot used the said propeller with a completely different type of engine, while the PKBWL findings show that the manufacturer agreed to such configuration. The information obtained by PKBWL also shows that the manufacturer of the propeller reimbursed the pilot the money for the propeller, which may indicate that the complaint related to the defective propeller has been accepted.

PKBWL comments to item **"14.2 Findings - text on pages 7-16":**

The tests described in Appendix 3 present the results of harmonic analysis in the form of the so-called Campbell diagram. This diagram shows the ranges of potential critical rotational speeds (RPMs) in which the blade vibration may be excited and a natural vibration may appear.

The presented results show that there are certain RPM ranges (purple in the graphs), which should be avoided.

If we understand the content of this Appendix correctly, we conclude that:

- the resonance tests concern a single blade and not a propeller as a whole with its mounting in a hub;
- if a blade used for the tests was permanently fixed on a test stand, the tests do not include the impact of centrifugal forces on the dynamic behaviour of the blade;
- the tests are not fatigue tests, (used to prove the appropriate durability of the propeller) but they only show ranges of sensitive (dangerous) RPMs.

PKBWL comments to item **"15. Causes of the Accident"**:

Appendix 3 shows the test bench and the tests results in the form of Campbell plots, but they are related to a single blade only. Such tests do not concern the propeller as a whole and cannot be treated as such.

Moreover:

- the tests described in Appendix 3 did not take into account the propeller rotation and the impact of the rotation on the stresses generated;
- fatigue life is affected by stresses resulting from rotation (average value) and vibrations, e.g. natural vibrations (amplitude). The whole spectrum of stresses must be taken into account to assess fatigue life.

PKBWL comments to item **“16. Safety recommendations - Z-1/2021/1048 "**:

PKBWL does not intend to correct the manufacturer's design errors but only indicates the areas requiring improvement. Determination of appropriate design requirements and their effective implementation are the roles of the manufacturer in consultation with a competent supervision authority to which the manufacturer is subjected.

PKBWL comments to item **“3. In conclusion"**:

The manufacturer claims that "… the long-term experiences clearly prove that the Manufacturer’s propellers (or other products) are flawless, made of suitable material, and feature suitable designs”, while the facts established in the course of the PKBWL investigation and contained in the presented Draft Final Report contradict the manufacturer's thesis.

Compliance with the legal requirements (especially local regulations) does not exclude the fact that a product has deficiencies, which have been revealed only during flight operations and which could lead to accidents in the future.

It is not the role of PKBWL to indicate specific requirements or technical solutions resulting in the improvement of the strength of defective structural elements, however, the content of the Draft Final Report is a clear assistance in this matter.

Among other things, the Report indicates, that “the thrust bearing locknut is not designed properly. The grub screws are located in a highly stressed area”.