Study of Load Spectrum occurring in the course of photogrammetric missions of the UAV

Dominik Glowacki[1],**Miroslaw Rodzewicz**[1]
[1]*Institute of Aeronautics and Applied Mechanics, Warsaw University of Technology, Poland*

One of common applications of light-weight civilian UAVs are aerial monitoring and photogrammetry. A good example of such an application is MONICA Project, which was devoted to aerial monitoring and photogrammetry of Antarctic Specially Protected Areas (ASPA) in King George Island (KGI). As a UAV platform there was used the PW-ZOOM, a plane powered by 4,8 hp gas engine, having 3,2 m of wing span and 24 kgs of take-off weight. During three Antarctic spring seasons (2014-2016) the PW-ZOOM performed over KGI 33 flights of total distance 3641 kms, and spent in the air 35,6 hours. Beside delivering a large amount of photogrammetry data, there were collected also flight-logs containing several parameters, which allowed for studying various flight dynamic aspects. The paper contains the analysis of flight-logs, which is oriented towards investigation of load spectrum during photogrammetry missions. There were chosen some flights having the same scenario and flight-paths, but which were performed in different weather conditions, especially at different wind speeds. The load spectra were developed as half-cycle arrays of load factor signal (i.e. transfer arrays based on the rainflow counting algorithm – Fig. 1), and as incremental load spectra (Fig. 2). Calculation algorithms were prepared by the authors in the LabVIEW environment. The obtained results allow for assessing the influence of weather on the fatigue loads during flight. They can be useful for preparing the bases necessary for load spectrum extrapolation and preparation of the fatigue tests of PW-ZOOM structure or similar planes.

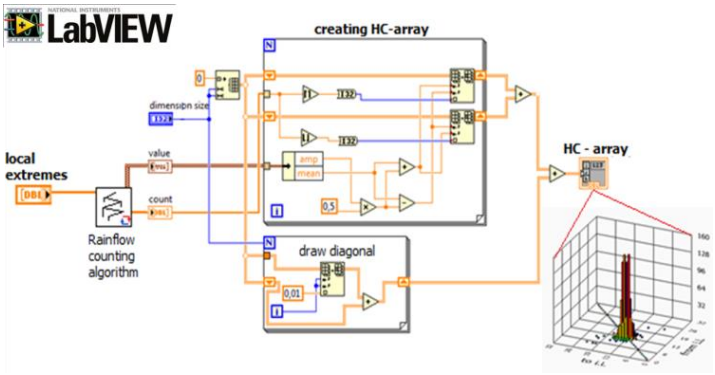

Figure 1. Half-cycle array(i.e. rainflow matrix) derrivation algorithm.

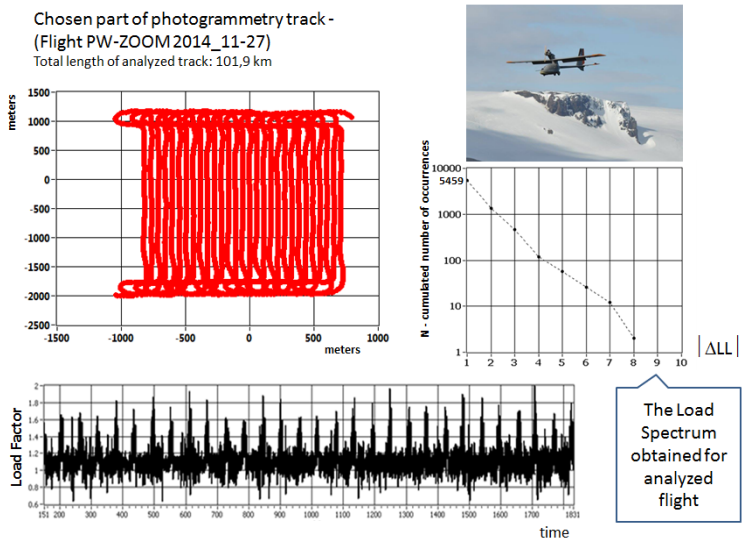

Figure 2. Example of flight track and load signal and derrived load spectrum.

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