

Analysis of the G Environment During a Red Bull Air Race



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Introduction

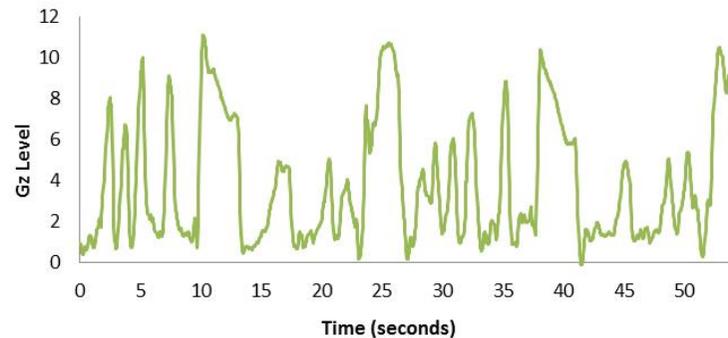
The Red Bull Air Race is an elite competition involving high speed, low-level aerobatic manoeuvres over a set course. During aerobatic competition, pilots are exposed to high levels of applied +Gz. A full understanding of the Gz environment of the modern high performance aerobatic competition aircraft remains to be developed. The purpose of this study was to document the nature and characteristics of the Gz environment to which aerobatic pilots are exposed during the Red Bull Air Race competition.



Methods

Gz data were downloaded from an aircraft competing in the Red Bull Air Race competition at a race during the 2015 season. The Gz data were acquired via the aircraft's onboard data acquisition system.

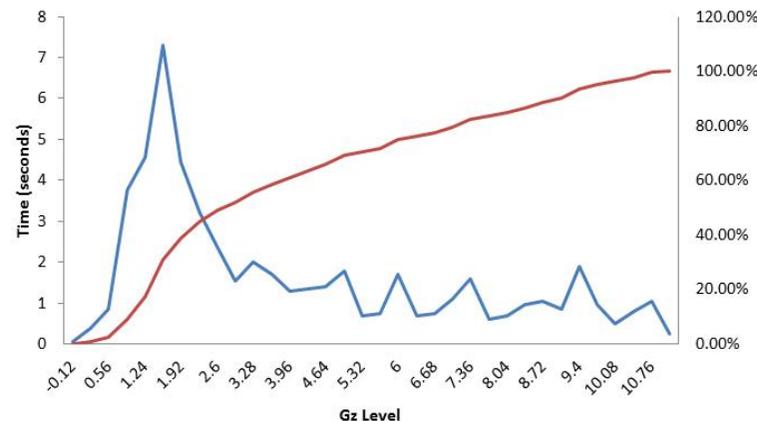
Gz vs Time



Results

The race run was around 1 minute in duration. The Gz environment during this run consisted of extremely frequent and repetitive excursions to very high peak +Gz levels; 39% of the duration of the race was spent at +Gz levels greater than +4 Gz. There were 8 separate exposures to +8 Gz. Maximum and minimum levels of Gz recorded were +10.76 Gz and -0.12 Gz, respectively.

Cumulative Gz Score



Conclusions

This study confirms the physiologically challenging nature of modern aerobatic competition. The G exposures appear to be very high, repetitive, but limited in duration. Rapid fluctuation in recorded Gz levels point to rapid onset and offset of Gz, which is most likely a result of race-specific aerobatic maneuvers. The aerobatic competition Gz environment is different from that of the modern fighter, with higher peaks but very limited duration. The potential for flight safety to be compromised by G-related symptoms is very real.