The Naturalistic Flying Study: Innovation in General Aviation Safety Research and Risk Management.

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Introduction:
Flight Data Management (FDM) has been implemented by many airlines around the world. Also known as Flight Operations Quality Assurance (FOQA), it is widely accepted as an effective method of proactive hazard identification (Higgins, 2012). FDM in commercial aircraft involves several activities: (a) systematic collection of data from onboard flight recording devices; (b) aggregation of data into a central data repository; (c) analysis of data to identify hazards currently undetected; and (d) adaption of policies and/or procedures to mitigate or eliminate the risks of all identified hazards (Higgins, 2012).

The “naturalistic driving study” (NDS) is a method involving driving data monitoring in cars, trucks and other land vehicles. The method was pioneered by the Virginia Tech Transportation Institute (VTTI), in the USA, and is being rolled out in several other countries (Regan et al., 2012). In the NDS, volunteer participants drive a vehicle (usually their own) for several months or years. In a recent US study, the cars of nearly 3000 drivers were instrumented (Antin, 2011). In the NDS, a Data Acquisition System (DAS) is fitted to a driver’s vehicle which records continuously what is going on in and around the car: what the driver is doing and where they are looking; behaviour of their vehicle (e.g. speed, lane position); behaviour of other road users with whom they interact; and their interactions with physical and meteorological characteristics of the road environment.

Traditional approaches to the collection and analysis of road safety data are limited in the depth, breadth and quality of information they may provide. The NDS, however, has a number of advantages over traditional methods of data collection (Regan et al., 2012):

- **Exposure**: New and more detailed data can be obtained for a wider range of driver, vehicle, road, traffic and environmental factors that increase crash risk.
- **Crash risk**: Data can be used to calculate odds ratios (relative risk) and population attributable risk percentages (proportion of crashes) for a much broader range of risky activities to which drivers expose themselves. The increased risk of exposure to a hazard (eg sending a text message while driving), for example, can be calculated.
- **Near-Crashes**: Data on the thousands of near-crashes that occur regularly on public roads, but which are never reported, can be detected and recorded.
- **Crashes**: NDS data reveal the truth about crash causation—what actually happens.
- **Normative data**: fundamental data can be recorded on how people drive – how they avoid crashes, navigate, maintain speed, adhere to traffic laws; stay within their lane; control the vehicle etc.
- **Violations**: the NDS provides a better understanding of which traffic laws are violated, by whom (drivers and other road users), where, when (e.g., at night) and in what situations (eg when distracted, drunk).
- **Validation**: data from the NDS can be used to validate findings from surveys, observational studies, simulator studies and Police-reported crashes.
• **Evaluation:** data from the NDS can be used to evaluate the effectiveness of new and existing countermeasures eg of advanced driver assistance systems; of new laws; etc.

Flight data monitoring in General Aviation is in its infancy, and very few studies have been conducted and reported (eg Steckel, 2011). This is because it is only in recent times that flight data monitoring equipment has become small enough, cheap enough and easy enough to install in GA aircraft. The equivalent of a naturalistic driving study in aviation – a “Naturalistic Flying Study” (NFS), involving scores or even hundreds of aircraft – has never been conducted in aviation. Such a study has potential to yield all of the categories of data described above, and to greatly enhance and enrich the evidence base in aviation safety.

This paper will describe the challenges and opportunities involved in planning and running a Naturalistic Flying Study in General Aviation, and will describe the design of the world’s first NFS involving GA aircraft that is being planned by the authors as part of a major international collaboration between Australia and the United States, led by the University of New South Wales in Sydney, Australia.

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