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Identifying Accident Factors in Military Aviation:

Applying HFACS to Accident and Incident Reports of the German Armed Forces

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ABSTRACT

Investigating accidents is an important method to enhance safety in aviation. Nevertheless, it is equally important to examine trends and factors across different accidents to adapt accordingly. Therefore, in the first study, 48 accidents and incidents occurring to manned military aircraft of the German Armed Forces between the years 2004 and 2014 were analyzed using the HFACS framework. Results show that preconditions for unsafe acts (37.7%) was observed most often, followed by unsafe acts (36.2%) and organizational influences (17.9%). Unsafe supervision was observed least often (8.2%). Thus, operators on the front line contribute the major part to manned aircraft incurrences in the German Armed Forces while higher levels of HFACS seem to play a smaller part. In the second study, 33 accidents and incidents occurring to unmanned military aircraft of the German Armed Forces between 2004 and 2014 were analyzed, also using the HFACS framework. Results show that technical issues were mentioned most often and human factors were identified considerably less than in manned aircraft.

KEYWORDS

Accident Analysis, Accident Investigation, Content Analysis, German Armed Forces, HFACS, Human Factors Analysis and Classification System, Human Factors, UAV

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INTRODUCTION

Analyzing accidents and incidents clearly is an important method for maintaining and improving safety and is done frequently (e.g. De Voogt, 2011; Goh & Wiegmann, 2002; Li, Harris, & Yu, 2008; Patterson & Shapell, 2010; Schröder-Hinrichs, Baldauf, & Ghirxi, 2011; Van Doorn, 2014; Van Doorn & de Voogt, 2007, 2011), especially in the aviation domain. Analyses of accident reports are mainly used either for identifying potential relationships and trends (e.g. Jenkins, Salmon, Stanton, & Walker, 2010; Lenné, Salmon, Liu, & Trotter, 2012; Patterson & Shapell, 2010) or for validating, adapting and comparing specific accident models (e.g. Celik & Cebi, 2009; Reinach & Viale, 2006; Underwood & Waterson, 2014).

It is necessary to publish such post-hoc analyses of aircraft accident/incident reports to make the results accessible for as much accident and safety researchers as possible. Since the German Armed Forces has never published such results for an international audience, the aim of the current study was to do so.

The Human Factors Analysis and Classification System

The Human Factors Analysis and Classification System (HFACS; Shappell & Wiegmann, 1997, 1998, 2000, 2001; Wiegmann & Shapell, 2001, 2004) is an accident investigation tool for analyzing human error in aviation. It was originally created for military purposes and is by now also a well-known tool for accident investigators in civil aviation and other domains. HFACS distinguishes human error by means of four different levels: 1) unsafe acts, 2) preconditions for unsafe acts, 3) unsafe supervision, and 4) organizational influences (see Figure 1).

At the first level, failures are classified into two categories: errors and violations, at the second level, failures are classified into three categories: environmental factors,

Figure 1. The HFACS framework (Shappell et al., 2007, p. 229)