# Parametric Survivability Analysis of Time to Incapacitation for Fire in Rotorcraft Crew Compartment A Case Study

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## Introduction

This case study details the STAT COE involvement in a Joint Live Fire Aircraft (JLF-air) Program Office test program to examine crew incapacitation in the event of a cabin fire. Excerpts of this case study are taken from the Test Report [1]. Collaboration between STAT COE and the test team commenced with a review of the existing test approach define in the previously-approved test plan. The initial review led to a revised test matrix and a new data analysis approach which increased the power and efficiency in reaching the test's objective. Unpredicted constraints were revealed during the test execution phase which limited the amount of collected data, but did not preclude significant findings in the analysis. Pertinant details of the test approach are described herein, followed by a comparison of the original and revised test matrix designs. Test results are presented and discussed in terms of time-to-incapacitation, based on a parametric survivability analysis of the available data.

The primary objective of this test was to collect data on temperature, visibility, oxygen depletion, carbon monoxide, and other toxic gases to support assessments of physiological constraints within military aircraft crew compartments resulting from fuel fires, as a function of time and distance from the fire source under realistic ventilation conditions. Collected data were intended to define baseline assumptions for future crew casualty models and analyses of time-to-incapacitation ($t_i$) to include:

1. Time-to-incapacitation due to heat effects ($t_{i|temp}$ and $t_{i|2D\ Burn}$).
2. Time-to-incapacitation due to toxic gas effects ($t_{i|toxic\ gas}$).
3. Time-to-incapacitation due to degraded visibility from smoke ($t_{i|visibility}$).