

## Technical Report Documentation Page

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16. Abstract  This report documents the outcomes of the Discovery Phase research for the FAA project "Visualizing Pilot Medical Risk for Executive Awareness." The initiative responded to the challenge of synthesizing diverse, high-dimensional medical and operational datasets such as toxicology findings, FAA medical records, NTSB reports, and MarketScan health data to improve executive decision-making about pilot medical risk. The research leveraged advanced Deep Topological Modeling and adopted military-inspired visualization techniques to reveal temporal and spatial patterns and risk factors hidden in traditional reporting formats. Through the integration of data streams, the project identified four primary pilot cohorts based on medication reporting and use including those reporting and taking medications, reporting but not taking, not reporting but taking, and using illicit substances and mapped differences to the general population using standardized drug hierarchies (notably ATC codes). Results demonstrate that most medication encoding differences between pilots and the broader population occur locally, affecting small clusters of pilots. The research produced dashboard prototypes to support executive situational awareness, proactive anomaly detection, and risk stratification, laying the foundation for operational deployment and a shift from static reporting to predictive, data-informed safety management within the FAA's quarterly briefings.		
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