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VTOLs are aircrafts designed to take off and land vertically, which makes them convenient for use in remote regions. There are different types of VTOLs including helicopters, hybrid aircrafts, cyclocopters, and thrust-vectoring fixed-wing aircrafts. eVTOLs are a type of VTOL that use electric power for take-off and landing and are used for short distance commercial flights. Several companies are working on developing efficient VTOL systems, and Volkswagen China released a prototype eVTOL called the Flying Tiger in 2022. The use of eVTOL aircrafts in Advanced Air Mobility (AAM) and Urban Air Mobility (UAM) has created opportunities for the use of Artificial Intelligence (AI) and Machine Learning (ML). These technologies can be applied in areas such as weather prediction, traffic congestion analysis, spatial analysis for landing locations, dispatching, and routing decision-making, and autonomous piloting. Developers use ML algorithms, including Multinomial logistic regression, Artificial Neural Networks, Random Forests, and Gradient boosting, to map the relationship between demand and predictor levels. Computer vision systems, like Daedalean AG's Raven, use ML and AI for positioning, landmark recognition, regular and emergency landing guidance, and traffic recognition. During testing, neural networks were used for landing guidance during emergencies. The visual positional system was used to track the aircraft's flight path visually using a black camera pod attached to the aircraft's nose. The design and operation of an autonomous personal air travel vehicle (APAV) for urban areas must consider sensing and perception, control and navigation, communication and integration, redundancy, and safety, as well as certification and regulations. The APAV should be equipped with sensors and cameras to detect and avoid obstacles, have a high degree of agility and manoeuvrability, communicate with other aircrafts and ground stations, include redundancy for safety, and comply with regulatory requirements. The machine learning problem in the context of designing an autonomous personal air travel vehicle (APAV) with collision avoidance systems involves the vehicle learning from experience E to achieve the task T of safe transportation of passengers with a performance measure P. The APAV must have a collision avoidance system that detects and responds to potential collisions in real-time using sensor data analysis, accurately identifying obstacles, and calculating their trajectory to provide alerts and path guidance to the VTOL control system. The VTOL must navigate through non-deterministic environments, avoid obstacles, and maintain safe distances from other airborne vehicles or objects, while adapting to changing environmental variables. The experience parameters involve training the collision avoidance system using data from various sources, including simulated pilot pathways, virtual flight tests, and air traffic control systems. The model must be reconfigured based on the feedback obtained from the training process to improve its accuracy. Thus, the use of machine learning in VTOL technology can improve flight control, navigation, collision avoidance, self-maintenance, and battery optimization. The design and operation of APAVs in urban and non-deterministic environments using collision avoidance systems require consideration of various parameters, including sensing & perception, control & navigation, communication & integration, redundancy & safety, and certification & regulations. The collision avoidance system's performance parameter should accurately detect potential collisions and redirect the VTOL to a safe path. The task parameter requires preventing collisions during take-off, landing, and flight. The experience parameter involves using data from flight tests, virtual flight tests, and other sources to train the collision avoidance system.

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