

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Satellite Services (4)

Author: Mr. Maximilian Prexl
Technical University of Munich (TUM), Germany

Mr. Matthias Tebbe
Technical University of Munich (TUM), Germany

Mr. Jan Harder
Technical University of Munich (TUM), Germany

Mr. Jürgen Letschnik
Technical University of Munich (TUM), Germany

Prof. Ulrich Walter
Technical University of Munich (TUM), Germany

TELEOPERATION OF UNMANNED AERIAL VEHICLES FOR EMERGENCY SERVICES AS A
FUTURE SATELLITE COMMUNICATION APPLICATION

Abstract

Unmanned aerial vehicles (UAV) have profited from recent achievements in miniaturization of electronic devices in the last decades. Due to these improvements, UAVs possess a great potential as a camera and sensor platform for various applications. Especially emergency services use commercial camera multicopters as a tool to find missing persons, locate fire sources, retrieve information for strategic decision making and documentation. Nevertheless, specialized UAV-pilots are necessary for such operations which may not be present on-site. Therefore, there is a specific need for an intuitive and fast teleoperation of UAVs controlled by a dispatcher in a coordination center, which could reduce work load on the firefighter's side. Considerations about the limited bandwidth and latencies has to be made for a setup over a satellite relay. A possible solution will be demonstrated by the DLR funded project *Copter control over a Ka-band satellite* (CopKa). It consists of a teleoperated UAV, equipped with a video camera to assist firefighters in search and rescue scenarios. The communication link to a coordination center is closed via a geostationary relay satellite. The aim of this project is to provide a dispatcher located at a coordination center with an intuitive tool that allows a fast and risk free evaluation of emergency situations, enabling fast support measures by a remotely controlled UAV. In order to realize this concept multiple aspects like communication link properties, connection buildups and save UAV teleoperation have to be considered. The communication links have to be investigated with respect to accessibility, necessary data rates, latencies and susceptibility to weather events. Notwithstanding of the technical link properties, law, regulations and safety issues for the UAV have to be addressed for a future approval by governmental organizations. Teleoperation of the UAV requires an intuitive tool to increase situation awareness, safety and lower time of practice. These topics are investigated using an enhanced human-machine-interface and virtual reality technology. A further challenge is the connection buildup which starts with a rapid auto pointing mechanism and fast service delivery of the satellite service after signal tracking. In this work, we present recent achievements of our research for the described satellite communication application including results on communication link requirements, operational aspects and connection buildup technologies.