**Design and Evaluation of a UAS combining Cognitive Automation and Optimal Control**

* Abstract
* Keywords

1. **Introduction**

* State of the Art (Current concepts of UAV guidance and operator support, separate concept and development of mission management and ‘optimal control’ path generation / flight control elements)
* Resulting problems and motivation for further CoCAMPUS project and development
* CoCAMPUS mission as a generic Air-Attack mission

1. **Cognitive Automation**

* The idea behind cognitive automation and its differences to conventional automation, introduction of an ACU as a single mission management unit
* Task Based Guidance paradigm to support and enable single operator UAV missions on a task level (Tasks are exemplarily derived to conduct the CoCAMPUS mission)
* COSA² as the ‚operating framework‘ to realize an ACU
* The new Knowledge Modeling Methodology (Leads to an exemplary knowledge representation and agenda von COSA²)

1. **Optimal Control**

* Real-Time path generation accounting for boundary condition and dynamic constraints (Including work of Pierre Aurich, implementing static threats and deriving weights with MOVI)
* Path Following for augmentation of commercial autopilot onboard the UAV

1. **Systems Engineering Approach**

* System Architecture to meet mission requirements and properly support the single operator by designing a semi-autonomous UAS with COSA as decision making engine.
* Interfaces between the cognitive automation and the optimal control elements, to show how to merge the symbolic reasoning and the parametric control worlds.

1. **Flight Tests & Results**

* Flight Test setup and ‚mission design‘ in Camp Roberts, CA
* Results of the path following setup, controlling the UAV on generated trajectories
* COSA² interactions with underlying automation elements ( Commands, information …)
* Overcoming unpredicted loss of aircraft control (COSA² using optimal control elements and sensor automation as part of a ‘never give up’ strategy following given tasks even in unforeseen events)

1. **Conclusion & Future Work**