

Boundary-Avoidance Tracking and It's Use in Handling Qualities Evaluations

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Abstract: The strategies used by operators to control machines have long been of keen interest to the flight test community. Research into these strategies has, until recently, assumed that pilots control their aircraft solely to maintain some condition. In 2004, boundary-avoidance tracking (BAT) was recognized as a strategy wherein pilots control their machines to avoid a condition. While BAT has provided some insight into pilot-induced oscillations (especially those involving hazardous boundaries) it has more recently been utilized at the USAF Test Pilot School to evaluate aircraft handling qualities using a subjective build-up approach.

An abbreviated history of BAT research at the USAF TPS is presented, from initial computer modeling to in-flight testing on the variable stability NF-16D VISTA aircraft. Earlier tests have demonstrated the existence of boundary-avoidance tracking, produced results that suggest modeling of pilot boundary-avoidance response is possible, and illustrated how tracking data gathered using boundaries may aid in characterizing aircraft handling qualities. Furthermore, the VISTA test showed a good subjective correlation between the Cooper-Harper task results and a BAT right test technique (FTT), strongly suggesting that an FTT utilizing boundaries may be sufficient to subjectively characterize an aircraft's pilot-in-the-loop capabilities for some tasks.

This success and others have led to the incorporation of BAT flight test techniques into the USAF TPS handling qualities syllabus to aid in training students about the effects of pilot gain and to provide a potential tool for their future flight test endeavors.