



CURTIS E. LEMAY CENTER

FOR DOCTRINE DEVELOPMENT AND EDUCATION



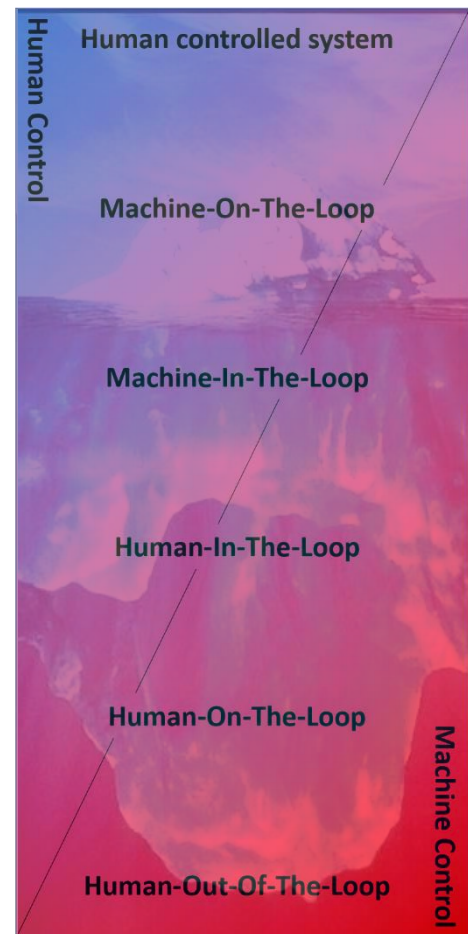
AIR FORCE DOCTRINE PUBLICATION (AFDP) 3-99 DEPARTMENT OF THE AIR FORCE ROLE IN JOINT ALL- DOMAIN OPERATIONS (JADO)

08 OCT 2020

HUMAN-MACHINE TEAMING

To achieve rapid adaptation necessary for all-domain operations, better human-machine teaming is required. Machine-to-machine communication and predictive modeling will be critical to moving away from current, imprecise procedural controls like those outlined in airspace control doctrine; these advanced human-machine teaming capabilities are in development. Effectively employing these systems requires a framework for understanding their employment. Nuanced value judgements require human decisions, and when and how leaders make those decisions will vary. Commanders should understand and balance benefits and risks of human-machine relationships. Airmen need to train as part of human-machine teams in order to build appropriate levels of understanding, trust, and skepticism with their machines. Examples:

- ★ Human Controlled System: A drill (machine does exactly what you tell it to)
- ★ Machine-On-the-Loop: Dashboard lights (machine performs some processes to simplify operation)
- ★ Human-In-the-Loop: Power plant control system (machine seeks input at critical decisions)
- ★ Human-On-the-Loop: Self-driving cars (machine can run by itself, but can be overridden)
- ★ Human-Out-of-the-Loop: Swarm drones (machine runs without human intervention)



**Degrees of Human and
Machine Control**