Human-Machine Teaming
711ᵗʰ Human Performance Wing

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Integrity ★ Service ★ Excellence

Automation and Autonomy

Automation

Autonomy

The system functions with no/little human operator involvement; however, the system performance is limited to the specific actions it has been designed to do.

Typically these are well-defined tasks that have predetermined responses (i.e., simple rule-based responses.

Systems which have a set of intelligence-based capabilities that allow it to respond to situations that were not pre-programmed or anticipated in the design (i.e., decision-based responses).

Autonomous systems have a degree of self-government and self-directed behavior (with the human's proxy for decisions).

AFRL Autonomy
Vision & Goals

Ensure operations in complex, contested environment

Demonstrate highly effective human-machine teaming

Intelligent machines seamlessly integrated with humans - maximizing mission performance in complex and contested environments
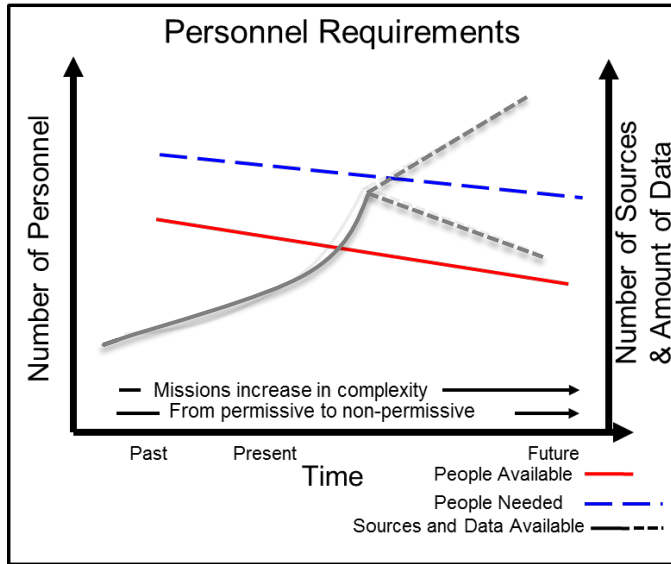
Create actively coordinated teams of multiple machines

Ensure safe and effective systems in unanticipated & dynamic environments

The PED Cell

Personnel Requirements

"We have roughly, let's say, 6,000 analysts across the DCGS enterprise—by about 2015, [we'll] need over 100,000 analysts," …."And obviously, **we're not going to do that because we don't have those people**." Outgoing AF/A2*

* Lt Gen Larry D. James quoted in "Focusing ISR," Air Force Magazine, Oct 2013, pg 47
** Air Fore ISR 2023: Delivering Decision Advantage, signed by Lt Gen Robert P. Otto, 2013, pg 14

Human-Machine Teaming for Autonomous Systems

| HUMAN DECISIONS GUIDE MACHINE BEHAVIOR | HUMAN AND MACHINE TEAM TOGETHER TO MAKE DECISONS |

HUMAN OPERATOR INTERFACE AGENT

HUMAN OPERATOR INTERFACE AGENT

Current Status

Future Status

Bi-Directional Flow of Information

Human-Machine Teaming Augmentation Framework

- Extraction of objective human measures to inform empirical studies
- Implement a controlled feedback cycle

SENSE

AUGMENT

ASSESS

detached from skin

attached to skin

5mm

Human-Centric "Control Loop"

Machine-Centric Control Loop

SENSE

AUGMENT

ASSESS

reference — input — output

K

Human Performance = $f(I/V, t, …)$

Nesting
Interdependence
Time Constants

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