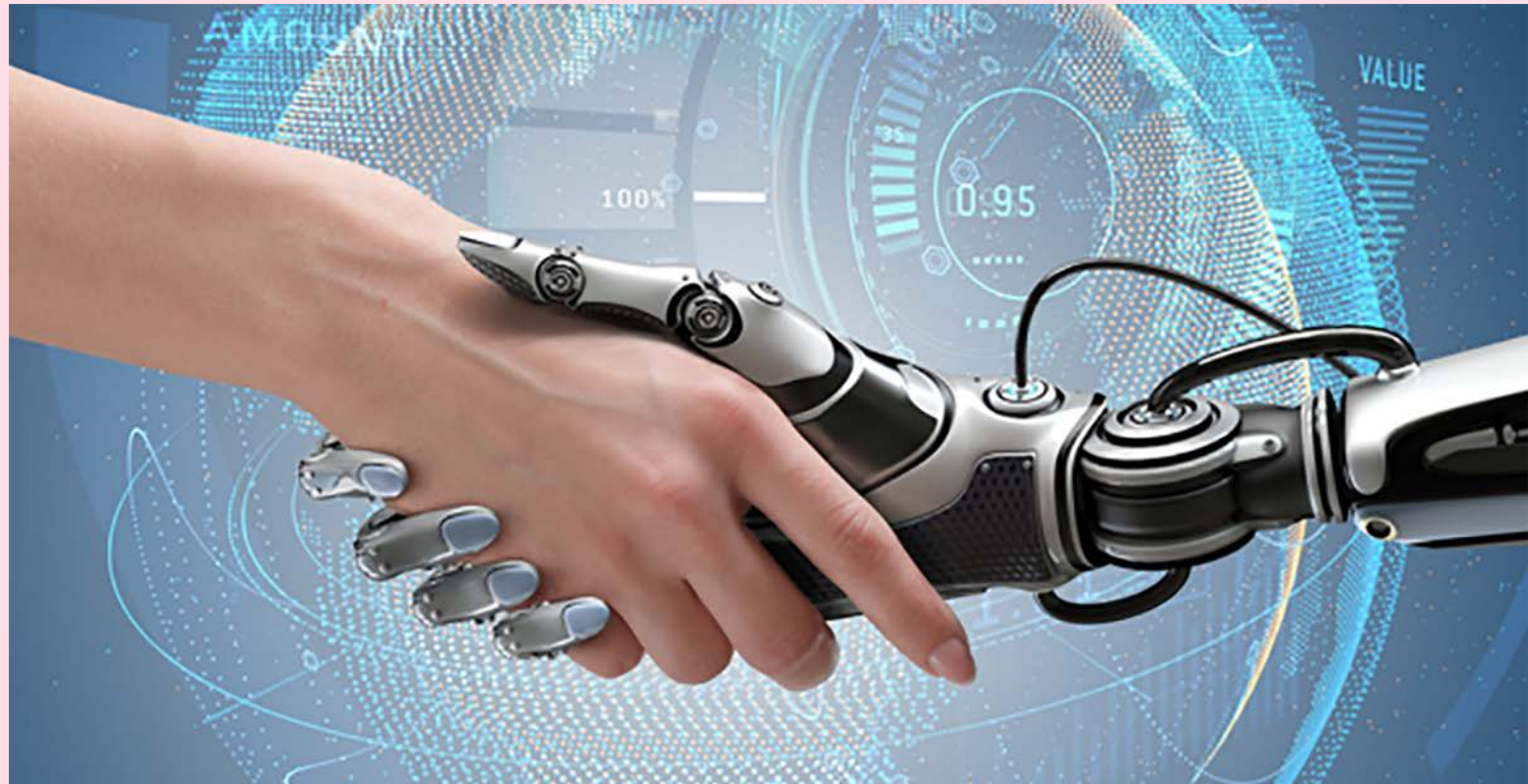


Functional human – machine teaming in safety critical systems

Arne Jarl Ringstad



Human control

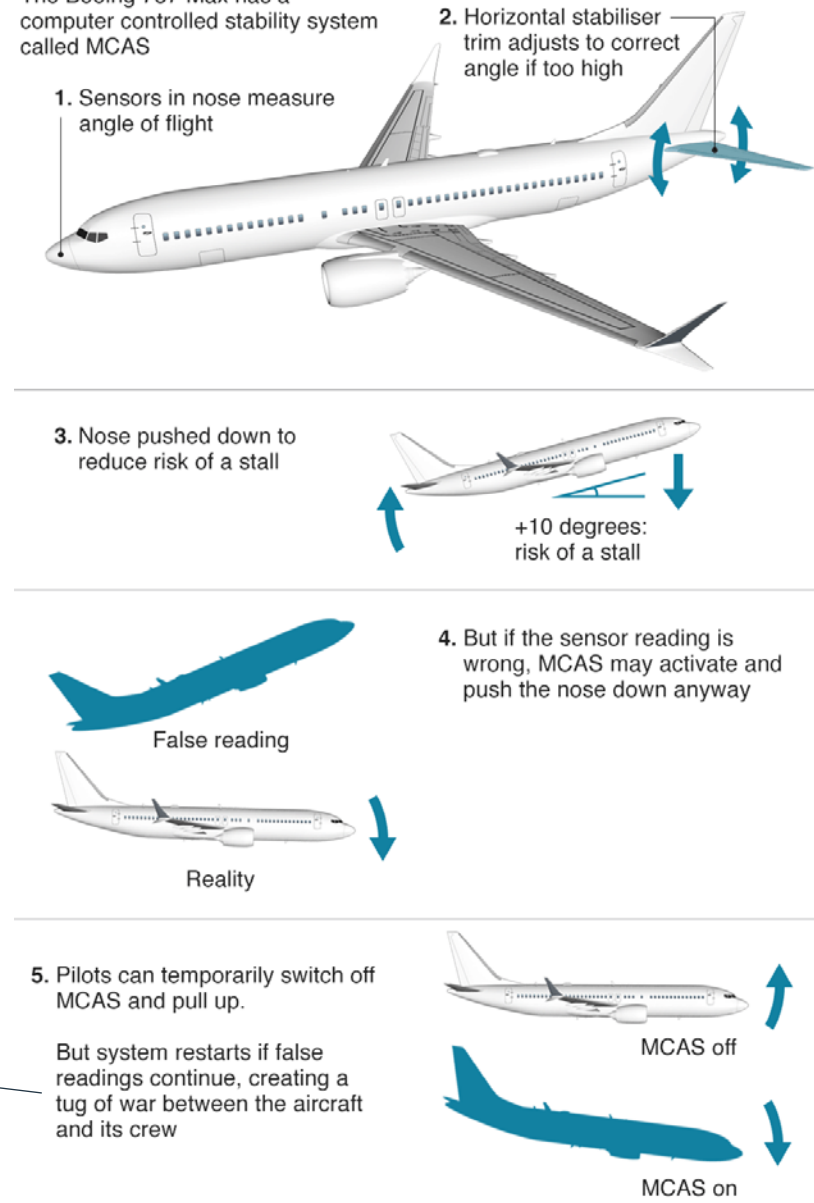
“The human operators shall always have the authority in the human-machine system. Operator shall have control of the different states of automatic systems and sequences in all operational modes.”

(TR1212 Operator Station HMI).

Pilots overruled by computers in the Boeing Max accidents

How the MCAS system works

The Boeing 737 Max has a computer controlled stability system called MCAS

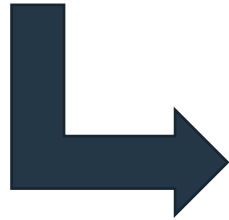


The irony of automation

Necessary to keep «.humans in the loop.»



Reduction of work tasks



- Operators less trained/experienced when called to action
- System may become more opaque – more difficult to diagnose/understand what is happening

Potential operator challenges related to increased digitalisation

- Operator complacency – “The system will fix the problem. It always does.”
- Operator lack of understanding – “The system is like a black box. I really haven’t a clue about what’s going on.”
- Operator response uncertainty – “I understand the problem, but I am not sure how to respond.”
- Operator trust in own judgment – “I believe I should shut down now, but the computer says no.”
- Operator inactivity – “Wow! Nothing happens for hours, and then all hell breaks loose.”



Simulator training



WR2927 - Kontrollromsopplæring og re-trening

Prosessområde:	Drift og vedlikehold (O&M)
Eier:	Morten Meinich
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System:	
Kompetanse:	
Gyldighetsområde:	



Meaningful Human Control of Digitalized Systems

- Joint industry initiative in the Norwegian oil and gas industry
- Time line 2021-2025
- Led by SINTEF





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