

MQ-1B Predator Drone Mishap

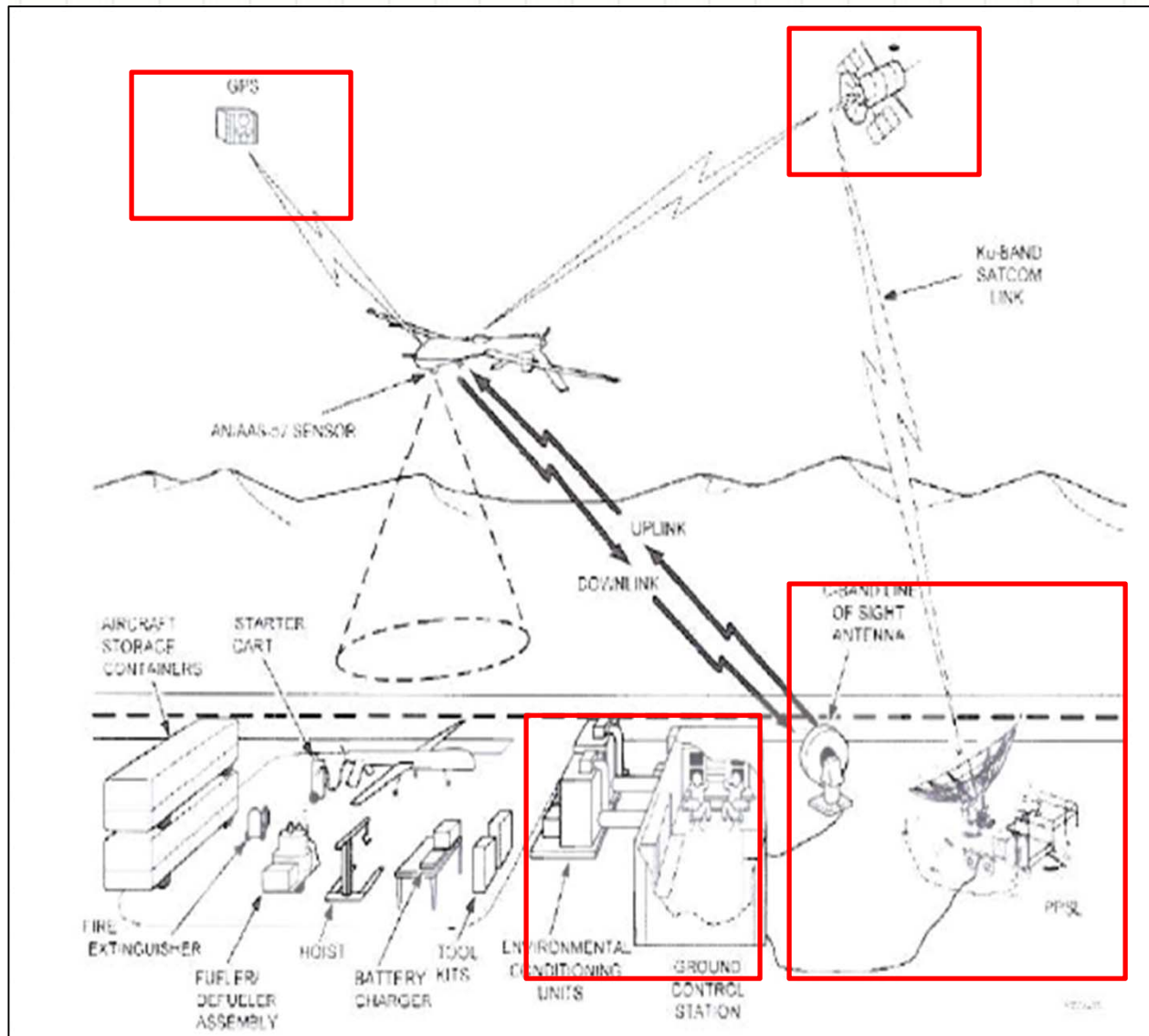
Brief on Mishap

- Horn of Africa
- US Air Force Base
- MQ 1-B Predator
- Private Inc. based in CA
- In-flight simulation
- Resulted in Mishap
- Inexperienced Operators
- Equipment Malfunction



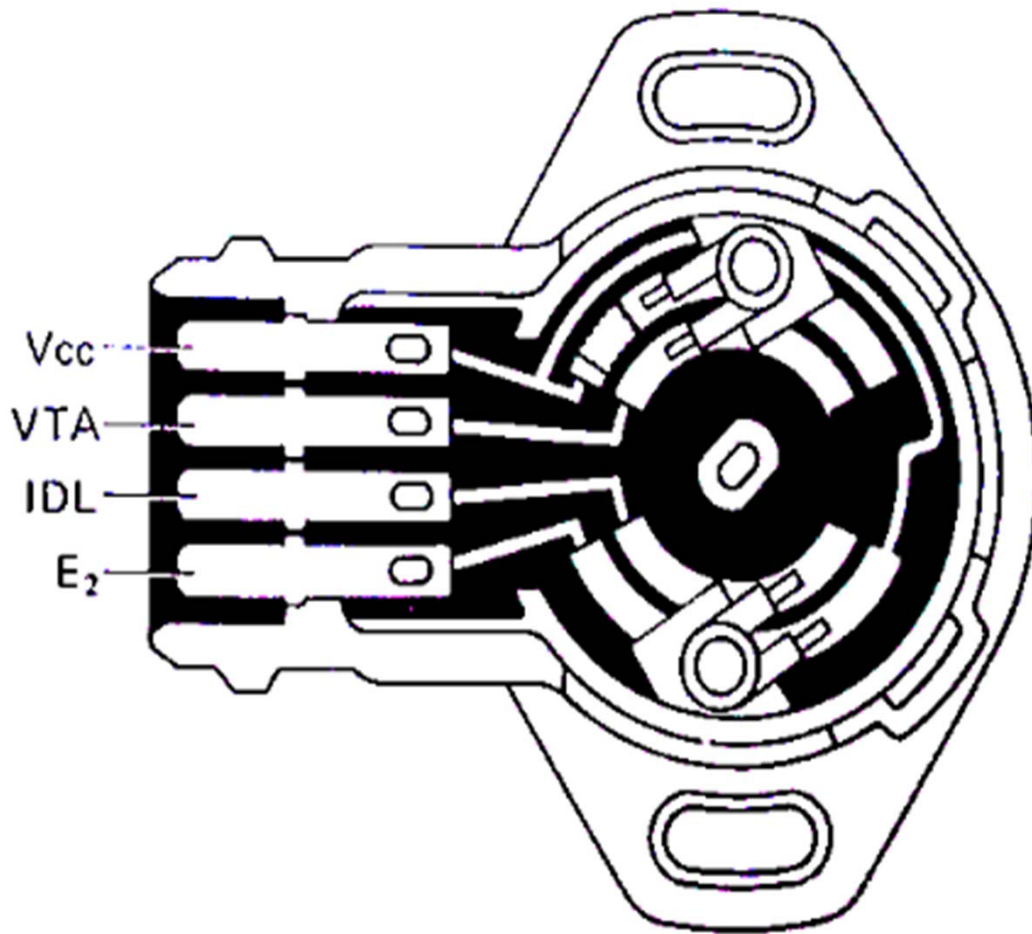
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Computer System

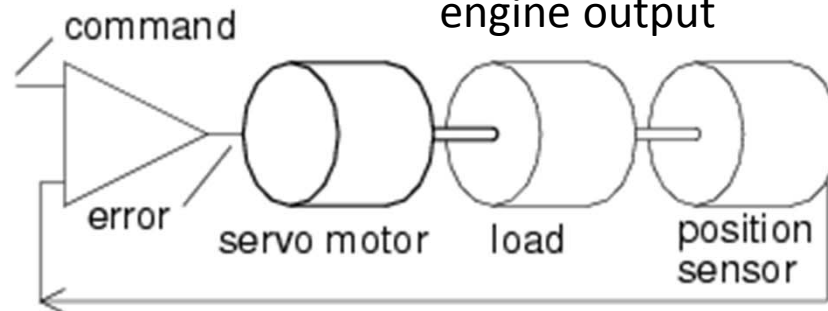
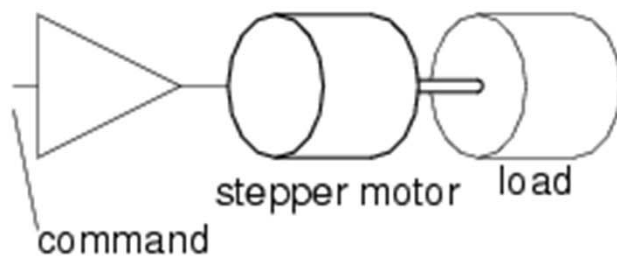


- ❖ Predator Primary Satellite Link (PPSL)
- ❖ Line of Sight Link (LOS)
- ❖ GPS
- ❖ Ground Control Station
 - ❖ Pilot
 - ❖ Sensor Operator

Normal Functions & Operations of Computer system



- ✓ Medium Altitude
- ✓ Long endurance
- ✓ Remotely piloted aircraft
- ✓ Servo motor armature is remotely controlled and regulated for variant throttle positions.
- ✓ Throttle controls power to engine
- ✓ Throttle position sensor gives feedback to controller
- ✓ Waste-gate adjustments actuate engine output



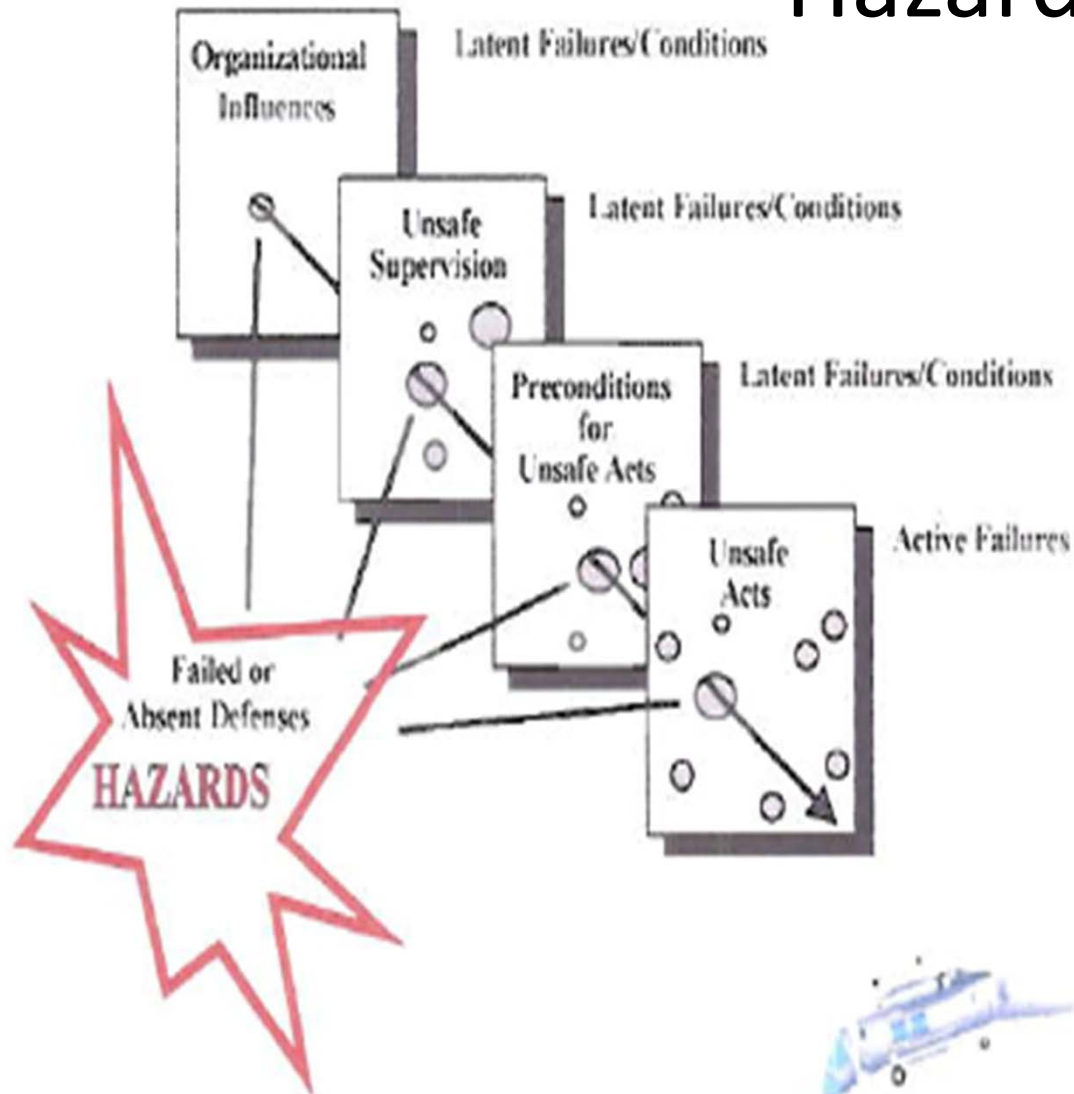
Stepper motor vs servo motor.

List of Hazards and Descriptions



1. Hardware Component Failure:
 - Hot melted epoxy hardened
2. Sensor Detection Faulty:
 - Throttle jammed at normal threshold
3. High Temp > 130 C
 - Low thermal conductivity in epoxy
4. Excessive engine heat checklist
 - Shut engine down
5. Engine high fuel burn ratio
 - Engine should have been disengaged

Failures and Faults that might lead to the Hazards



- Servo Motor case
 - Temperature > 130°C
 - excessive heat
 - Melted insulating epoxy components
 - Failed throttle servo jam at 88%
 - Excessive thrust
 - Waste gate adjustments not efficient enough to idle engine
 - Low thermal conductivity in the component insulation
- Pilot Error
 - Failed to follow proper emergency protocol

Advanced materials with advanced properties could have limited the heat transfer damage

A combination of software/system, electrical and human error contributed to the mishap

Pilot could not diagnose the throttle servo failure

CONCLUSIONS

