



(Austrian Federal Railways)

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IRSC 2025

*Advancing Railway Safety through
Innovations and Collaborations*

Hong Kong, China 25th - 30th November 2025

Train-meets-Plane

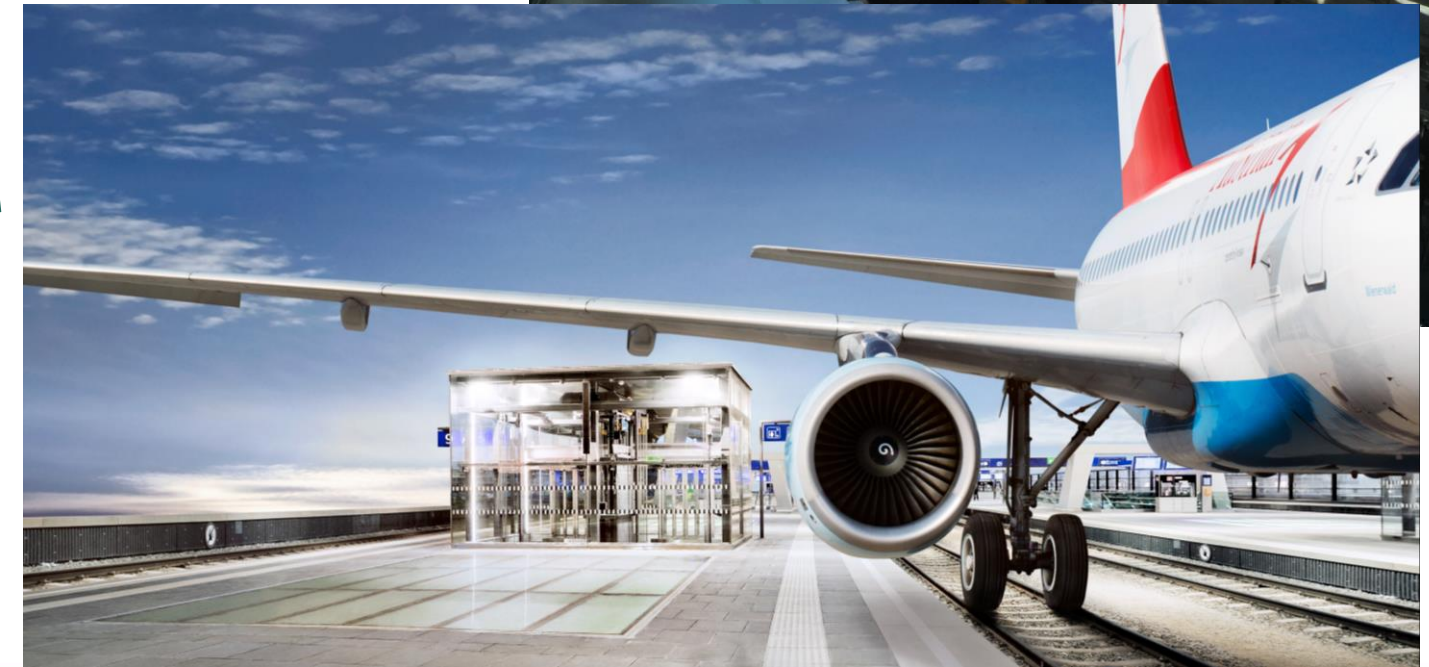
How safety concepts in aviation contribute to new safety levels in train operation

Dr. Peter Woditschka
Mobility Expert & Airline Pilot
in Cooperation with 

Dr. Peter Woditschka

- **Research and Development in Rail Industry**
 - high-speed train bogies
 - electrical motors for locomotions
- **Strategy consulting & University lecturer**
 - OEMs and operators
 - Strategy, ops excellence and safety
- **Airline Pilot**
 - Fokker 70/100 Jet, Dash 8 Q400 Turboprop, Airbus A320/A321 Jet

Engineer
Academia
Pilot



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Who is ahead, Train or Plane?

1. **Railindustry has solved it**, Aviation suffers a lot
→ **Climate change** See slides „Electric trains, electric planes“
2. **Aviation has solved it**, the Railindustry suffers a lot
→ **International harmonization** See slide „Flying an ILS around the world“
3. **Both industries are equally affected**
→ **Safe operation** Today's' focus: „**Closed loop concept**“



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Electric Trains, Electric Planes...



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Electric Trains, Electric Planes...

1. Electric trains (e.g. in Austria)

- 90% of traffic / 78% if tracks already electric (overhead supply)
- Even on the non-electric tracks we find electric trains soon

2. Study about electric passenger planes

- 2035..2040: 60min turboprop mission possible
- 2040..2045: 10hrs longrange mission possible



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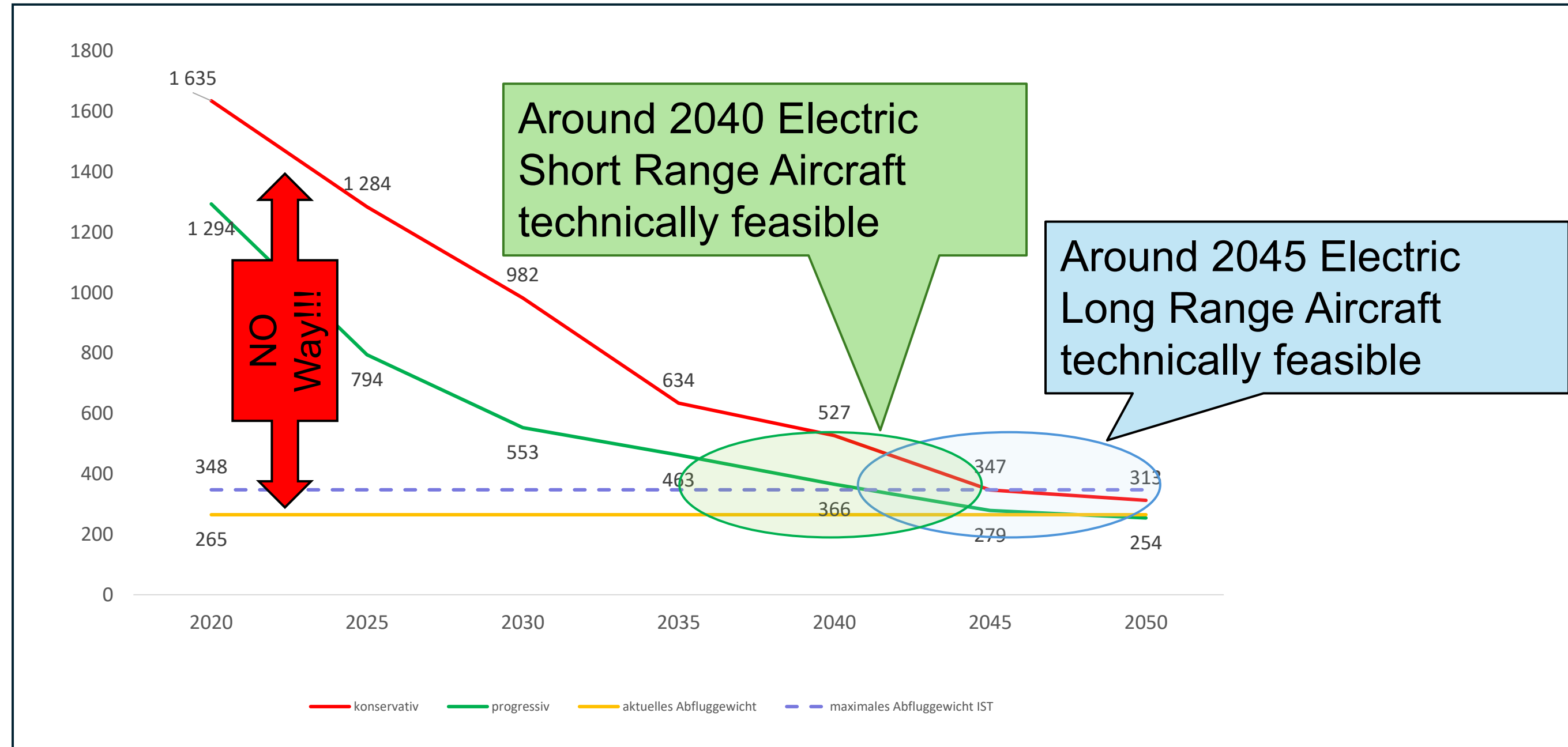


Electric Planes...

Study about feasibility of electric planes:

Expected weight in t if kerosene tank is replaced by (efficiency-adjusted) battery.

Feasibility reached when weight comes in the order of magnitude of the current maximum weight

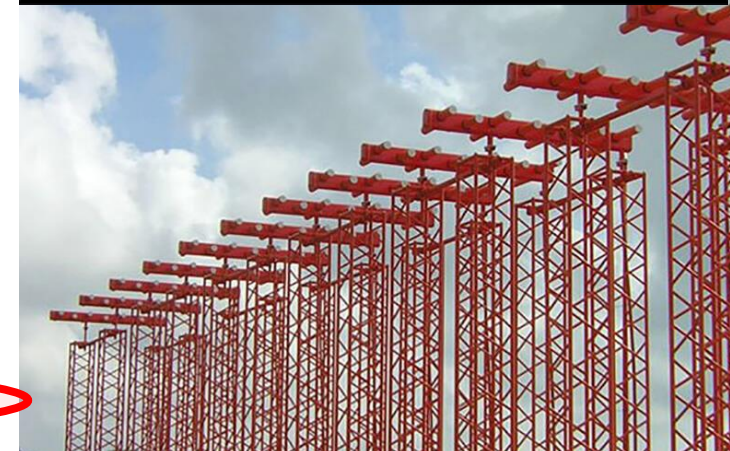
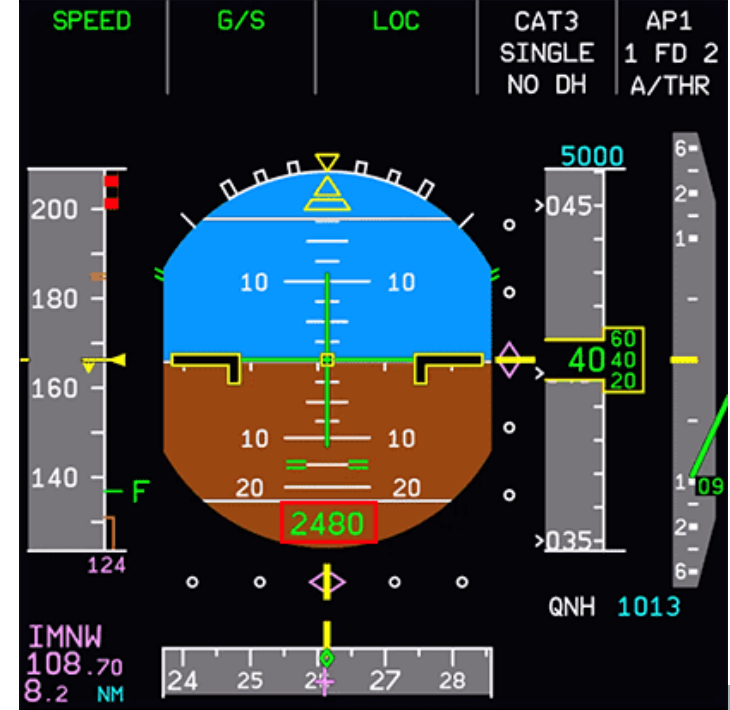


ILS in the US, France, Italy, China...

ILS (Instrument Landing System)

- Yes, also in aviation it is (was) a topic; still minor technical differences e.g. meters vs feet for altitude
- Same receiver, same ground technology, same procedures,...
- What is the main difference in the mentioned countries?
→ the slang/accent of the ATC controller!!!

...compare that to train-control-systems, operators' language, operating-procedures



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When closed loop communication fails...

Two examples, where **communication failures** worsened significantly the outcome of an accident

- Paris, Gare de Lyon train accident
- Everglades plane crash



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Loss of braking in local train / Paris

27.6.1988, Paris Gare de Lyon

Loss of braking in local train, fully loaded, 56 fatalities (all in another train!!!)

Chain of events:

- Passenger misused emergency brake
- During reset inadvertent deactivation of most brakes
- Downhill track towards to final stop in Paris / Gare de Lyon
- Electric brake normally not used, therefore forgotten
- Excellent crash preparation inside the train → no fatalities inside the train
- **Mishap during communication: rail control center confused which train was out of control → train directed to an occupied track**
- Crash with 70km/h into an almost fully loaded train, waiting for departure



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"How are things comin' along out there?"

29.12.1972, Florida, USA:

- 1 "gear down & locked-indicator" didn't show a green light
 - Go-around and holding initiated
 - Neither pilot realized that the plane started descending
 - Air traffic control noticed the low altitude and asked:
"How are things comin' along out there?"
 - Pilot answered "gear problem solved"
 - Plane crashed seconds later
 - 101 fatalities, 75 survivors
- Main failures: **Communication** & preoccupation with a single problem



Closed loop communication

Example how closed loop communication is ensured in high-speed-train operation at ÖBB

Head of train staff - action when departure time is reached:

- Signal NOT RED?
 - All doors closed?
 - Platform safe to depart?
- Call Train Driver

Train Driver after receiving the call from head of train staff:

- Signal NOT RED (doublecheck with head of train)
 - Warning lights for open doors extinguished?
 - Platform safe to depart?
- **Accelerate the train**



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FIRE!!! - Closed loop communication

Pilots reaction if an aircraft engine catches fire during take-off?

- Three main items:
thrust idle, fuel off, activate fire extinguisher

→ Key challenge?

1) Perform those three items for the ENGINE ON FIRE
AND

2) Do NOT perform ANY of those items for the GOOD ENGINE



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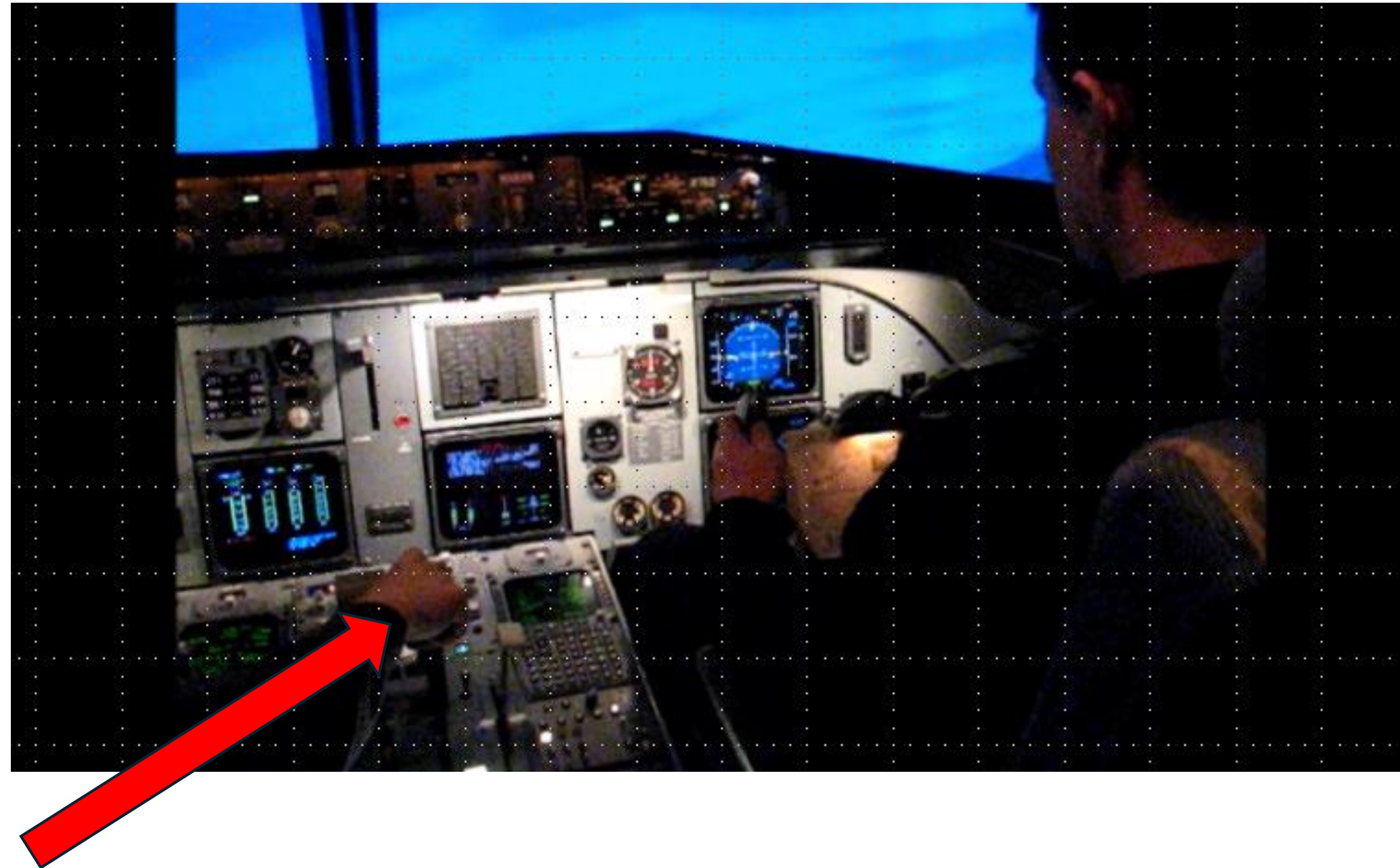


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FIRE!!! - Closed loop communication

- One pilot puts **hand on the correct thrust lever** and asks the other pilot: “confirm thrust lever 2”
- Second pilot checks that **hand is on the correct thrust lever** and replies “I confirm thrust lever 2 to idle”

ONLY AFTER THIS CONFIRMATION the thrust lever is actually moved to idle!



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„Train-meets-Plane“: 2 main focus groups

SYSTEM ARCHITECTS

- Target group → Managers
- Key question → How do I **design my system** to get the safest possible operation?

SYSTEM OPERATORS

- Target group → Front end operators (e.g. train drivers/pilots,...) & their trainers
- Key questions → **How do I drive** my train / fly my plane and which „tips & tricks“ help me to do that the best way?



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Let's see how we do “Train-meets-Plane” in practise....



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Conclusion

- Communication needs to be **structured, standardized and trained**
 - Aviation AND Rail benefit from a
CLOSED LOOP COMMUNICATION and CROSS-CHECKING of human actions
 - Cross-industrial exchange helps to improve the Rail System
- Invest in Training-standards
→ Keep an eye on aviation
- Many more aspects are discussed in Train-meets-Plane
Decision making / Safety-Culture / Reporting-Culture / Dealing with mistakes /
Hierarchy vs. Speak-up-attitude /



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Thank you!



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