

Air Midwest Flight 5481, Charlotte, NC Board Meeting

Kevin J. Renze, Ph.D.

Airplane Performance



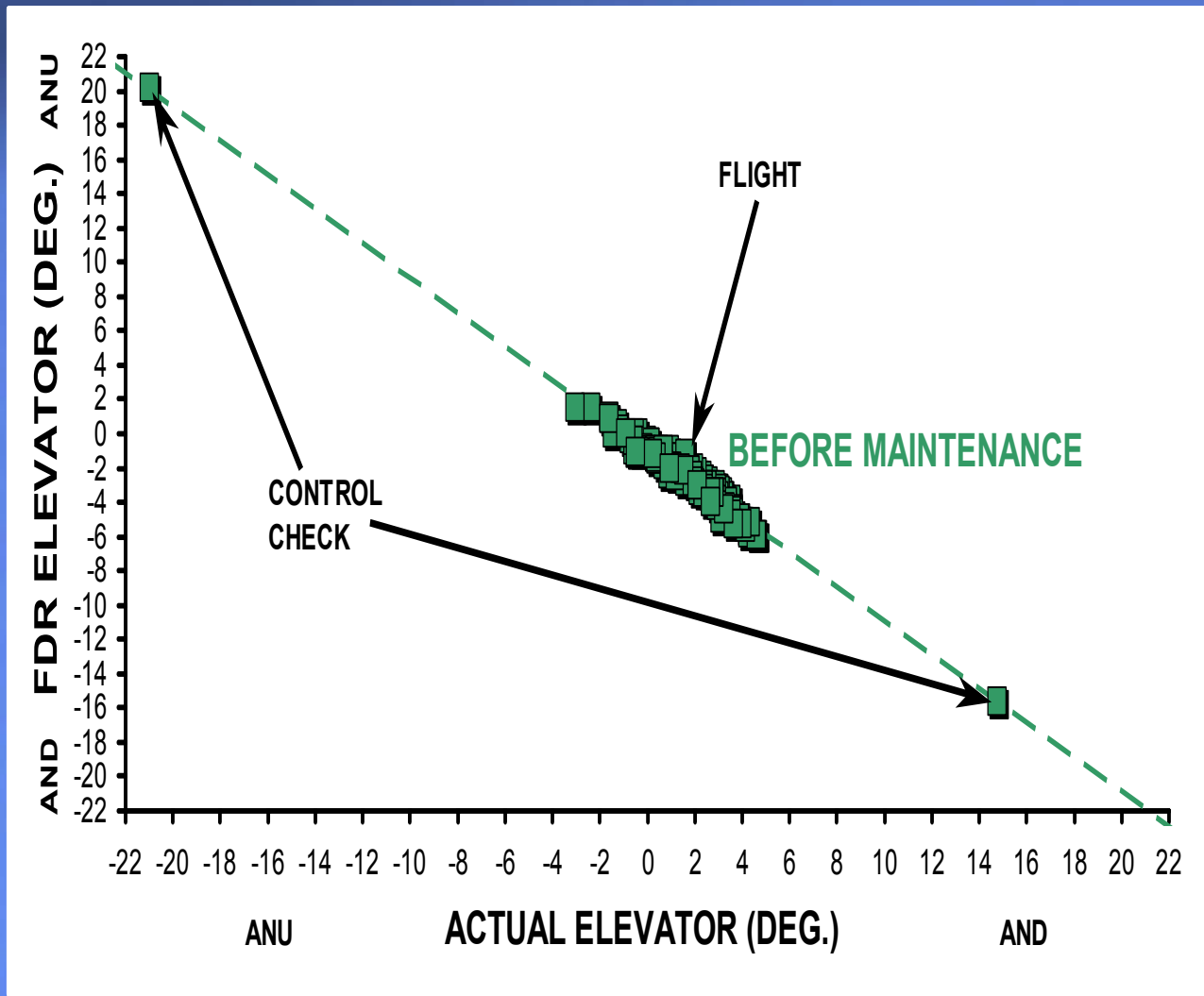
National Transportation Safety Board

Elevator Control Authority Investigation

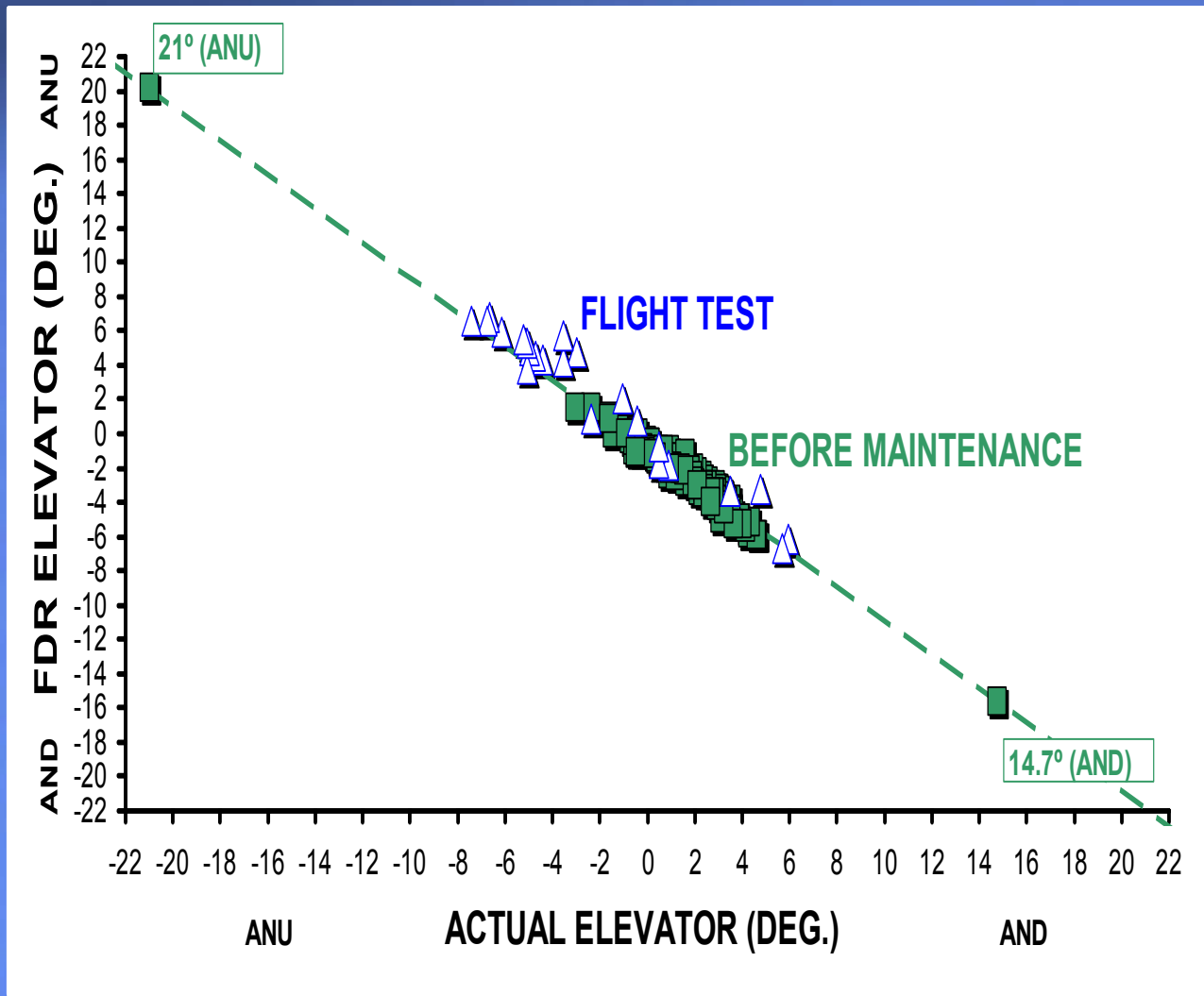
- FDR data from 84 previous flights operated with the accident airplane
- Beechcraft 1900D simulation



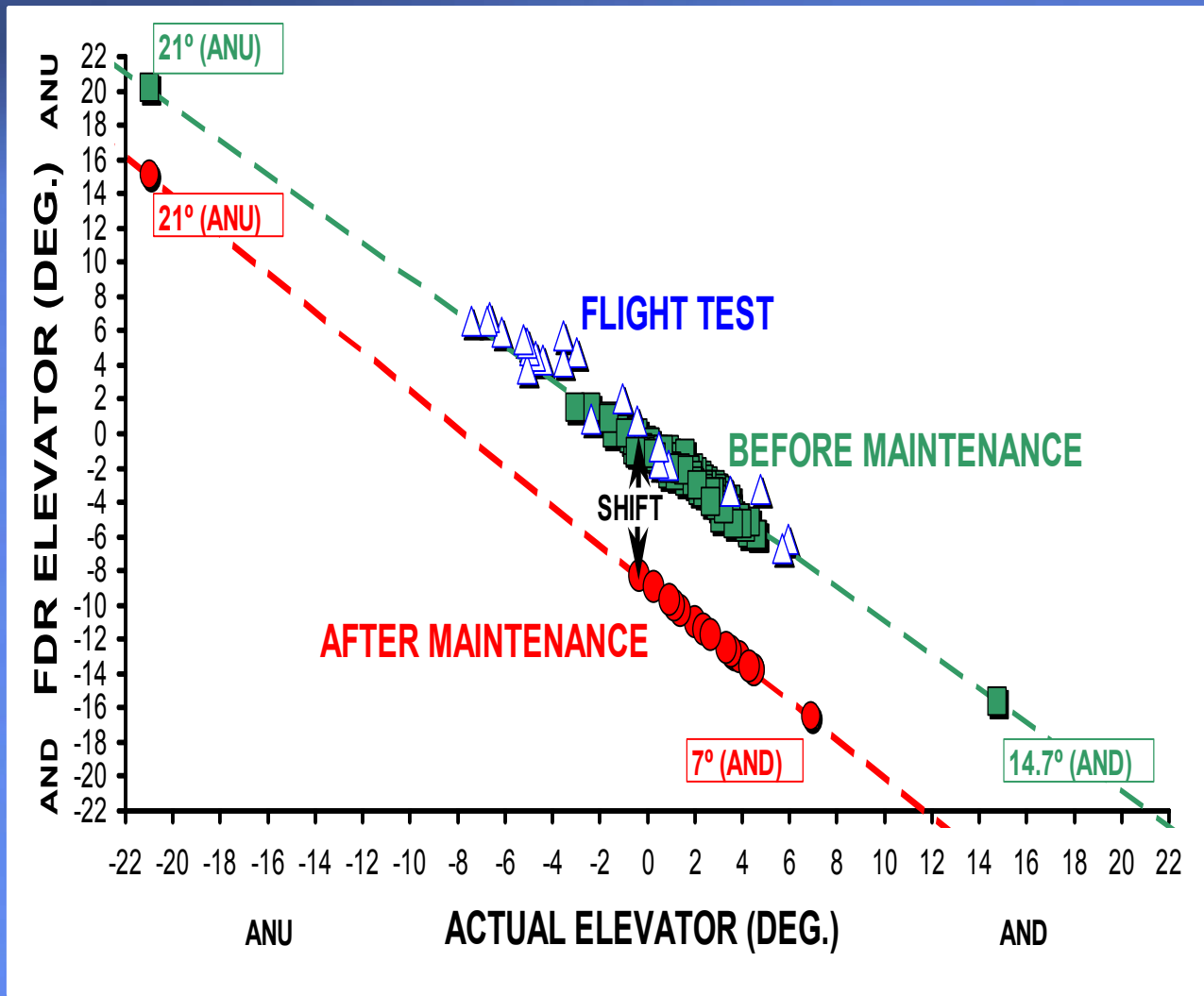
Elevator Travel Range



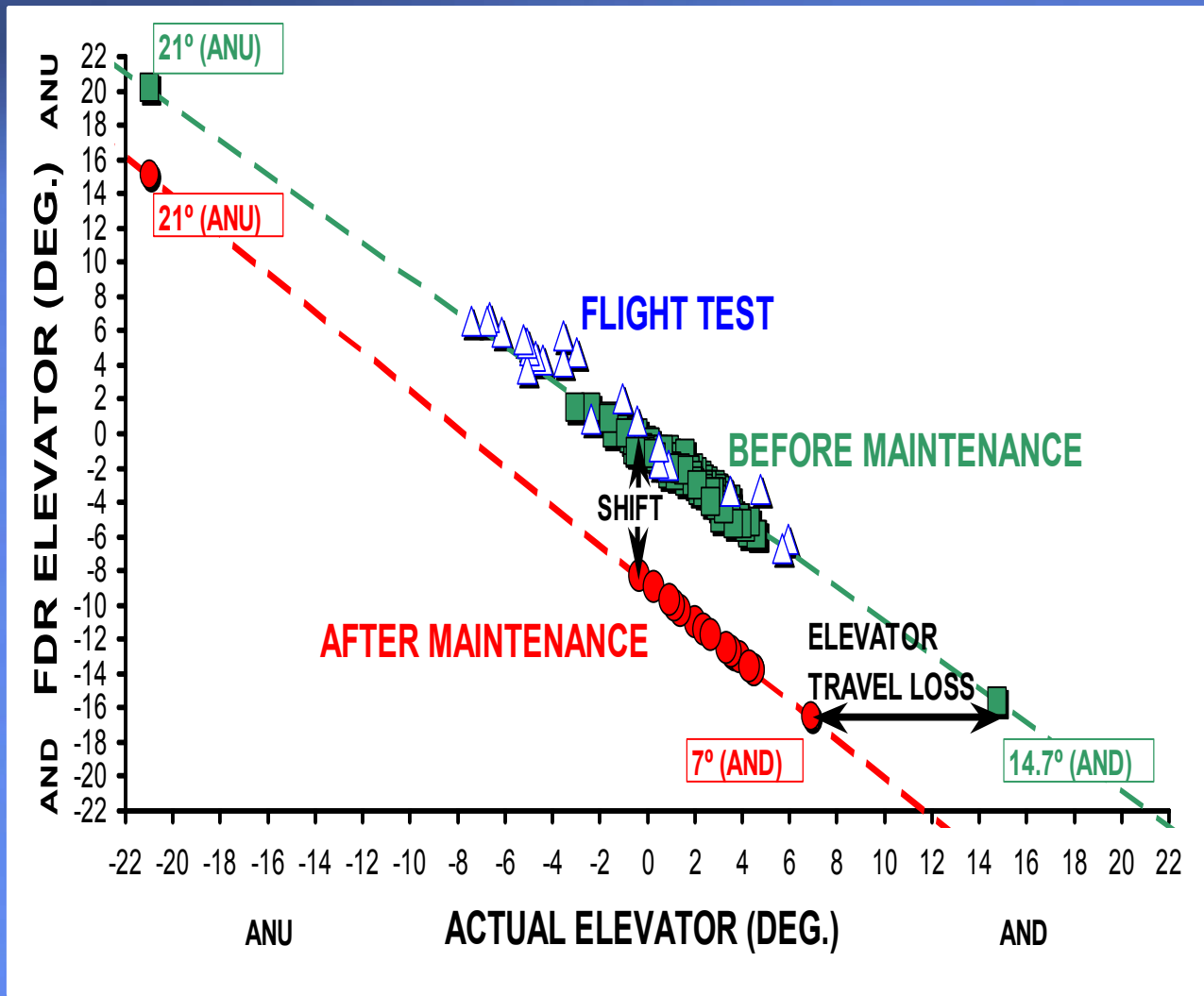
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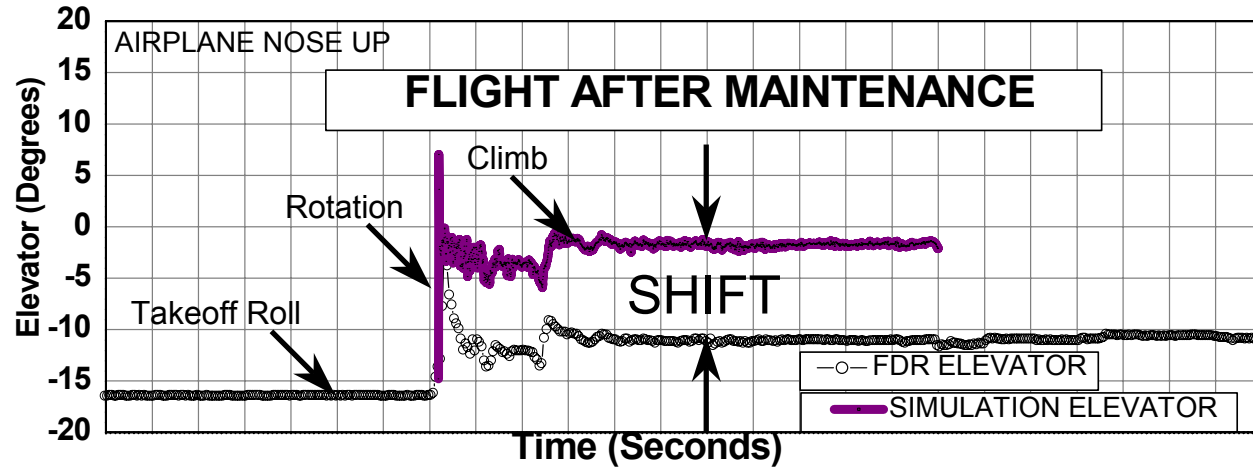
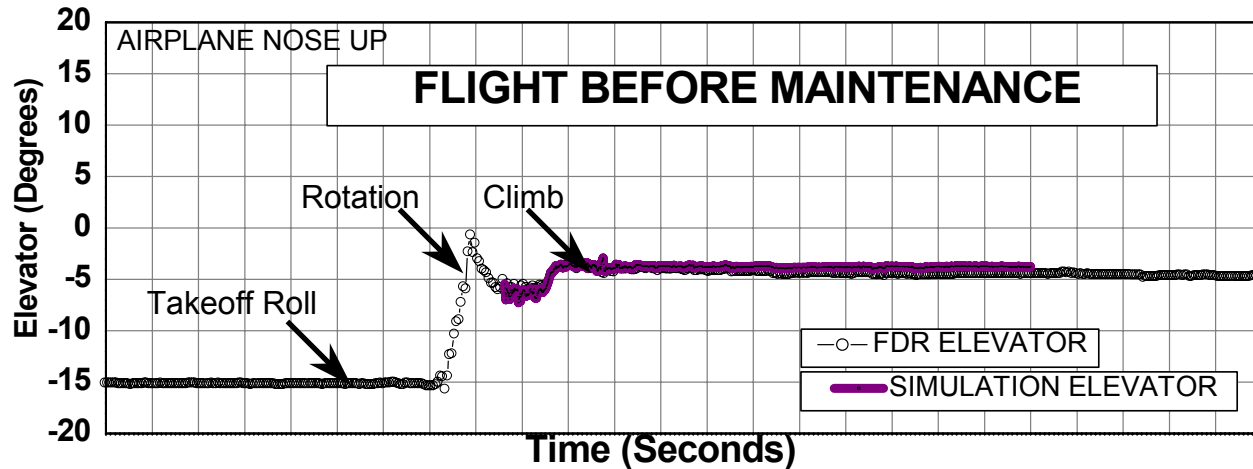


Beechcraft 1900D Simulation

- Engineering models provided by RAC
- Implemented in NTSB simulation tools
- Validated against Beechcraft 1900D flight test data



Beechcraft 1900D Simulation Results



Flight 5481 Simulation Results

- The elevator was restricted to 8° downward
- 9.5° downward elevator was needed
- 7° downward elevator needed if CG within limits
- Balance is critical pitch control factor, not weight



Conclusions

- Maintenance changed the pitch control system
- Elevator was restricted to about half its downward travel
 - FDR data analysis (7° downward)
 - NTSB simulation (8° downward)
- 9.5° downward elevator needed
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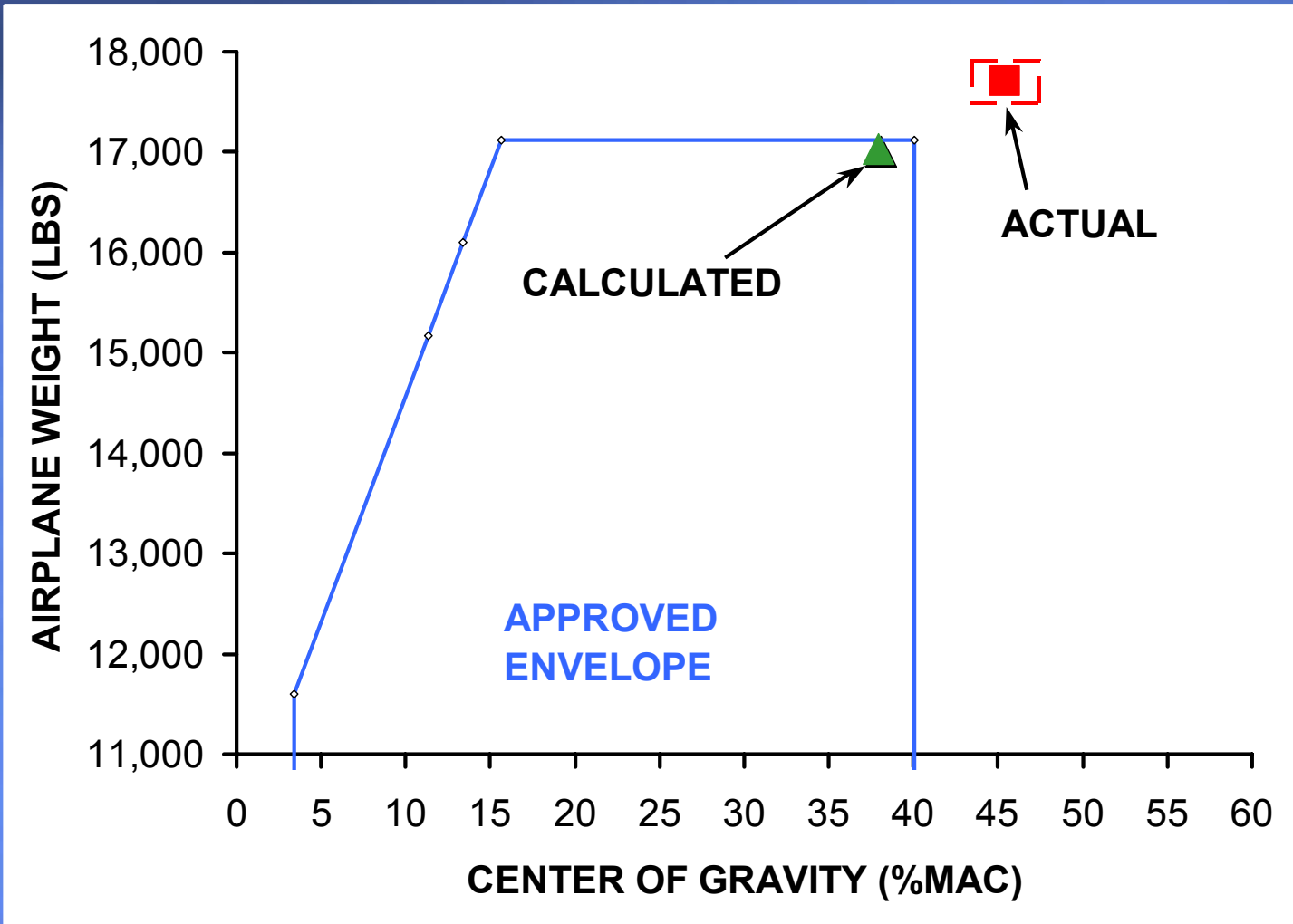
National Transportation Safety Board

Airplane Weight and Balance

- Air Midwest program
- Component load buildup
- Takeoff ground roll analysis



Flight 5481 Weight and Balance



Average Weight Comparison

| Component | Air Midwest ¹ | | FAA Guidance | |
|--|--------------------------|----------|--------------|--------------|
| | Old (lb) | New (lb) | Old (lb) | Interim (lb) |
| Passenger and carry-on bags/ personal items | 175 | 200 | 185 | 195 |
| Checked bag | 25 | 30 | 25 | 30 |
| Carry-on bag checked planeside | 25 | 20 | - | - |

¹ Limited carry-on program



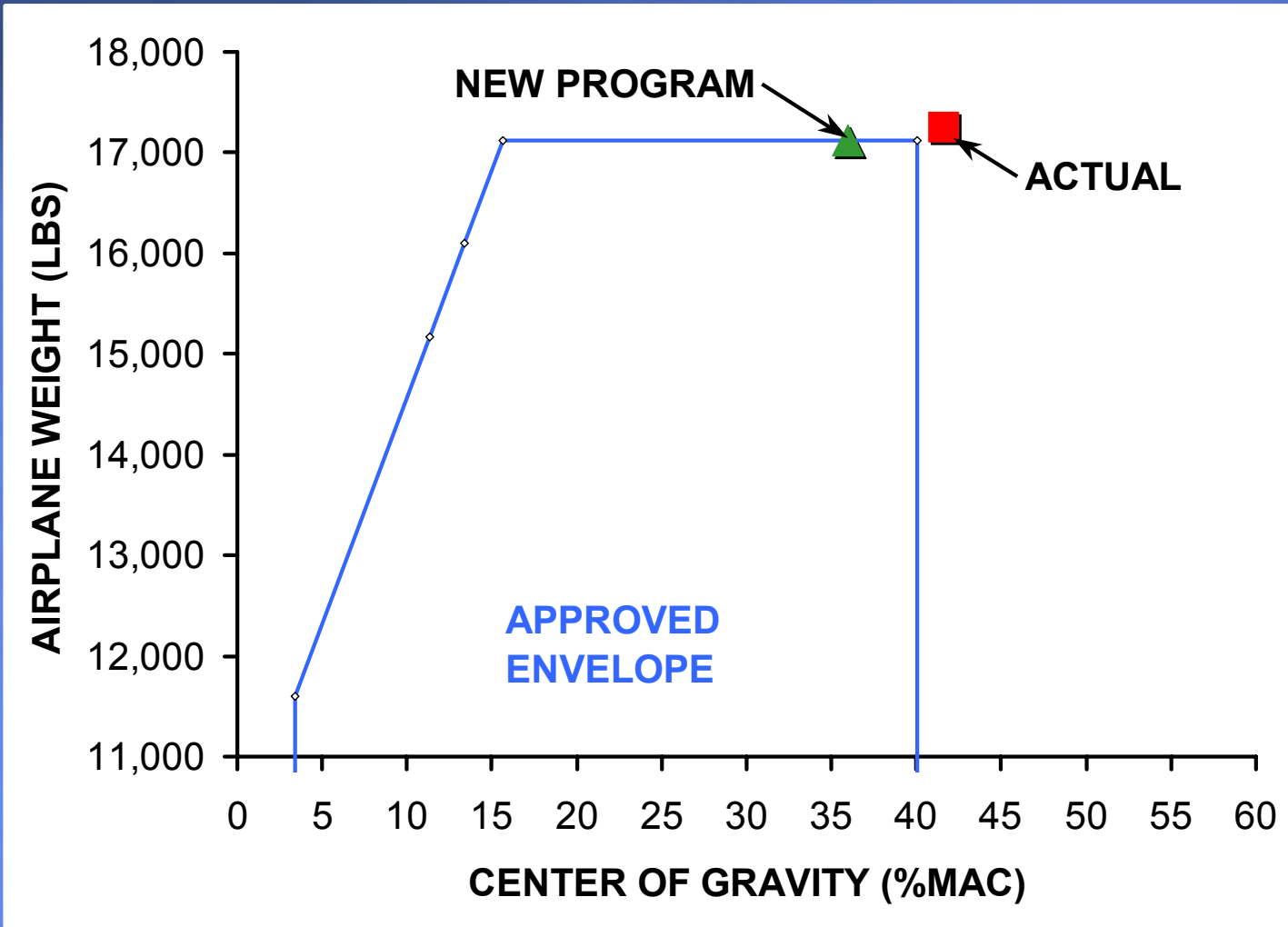
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Improved Weight and Balance



Weight and Balance Concerns

- **Average Weight Error Sources**
 - Understated average weights
 - Heavy bags
 - Variance in actual weight and weight distribution
- **Average weight programs need improvement**
- **Actual weight and location data could eliminate these errors**



Pitch Control Assessment

| | Center of Gravity | Elevator Travel | Pitch Control |
|----------------|-------------------|-----------------|---------------|
| Pre D6 Flights | In Limits | Normal | Adequate |



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Conclusions

- Air Midwest's program did not detect the significantly aft CG
- Unacceptable errors still exist in average weight programs and require improvements
- Actual weight and location data could eliminate these errors
- The significantly aft CG and restricted elevator resulted in a loss of pitch control



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