

# C-130 SOF Fleet Management Analysis

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- Motivation and Approach
- Technical Drivers
- Component Structural Status
- Maintenance Cost
- Conclusion

- SOF C-130 variants fly severe missions and are approaching 20+ years age
  - MC-130E
  - MC-130H
  - MC-130P
  - AC-130H
- Service life estimate of fleet is necessary to:
  - Develop repair / buy decisions
  - Determine ROI of maintenance
  - Forecast future ownership costs

- Objective is to predict useful life and maintenance costs for SOF C-130 variants
- Approach
  - Determine *technical drivers* for service life
  - Characterize *component structural status* and predict component wearout / replacement schedules
  - Predict future *maintenance costs* based on historical data and component replacement

Technical drivers for service life can be separated into two categories:

- Design Limitations
  - Component fatigue
  - Modification costs
  - Obsolescence issues
- Maintenance Limitations
  - Maintenance cost
  - Maintenance time
    - Programmed Depot Maintenance (PDM) duration
    - Aircraft downtime

- Component fatigue on USAF C-130 fleet is tracked in C-130 Automated Inspection, Repair, Corrosion & Aircraft Tracking (AIRCAT) system
- Cumulative fatigue is expressed in terms of Equivalent Baseline Hours (EBH):

$$EBH = SF * AFH$$

where

**SF = Severity Factor**

→ Comparison of given mission to baseline C-130E mission

→ Baseline mission assigned SF = 1

**AFH = Airframe Hours**

- EBH limitations have been established for some components

## C-130 Component Design Limitations

### Empennage

None Established

### Center Wing

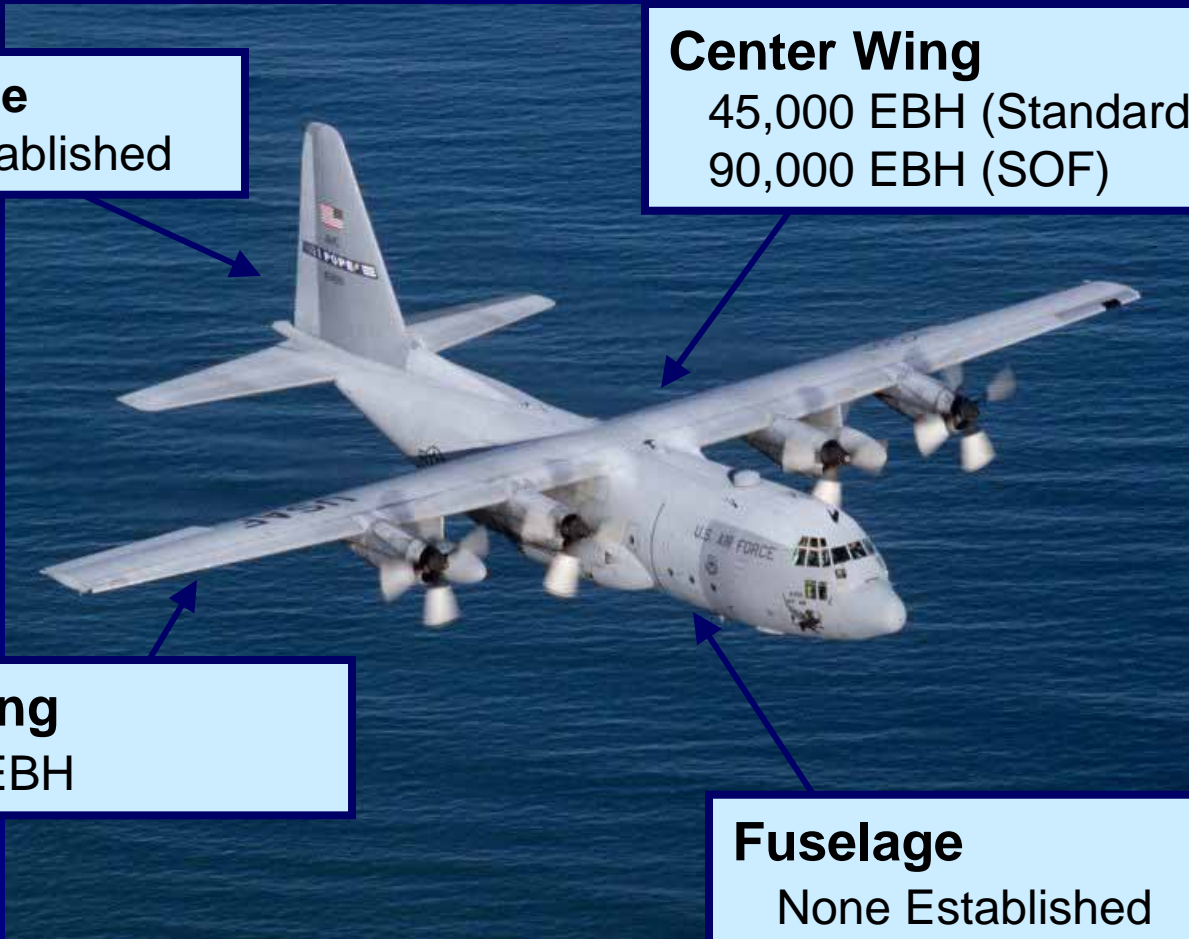
45,000 EBH (Standard)  
90,000 EBH (SOF)

### Outer Wing

60,000 EBH

### Fuselage

None Established





## SOF C-130 Component Status

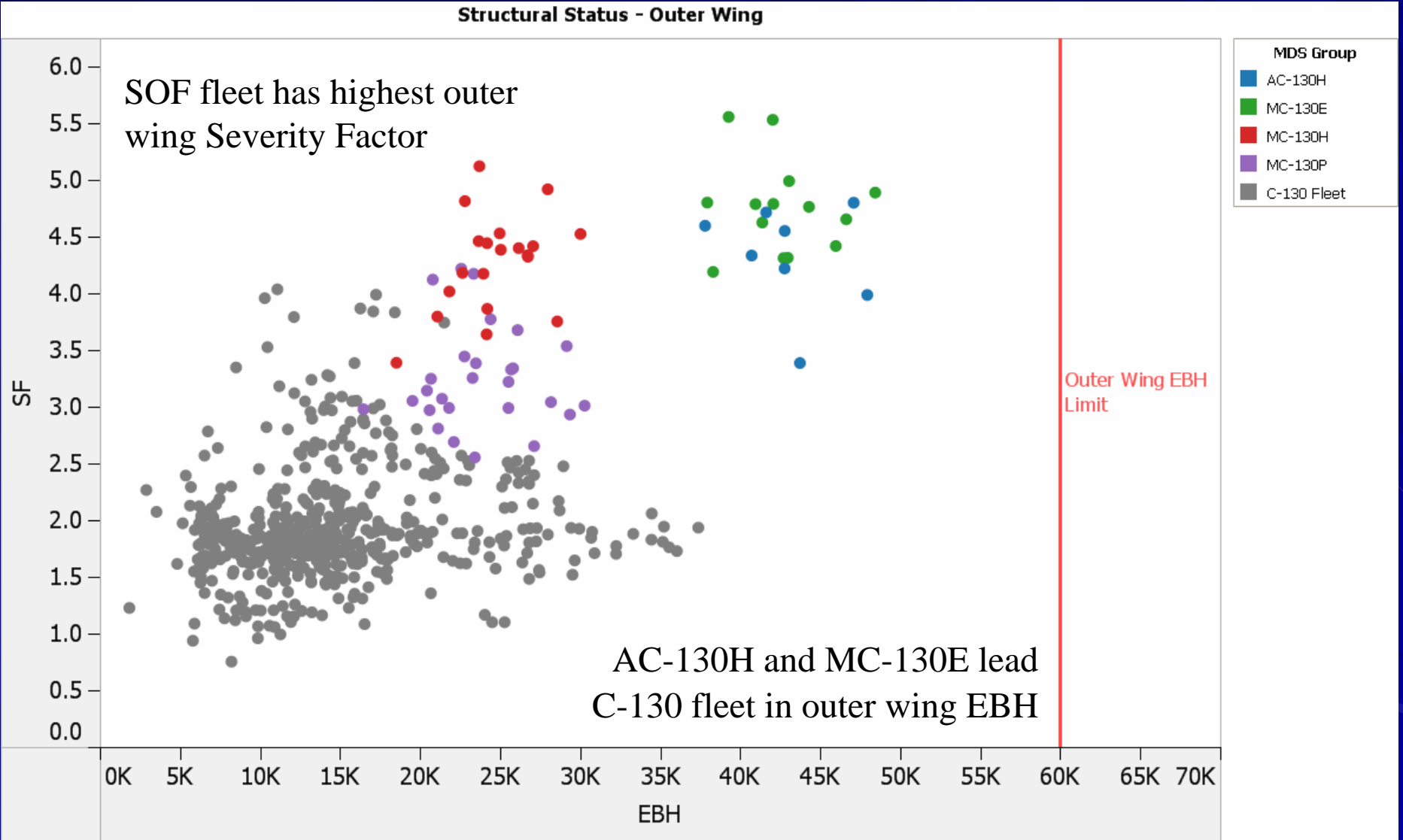
- EBH and Severity Factor for major components of SOF fleet obtained
- Severity Factor and flying rate can be used to predict when component replacement will become necessary
  - Outer wing and center wing can be replaced
  - Approximate costs:
    - Outer wing (from retired aircraft): ~\$1M
    - Center wing: ~\$7M

SOF C-130 Component Replacement History

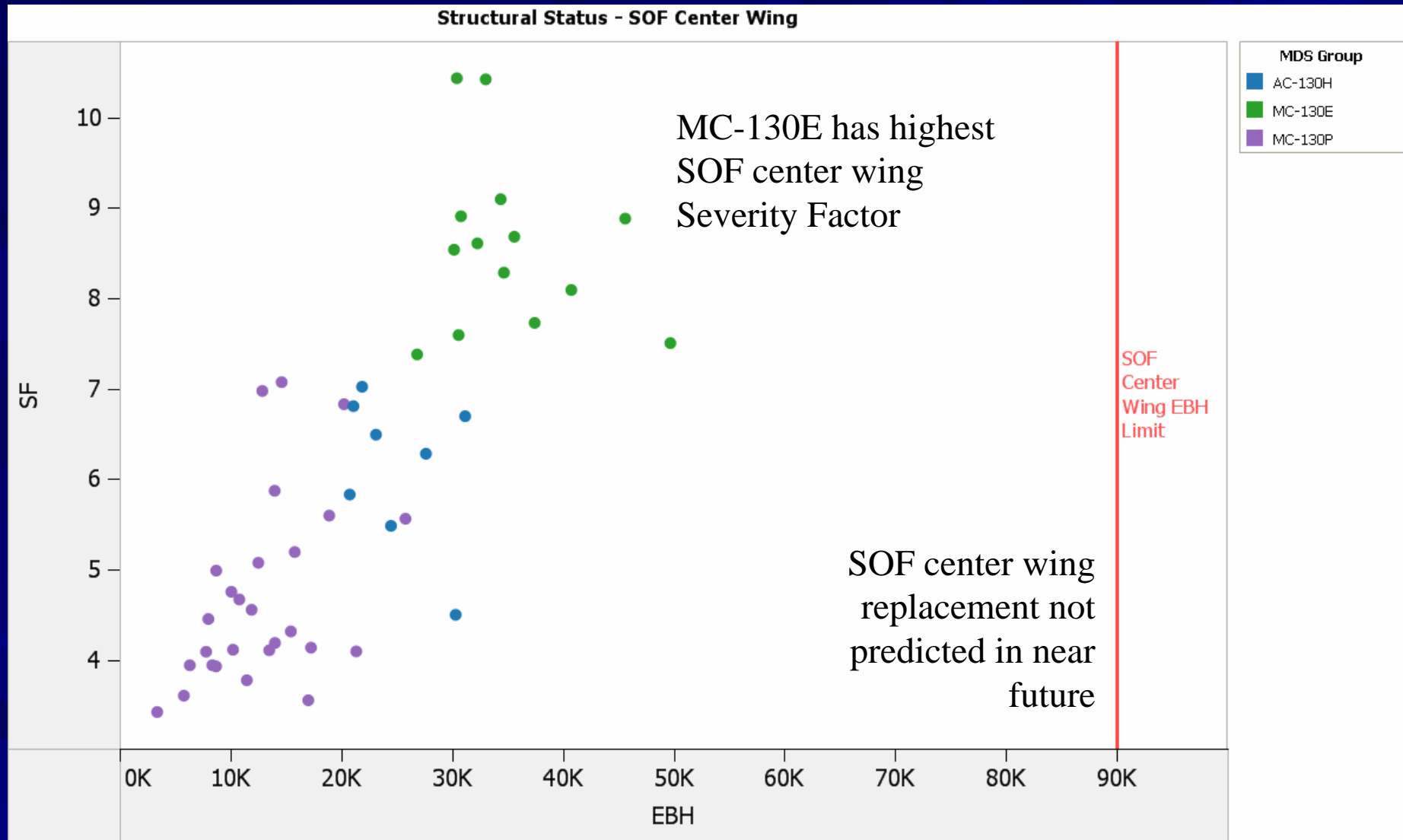
<b>MDS</b>	<b>Avg Aircraft Manufacture Date</b>	<b>Outer Wing Replacement</b>	<b>Center Wing Replacement (SOF)</b>
AC-130H	1969	~1985	~1995
MC-130E	1964	~1985	~1995
MC-130H	1987	None	None
MC-130P	1967	~1987	~1997



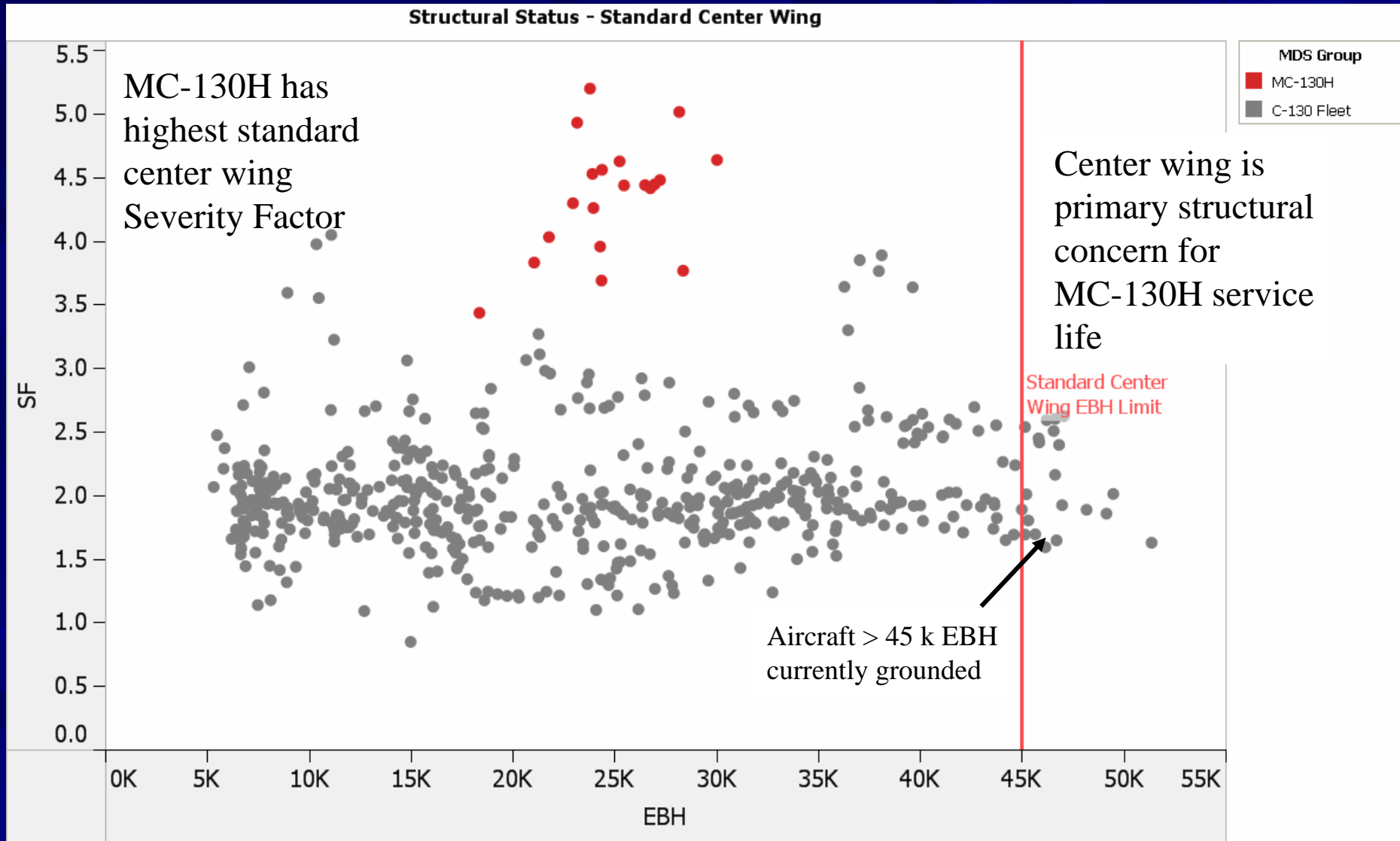
# Outer Wing Structural Status



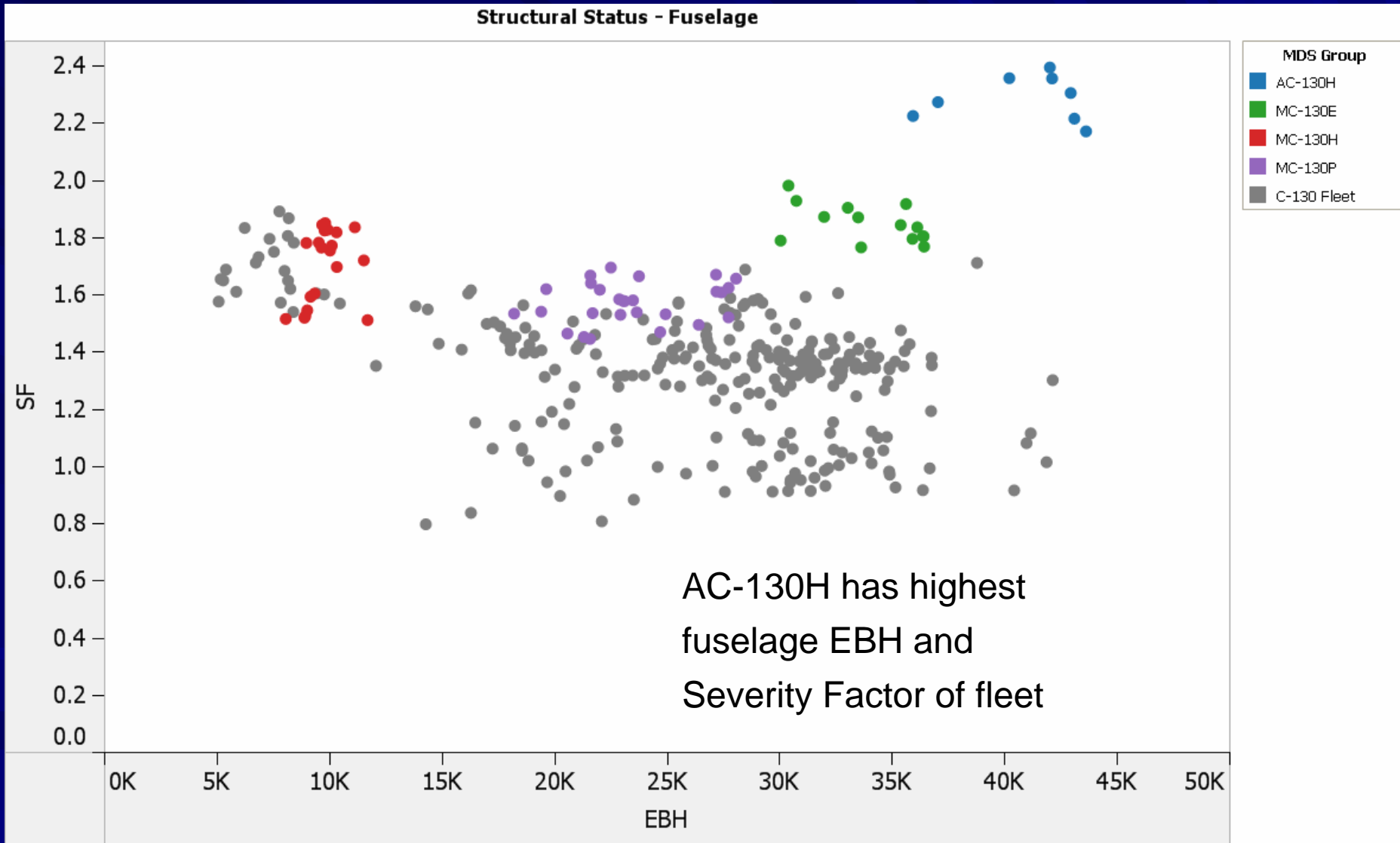
# SOF Center Wing Structural Status



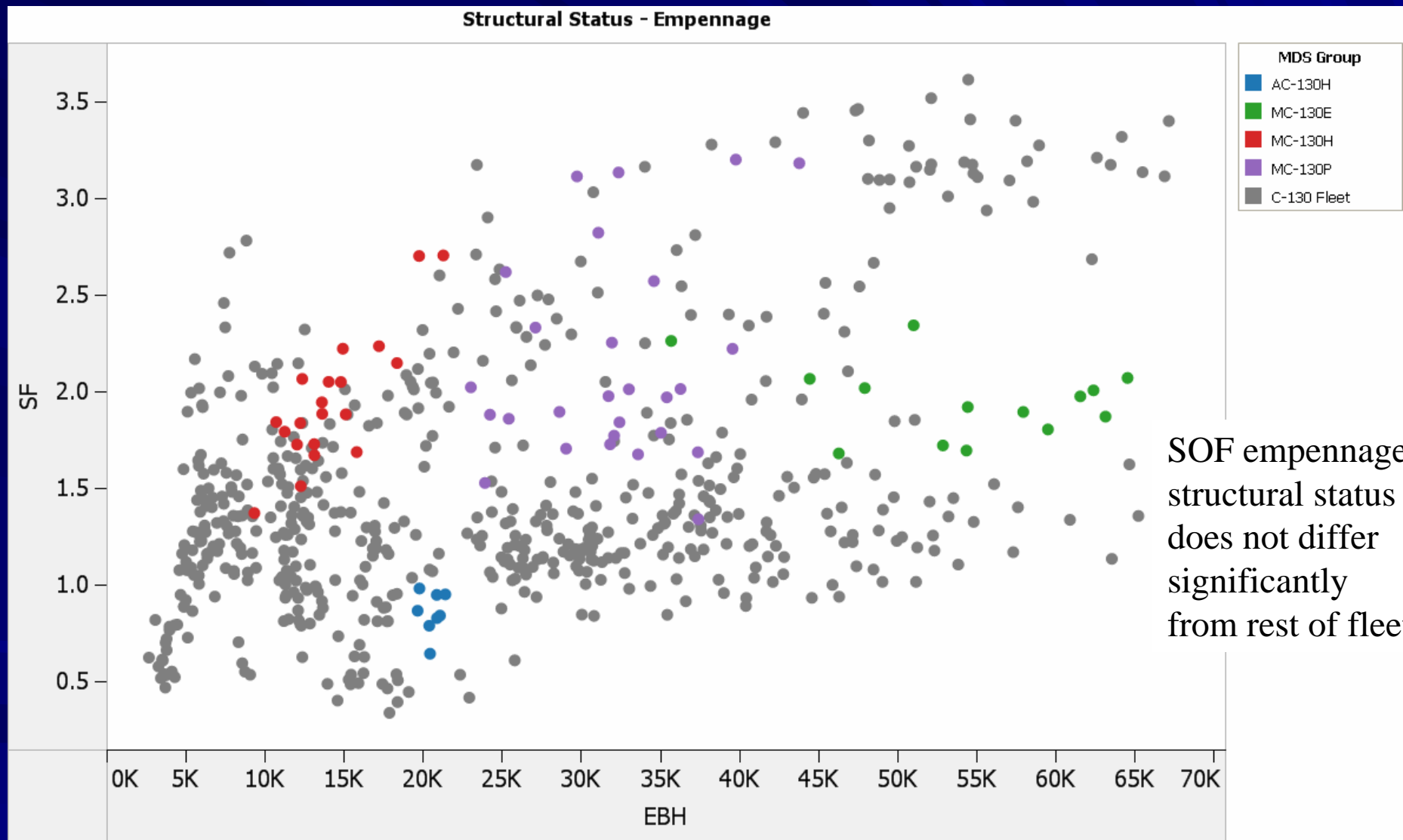
# Standard Center Wing Structural Status



# Fuselage Structural Status



# Empennage Structural Status



## Forecast Component Replacement

- Outer wing is primary structural concern for AC-130H and MC-130E
- Center wing is primary structural concern for MC-130H
- Fuselage EBH and Severity Factor are high for AC-130H and MC-130E
  - No known EBH limits for fuselage
  - High EBH and Severity Factor may drive increased maintenance time and cost

MDS	Outer Wing Replacement		Center Wing Replacement (SOF)	
	Forecast	Scheduled	Forecast	Scheduled
AC-130H	~2013	2012+	TBD	2040+
MC-130E	~2014	2008 - 2015	TBD	2035+
MC-130H	~2022	2015+	~2014	2006 - 2012
MC-130P	~2034	2025+	TBD	2050+

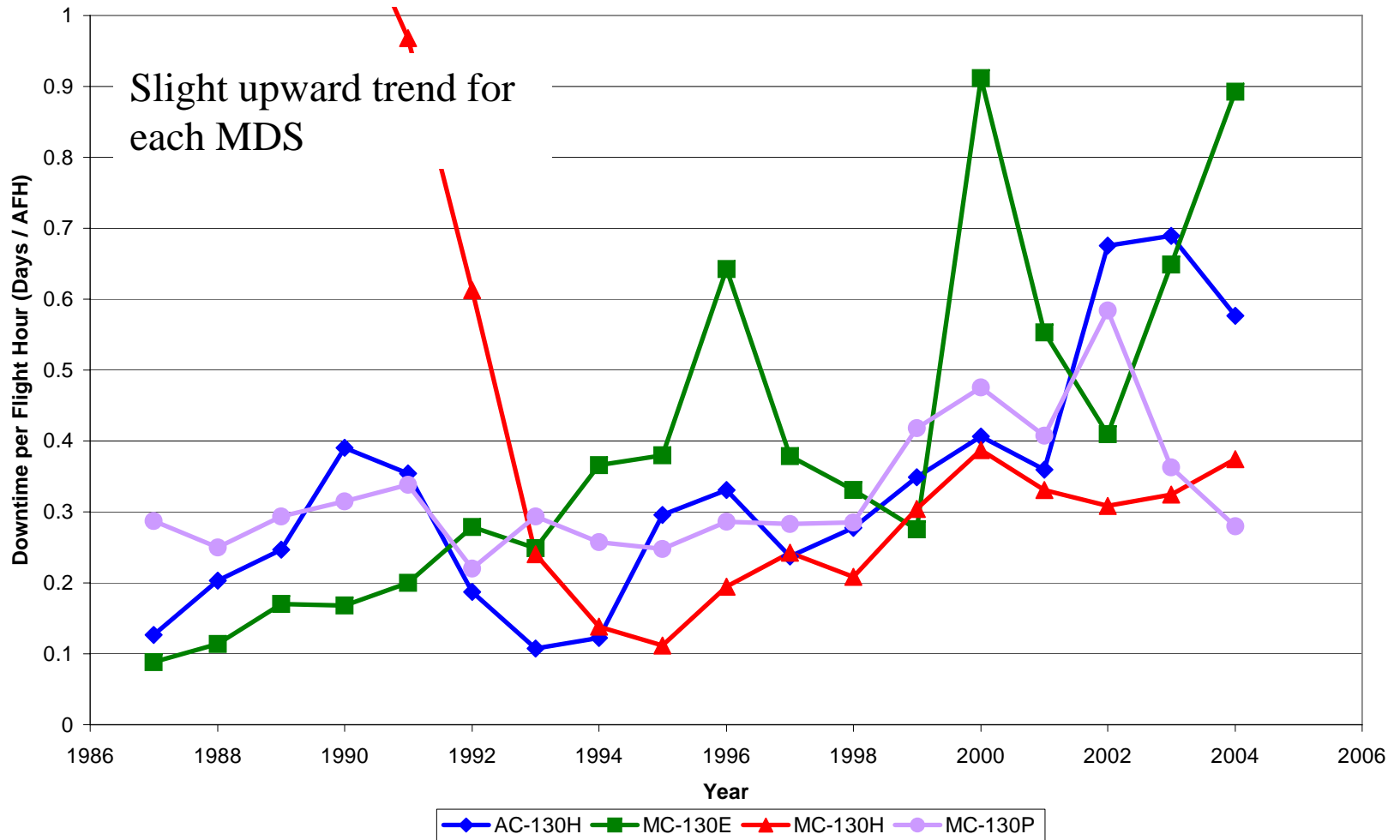
Funded Program

- As aircraft age, increased maintenance may lead to significant downtime
- Flight histories for SOF aircraft researched to identify gaps of > 30 days
  - Downtime consists of calendar duration during these gaps in flight histories
- Downtime divided by:
  - Airframe hours flown by fleet per year
  - Number of aircraft in MDS
  - Allows comparison across variants
- Programmed Depot Maintenance (PDM) durations also investigated
  - No trends observed



# Maintenance Limitations

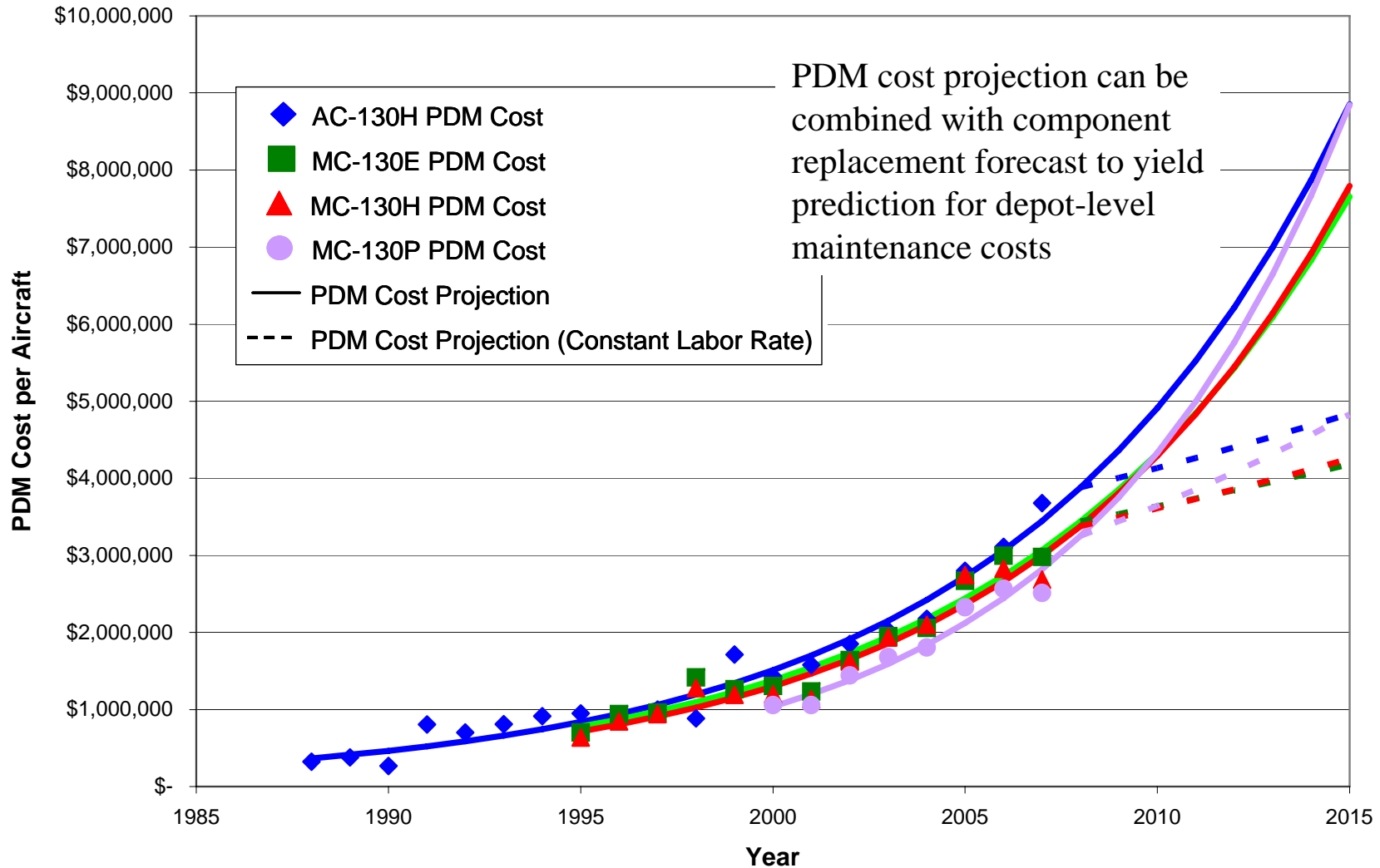
### SOF C-130 Downtime



## PDM cost calculation

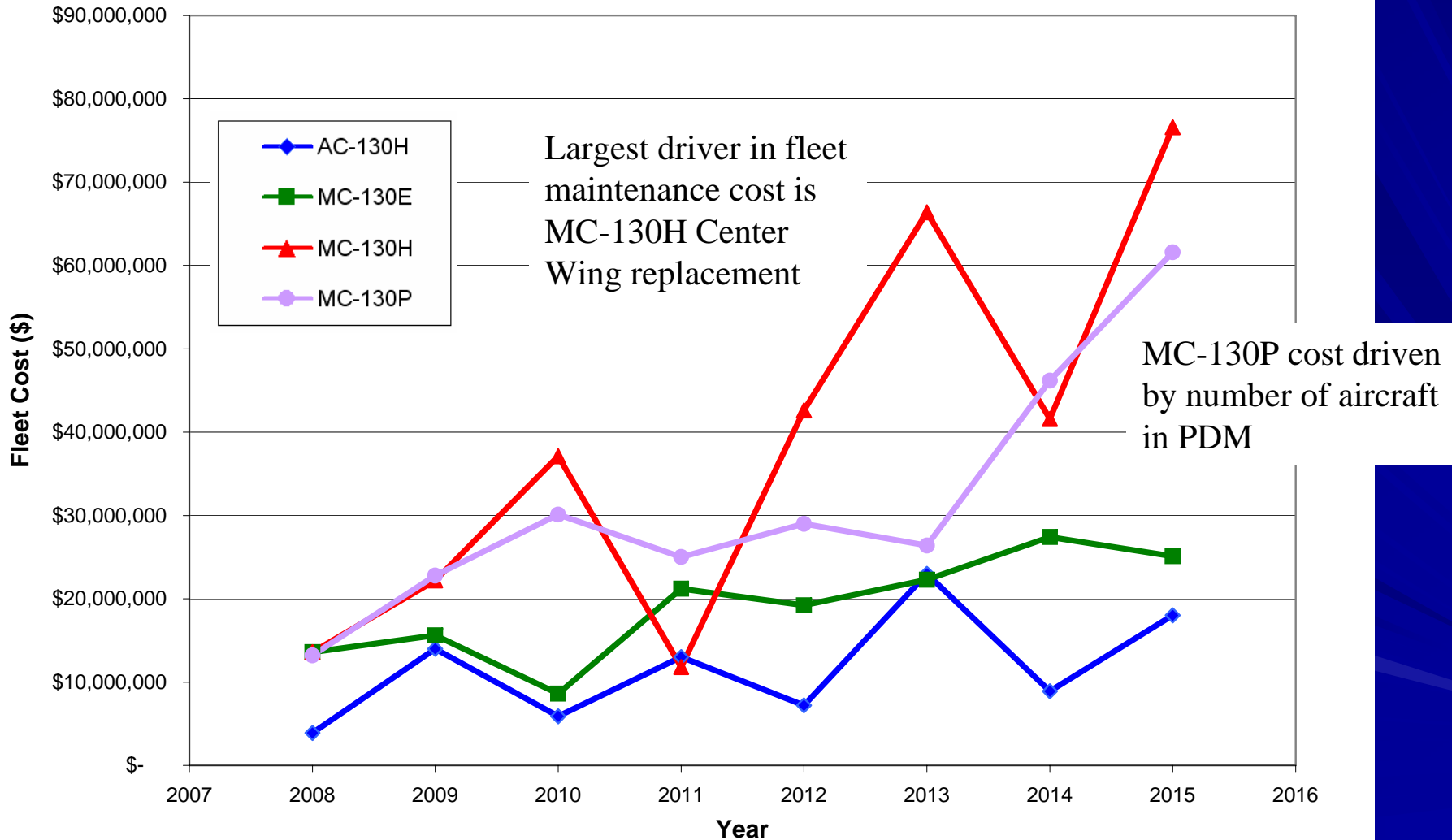
- PDM costs are a function of labor hours and labor rate
- Labor hours for 1998 – 2007 for each MDS gathered from Maintenance Requirements Review Board (MRRB) brochures
- Trend in PDM cost for each MDS calculated for each aircraft
- Trends and component replacement forecasts used to predict future depot level maintenance costs through 2015

### SOF C-130 PDM Cost Summary



# Maintenance Cost

## SOF Depot Level Maintenance Cost Prediction



- As SOF C-130 variants approach 20+ years, no design factors have been identified that limit service life
  - Key is ability to replace components with established limits
- No sudden sharp increases in maintenance costs or aircraft availability are forecast
- Maintenance-related factors are likely to drive replacement / retirement decision
  - Aircraft availability may eventually impact fleet usage
    - Slight upward trend in aircraft downtime exhibited
    - No increase in PDM durations identified
  - Near-term maintenance costs largely due to component replacement

# Questions / Comments