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*Prevention and Control Office*

# **2004 USAF DIRECT COSTS OF CORROSION**

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USAF Corrosion Prevention  
and Control Office**



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# Cost of Corrosion Report and Analysis

- Four studies have been done (1990, 1997, 2001, 2004)
- Goal of determining the Total Annual Direct Corrosion Maintenance Costs
  - With each report there has been a growing emphasis on reporting the various cost elements beyond the total cost
  - Collection skills and field cooperation has increased with each study



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# **Direct Corrosion Maintenance: Included**

- **Cleaning to remove surface contaminants or to facilitate inspection for corrosion.**
- **Stripping of protective coatings (regardless of purpose).**
- **Inspection to detect corrosion or corrosion related damage**
- **Treatment of corrosion damage (corrosion removal, sheet metal or machinist work, replacement, etc.).**
- **Application of surface treatment (Alodine, other surface etch).**
- **Application of protective coatings (regardless of reason).**
- **Time spent gaining access to and closure from parts requiring any of the above activities.**
- **Preparation and clean-up activities associated with any of the above.**



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# **Direct Corrosion Maintenance: Excluded**

- **The cost of training personnel in corrosion control maintenance.**
- **The cost of constructing and maintaining facilities for performing corrosion maintenance.**
- **The cost of aircraft downtime associated with corrosion maintenance.**
- **The added initial cost of obtaining aircraft with corrosion resistant systems installed.**
- **The cost of maintaining a technical and engineering work force well trained in corrosion prevention and control techniques and processes.**
- **The cost of R&D efforts related to corrosion prevention and control.**
- **A significant number of management positions throughout the Acquisition Centers and the Air Logistics Centers are provided in support of corrosion control maintenance; these indirect personnel are not included.**
- **RP and RPIE**
- **Classified Systems**



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# Total Corrosion Costs Comparison, FY 04\$'s

## Total Costs, Then Yr Dollars (Millions)

<b>1990</b>	<b>1997</b>	<b>2001</b>	<b>2004</b>
\$720	\$795	\$1,139	\$1,497

## Total Costs, Adjusted to Constant 2004 \$'s (Millions)

<b>1990</b>	<b>1997</b>	<b>2001</b>	<b>2004</b>
\$926	\$857	\$1,175	\$1,497



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# Total Corrosion Costs and USAF O&M Budget(s)

Total Costs, Then Yr Dollars				AF O&M Budget, Then Yr Dollars			
1990	1997	2001	2004	1990	1997	2001	2004
\$720	\$795	\$1,139	\$1,497	\$25,160	\$22,728	\$29,328	\$38,406
Total Costs, Adjusted to 2004 \$'s				AF O&M Budget, adjusted to 2004 \$'s			
1990	1997	2001	2004	1990	1997	2001	2004
\$926	\$857	\$1,175	\$1,497	\$32,342	\$24,512	\$30,246	\$38,406
Corrosion Cost Growth as a Constant Compounding Rate				Corrosion Proportion of AF O&M Budget			
5.23%				1990	1997	2001	2004
				2.86%	3.50%	3.88%	3.90%
Fleet Size Study Year							
8,722	5,991	6,075	6,066				

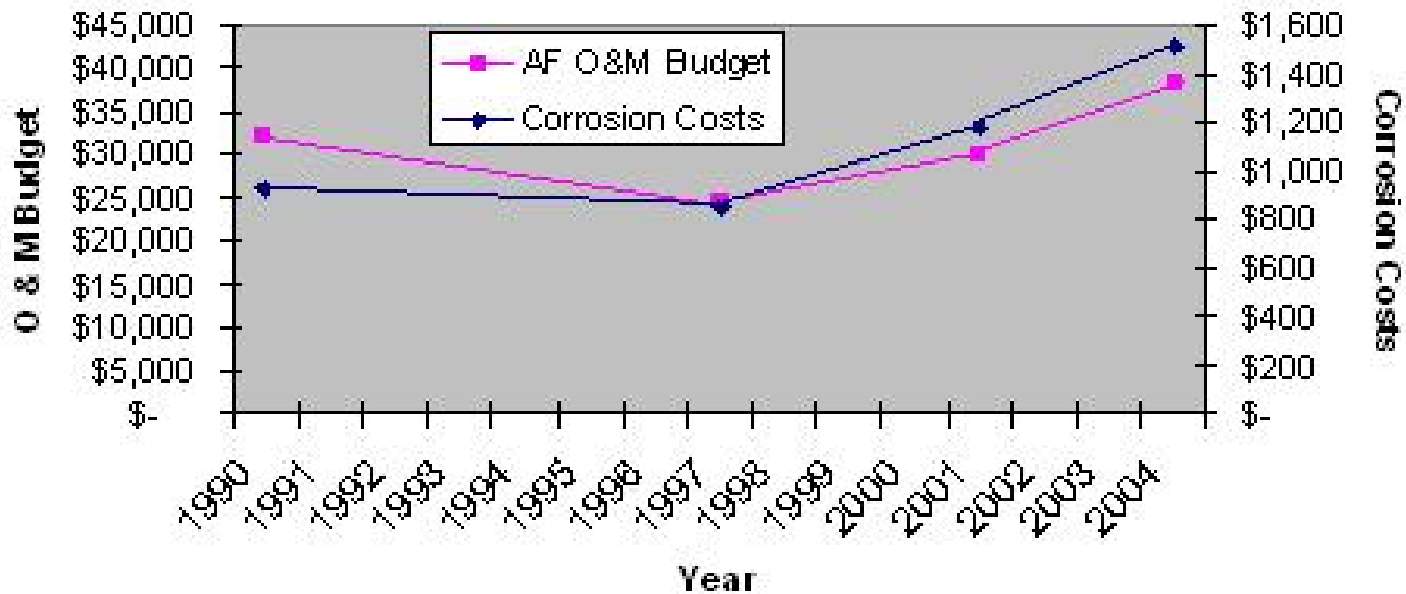


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# Chart of AF O&M Budget vs. Total Annual Corrosion Costs

**AF O&M Budget vs Corrosion Costs**



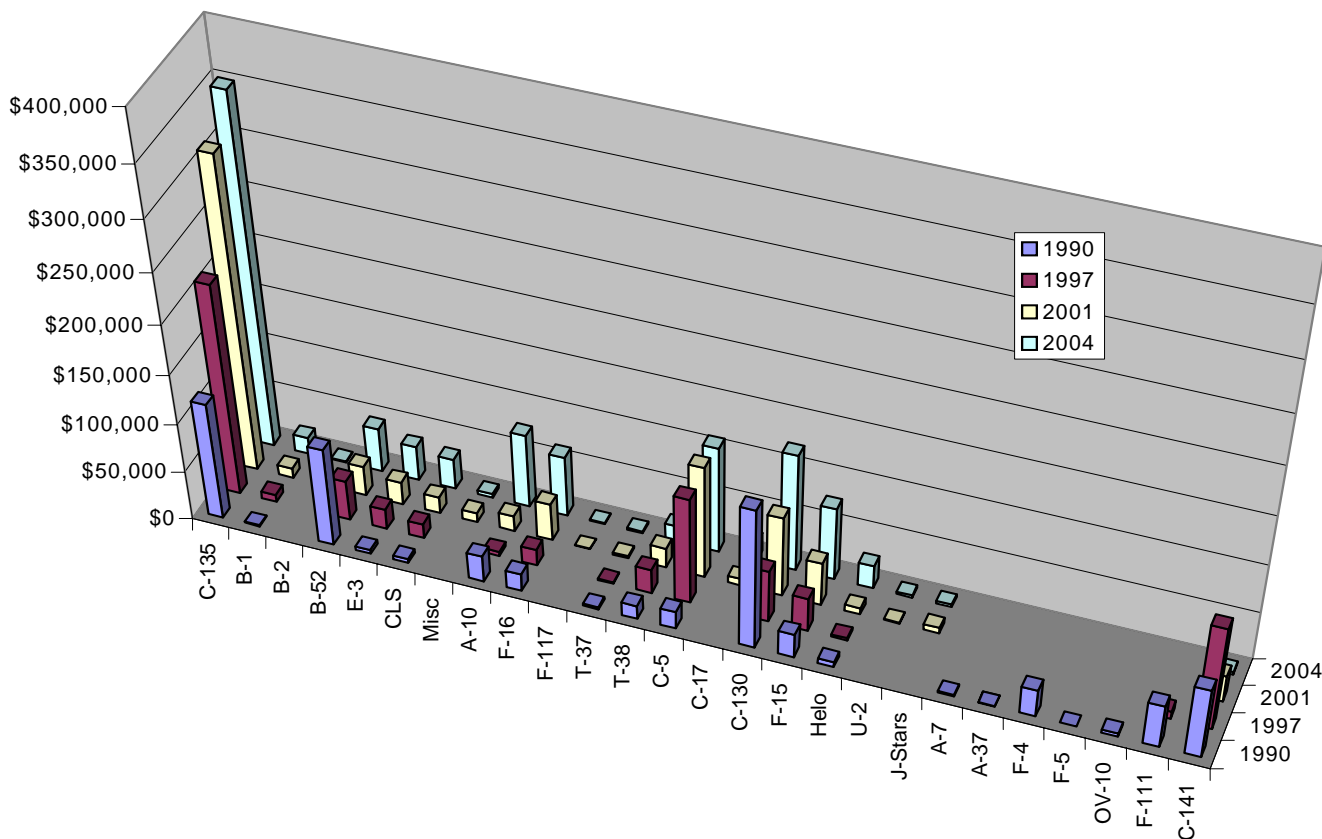


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# Fleet Cost Comparison Study to Study

4 Study Fleet Cost Comparison, in 04 \$'s (in thousands)



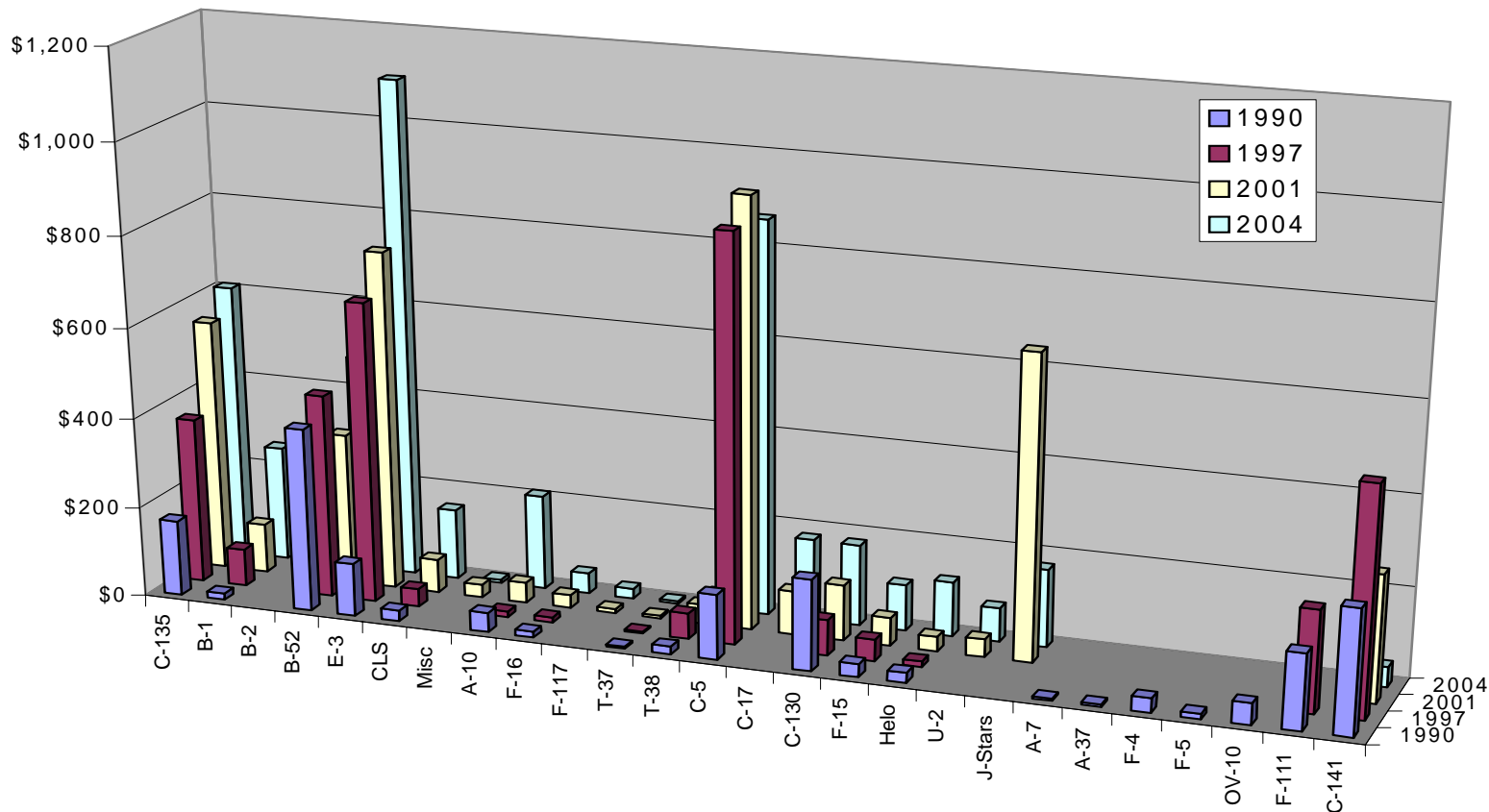


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# Per Aircraft Costs, all fleets, FY04 dollars, (thousands)

Per Aircraft Cost Comparison





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# Other Observations

## Depot Costs vs. Total Corrosion Costs

	1990	1997	2001	2004
Depot Costs	\$735,568	\$712,922	\$853,882	\$1,052,832
Command Costs	189,969	144,471	320,786	443,702
<b>Total Costs</b>	<b>\$925,537</b>	<b>\$857,393</b>	<b>\$1,174,668</b>	<b>\$1,496,534</b>
Depot % of Total	79.5%	83.1%	72.7%	70.4%

## Prevention vs. Repair\*

	1990	1997	2001	2004
Repair	\$650,765	\$526,716	\$800,435	\$886,802
Prevention (Paint + Wash)	137,181	224,229	299,107	354,018
<b>Total</b>	<b>\$787,946</b>	<b>\$750,945</b>	<b>\$1,099,543</b>	<b>\$1,242,824</b>
Prevention %	17.4%	29.9%	27.2%	28.5%

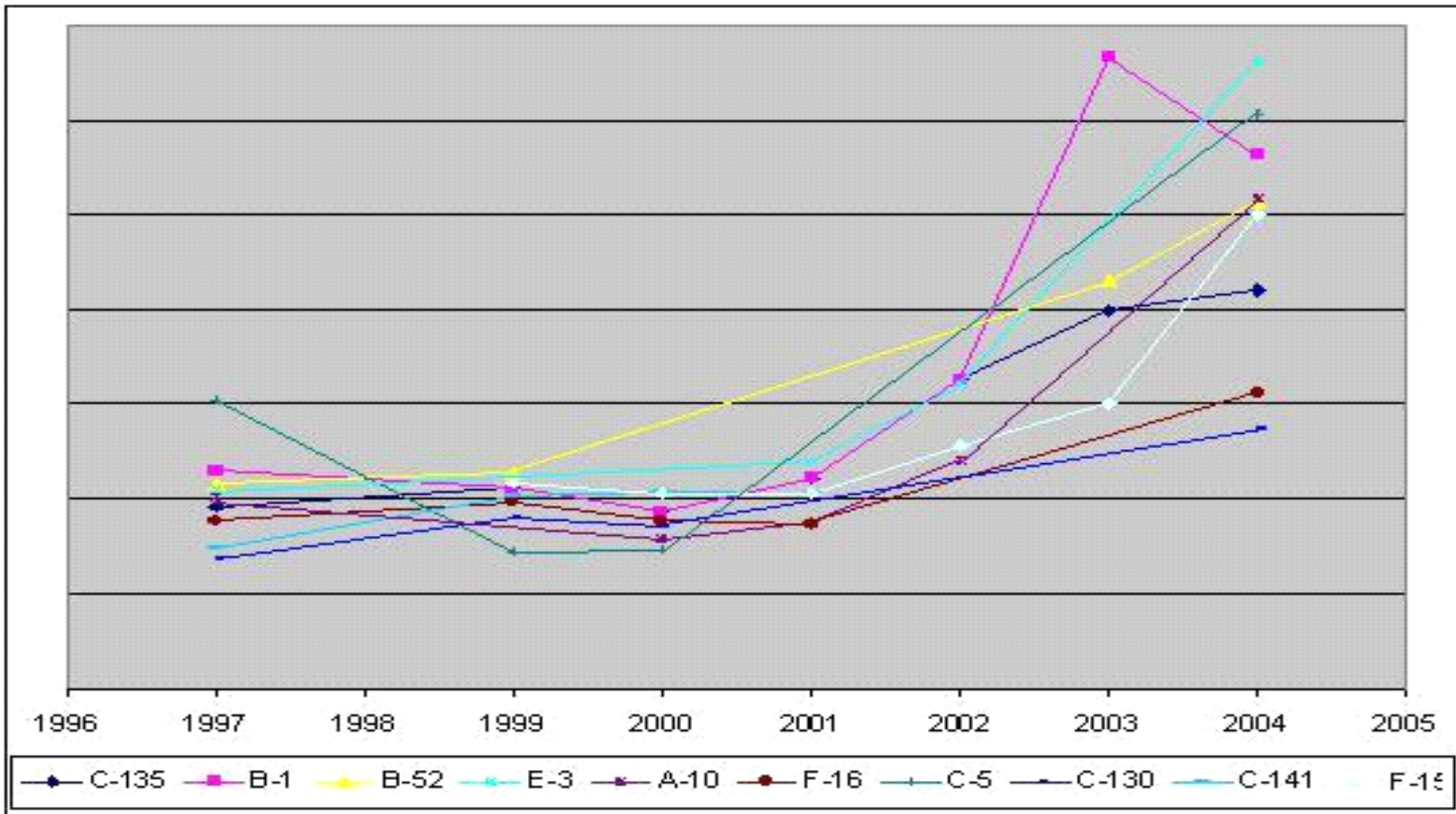
\* Paint + Wash and Inspect – but some repair costs are actually (inseparable) corrosion inspections.



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# Depot Labor Rates





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## Corrosion Maintenance Dollars vs. Corrosion Maintenance Man- Hours

- Depot vs. Field Level Maintenance
  - Depot labor rates are much higher than field labor rates such that the split is a major factor in the overall cost.
  - Depot corrosion Man-Hours tend to be large, per aircraft processed. Thus, changes in the number of aircraft processed in a given year in the depot can significantly affect the hours for that system in that year.
  - Business practices and other factors can impact costs and man-hours.
- Materials
  - Materials costs can be a significant factor in the dollar cost of corrosion maintenance and materials may be procured in a difference year than that in which the maintenance is actually done.
  - Field level Man-Hours may be slightly inflated where total corrosion costs were not delineated between labor and materials.



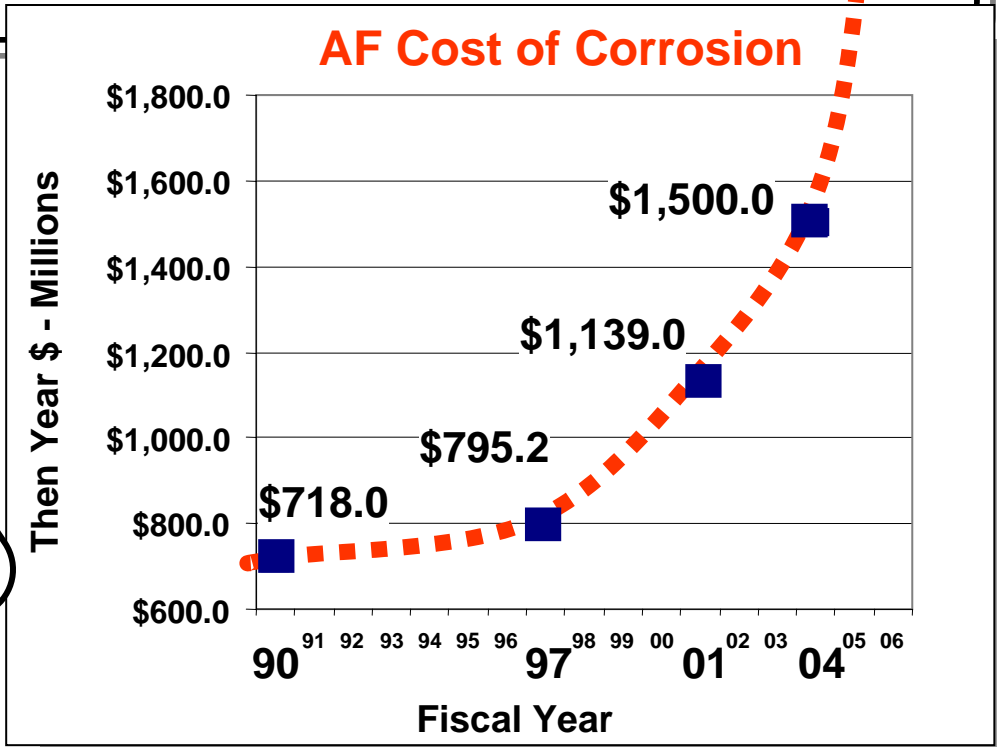
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# Corrosion Costs are growing Exponentially

**FACT**

**MYTH?**



**Corrosion is getting worse....**  
**..... maintenance growth is Exponential?**

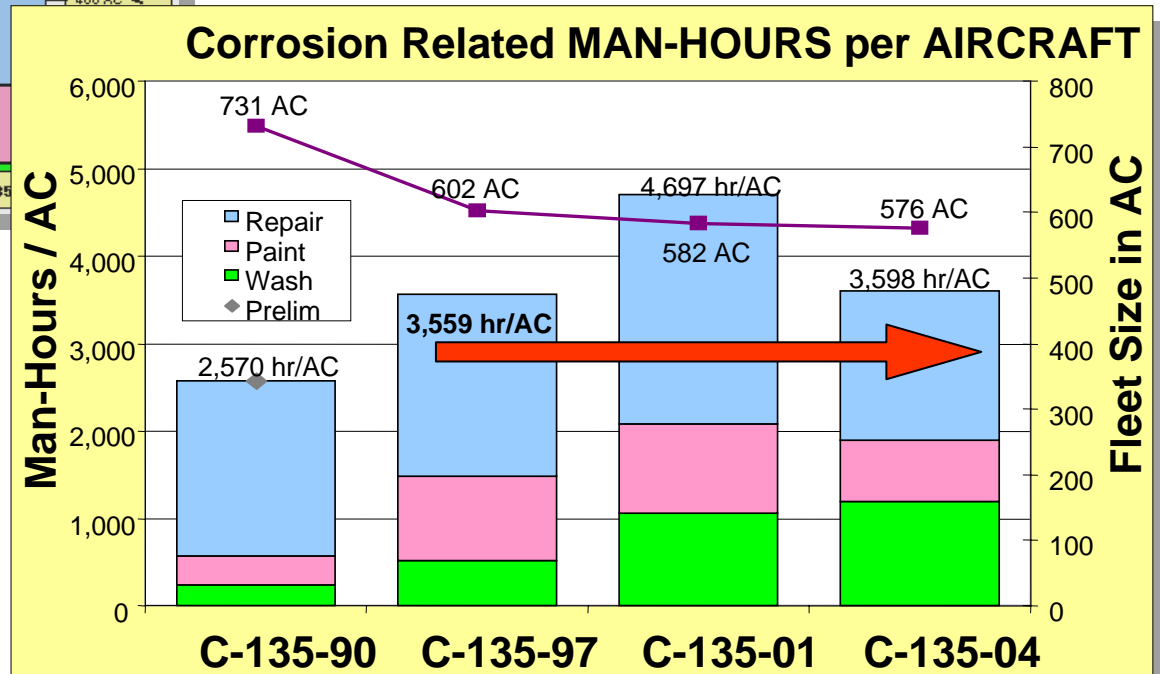
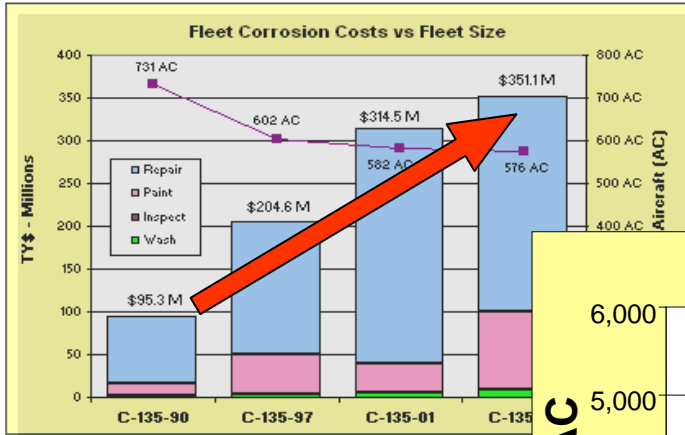


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# C-135

## Corrosion Costs and Man-Hour Trends



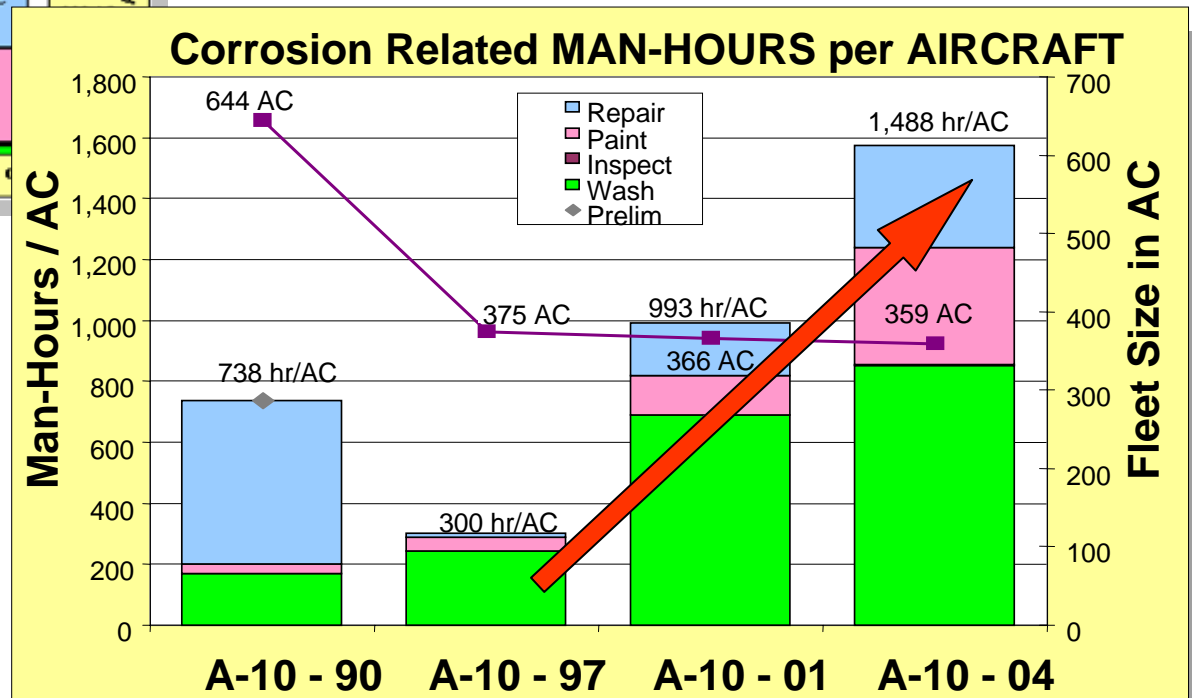
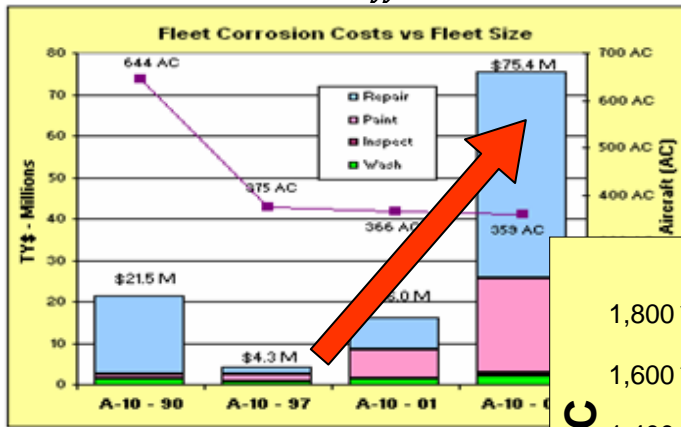


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# A-10

## Corrosion Costs and Man-Hour Trends



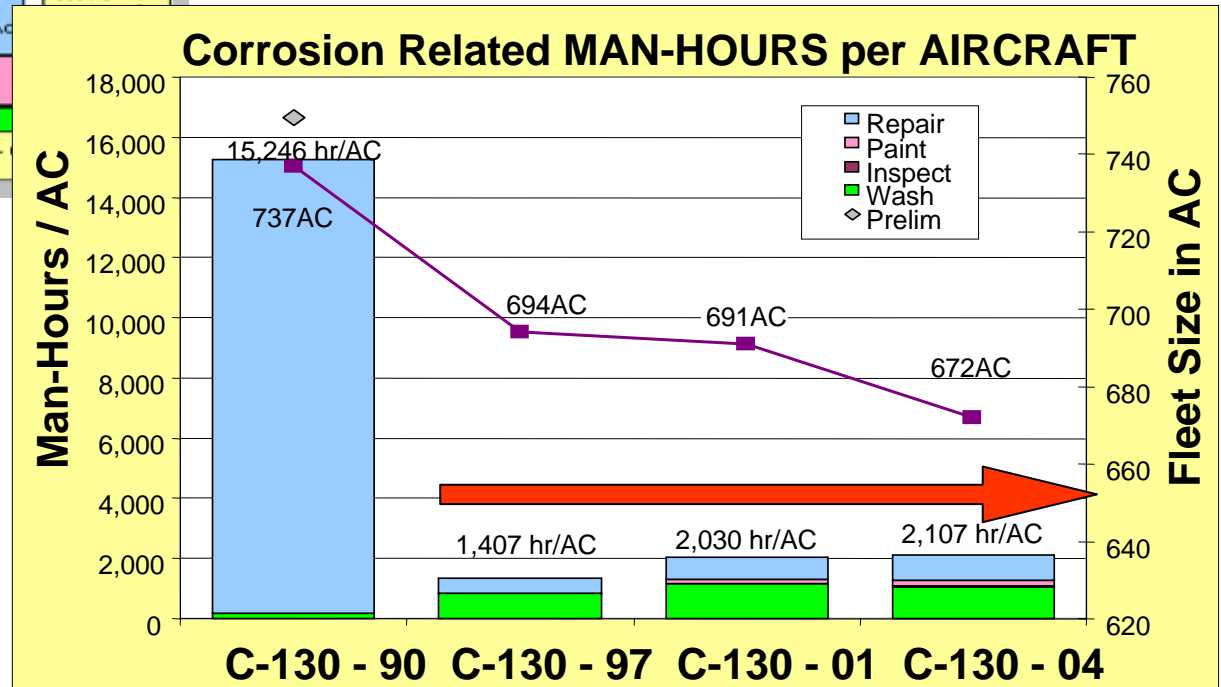
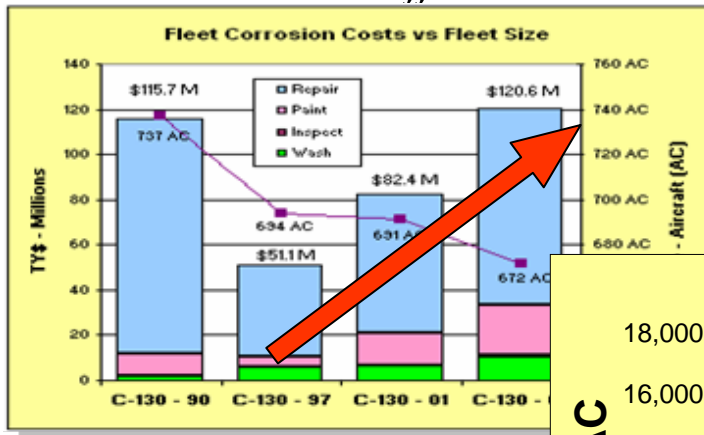


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## Corrosion Costs and Man-Hour Trends

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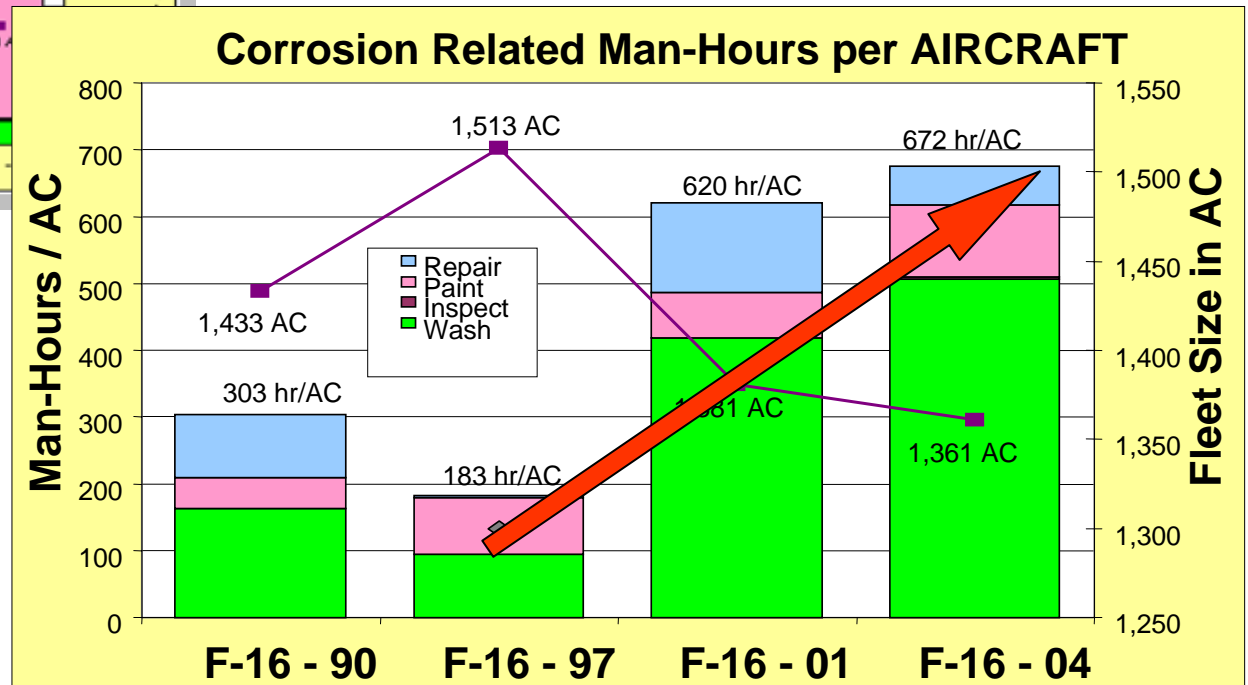
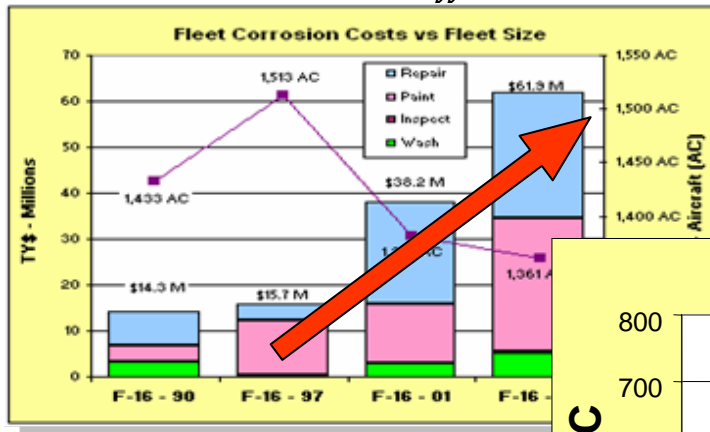


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## Corrosion Costs and Man-Hour Trends

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# Results and Conclusions

- Final Data indicates that Total Direct Maintenance Cost of Corrosion in the USAF in 2004 was right at \$1.5 Billion
- Depot consumed 70% of 2004 corrosion maintenance dollars
- From 2001 to 2004 corrosion costs grew by more than 27% above the cost of inflation - though a significant portion of this increase resulted from increased labor rates
- Corrosion Prevention Activities consumed 28.5% of the 2004 corrosion maintenance dollars



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# Acknowledgements

**This Cost of Corrosion Study was done for  
S&K Technologies & AFCPCO**

**by**

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