Slide 1

CNA

Forecasting Aircraft Replacement

A Presentation to the International Symposium on Military Operational Research

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The Issue

- The KC-130F is the US Marine Corps' air to air refueler
- The aircraft were built in the early 1960s for a 30 year service life
- Initial tasking - find a cost effective solution to the pending retirement of 38 Marine Corps KC-130F's
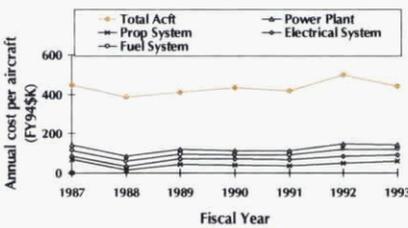
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Slide 3
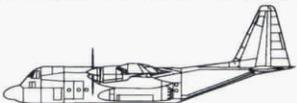
Our First questions

- Did the aircraft really need to be retired at the 30 year point?
  - A service life extension had been applied to critical components some years earlier
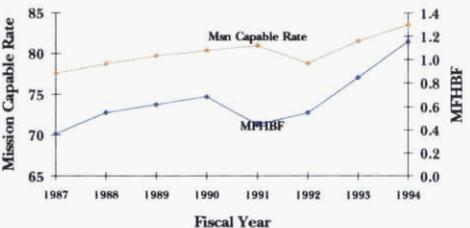- What were the maintenance and readiness trends?
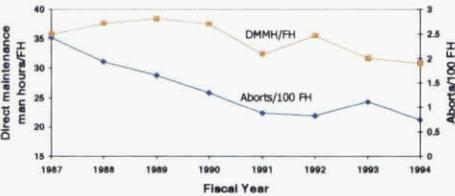
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Slide 4

KC-130F Maintenance Cost Trends

Legend: Total Acft, Prop System, Fuel System, Power Plant, Electrical System

Y-axis: Annual cost per aircraft (FY94$K); X-axis: Fiscal Year (1987–1993)

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Slide 5

Readiness Trends

Y-axis (left): Mission Capable Rate; Y-axis (right): MFHBF; X-axis: Fiscal Year (1987–1994). Labels: Msn Capable Rate, MFHBF

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Slide 6

More Readiness Trends

Y-axis (left): Direct maintenance man hours/FH; Y-axis (right): Aborts/100 FH; X-axis: Fiscal Year (1987–1994). Labels: DMMH/FH, Aborts/100 FH

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The KC-130F Evidence

- Operating service years
  - Avg life was more than 30 yrs - but the fleet has had service life extension
- Fatigue life expended
  - Center wing section - 25%
  - Outer wing - 22%
- Maintenance cost trends - up
- Readiness trends - up

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Initial Conclusions

- The aircraft is not falling apart
- Maintenance costs are rising, but so is readiness
- Delayed replacement may make economic sense, so
- An economic analysis of replacement alternatives is in order

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Economic Analysis Alternatives

- Begin buying the new KC-130X in FY 1998 to coincide with the KC-130F retirement dates anticipated in the Marine Corps tasker

- Because no major structural or maintenance problems are evident, delay the KC-130X buy for ten years and continue to operate the KC-130F

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Economic Analysis Variables

- Number of KC-130Fs - 38
- Number of KC-130Xs - 35
- Unit procurement cost of KC-130X - $45.4M
- Starting annual maintenance cost of each aircraft
  - KC-130F/$740K, KC-130X/$554K
- Annual maintenance cost growth rates
  - KC-130F/6.8%, KC-130X/0% for 1st 10 yrs then 2%/yr
- Residual value of KC-103X at end of analysis - calculated by straight line depreciation
- Discount rate - 4.4%

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Discount Factor

The factor that translates expected costs or benefits in any given future year into present value terms

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Economic Analysis Model
(FY94$ 000's)

Year	No. of KC-130Fs	No. of KC-130Xs	Investment Cost (KC-130X)	Maintenance Cost (KC-130X)	Maintenance Cost (KC-130F)	Total Undiscounted Cost	Discount Factor	Total Discounted Cost
1996	38	1	45,400	28,052	554	74,006	0.979	72,510
1999	37	7	272,400	31,188	3,878	307,466	0.939	288,713
2000	30	13	272,400	27,037	7,202	306,909	0.900	276,059
2001	23	19	272,400	22,113	10,626	305,039	0.863	263,304
2002	16	25	272,400	16,429	13,850	302,679	0.828	250,465
2003	9	31	272,400	9,870	17,174	299,444	0.793	237,601
2004	2	35	161,800	2,342	19,390	203,532	0.761	154,987
2005		35			19,390	19,390	0.729	14,143
2006		35			19,390	19,390	0.699	13,560
2007		35			19,390	19,390	0.670	13,001
				Years 2008-2024 not shown				
2025		35			24,535	24,535	0.314	7,710
2026		35			25,027	25,027	0.301	7,840
2027		35			25,527	25,527	0.289	7,374
Totals			1,569,000	137,033	543,029	2,253,058		1,771,752
Less Residual Value						211,003		61,203
Net Life-cycle Cost						2,677,162		1,710,558

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Economic Analysis Summary- What are the Costs of Each Option?
30 yr Life-cycle costs (FY94$M)
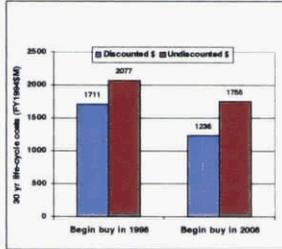
- Life-cycle costs are lower, both in discounted and undiscounted dollars, by delaying the aircraft buy until 2008
- Given the assumptions in the analysis, it makes economic sense to delay a new procurement until after FY2008
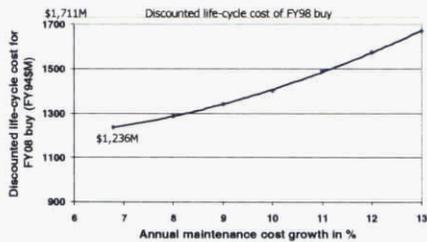
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Follow-on Question

How high would the KC-130F maintenance cost growth rate have to go until it became more economical to start the KC-130X buy in FY 1998 vice FY2008?

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Maintenance Cost Growth Limit

Conclusion: costs would have to grow by more than 13% to justify a new buy in FY98

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Study Conclusions

- Maintenance costs are up but so is readiness
- The end of the KC-130F service life is not imminent
- A new buy can be delayed
- Initiatives focused on the Big 4 can help control rising maintenance costs
- Structural data recorders should be installed to collect stress data

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