ERRATA

To: Recipients of MR-1641-AF, Aging Aircraft: USAF Workload Material Consumption Life Cycle Patterns by Raymond A. Pyles, 2003

From: RAND Corporation Publications Department

Date: January 2004

Re: Corrected pages (pp. 122-126)

Attached please find replacements for pages 122-126.

Decimal point errors in tables 5.13-5.15 resulted in erroneous dollar amounts in the text on pp. 123, 124 and in figures 5.13-5.15.

We regret the inconvenience.

First, we examined Cook's distance and leverage values in a scatterplot and found that all data points were within acceptable levels for Cook's distance.

Table 5.13

Age Affects Depot-Level-Reparable Repair Costs in the Full Regression

Results of regression analysis				
Analysis Performed: Sun 03 Mar 2002 22:03:06				
Data set used: D:\Documents\Dbases\Analysis\DataFiles\DeflDLRCost				
Rule set used: D:\Documents\Dbases\Analysis\Rules\ConsDLRCostRules				
Dependent variable:	LRep$			
Total sum of squares	1.5684E+07			
Regression sum of squares	8.2014E+06			
Residual error	7.4822E+06			
F-Statistic	12.7620			
Degrees of freedom	14,163			
R-squared	0.5229			
Variable	Coefficient	Standard Error	*t*-Statistic	Probability
Constant	379.46832			
Bmbr	330.63425	91.16771	3.6267	6.77E-04
C2	–312.01353	78.60159	–3.9696	2.87E-04
Crgo	–304.54298	56.95272	–5.3473	1.31E-05
Helo	–381.14791	70.73309	–5.3885	1.20E-05
Tnkr	–392.12872	97.12723	–4.0373	2.43E-04
Trnr	–81.94107	73.44513	–1.1157	0.2653
FAge	2.61081	3.67539	0.7104	0.5144
Flyaway	–0.73895	0.14049	–5.2600	1.56E-05
Year98	–9.02363	8.64848	–1.0434	0.2987
FAge*Fly	0.07562	0.02235	3.3834	1.27E-03
Pulse5	–155.46611	123.58602	–1.2580	0.2075
Pulse10	153.08101	102.29941	1.4964	0.1325
Ramp5	393.45139	216.73392	1.8154	0.0677
Ramp10	–284.14923	301.90677	–0.9412	0.6498

Practical Implications of the Regression Equation for DLR Repair Requirements

In Figure 5.13, which displays the forecast computed per-flying-hour expected-value DLR repair requirements for the $30-million fighter and the $100-million cargo aircraft fleets, we can see that the fighter would require more DLR repair expenditures per flying hour throughout its first 60 years of operation than would the cargo aircraft. (Fighters are only rarely operated beyond 30 years.) Both the negative cargo coefficient and the negative flyaway-cost coefficient contribute to that effect. The $100-million flyaway cost lowers the basic requirement by $79 per flying hour, and the cargo coefficient lowers it another $294 (see Table 5.14).

Table 5.14

Age Affects Depot-Level-Reparable Repair Costs in the Reduced Regression

Results of regression analysis				
Analysis Performed: Sun 03 Mar 2002 22:07:15				
Data set used:				
D:\Documents\Dbases\Analysis\DataFiles\DeflDLRCost				
Rule set used:				
D:\Documents\Dbases\Analysis\Rules\ConsDLRCostRules				
Dependent variable:	LRep$			
Total sum of squares	1.5684E+07			
Regression sum of squares	7.8437E+06			
Residual error	7.8399E+06			
F-Statistic	24.2975			
Degrees of freedom	7,170			
R-squared	0.5001			
Variable	Coefficient	Standard Error	*t*-Statistic	Probability
Constant	421.06569			
Bmbr	417.94321	77.19352	5.4142	1.12E-05
C2	–248.78963	73.65361	–3.3778	1.28E-03
Cargo	–248.99831	47.11592	–5.2848	1.46E-05
Helo	–342.62010	63.21326	–5.4201	1.11E-05
Tnkr	–309.87809	66.92529	–4.6302	5.97E-05
Flyaway	–0.79061	0.09541	–8.2865	1.02E-07
FAge*Fly	0.06626	0.01875	3.5347	8.51E-04

Table 5.15

Depot-Level-Reparable Repair Costs Did Not Decelerate with Age

Results of regression analysis				
Analysis Performed: Sun 03 Mar 2002 22:08:55				
Data set used:				
D:\Documents\Dbases\Analysis\DataFiles\DeflDLRCost				
Rule set used:				
D:\Documents\Dbases\Analysis\Rules\ConsDLRCostRules				
Dependent variable:	LRep$			
Total sum of squares	1.5684E+07			
Regression sum of squares	7.8453E+06			
Residual error	7.8383E+06			
F-Statistic	21.1438			
Degrees of freedom	8,169			
R-squared	0.5002			
Variable	Coefficient	Standard Error	*t*-Statistic	Probability
Constant	417.39865			
Bmbr	413.96890	80.35187	5.1520	1.93E-05
C2	–249.19173	73.89586	–3.3722	1.30E-03
Cargo	–250.91390	48.37646	–5.1867	1.79E-05
Helo	–343.37444	63.52518	–5.4053	1.15E-05
Tnkr	–316.52077	76.15448	–4.1563	1.81E-04
Flyaway	–0.79873	0.10531	–7.5847	2.73E-07
FAge*Fly	0.06781	0.02059	3.2937	1.59E-03
$FAge20^2$	0.03785	0.20503	0.1846	0.8480

Nevertheless, the more-expensive cargo aircraft's requirement grows more rapidly, because of the age–flyaway cost interaction term. Thus, the fighter's DLR requirement would grow about $2 per flying hour each year, but the cargo aircraft's requirement would grow over three times as fast, at $7 per flying hour per year. In that case, the fighter flying 300 hours per year would encounter DLR repair cost growth of about $600 additional repair demands per year, and the cargo aircraft flying 500 hours per year would experience annual growth of about $3,300. Each fighter of a wing of 54 fighters flying 300 hours per year would cause the USAF's DLR repair costs to grow about $32,000 annually, whereas each cargo aircraft wing of 30 flying 500 hours per year would cause about $99,000 annual growth.

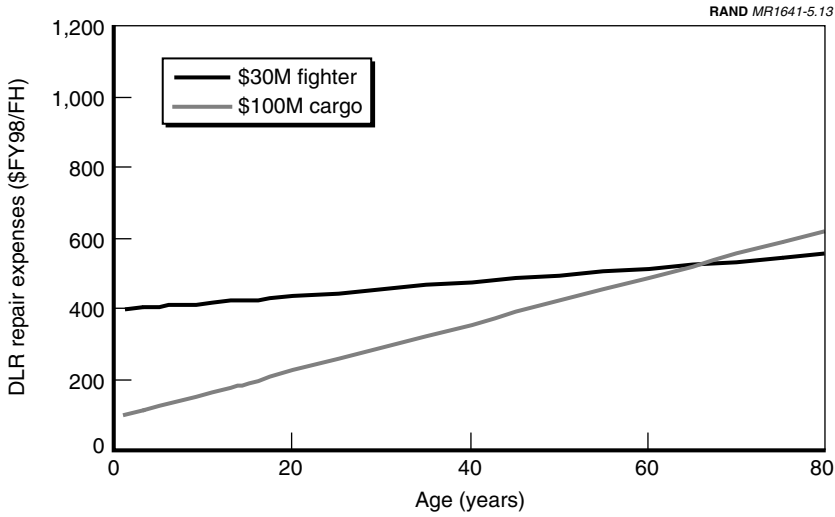

Figure 5.13—DLR Repair Expenditures Grow Steadily as Aircraft Age

Despite the difference in their annual growth rates, it would take over 60 years for the cargo aircraft's DLR repair costs per flying hour to catch up with the fighter's.

While it is difficult to see in Figure 5.14, which shows how aircraft age affects the range of likely DLR repair requirements for a fighter aircraft, the range of likely DLR repair requirements fans out as the aircraft age increases. The fanning-out is more noticeable in Figure 5.15, which shows DLR repair requirements for the more-expensive cargo aircraft.

FINDINGS FOR GENERAL STOCK DIVISION MATERIAL CONSUMPTION

Table 5.16 shows the parameter coefficient estimates for the full regression of General Stock Division (GSD) material expenditures as aircraft fleets age. The full regression found the age–flyaway cost interaction term (FAge*Fly) significantly related to GSD consumption,

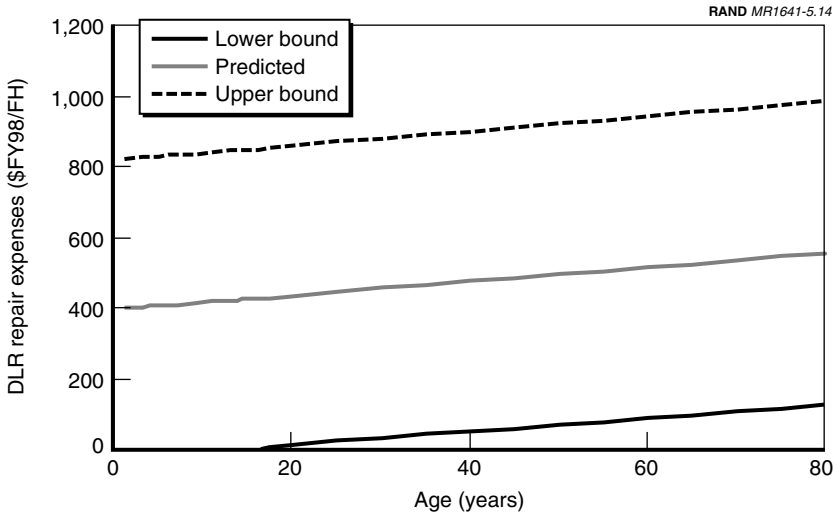

Figure 5.14—DLR Repair Expenditures for Fighters Vary Widely

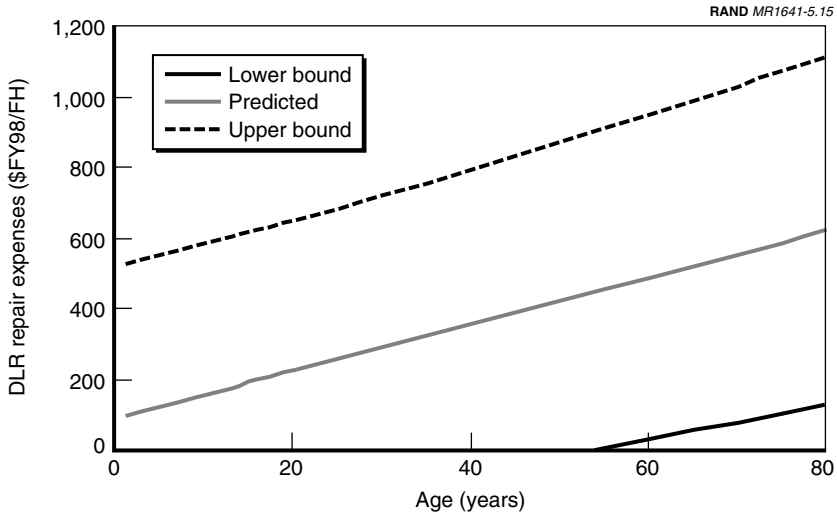

Figure 5.15—Variability in DLR Repair Expenditures for Cargo Aircraft Increases Noticeably as Fleets Age