AIR FORCE FOREIGN MILITARY SALES PAYMENT SCHEDULE CURVES

By

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Introduction

The Air Force is involved in several billion dollars of new weapon systems sales cases and follow-on support cases for foreign countries each year. Each foreign country must pay the U.S. government before the work is performed by the manufacturer. The Air Force then pays the contractor as billed. A payment schedule which projects the expenditure pattern that the Air Force expects to follow in paying the contractor forms the basis for the rate of collections from the foreign government. Provisions covering the possibility of termination of the Foreign Military Sales (FMS) case, i.e., termination liability, are included in the rate of payment.

DOD 7290.3-M, "The Foreign Military Sales Financial Management Manual," provides general payment schedules (i.e., percentage factors) as a guideline for use by the Air Force. However, believing the schedules to be outdated because they were based on expenditure data for older weapon systems, Air Force System Program Offices (SPOs) developed their own estimates of the schedules and used these estimates on Letters of Offer and Acceptance (LOAs). Foreign governments, however, then complained that the SPO estimates were too pessimistic, or in other words, required too much money be collected from the foreign country too early in the case. The Defense Security Assistance Agency (DSAA), and the General Accounting Office (GAO) were sensitive to these complaints and requested that the HQ Air Force Policy and Management Division of the Directorate of International Programs (HQ USAF/PRIM) defend these estimates. The Directorate of Comptroller Support at the Air Force Accounting and Finance Center (AFAFC/CW), was asked to review the published payment schedules with the following objectives: (1) develop a payments schedule curve based on expenditure data reflecting current weapon systems; (2) develop an accurate and defensible analysis to support the rate of termination liability incurred by U.S. contractors; and (3) examine the actual time period from LOA signature to contract award. The following summarizes the expenditure and termination liability analysis that resulted from our review at AFAFC/CW. This review led to the development of new payment schedule curves for not only complete aircraft, but also spare engines, spares, and support equipment. During the analysis process, we also noted that some assumptions made in the past were incorrect regarding the application of payment schedule curves and the start of payments in relation to delivery.

Expenditure Authority

First, we had to find data that had incremental disbursements to contractors for FMS cases and lines. Also, we needed contract numbers, FMS case and line item designations and explanations, LOA signature dates, contract signature dates, and delivery schedules. No single data source contains all this information.

Most needed were disbursement data. Two sources existed that contain monthly disbursements by FMS case and line item. The first was the Departmental Accounting Data Base (DADB) maintained at the Air Force Accounting and Finance Center, but this source contained only four years of automated data. The other source of disbursement data was the Acquisition Management Information System (AMIS) financial disbursement history maintained at HQ AFSC/PMQ, Wright-Patterson AFB OH, which contained monthly payments on contracts managed by the Air Force Contract Management Division (AFCMD). These data were by line and contract number and were from FY73 through FY84. Delivery schedules were obtained from the contractors, the appropriate SPO, and HQ USAF/PRI. We obtained general case information from the Security Assistance Accounting Center (SAAC); contract signature dates from the SPOs; and LOA signature dates from the Air Force Accounting and Finance Center.

For the most part, we used the AMIS data base for our analysis since it covered a longer period of time and included more cases. In addition to FMS data, we also used USAF procurement data in both DADB and AMIS.

To develop an expenditure curve, cumulative disbursements of all FMS cases/lines and U.S. buys had to be related on a common time line for comparison. The time line was determined to begin with the first payment or contract signature, and conclude with the last payment at the last delivery. We computed the percentage that the cumulative disbursement represented of the total case line for each quarter. This cumulative disbursement percentage for each line and each U.S. buy was the basis of the expenditure curve development. The average length of the time line from contract signature to last delivery was 11 quarters.

Initially, to develop a composite curve, we considered the cumulative percentage disbursement for current and major weapon sales (F-15 and F-16) to foreign countries. The composite curve would be an average of the cumulative disbursement percentages. However, many of the FMS cases had to be eliminated when developing the composite curve due to abnormalities in the case histories. For example, the Egyptian Peace Vector F-16 cases were not used because Peace Vector I was a diversion from USAF assets and Peace Vector II was not yet complete; final delivery was not scheduled until FY85 and our data base concluded with the end of FY84.

Likewise, the Israeli F-16 case, Peace Marble II, did not have final delivery scheduled until FY86. Therefore, the Israel F-16 data for Peace Marble I were used instead of the average of Peace Marble I and Peace Marble II. The Korean F-16 case, Peace Bridge, was also not complete and could not be used. Similarly, the Pakistan F-16 Peace Gate case data were not used since Peace Gate I was a diversion and Peace Gate II was not yet complete. Finally, the Venezuela F-16 case, Peace Delta, was not used in the study because it involved both accelerated and incomplete deliveries which would have distorted the analysis.

The cases/U.S. buys that did appear to be normal are listed in Table I. Notice that the U.S. buys were important in computing the composite curve. The four aircraft lines selected were averaged to determine the composite expenditure curve, "COMP", in Table I.

TABLE I
AIRCRAFT PAYMENT HISTORY
CUMULATIVE PERCENTAGES OF TOTAL DISBURSEMENTS

A/C CC Qtr	F-15 ISRAEL	F-15 US	F-16 US	F-16 ISRAEL	COMP
0					
1	1		1		1
2	6	4	3		4
3	16	8	9		11
4	25	20	21	18	21
5	35	41	39	27	36
6	53	67	59	38	54
7	76	84	74	53	72
8	89	95	87	74	86
9	98	97	95	91	95
10	100	100	100	100	100

The aircraft and country code are the column titles. The time line is the quarter from first disbursement to last delivery (LD). Contract signatures occurred, on the average, one quarter before the first disbursement. Each column represents the aggregate of cumulative disbursement percentages for that country's purchase of that particular weapon system.

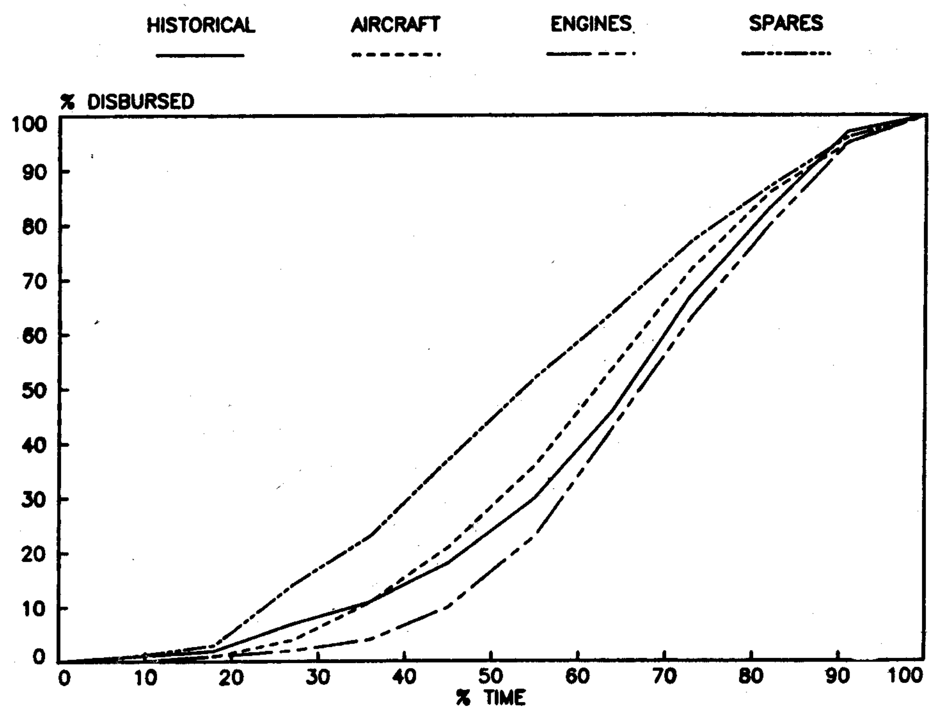
The same procedures were applied to spare engines and spares disbursement data. The composite expenditure curves are displayed graphically in Chart I along with the historical Air Force curve.

Probably the most important change from the historical curve was the delay in starting. Analysis of the expenditure data showed that there was a two-quarter or six-month delay from contract signature to the first significant payments for aircraft. After about six months of a contract, the data followed a steeper curve than the historical curve portrays. The delay in seeing first payments was even more exaggerated for engines and spares.

Support equipment data proved to be too erratic to develop a composite curve. Since support equipment costs were a relatively small percentage of the total case values, the composite aircraft curve was recommended for support equipment.

CHART I

EXPENDITURE CURVES



Termination Liability Analysis

The most difficult portion of the analysis was determining the amount a country should pay to cover an unplanned contract termination. The amount of termination liability that must be included in each payment is to cover an incremental cost of the build up of labor and material that the manufacturer has made to complete the contract. Termination liability is a function of future expenditures. For example, a contractor bills for completed work. At the same time he is accruing costs that will be charged at the end of the next billing period. If a country were to terminate a contract, the U.S. would be liable to the manufacturer for his accrued costs. The U.S. government, therefore, must obtain advance collections to meet a termination contingency.

The SPOs, for the most part, use the contractor estimate for termination liability. The Fighter Attack SPO said that while it generally uses the contractor estimate, it believed that termination liability led disbursements by three months. At General Dynamics, Mr. John Denheyer has done some estimates on termination liability for long lead contracts. He believes that termination liability incurred leads disbursements by six months. A cost analyst at McDonnell Douglas claimed that 25 percent of the way through the program, termination liability led disbursement by eight months and 50 percent of the way through the program, termination liability led disbursement by five to six months. Pratt and Whitney provided a copy of their termination liability curve which showed that they believe that liability leads disbursement by 12 months at the beginning of a program, and drops to 10 months ahead about 50 percent of the way through the program. To investigate these varying estimates of termination liability, we had to look at the breakout of labor and material for the prime and sub-contractors.

General Dynamics provided a breakout of airframe material and labor (Table II). Sixty-nine percent of the total airframe cost was labor, 17 percent was sub-contractors (primarily avionics), and 12 percent was provided by the European Participating Governments (EPG). Thirty-one percent of the airframe costs was material, of which seven percent was that of the sub-contractors.

TABLE II
TERMINATION LIABILITY DETERMINATION
GENERAL DYNAMICS LABOR/MATERIAL BREAKDOWN
(PERCENTAGE OF TOTAL COST)

	Labor	Material	Total
GD	40	24	64
SUB-CON (Avionics)	17	7	24
EPG	12	--	12
TOTAL	69	31	100

Also, according to General Dynamics, the administrative lag for accruing labor costs was approximately one month, and the billing procedure was another two weeks. For this reason, 1.5 months multiplied by the 40 percent of the labor attributable to General Dynamics determined a weighted average of time which represented the liability incurred for prime contractor labor (Table III). Similarly a weighted average of time for liability incurred for raw materials of the prime contractor was computed by multiplying the percent of the total contract that was prime contractor materials (24 percent) by the lead time that exists for materials (six months). This material lead time was a conservative estimate (according to Mr. Denheyer at General Dynamics) and appeared reasonable because many raw material contracts involved payment on delivery, and many small job shops did not have "automated" accounting systems and billed in a sporadic fashion. The lead time consists of the time the provider of materials starts to incur liability to the time the sub-contractor bills General Dynamics (approximately 4.5 months) and the time General Dynamics records the bill and in turn bills the government (1.5 months). The sub-contractors' labor (17 percent of the total contract) multiplied by their accruing and billing time, plus General Dynamics' accruing and billing time (1.5 months plus 1.5 months), resulted in the weighted average of time which was liability attributable to the sub-contractors' labor. The sub-contractors' material liability lead time was seven percent times the material lead explained above, plus accruing and billing time (6 months plus 1.5 months). The EPG liability lead time was calculated by multiplying their portion of the contract (12 percent) times accruing and billing time (1.5 months).

TABLE III
LIABILITY LEAD-TIME TO DISBURSEMENTS
(AIRFRAME)

G D Labor	1.5 Mo x .40 = .60
GD Raw Materials	6 Mo x .24 = 1.44
Sub Cont Avionics Labor	3 Mo x .17 = .51
Sub Cont Avionics Materials	7.5 Mo x .07 = .53
EPG	1.5 Mo x .12 = .18
	Average 3.26

Summing all these weighted averages of liability lead time, we found that the average liability lead time over the term of an airframe contract was 3.26 months. The same process was applied to engines. According to Howard Manetti of OASD (PA&E), 50 percent of engine contracts related to prime contractors and 50 percent to sub-contractors. Of the total, the prime contractor portion is 45 percent for labor and five percent for material. The subcontractor is split 40 percent labor and 10 percent material. The lead times are assumed to be the same as for an airframe. Avionics were assumed to be the same as engines. The weighted average of liability lead time for engines and avionics over the life of the contract was 3.03 months.

Table IV is a composite of the airframe (60 percent of the total contract according to contractor estimates), engines and avionics (30 percent of the total contract), and government furnished equipment and materials (10 percent) which were assumed to have a three-month lead time. The composite weighted average is 3.2 months.

TABLE IV
LIABILITY LEAD-TIME
(COMPOSITE)

Airframe	.60 x 3.26 = 2.0
Engine/Avionics	.30 x 3.03 = .9
GFE/GFM	.10 x 3.00 = .3
	Average 3.2

Since a spare engine expenditure curve and a spares expenditure curve were estimated, we also computed weighted average lead times for engines and spares. The weighted average for engines was 3.0 months of liability lead time to disbursements, and for spares the weighted average was 3.9 months.

Thus far in the termination liability analysis, we found that: (1) General Dynamics did an extensive study on long lead contracts and found termination liability lead time to be six months; (2) analysis of the labor and material lead time liability showed that liability incurred over the life of a contract averaged 3.2 months ahead of disbursements for aircraft, 3.0 months for engines, and 3.9 months for spares; (3) McDonnell Douglas and Pratt and

Whitney estimated longer lead times than General Dynamics, but both claimed that the lead times decreased over time; and (4) termination liability was zero at the end of a contract, that is, at final delivery. The AMIS data confirmed that the contractors got all of their money when the final item was delivered.

The extensive study that General Dynamics did on long lead contracts was convincing; however, a six-month lead over disbursements did not hold throughout the contract since the lead time analysis showed a weighted averaged of 3.2 months overall, and we knew that, at the end of the contract, the termination liability was zero. To develop the termination liability curve, we assumed a six-month lead time at the beginning of the contract and zero at the end. The middle portion of the curve was smoothed so that the lead time, multiplied by the percentage of dollars expended, had a weighted average of 3.2 months. Table V is the recommended payment schedule. The column entitled "T/L Lead Time (MOS)" is the smoothed lead time curve. "FD" is the first delivery, and "LD" the last delivery. The weighted average of that smoothed curve is 3.2 months. This average was determined by breaking out material and labor lead time build up.

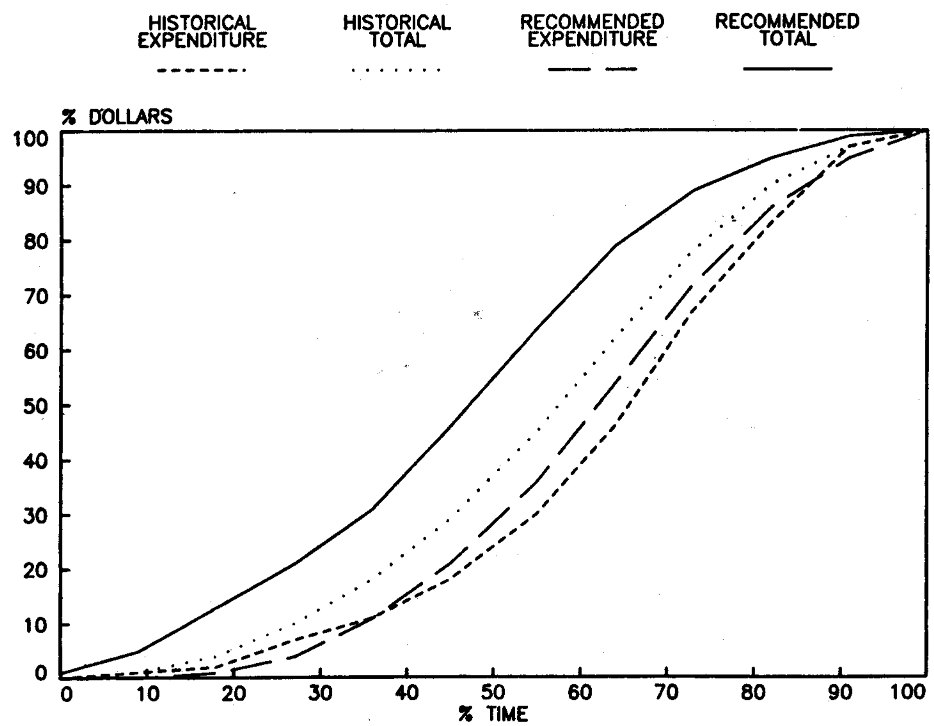
TABLE V
RECOMMENDED AIRCRAFT
PAYMENT SCHEDULE CURVE

	Expenditure Curve	T/L Lead Time (MOS)	T/L Lead Time Applied	Payment Schedule
0	0	6	1	1
1	0	6	4	5
2	1	6	11	13
3	4	5	18	21
4	11	4	26	31
5	21	3.5	39	46
6	36	3	54	64
7 (FD)	54	2.5	69	79
8	72	2	81	89
9	86	1.5	90	95
10	95	1	97	99
11 (LD)	100	0	100	100
		Weighted Average = 3.2		

The "T/L Lead-Time Applied" column is the termination liability lead time curve applied to the expenditure curve. The final recommended "Payment Schedule" column includes profit and contractor hold back. Chart II is a graphic portrayal of the recommended aircraft payment schedule curve. The proposed expenditure curve and "total" payment schedule curve are shown in comparison with the historical Air Force curve. This shows that the historical curve in DOD 7290.3-M was predicting expenditures too early but was not estimating nearly enough termination liability. This is probably why the SPOs began submitting their own estimates. However, we believe that the SPOs, mostly because they accepted contract estimates of termination liability, were overestimating the rate of payment. Substitution of our curve for the SPO estimates will slow down the rate of payment in every case. This can be seen in an application of the curves to an actual case (Chart VI).

CHART II

PAYMENT SCHEDULE CURVE - AIRCRAFT
(Historical Versus Recommended)



In DOD 7290.3-M, the assumption was that one generic curve was good for spare engines, and spares, as well as aircraft. Using the same procedures as described for new aircraft curves, we developed separate curves for spare engines (Chart III) and spares (Chart IV).

Time Lines

During the course of the study, some facts concerning time periods from LOA to first payment were discovered. Historically all contracts for aircraft, spare engines, spares, and support equipment were estimated to be signed three months after LOA signature date; however, after examining the major weapon system sales, we found this to be true only for aircraft and spare engines. Table VI (numbers are fiscal year and quarter) shows that for six major cases, the average time from LOA signature to the time when payments were made was two quarters.

CHART III

PAYMENT SCHEDULE CURVE - ENGINES
(Historical Versus Recommended)

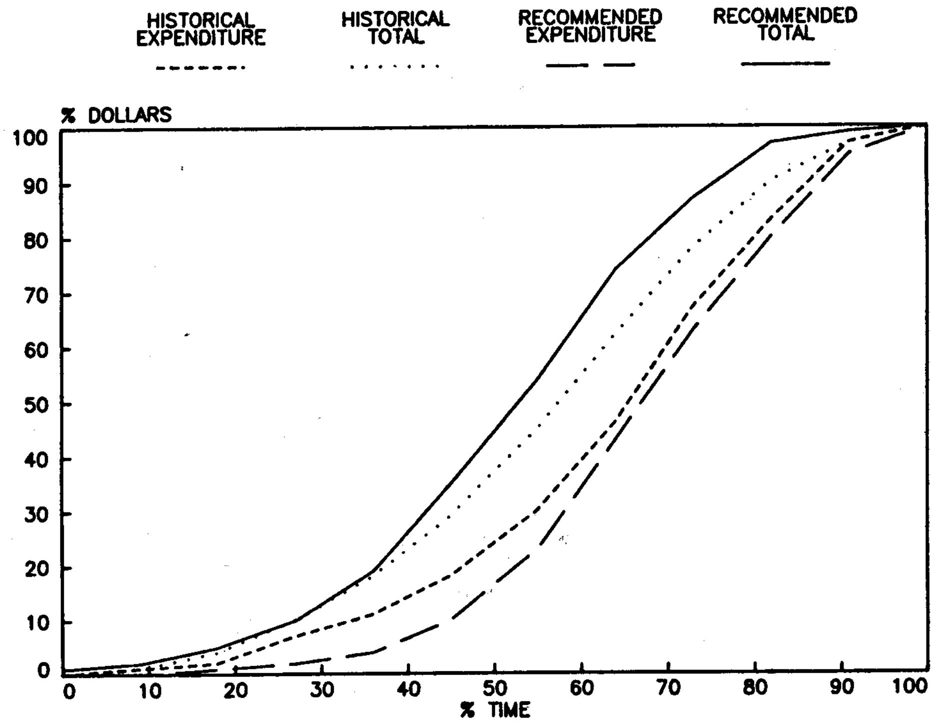


CHART IV

PAYMENT SCHEDULE CURVE - SPARES
(Historical Versus Recommended)

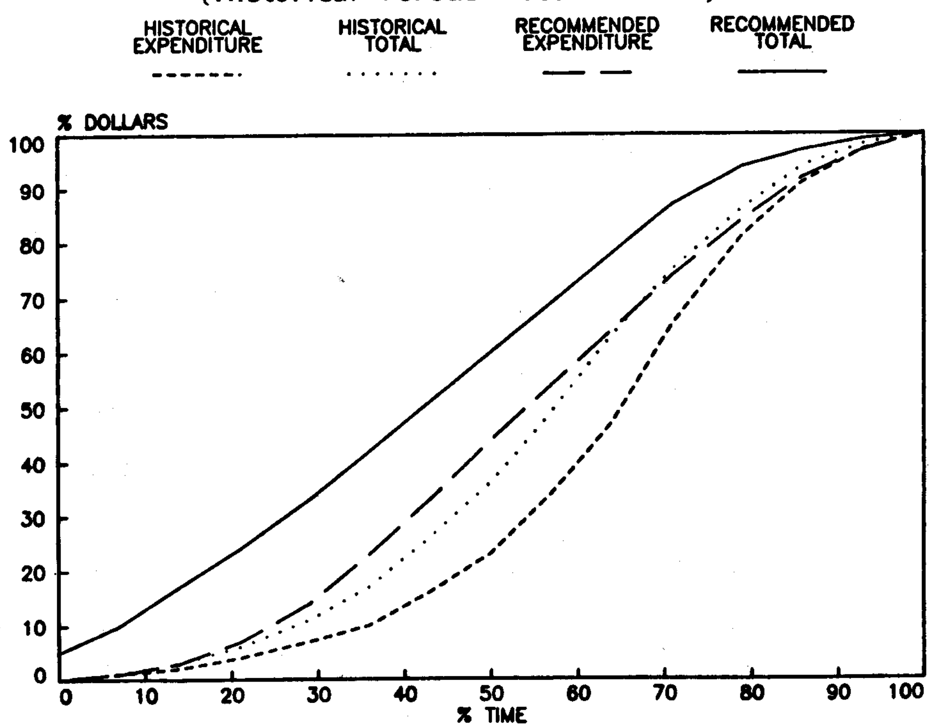


TABLE VI
TIME LINES

Case	LOA Qtr	First Pay Qtr	DIFF
A	822	824	2
B	814	822	2
C	783	792	3
D	783	791	2
E	761	762	1
F	822	824	2
		Average =	2

This is significant for applying the payment schedule. Based on the times we noted in our analysis, we proposed the following times be used:

(1) Contracts for aircraft and spare engines are signed three months after LOA.

(2) Contracts for spares are signed 12 months after LOA.

(3) Last delivery of spares is six months after last aircraft delivery.

(4) Contracts for support equipment are signed six months after LOA.

Conclusion

To test our recommended curves, we applied them to an actual case and compared them to the curves published in DOD 7290.3-M and to the curves published on the LOA developed by the SPO. Chart V is a comparison of those three expenditure curves. As we suspected, the curve originally estimated on the LOA was more pessimistic, requiring more money to cover expenditures up front. Our curve lagged behind the DOD 7290.3-M curve, as expected.

Chart VI shows the comparison of the total payment schedule curves for the same case. Our recommended curve leads the DOD 7290.3-M curve which was not allowing enough time for termination liability. As in the expenditure curve comparison, the SPO curve was more pessimistic than our curve.

In summary, the two major recommendations from our study were:

(1) The historical expenditure curve and termination curve should be replaced with three new curves--one for aircraft, one for spare engines and another for spares. Support equipment and other miscellaneous equipment should use the new aircraft curve. These new curves reveal that expenditures initially will be lower than those currently being shown (Chart I). However, the termination liability is much greater than the historical curve projected in DOD 7290.3-M (Charts II-IV).

CHART V

36 F-16s

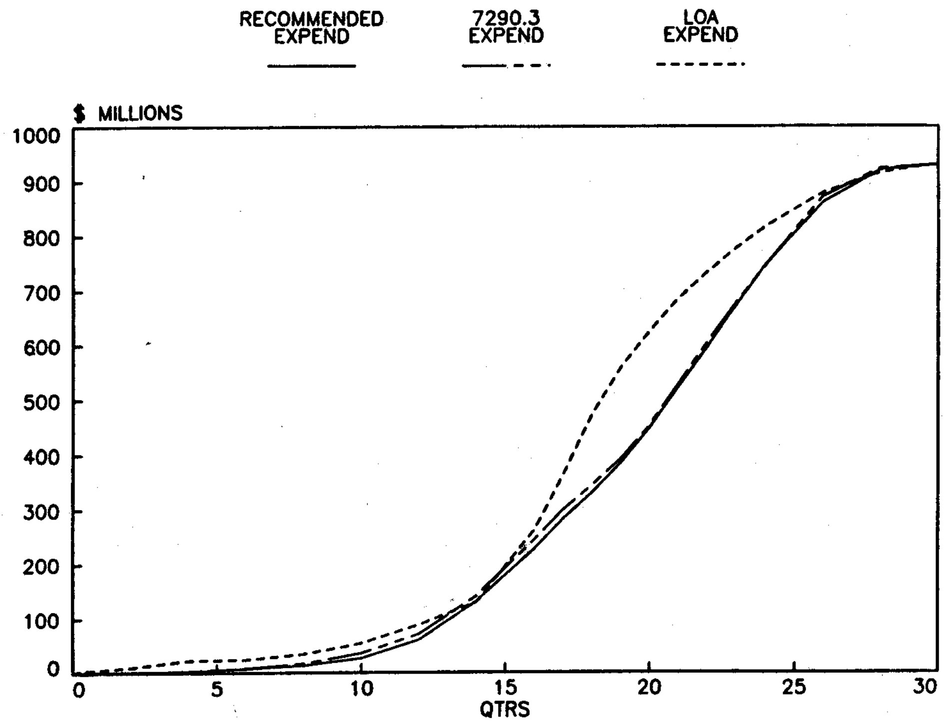
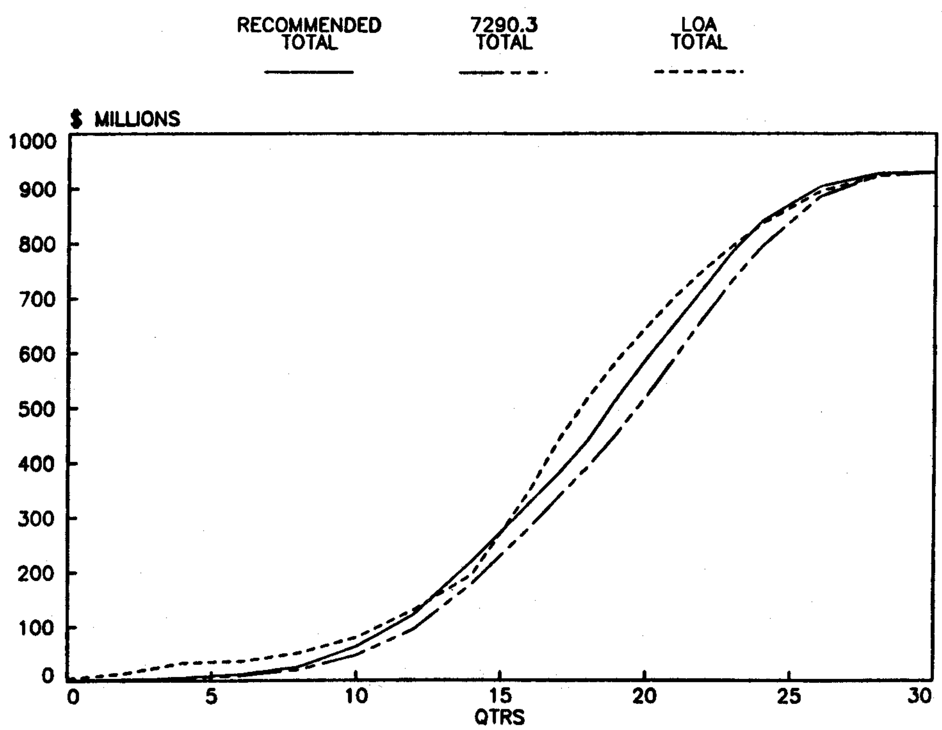


CHART VI

36 F-16s



(2) Currently, LOAs assume that all contracts for aircraft, spares, spare engines, and support equipment are signed three months after LOA signature date. This assumption is appropriate for determining disbursements for aircraft and spare engines. However, spares contracts do not normally commence until 12 months after LOA signature, and support equipment, until six months after. Furthermore, in the past, delivery of spares has been estimated to be the same as that of the aircraft. In reality, deliveries of spares are completed six months after the last delivery of the aircraft.

Results of Study

After completing our study, we briefed the Air Force FMS Steering Group, chaired by the Director of International Programs. The Air Force Systems Command and the International Logistics Center, Air Force Logistics Command, were given the opportunity to review the results. The FMS Steering Group then approved the new curve. Subsequently, the Policy and Management Division, Directorate of International Programs, implemented the new curve and prepared instructions and training for the curve's use throughout the Air Force.

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