7.4 DTC Implementation for Lifecycle Cost Using Information of Difference

7.4.1 What is Lifecycle Cost Design?

Lifecycle cost points at the total expenses necessary for a product, from its procurement to the end of its use by a user; which means that designing the lifecycle cost will be either of the following two things:

(1) Searching for and adopting a design plan which brings a low lifecycle cost and unit price.

(2) Adopting a design plan which requires some extra manufacturing costs, but brings down the total lifecycle cost, including the unit price, to a cost a few times less than the investment cost.

7.4.2 Lifecycle Cost Design using Information of Differences

In general, when you try to design the lifecycle cost, you are unable to judge which design plan is better unless the estimates of the product's lifecycle cost are comparable. Even if you can estimate the lifecycle cost of the product, you will find out that extremely complex prerequisites are necessary for estimates. At the same time, if you come to think that the estimate results contain a large error, the merit difference of the lifecycle cost through comparisons of design plans will seem to be overwhelmed by error. As a result, you will feel that comparison of the design plan itself is meaningless.

In order to avoid running into these problems, adopt the rules in Table 7.4-1 "Principle of Lifecycle Cost DTC by Information of Differences." See examples of the calculation model of the lifecycle cost in Table 7.4-2 and of the DTC trade study example which brought a large difference in the lifecycle cost in Figures 7.4-1 and 7.4-2.

Table 7.4-1 Principle of lifecycle cost DTC by information of difference

(1) Define the lifecycle operation time(e.g.7500hours)
(2) Focus only on the difference between the comparative design ideas in lifecycle cost
(3) Compare the difference between the increasing or decreasing of production cost and operating cost of total life in the same year cost (Each one consists of consumer price, wage cost, fuel cost, repair part cost etc.)

〈Necessary conditions prior to thinking〉

A. Assume that the interest rate of investment roughly compensates the inflation rate of money.
B. The comparison objective scopes are in the extent of the following (4).
It is acceptable to calculate them by rough comparison.

(4) The comparison of lifecycle cost must be proceeded in the following cases of design:

A. When the lifecycle cost difference between comparative plans is predicted to be more than 1/100 Of unit production cost
B. When the design theme should be examined from the standpoint of reliability and maintainability, Because effectiveness of reliability and maintainability largely depends on the created and selected design idea.
C. When the customer wants to proceed with a lifecycle cost trade study, because the customer has a different stand point from manufacturers.

(Note) This principle was officially approved in XT-4 Project of JDA(Japan Defense Agency)

  ISBN 0-941243-00-1

Table 7.4-2 Calculation model of lifecycle cost (By S. Fujisaki)

	CAT.	Item		Formula	Mil $	Note
LCC	Development cost(A)	Basic design		ΣDi ＋ ΣTi		Di ; EngineeringM/H　Ti ; Test cost
		Jet trainer detail design		ΣDi ＋ ΣTi		Di ; EngineeringM/H　Ti ; Test cost
		Prototype	MAT'L cost	Σβiωi+ΣAi+ΣCi		Ci ; Development cost
			FAB.cost	(1+k) Σβi Ni		βi ; Basic unit cost of each category ωi ; Item in each catifory Ai ; Unit price of part
			Direct cost	ΣEi		
			Equipment cost	ΣAi ＋ ΣCi		Electronics equipments are GFE in production measuring equipments are only for prototype
		Static load Test		Σβiωi+ (1+k) Σβi Ni +ΣDi		Σβiωi ; Material cost (1+k) Σβi Ni ; Fabrication cost
		Fatigue test		Ditto		Ditto
		Flight test spport		ΣDi		Di ; Engineering M/H
		Sub total		"A"		
	Production cost(B)	Material cost		Σβiωi+ΣAi		βi ; Basic unit cost of each catogory ωi ; Item in each catogory Ai ; Unit price of part
		Fab.cost		(1+k) Σβi Ni		k ; Coefficient of assy/Fab cost Ni ; Item in each category
		Direct cost		ΣEi		Ei ; Expenses of each category
		Amotize cost		1/200ΣSi		Si ; JIG cost
		GFE cost		ΣAi		Ai ; Price of each part
		Sub-total		"I"		
	Operation cost®	Maintenance part cost		Σ {Ai× (7500/MTBF) Note)}		Ai ; Basic unit cost MTBF ; Mean time between failure
		Fuel & oil cost		7500 ΣLi/FH		Li/FH ; Fuel and oil cost per flighr hour
		Maintenance cost		7500 ΣGi/FH		Gi/FH ; GFE expenses per flight hour
		Scheduled maintenance cost		αΣ {(7500/Ti) (*) Mi}		α ; M/H rate　Ti ; Time between inspection Mi ; M/H for each item
		Un-scheduled Maintenance cost		αΣ {MTTR×n× (7500/MTBF) (*)}		MTTR ; Mean time to repair n ; Number of person assigned for repair
		Sub-total		"R"		
		Total		"A+I+R"		

＊ Note ：Sub stract 1, if 7500/MTBF = Integral number, because the final maintenace is not necessary before disuse.

Fig. 7.4-1 DTC trade study example

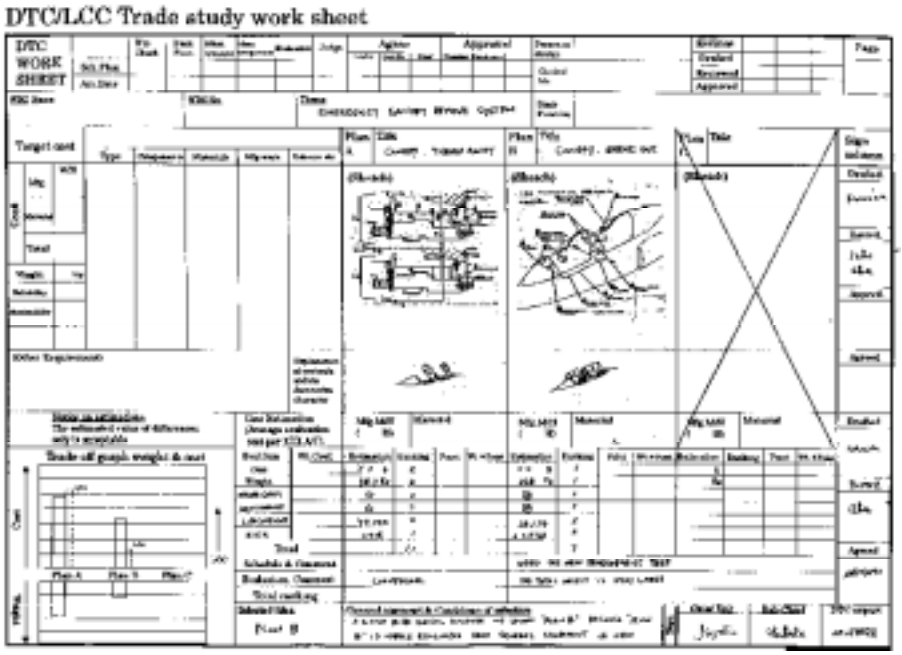

Fig. 7.4-2 Lifecycle cost calculation of Fig. 7.4-1